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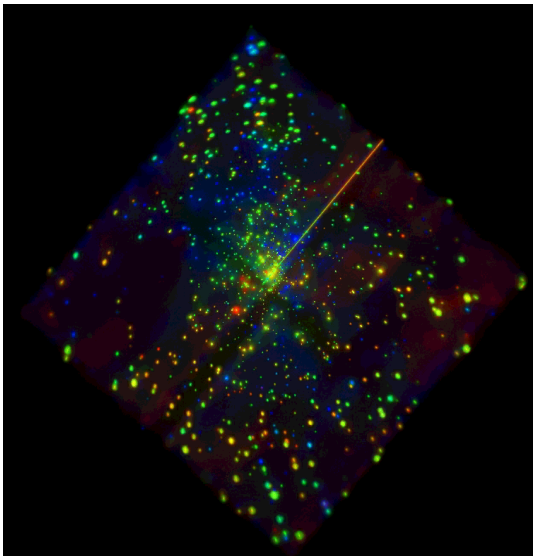

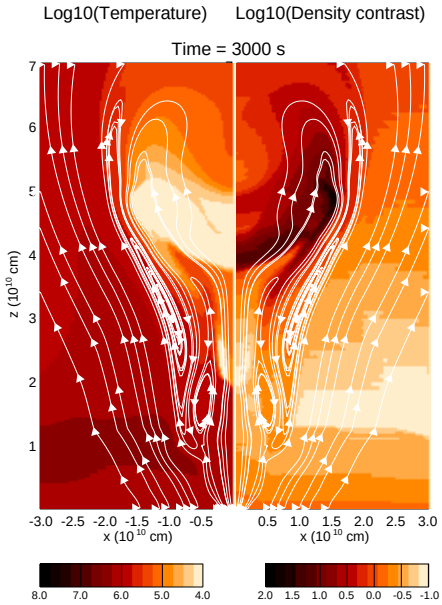

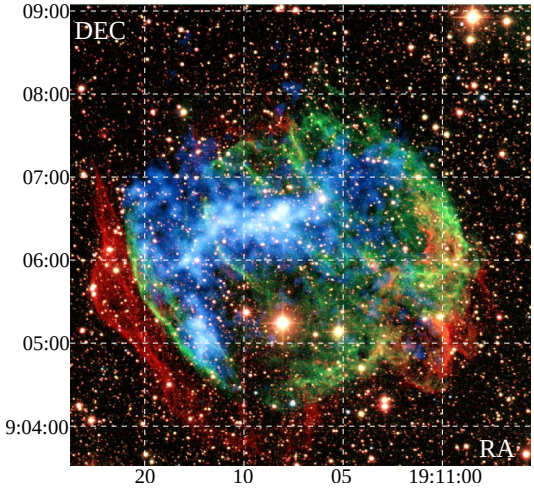

ACTIVITY REPORT

2004–2007

Captions:
Upper left: X-ray image of the Orion star forming region, observed for 850 ksec with Chandra/ACIS-I (Chandra Orion Ultradeep Project).
Upper right: 2-D MHD simulation of a Coronal Mass Ejection performed with the FLASH code at the OAPA SCAN. The two panels show the temperature (left) and density (right) contrast at a given time; white lines trace the magnetic field.
Lower left: X-ray beam line and vacuum pipe of the X-ray Astronomy Calibration and Testing (XACT) facility.
Lower right: Combined image of the supernova remnant W49B observed in X-rays (K-shell Fe XXV emission in blue), and in IR (H_2 2.12 μm emission in red, [Fe II] 1.64 μm in green).)

This document has been prepared by S. Sciortino, the OAPA Director, with the contributions of M. Barbera, F. Bocchino, I. Chinnici, A. Collura, A. Maggio, G. Micela, S. Orlando and F. Reale. Special thanks to A. Maggio and D. Randazzo for their painstaking work to prepare the list of publications.

Palermo, October 9th 2007

Contents

1 The National Scenario

Until 2000 the Italian astrophysics was organized in 12 independent Observatories (hereafter OOAA), 3 institutes of the National Research Council (CNR) and several university research groups. The OOAA operated under the supervision of a ministry advisory body, the Council for Astronomical Research. Starting with 1996 a national consortium (CNAA) of the 12 Observatories was constituted with the specific aim of funding and running the big national enterprises, mainly for the optical/IR astronomy from ground. The CNAA had a sizeable amount of fresh additional resources (about 5 Meuro/year in today spending value) of which the Italian astrophysics has benefited until 2001. The 3 CNR institutes were mainly focussed on radio-astronomy, on high-energy space physics, on plasma space physics and solar system studies; research activities from space were and are entirely funded by contracts with the Italian Space Agency (ASI). In 2000, after a long gestation period, the Italian Parliament approved a law for the foundation of the Italian National Institute of AstroPhysics (INAF) by the merging in a single national institute of the 12 OOAA. Factually INAF started to operate January 1-st of 2001. In the spring of 2003 the new ministry decided to actuate a reform of national research institutes (Enti di Ricerca) and, as a result, the ”2001 INAF” and the 3 CNR astrophysical research institutes have been merged in a new INAF that was directed by a special administrator until the end of 2003. The motivation was to have a unique national institute to drive the entire Italian astrophysical research, and, in particular, the realization and running of big national enterprises. The university professors (as well as any other scientist interested in the INAF activities) can ask to be associated to INAF, gaining the right to participate to INAF internal AOs for resources, to vote for, and to be elected in, the INAF scientific bodies by taking some obligations with respect to INAF scientific plan, etc..

Table 1: Breakdown of Italian Astrophysics human resources(1)

Position	December 2003			December 2006
	ex-OOAA	ex-CNR	INAF	INAF
Permanent Staff: Researcher	315	202	517	571 (527+44)
Permanent Staff: Other(2)	420	129	549	508 (478+30)
Temporary Staff: Researcher	184	100	284	316
Temporary Staff: Other	33	20	53	30
Total Permanent Staff	735	331	1066	1079 (1005+74)
Total Temporary Staff	217	120	347	346
Total Staff	952	451	1403	1425
University Professors active in Astrophysics				$\sim$ 200

Notes:
(1) - Data taken from INAF official triennial plan documents
(2) - The number given in the 2006 column is the sum of the already permanent staff (first number in parenthesis), and of those that will become permanent employed soon, thanks to a recently approved Italian law (second number in parentheses).

At the end of 2003 1403 people worked within INAF research structures (this and all following numbers do not include people working either at INAF central offices or at CNR central offices), about 30% of which had temporary positions. This number has increased to 1425 at the end of 2006. The temporary positions are 32%, most of which on short-term (typically 1 year long) contracts. In the most optimistic description by considering as permanent those positions that will become soon (but are not yet), the temporary positions are 25% of the total INAF employes[1]. On the other hand a substantial part of research

[1]Those 25% temporary staff typically have a low salary level and a quite reduced social security coverage. The salary is

activity within INAF is performed by those young people. A detailed position breakdown and its temporal evolution is summarized in table 1.

The distribution among the three career levels of researchers in the OOAA and CNR institutes was strongly pyramidal and is strongly pyramidal within INAF, while the university professor career distribution among the three levels has today a more or less cylindrical shape.

To complicate the matter, while all former OOAA employes (both researchers and non-researchers) had the same status of the university staff, and, in particular, the OOAA researchers were selected with the same rule and can interchange with the university professors, with the foundation of INAF its staff belong (indeed should belong ..) to the research branch of national labor contract (the same of the ex-CNR staff). A procedure to ”move” the entire ex-OOAA staff in the new legal status was envisaged, but with the prescription that OOAA researchers can choose between the old and the new status (this freedom of choice was compulsory given the Italian law). As of today there is still uncertainty on the rules of such a procedure, the last stop has come from one of the ministry that has not given its needed approval to the agreement reached between INAF and the Unions in the spring of 2007. This situation continues to determine a great level of distress among INAF personnel.

Setting apart the compulsory expenditures for salaries and the incompressible running costs, since 2002 the available INAF resources have decreased. In the last triennial plan the INAF special administrator states that, to run at the best the Italian astrophysics, INAF needs about 120 Meuro per year from the University & Research Minister (MUR), while the last (2006) resource transfer from MUR was of about 84 Meuro. In the spring of 2007, as a result of the financial crisis and other controversial decisions, the credibility of the entire INAF board was strongly questioned by INAF personnel, by INAF Scientific Council – that has resigned in the Ministry hands – and by all the Directors of INAF Research Structures. In May 2007 the new ministry has decided to nominate a special administrator to run INAF in view of a new planned reform of Research Institutions (Enti di Ricerca). This reform was strongly requested from a large part of the scientific community to overcome the drawbacks of the 2003 reform. A law to delegate the Ministry to actuate the new reform has been approved on September 19-th 2007 by the Italian Parliament.

In conclusion the Italian astrophysical research system has already gone under two reforms (in 2000 and in 2003), both of which were not brought to the end, and both of which were planned as zero-cost reforms, and now we are waiting for a third one, likely to occur in the next 6-12 months. The special administrator has decided to ask an ad-hoc panel of 6 INAF senior researchers (one of them is the OAPA Director), elected by the Structure Directors and by the elected representatives of INAF science community, to prepare a document describing a possible INAF asset for the years to come. Document drafts have been publicly discussed in a couple of meetings in June and end of July 2007, and the final emended version was sent by the ad-hoc panel to the special administrator at the beginning of August 2007 and to their electors at the end of September 2007.

2 Structure Outline and Internal Organization

The Osservatorio Astronomico di Palermo, that had lost in 1923 its status of ”Ente di Ricerca”, was reinstalled among all the other Italian Observatories in 1988 after a decade of frantic resurrection of research activities thanks to the, seemingly, endless energy and vision of Giuseppe S. Vaiana, the Director at that time. Vaiana was one of the founders of X-ray astronomy and an internationally recognized scientist in the field of solar and stellar coronal studies.

Since its re-foundation the OAPA has a specific vocation in the field of X-ray Space Astrophysics that is the core of the ongoing research activities. In pursuing this research line OAPA has realized the

typically intermediate between that of a graduate student and of a junior researcher.

XACT facility for the development and calibration of X-ray optics, large area filters and detectors and has reached an internationally recognized reputation in the field of X-ray solar and stellar astrophysics, and more generally of multi-wavelength studies of stellar systems. During the last decade the scientific and technological activities have been extended, thanks also to specific financial resource of the Sicilian Regional Government, to the development of optical/IR spectrographs for big telescopes. Moreover OAPA has a strongly rooted interest in high performance numerical modelling (OAPA has obtained special funds – 1 Meuro in today spending value – from Italian University and Research Ministry in 1999); it has been strengthened thanks to Sicilian Regional Government funds that in 2004 have allowed to acquire a state-of-the-art Linux cluster parallel system, and very recently it has allowed the deep involvement of OAPA in the PI2S2 (*Progetto per la Implementazione e lo Sviluppo di una e-Infrastruttura in Sicilia basata sul paradigma della GRID*) project of the Sicilian COMETA (*COnsorzio Multi Ente per la promozione e l'adozione di Tecnologie di calcolo Avanzato*) consortium[2]. The PI2S2 has been approved in 2006 by MUR on the PON (National Plan for UE Objective 1 Regions) resources and has a 3 year budget of about 11.5 Meuro, 25% co-funded by consortium partners and 75% consisting of fresh financial resources. The INAF share of them is 1.5 Meuro, half to be invested in Palermo and half in Catania.

The high level qualification is demonstrated by the fact that in the last 3-4 years the OAPA scientists:

- have obtained, in reply to competitive selections for research activities, financial resources from ASI (4 programs for data analysis), from Sicilian Regional Government, from MUR national programs (PRIN, 3 have closed at end of 2006), from MUR Special program for High Level Formation and Research (1 has closed in September 2007), from MUR-PON (National Program for UE Objective 1 regions; 2 programs closed during 2006), from UE (3 out of 4 programs still active) and from INAF national programs (5 programs still active). All together those financial resources are much larger than the sum of financial resources transferred from INAF to cover OAPA running and basal research costs;

- are responsible of INAF national programs and have had key roles in the preparation of INAF programmatic scientific documents such as that for the long-term program of the Italian High-Energy Astrophysics;

- have an ample network of international collaborators all over the world, and have been and are part of national and international scientific committees for the allocation of observing time of big observational facilities (INAF TNG, ESO Telescopes, XMM-Newton, Chandra), for the verification, planning and selection of ESA space astrophysics programs as well as for the distribution of resources from the ASI-INAF national contracts for data analysis and future mission studies.

OAPA is still a numerically small INAF research structure, this allows a continuous day by day interaction among the entire personnel and between the personnel and the Director. The interaction is necessarily less frequent with the people working in the separate, a couple of kilometers apart, laboratory building.

Given the OAPA size, no strong need has been felt to have formal meetings of an "informal" (since INAF regulation has no-provision for it) scientific board of the research structure. From time to time ad-hoc meetings are called by the Director to openly discuss key questions.

From a functional point of view, OAPA is organized in the (understaffed, see below) administrative office, the general service and building maintenance office, the computer system office, the librarian system (that includes both the historical and the current sections), the (understaffed) technical and machine shop services to support the need of laboratory activities, and the direction. This latter lacking any secretarial

[2]In the COMETA Consortium participate the three Sicilian Universities, the INFN (National Institute for Nuclear Physics) with its national laboratory and section of Catania, the INAF with its 3 Sicilian research structures in Palermo and Catania, the INGV (National Institute for Geophysics and Vulcanology) with its section in Catania, and the SCIRE consortium.

service includes only the Director. Some important services, such as the maintenance of a OAPA general bibliography, or the maintenance of OAPA Web pages are shared among 2-3 people from other OAPA functional sections.

Each project/activity is under the responsibility of one of the scientists[3]. Each scientist responsible for a project deals in first person with all interaction and reporting to the funding agency with some support from the administrative office and advice, if needed, by the Director[4].

There are activities, such as the public outreach, or the museal ones, that should be better structured but not enough human resources are available to even attempting this.

The technical and machine shop services and the laboratories are located in a separate building hosting also, for better efficiency (and lack of other space), the office of the researchers doing mostly experimental/technological research activities.

Meteorological data have been collected at OAPA over more than 200 years. Data collection continues today thanks to the OAPA modern meteorological station.

With respect to the administrative office it is worth mentioning that the lack of some key INAF centralized services (careers, salaries, retirements, etc.) leaves this workload on the research structure administrative offices. Moreover the need to compute the salaries of ex-CNR personnel (previously a duty of CNR central offices) has been padded by assigning it to the administrative offices of some of the INAF research structures. As a result INAF-OAPA administrative office calculates the salary of all the about 50 staff of ex-CNR institutes working in Sicily; the additional workload is substantial and produces a serious impact on the ordinate running of the OAPA activities. No compensation in terms of additional human resources has been provided or either planned to ease the situation.

3 Research Programs

Below are synthesized the main research activities that have been pursued by the OAPA scientists in the period covered by this report. A bibliographic list covering the period 2004-October 2007 is enclosed at the end of the report. In the following for all research lines are reported the source of financial resources and an estimate of involved human resource (in man/year). This latter figures includes all the permanent and temporary employes as well as 50% of the graduate student man-power. Where appropriate the above figures include also man power from the support staff, especially technicians and/or computer specialists.

3.1 Physics of Stellar and Planetary Systems

This is one of the main research activities of OAPA researchers and is largely based on the acquisition, analysis and interpretation of X-ray data (Chandra, XMM-Newton, Suzaku) and optical data (TNG, ESO telescopes) and more recently of IR data from Spitzer observatory. This activity is based on a network of international collaborations with researchers of the High-Energy Astrophysics Division of the Center for Astrophysics (Cambridge, MA, USA), the MIT X-ray Group, the Max-Planck Institut für Extraterrestrische Physik, the X-Ray Astronomy Group of Leicester University, the LAEFF of Madrid, the X-ray group of Penn State University, the RSSD of ESA-ESTEC, the Paul Scherrer Institute of Zürich, the Observatoire de Grenoble, the Hamburger Sternwarte, the Spitzer Center a IPAC-Caltech, the stellar group at the University of St Andrews, etc.

[3]In the last few years special attention has been devoted to increase step after step the assumption of responsibility of younger scientists.

[4]Given the workload of the administrative office the coverage of some ”administrative” duties by the responsible scientist is the only possible feasible solution. In the case of reporting to non-Italian funding agency the language barrier is an additional difficulty that requires the direct role of the researchers.

OAPA researchers are part of, and in some case lead, the international teams of 5 out of 6 Key/Large projects of X-ray astronomy that have been approved since 2003 in the field of star formation and early evolution, namely:

- the ”Chandra Orion Ultra-deep Project” (COUP), based on the longest continuous observation (850 ksec) of a star formation region (Orion) ever done (PI: E. Feigelson)
- the ”XMM-Newton Extended Survey of the Taurus Molecular Cloud” (XEST, 650 ksec) devoted to the study of the characteristics of X-ray emission from PMS stars of the Taurus star formation region (PI: M. Güdel).
- the ”Deep Rho Ophiuchi XMM-Newton Observation” (DROXO, 500 ksec), a joint XMM-Newton ESO-VLT program, for studying the characteristics of X-ray emission of a 1 Myr old star forming region thanks to a continuous long X-ray observation which allows time-resolved X-ray spectroscopy (PI: S. Sciortino).
- the joint Chandra/Spitzer Deep Survey of NGC 1893 (450 ksec Chandra; PI G. Micela) aiming to deduce the IMF of a young stellar cluster in the external region of the Galaxy and to verify the effect of ”environment” conditions on star formation and resulting IMF.
- the Orion-A XMM-Newton survey approved on Dec 2006 (350 ksec, PI: S. Wolk) that aims to identify and study a complete sample of young star in Orion A and to put constraints on the history and mechanisms of star formation by a joint use of X-ray and IR/Spitzer data.

In the case of COUP many of the results have been published in 2005 in 13 papers (OAPA researchers are co-author of 10 and leading authors of 2) in a fully dedicated number of ApJS, further papers have been printed in 2006-2007 or are currently in press. In the case of XEST, the results have been published in June 2007 in 15 papers (OAPA scientists are co-authors of 10 and leading authors of 2) enclosed in a specific issue of A&A. A first paper from DROXO, with a novel result on the origin of Fe K_α 6.4 keV fluorescent line of YSO, is in print on A&A, further results have been presented at international meetings, and more papers are in preparation. In the case of the other projects, either the analysis is ongoing or data have still to be gathered.

Most of the recent scientific activity has focused on the properties of X-ray emission of Young Stellar Objects (YSOs), in particular we have focused on:

- the analysis of COUP data, OAPA was responsible of coordinating X-ray variability and spectroscopic studies and has obtained several results, namely: the study of ”young Suns” has shown that they spend 70% of their time in a characteristic low level of X-ray emission with $L_X \sim 10^{30}$ erg/s (0.3% of L_{Bol}) and a spectrum than can be described by two thermal components with $kT_{low} \sim 0.85$ keV and $kT_{high} \sim 2.3$ keV. Intense flares occur on top of this ”basal” level at a rate of 1-2 per week, with peak $L_X \sim 10^{31}$ erg/s and $kT_{high} \sim 7$ keV. This emission is likely to be a relevant source of ionization of circumstellar material, in particular of circumstellar disks; X-ray rotational modulation has been found in 23 ONC members (10% of the studied sample), with P_{rot} in the 2-12 day range and modulation amplitude ranging between 20% and 70%. In 16 cases P_{rot} is equal to that derived from optical observations, while in 7 cases it is half the optical value suggesting the presence of localized emitting structures on opposite hemispheres. The observed rotational modulation requires emitting structures non-homogeneously distributed in latitude and with vertical extent smaller than stellar radius. Since those YSOs have $L_X/L_{Bol} \sim 10^{-3}$, near the saturation limit, it is evident that such a saturation cannot be explained as due to the complete filling of the entire stellar surface with

X-ray emitting regions. The analysis of 32 intense flares has allowed deducing their characteristics and, in particular, to estimate the size of the flaring confined structure. In a about 10 flares the deduced size is significantly larger than the stellar radius and, indeed, it is comparable to the star-disk separation. This can be interpreted as an observational evidence of magnetic structures (magnetic funnels) connecting the star and its circumstellar disk (at corotation radius), as predicted from long time by magnetospheric accretion models of YSOs. Many others results have been obtained: on the existence of an embedded population of YSOs in the OMC-1 region, on the characteristics of the X-ray emission of the Orion brown dwarfs, and high mass stars, on the confirmation of the factor 2-3 lower X-ray emission of CTTS with respect to the WTTS pre-main-sequence stars (a result already found by OAPA group using pre-COUP data), on the lack of relation between L_X and stellar rotation rate as well as Rossby number.

The analysis of a sample of 86 X-ray ACIS spectra has allowed deriving the chemical abundances of the Orion PMS stars. The observed abundance distributions are compatible with a single pattern of abundances for all stars. Comparison of the deduced plasma abundances with those of the stellar photospheres and those of the gaseous component of the nebula indicates a good agreement. There is evidence of a significant chemical fractionation effect only for iron, which appears to be depleted by a factor 1.5-3 with respect to both the solar composition and the average stellar photospheric values.

The flare-like variability of 165 low mass (0.1-0.3 M) ONC members has been studied in order to test and constrain the physical scenario in which (micro)flares explain all the observed emission. The high energy tail of the energy distribution of flares is well described by a power-law with index 2.2. At 1 Myr, low mass and solar mass stars of similar X-ray luminosity have very similar flare frequencies. The observed light curves are compatible with being built entirely by overlapping flares with a single power law energy distribution. The intense flares are individually detected, while the weak ones merge and form a pseudo-quiescent level.

- an XMM-Newton survey of a region of the 5 Myr old Upper Scorpius nearby association, discovering 13 new low-mass members, with joint IR and optical photometry. The study of their flares has shown that already at 5 Myr coronal structures have sizes less or at most comparable to the stellar radius, while in the case of 1 Myr COUP and DROXO YSOs we have found in some cases evidence for very long loops with size comparable to the star-disk separation;

- a study of the stellar population of the 1-3 Myr old NGC 2264 star forming region and of the properties of its X-ray emission thanks to a 100 ks Chandra observation. 420 sources have been detected, 85% of which have optical and IR counterparts. In this way we have increased the total NGC 2264 population by 100 new members. The X-ray emission for CTTSs is lower and more scattered than that of WTTSs, and CTTS X-ray emission is more variable and harder. However in few CTTSs a quite soft component has been found that can be interpreted as due to accretion shocks of circumstellar matter infalling on pre-main-sequence stars.

- a study to unveil the low-mass stellar population of Cygnus OB2 thanks to a deep Chandra observation. More than 1000 point-like sources have been detected, 775 of which have a near-IR counterpart and are likely newly identified low-mass members of Cygnus OB2. While the nominal age of Cyg-OB2 is 2 Myr, little evidence has been found for conspicuous circumstellar disks. The observed X-ray variability can be explained as due to magnetic activity in low-mass stars similar to that found in the Orion Nebula Cluster.

- the study of the YSOs in the Taurus-Auriga region and of their X-ray emission based on the XMM-

Newton data gathered with the XEST large program. This survey has improved by a dex the limiting sensitivity and has allowed to study the faint and absorbed part of the YSO population in Taurus. Detection rate has been 85% and 95% for CTTSs and WTTSs, respectively and about 50% among the protostars and brown dwarfs. About 50% of the sources are variable and in 26% of cases the variability is due to a flare. The frequency of strong flares is about 1 event for YSO every 800 ksec. The number distribution of the flare released energy can be described with a power law, the deduced slope is compatible with that observed in main sequence stars and in the Sun. This suggests that most of the X-ray emission of Taurus members is of coronal origin, probably, in the form of unresolved flares. The analysis of flares shows that the size of flaring loops is smaller than the stellar radius. This survey has allowed selecting a sample of 57 new likely members of the Taurus association.

- the discovery, thanks to a Chandra observation, of an expanding source of X-ray emission associated with the proto-stellar jet HH 154. The observed morphology suggests the presence of a pulsed jet that propagates in a non-homogeneous medium. The study of this phenomenon is pursued also thanks to archive and new HST observations as well as by an extensive program of numerical modelling of the observed emission.

- the study of the properties of the X-ray emission of the YSOs in the 1 Myr old Serpens star forming region. With respect to the controversial issue of X-ray emission from class 0 YSOs, i.e. the earliest, 10^4 yr long phase of YSO evolution, none of the 6 known class 0 have been detected as X-ray sources. The deduced upper limits to their X-ray luminosity is L_X = 4 10^{29} erg/sec, still ten times higher than the active Sun. The analysis of a flare in a class I YSO has allowed deducing a size of flaring loop of about 20 stellar radii suggesting that the flare occurred in a flux tube connecting stellar surface and circumstellar disk (at co-rotation radius).

- the determination of the stellar population of the young (5 Myr old) open cluster NGC 2362 thanks to a deep Chandra observation as well as to deep UBVI and H_α photometry. The fraction of stars still accreting is in the 5-9% range and the deduced IMF seems to be less step at high mass than that found in other open clusters.

- the determination and the study of the characteristics of the stellar population of the young open cluster NGC 6530 thanks to a multi-wavelength campaign including photometric and spectroscopic optical observations as well as a deep Chandra observation. The IMF of NGC 6530 has been determined as well as the distributions of rotational velocities of WTTS and CTTS members.

A substantial part of these researches are based on optical/IR photometric and spectroscopic observations of star forming regions and open clusters. These observations allow deriving both stellar (mass, age, rotation, spectral type) and circumstellar disk properties. These programs are conducted in collaboration with researches of ESO, IAC, CfA, University of Maryland, TNG center and of the Observatories of Arcetri, Bologna, Padua and Trieste. Among the most interesting results we mention: the discovery, obtained in collaboration with researchers of the Osservatorio di Arcetri, based on the so-called Lithium Boundary Test, that the very-low mass stellar population of the Orion Nebula Cluster presents an age spread that can hardly be reconciled with a model of fast, almost ”instantaneous”, star formation process; the evidence that the UV emission from the OB stars affects the evolution of low-mass circumstellar disks in the NGC 6611 young open cluster due to photo-evaporation processes.

Part of the research activity has been focused also on: (i) the study of stellar populations, in particular the analysis of the young stars in the solar neighborhood selected in X-ray flux limited survey and in kinematically selected moving groups; (ii) the study of the X-ray emission of the very-low mass stars and of brown-dwarfs with the aim to investigate if a dynamo operated in this objects and to understand its

nature. Dynamos in very-low mass stars & BDs are expected to be different from the solar-like dynamo (due to the different interior structure). Furthermore, even in the presence of a magnetic field, magnetic activity may be prevented due to the low ionization level of the atmospheres of those objects. As part of this research project, we studied a giant flare on the ultracool (SpT M8) dwarf LP412-31, detected simultaneously in X-ray + optical light with XMM/Newton's EPIC+OM. The flare can be explained with an impulsive release of energy followed by a phase of radiative cooling, it occurred on a small fraction of the star's surface and in a loop whose length is comparable or larger than the star's radius; (iii) the study of stellar coronal properties, and specifically, their density, chemical abundances, and differential emission measure. Those studies are largely based on high resolution spectra collected with the Chandra and XMM-Newton grating spectrographs. In the case of pre-main-sequence stars the high resolution X-ray spectra can provide also important clues on the presence of an emission component associated to accretion shocks and, indeed, in the case of MP Muscae, a CTTS with an estimated age of 15 Myr, thanks to an XMM-Newton RGS spectrum, evidence of a "standard" coronal component has been found as well as of a cold ($\sim$ 2 MK) emitting plasma component with density N_e = 5 10^{11} cm^{-3} associated to an accretion shock that occurs on 0.3% of the stellar surface.

More recently thanks to a synergy between the OAPA scientist expertise, that of C. Cecchi-Pestellini of INAF-OA di Cagliari, and those of T. Penz (one of the Marie Curie fellow of the ISHERPA program) it has been started a research line on the effect of stellar UV/X radiation on planetary atmospheres, both at current time, as in the case of hot Jupiter, as well as in the past when the high-energy radiation from the Sun was several dex higher than today. This activity is connected to the program of experimental astrobiology (see section 3.7 and 7) and an effort is currently carried on to incorporate it in a larger European program, Europlanet, to be presented for evaluation to the EU.

In the next future, the Palermo researchers will be involved in the exploitation of some aspects of Corot data. In particular, they will be involved in the study of rotation and stochastic variability of stars in the exo-planet and seismology fields, as part of the team of an accepted Corot proposal. This study will be particularly valuable for understanding the evolution of stellar rotation and activity in the solar neighborhood. They are also co-I also of an accepted proposal for a short Corot observing run on the star forming region NGC 2264 (PI F. Favata). In particular G. Micela is the responsible of the team on rotation and activity. This observing run has been scheduled for March-April 2008.

These research activities have been possible in the period covered by this report thanks to resources from many sources, namely: two INAF-PRIN entitled "Open Clusters: test for star formation and evolution" and "From disks to planetary systems", the INAF-ASI ADAE contract supporting the analysis of guest observer X-ray data to the project "The X-ray emission as a probe of stellar physics through the evolutionary sequence", the INAF-ASI contract supporting the analysis of archive data to the project "X-ray emission as a probe of fundamental properties of stellar populations and star forming regions in our Galaxy", the INAF-ASI contract supporting the theory and model program entitled "Study of the effects of stellar X-ray emission in the early phase of stellar life-time", 2 Marie Curie UE TOK programs (ISHERPA, and PHOENIX) and a Marie Curie RTN (Constellation, additional details are provided in section 8), 4 MUR-PRIN programs, and 1 MUR special program for high formation and research.

Since 2004 about 10 person/year have worked on this research lines, a substantial fraction of human resources has been recruited thanks to the UE financial resources, and during the last year also thanks to resources provided by ASI.

3.2 Solar Coronal Physics

The research in Solar Physics is conducted in synergy with the Astronomy Section of the DSF&A (Department of Physical and Astronomical Science) of the University of Palermo, and mainly addresses the

physics of confined and non-confined corona observed in the UV and X-ray band and involves analysis of data from solar satellites, i.e. Yohkoh, SoHO, TRACE, GOES and Hinode, and numerical modelling with MHD and hydrodynamic codes.

Studies of the confined corona have concerned the fine structure of the coronal magnetic loops, i.e. the building blocks of the bright X-ray corona. Hydrodynamic numerical loop modelling has been used to investigate the role of nanoflare heating in the emission and thermal structuring of the loops. These studies have involved a PhD Thesis (P. Testa) and a collaboration with the University of Calabria (P. Veltri, F. Malara, G. Nigro). Loop modelling has been used also to explore new diagnostics of flaring loops, in the framework of a long-term research line about solar and stellar flares. The group has been also actively involved in workshops about coronal loops and contributed to the current debate about the fine spatial and thermal structure of loops by analyzing data collected with imaging instruments, TRACE in the UV band and Yohkoh/SXT in the X-ray band and with spectroscopic instruments, i.e. SoHO/CDS. More recently the group has been involved in the analysis of the data collected with the X-Ray Telescope (XRT) on board the Hinode mission launched in late 2006. This work is also connected with an ISSI working group and is conducted in collaboration with S. Parenti (Observatoire of Belgium) and with contributions from the solar group at the SAO-CfA (L. Golub) and from the Japanese Hinode team.

The group has developed a method to ”translate” the coronal data collected with solar X-ray observatories as if they would have been obtained with stellar observations collected with X-ray observatories. This has allowed studying the Sun as an X-ray star and to adopt solar observations as a template to interpret X-ray observations of stellar coronae. In these years there have been several applications of this method using data from GOES and Yohkoh missions, to compare the solar coronal activity to the stellar ones and to explore what kind of and how many solar structures are necessary to explain the stellar coronal emission. The last step has been to investigate the role of coronal flares in the global coronal budget.

The group is actively involved in the data analysis and modelling of Coronal Mass Ejections (CME). Extensive programs of analysis of CME observations have been conducted mainly in collaboration with researchers of the Harvard-Smithsonian CfA (J.C. Raymond, J. Kohl). The analyzed data are collected mostly with the UltraViolet Coronographic Spectrometer (UVCS) onboard of SOHO, in which the Italian solar community has a large participation, and which has brought a breakthrough in the physical diagnostics of CMEs. The analysis has concerned the diagnostics of the plasma clouds and shock fronts involved in the CMEs, of their energy budget, and extensive CME surveys and classification.

Also in the framework of a Laurea and PhD Thesis (P. Pagano) the group has recently started an extensive project of MHD modelling of CME features, in collaboration with J.C. Raymond of the Harvard-Smithsonian CfA, devoted to discover new diagnostic tools and to acquire new insight in the detailed CME physics after their generation. The project is based on the MHD version of the advanced FLASH code, developed by the University of Chicago, and has obtained substantial HPC resources, including those of 2 approved key projects, within the INAF/CINECA[5] agreement of the last two years. A first work was devoted to study the propagation of CME fragments in a magnetized hot medium and another one is in course about the diagnostics of CME-originated shock fronts. We are also beginning a study about the generation of CME events in collaboration with A. van Ballegooijen (Harvard-Smithsonian CfA).

These research activities have regularly obtained funds from ASI (apart for the 2002-2004 crisis), the University of Palermo and MUR-PRIN programs. Other support has been given by PhD and Postdoc programs of UNIPA, ISSI working group, CfA, and INAF/CINECA agreement.

Since 2004 about 3.0 person/year have worked on this research line, a substantial fraction of human resources has been recruited thanks to the UNIPA and ASI financial resources assigned to OAPA.

[5]The CINECA is a national consortium of several Italian universities that is running a big national computer center near Bologna. This center was until recently the only one where it was possible to perform in Italy high performance computation for the solution of large size problems.

3.3 SNRs Physics

This research line aims to understand the physical processes that regulate the high-energy emission of SNRs and pulsar wind nebulae, and to deduce the physical characteristics of the progenitor stars and of circumstellar/interstellar medium in which those objects evolve.

In the period covered by this report, the following aspects have been considered: 1) the synchrotron radiation of pulsar wind nebulae and comparison of model with observations; 2) the interaction between the pulsar wind nebula and the ejecta inside evolved composite SNRs; 2) the properties of circumstellar material and of stellar ejecta in young and evolved SNRs, including a comparison with model of nucleosynthesis of SN; 4) the X-ray, optical and radio emission of SNRs interacting with the inhomogeneities of ISM at large and small scale (molecular cloud, bubble, etc.) and comparison with numerical models; 5) non-thermal radio and X-ray emission of shell SNRs produced by particles accelerated by the main shock, and diagnostic on the dependence of the acceleration efficiency from the orientation of the ISM magnetic field; 6) the effect of interstellar dust scattering on the morphology of absorbed extended sources and diagnostic of the physical characteristic of the absorbing material.

Among the many results achieved, we mention the recent discovery, for the first time, of ejecta shrapnel inside the shell of the very evolved Vela SNR. This discovery opens up the possibility to study the product of supernova nucleosynthesis in this large and near object, with a level of details not achieved in more distant and small SNRs, which have been traditionally used up to now to infer the composition of the stellar ejecta. Unlike the ejecta in other young SNR, the Vela shrapnels are likely to represent the fastest objects in the population of the ejecta fragments, and therefore they are believed to represent the outer layer of the exploding supernova. Future works on this issue include the study of the spatial distribution of the ejecta shrapnel inside Vela, and the comparison between appropriate nucleosynthesis models and the results obtained in the ejecta shrapnel located outside the shell. Moreover, we have planned an extensive program of numerical simulations to link the shrapnel observed properties to the properties of the progenitor supernova.

These activities are mainly based on the analysis of *Chandra* and *XMM-Newton* archive X-ray observations, of GO *XMM-Newton* and Suzaku observations as well as on the analysis of *Integral*, optical and radio data. Recently approved observational programs include: SUZAKU AO2, *The break in the HXD spectrum of G54.1+0.3*, PI F. Bocchino; XMM AO6, *An X-ray search for PWN in SNR shells*, PI. F. Bocchino; XMM AO5, *A deep view into G54.1+0.3*, PI R. Bandiera; XMM AO4, *Multi-wavelength study of shock-cloud interaction in the Vela SNR*, PI M. Miceli; XMM AO4, *An X-ray study of IC443 ejecta fragment inside a molecular cloud*, PI F. Bocchino. Moreover, the observational activities are closely complemented by an effective modelling program carried out in collaboration with OAPA researchers expert in the numerical modelling of astrophysical plasmas. The modelling of SNRs is being done with MHD numerical simulations carried out both at the SCAN facility at the OAPA and at the CINECA facility using computational resources available on competitive basis. Highlights from this group include the development of a self-consistent MHD model of the evolution of barrel shaped SNRs, including the synthesis of the synchrotron radio emission, and taking into account for the first time the dependences of the electron acceleration from the shock obliquity angle (the angle between the shock speed and the interstellar magnetic field). Future works on this line will include the MHD modelling of specific objects (e.g. the SNR SN1006) and MHD models of other poorly understood classes of SNR (e.g. the mixed morphology SNRs). For the latter 2 key projects have been approved and executed at CINECA.

Since 2004 about 2.5 person/year have worked on this research line, a substantial fraction of human resources has been recruited thanks to financial resources from MUR special program and from COMETA/PI2S2 program funds at OAPA. Recent sources of funding have been a INAF-PRIN program and the ASI-INAF ADAE contracts. The research is performed in collaboration with researchers of other

INAF research structures as well as with colleagues of European and non-European countries.

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3.4 Scientific and Technological Research for X-ray Astronomy Instrumentation

During the period covered by this report we have kept active, at least at a basal level, a number of activities, notwithstanding the serious difficulties in finding financial resources for the R&D of space activities (further discussed in the budget section). This activity has also suffered by the relocation of the XACT facility, that at the end of 2005 has been moved to a new building. As a consequence, experimental activities stopped for about 1 year. In the following we list and briefly describe the main ongoing activities.

Cryogenic X-ray detectors

A program for the development of X-ray detectors based on microcalorimeters has been active in the last few years as part of a collaboration with SAO (PI:dr. Eric Silver). This program has been funded by Sicilian Regional Government, by two PRIN-MUR programs in 2000-2001 and 2002-2003, by a PRIN-INAF program in 2006, and by ASI in 2006. After the development of an Adiabatic Demagnetization Refrigerator (ADR) able to reach the temperature of a few tens of mK, and the test of some detectors based on germanium thermometers, we have started, in collaboration with Dipartimento di Ingegneria Elettrica Elettronica e delle Telecomunicazioni (DIEET) of the University of Palermo, a program based on planar etching technologies for the realization of arrays of microcalorimeters. In this framework we have developed a technique based on microlitography and chemical etching and we have demonstrated our ability in obtaining germanium arrays with the resolution and precision necessary to build an array of microthermometers. We have also designed a fully planar process, based on technologies typical of microelectronic industry, to build an array of microcalorimeters based on doped germanium microthermometers. This new approach puts potentials of germanium based microcalorimeters to be strongly competitive with respect to other investigated technologies.

Ultralight grazing incidence X-ray optics

We have also active a program for the development of ultra-light grazing incident X-ray optics based on the use of thin plastic material support. This program that was started in collaboration with SAO (PI: dr. Herbert Schnopper) has been supported by a PRIN-MIUR program in the years 2005-2006. We are currently conducting a survey of various plastic foil materials to try and set-up a solid industrial partnership to provide the foil material and eventually provide also coating facilities. Such an optic could open the possibility to make feasible missions with large collecting area and modest angular resolution suited for X-ray polarimetric studies of astrophysical sources.

Calibration activities

The X-Ray Astronomy Calibration and Testing Facility of INAF-OAPA was set-up initially to participate in the development and calibration program of the HRC on Chandra. The role of the XACT facility and the OAPA team was crucial in solving the problem of the unknown UV-leak found in Einstein and ROSAT and in proposing a solution that has then also been implemented in other instruments. The XACT facility was also successfully used in the development program of the XMM-Newton EPIC camera. More recently OAPA scientists have been involved in the program for the realization of the grazing incident X-ray mirror (XRT, PI: L. Golub, SAO) for the solar mission Solar-B (HINODE) that is now successfully collecting data. OAPA scientists have had the responsibility of the calibration of the focal plane filters at the XACT facility, and have participated in the end-to-end calibration at Marshall Space Flight Center.

Following the reactivation of the XACT facility (details in the scientific infrastructure section) OAPA scientists have taken part in the calibration of the Lunar Orbital X-ray Fluorescence Imaging Spectrometer (LOXIA) designed and constructed at the Institute of High Energy Physics of the Chinese Academy of Sciences in Beijing to perform chemical composition analysis of the Moon surface. This instrument will

operate on-board the Chang'E-1 mission, the first Chinese lunar spacecraft to be launched in October 2007. For continuing and strengthening the collaborative program with Chinese colleagues we have recently advanced a funding proposal to the MUR that is still under consideration for its inclusion among the China-Italy bilateral programs.

In October 2007 the XACT facility will be used for the calibration of the SPHINX X-Ray spectrograph, an instrument developed at the Space Research Center of the Polish Academy of Sciences in Wroclaw, that will fly on board the Russian satellite CORONAS-photons for the observation of the Solar corona. Furthermore, we have received a formal request to calibrate part of the TESIS instrument developed at the Optical Department of the P.N. Lebedev Physics Institute of Russia in Moscow, which will be also part of the scientific payload of the CORONAS-photons mission. Details on this last calibration program have to be discussed soon in a meeting between the OAPA and the Russian teams.

Future Missions

Finally we have been involved in proposal and phase-A studies of future X-ray observatories such as: 1) Simbol-X, a french/italian/german collaboration for an observatory, now in phase A study, that plans to image the X-ray sky in the 0.8-60 keV bandpass. In particular, OAPA is in charge for the design and calibration of the thermal shields aimed at maintaining uniform the temperature in the mirror module and reducing the heating power, 2) XEUS a large world-class X-ray observatory for the 2020 decade that has been submitted to the ESA Cosmic Vision AO by a large international team involving scientists from Europe, Japan, China, Russia, and USA, 3) EDGE an explorer class mission aimed at tracing the cosmic history of the baryons from the early generations of massive stars by Gamma-Ray Burst (GRB) explosions, through the period of galaxy cluster formation, down to the very low redshift Universe, by use of wide field X-ray optics coupled to CCD and an array of X-ray microcalorimeters. The EDGE proposal has been recently submitted to the ESA Cosmic Vision AO by a large international scientific team led by Italy, The Netherlands and Japan. The support to the initial XEUS activity has been provided by the INAF Project Department, that to Simbol-X by a INAF-PRIN. Currently the three above mentioned studies are funded by an ASI-INAF national program for High Energy Astrophysics coordinated by Enrico Costa (INAF-IASF Roma).

Since 2004 about 5 person/year have worked on this research line, a substantial fraction of human resources has been recruited thanks to financial resources from MUR, from OAPA basal research and from MEF-PRISMA. This latter is a program of technological transfer that has been held in and around the XACT facility as describes in detail in section 10.

3.5 Optical Instrumentation for Large Telescopes

The development and realization of optical instrumentation for large telescopes are connected and integrated with analogous ongoing activities in other research structures of INAF (Milan, Padua, Trieste, Florence, Rome, Naples and Catania). They are part of a national network that is active from many years and is developing instrumentation for the TNG, the VLT and the LBT.

The OAPA activity was started by R. Pallavicini, first with the participation in the realization of the SARG spectroscopy for the TNG, then with the participation in the realization of FLAMES, the multi-fiber echelle spectrograph, for the UT2 of the VLT, and currently with X-SHOOTER, a high efficiency cross-dispersed echelle spectrograph covering an ample spectral range with 3 arms (visible, UV, IR), selected by ESO as a 2-nd generation instrument for VLT at the end of 2003. X-SHOOTER has been designed and is being realized by an ample European (ESO, Italy, The Netherlands, Denmark, France) collaboration with the involvement of many research institutes. The Italian participation has seen active 4 observatories, the Italian PI is R. Pallavicini and the OAPA has taken care of the selections and the acquisitions of many of the critical components (mirror, lens, camera, diffraction gratings) and optical bench for the visible and

UV arms.

The final X-SHOOTER design was approved in February 2006, and then has started the realization phase. At the time of writing (Sept. 2007) the instrument is in the integration phase at the Osservatorio Astronomico di Brera, in the Merate optical laboratory. The visible arm has been integrated with success in July 2007 and the subsequent tests have given positive results, the UV arm is being integrated. To conduct some of the tests, the Fizeau interferometer of the OAPA has been temporarily moved to Merate.

The final integration will take place at the ESO laboratories in Garching starting in November 2007 and then will be subject to extensive tests for a 6 month period. Instrument first light is foreseen at the end of 2008.

The Italian participation to X-SHOOTER is economically supported by the INAF Project Department, and a formal Memorandum of Understanding between INAF and ESO has been signed. As a result of its contribution INAF will obtain a bunch of guarantee observing nights that will be available to Italian community under scientific responsibility and coordination of the Italian PI. In view of the optimal use of the GO time it has recently started by the Italian PI an activity aiming to define within Italian community an ensemble of possible scientific programs to be discussed and homogeneized by next spring within the entire European XSHOOTER team in order to agree on the use of GO time.

Since 2004 about 1.5 person/year have worked at OAPA on this research line, a fraction of human resources has been recruited thanks to financial resources from MUR PRIN and INAF XSHOOTER funds.

3.6 High Performance Computing and Information Technology

OAPA researchers have a long tradition on investigation and diagnostics of astrophysical processes through extensive numerical modeling based on high performance computing. This research line has been pursued making use of the SCAN (see below) computational resources as well as the CINECA computational resources made available on a competitive basis to the Italian astrophysical community thanks to an INAF-CINECA agreement. In the recent past, OAPA researchers have taken part in the development of specific computational modules (Spitzer conductivity and viscosity, radiative loss of optically thin plasma, non-equilibrium of ionization condition effects) of the FLASH code[6] and have ported the code to the *Alpha*/TRUE-64 computers. As of today the research activity is concentrated on three main programs: the first focuses on 2-D and 3-D magneto-hydrodynamical (MHD) simulations aiming to study the dynamics of the interaction between a SNR shock and the inhomogeneous interstellar medium; the second focuses on 2-D and 3-D MHD simulations aiming to study the physics of young stellar objects (YSOs), and their interaction with the circumstellar environment and to investigate the X-ray emission mechanisms of protostellar jets; the third focuses on the propagation of a CME (Coronal Mass ejection) in the solar atmosphere. The more demanding simulations have been performed on the CINECA computers thanks to numerical resources that have been obtained with the approval of three Key projects and several standard projects.

As a natural development of the activity, we have been among the promoters of the constitution of the Sicilian COMETA consortium and of the definition of the PI2S2 project, approved in 2006 by MUR on a specific PON initiative for the strengthening of computational resources for research activities in southern Italy. As a result of this project a number of computational poles based on the GRID paradigm are being constituted in Palermo, Catania and Messina. The two Palermo actors (University of Palermo and INAF) have decided to realize a large joint computational pole that is hosted in spaces made available by the DSF&A (Dipartimento di Scienze Fisiche ed Astronomiche) of the University of Palermo. OAPA researchers have devoted in the last 18 months a large amount of time to the final design and realization of this pole. An initial version of the pole has started to be open to research community since last July,

[6]FLASH has been developed mainly at the University of Chicago under the ASC (Advanced Simulation and Computing) / ASAP (Academic Strategic Alliances Program) program of the USA government.

the final version ($>$ 600 cores at 64 bits, and 22TB disk storage) is foreseen to be operative by the end of 2007. OAPA scientists are planning to use this computational infrastructure both for the massive running of simulations, including MHD studies of astrophysical plasmas, as well as for data analysis problems. The main research lines are: MHD modeling of the ambient medium surrounding YSOs, aimed to determine the physical conditions in protostellar environments, and how the protostellar jets interact with other protostellar components (circumstellar environment, disk, protoplanets, etc.) through radiation and/or mechanical impact; MHD modeling of SNR shocks expanding through a magnetized inhomogeneous medium, aimed to investigate the physical conditions leading to the complex morphologies observed in the radio, optical and X-ray bands; analysis of large datasets of X-ray spectra, aimed to characterize the X-ray emission of YSOs during both flaring and quiescent phases. Recently, OAPA researchers are collaborating with researchers at the Harvard-Smithsonian Center for Astrophysics to model the outburst of the recurrent nova RS Oph observed with both Chandra and XMM-Newton in 2006, with the aim to investigate the origin of the observed X-ray emission and the physical conditions of the circumstellar medium in which the nova occurs.

Finally in the time period covered by this report thanks to a successful MUR-PRIN proposal it has been possible to radically improve the performance of the OAPA computer network devoted mainly to research activities. This has allowed to overcome some of the limitations that have started to show up with the growing number of users and the growing number of their computational requests.

Since 2004 about 2.5 person/year have worked on this research activity, a substantial fraction of human resources has been recruited thanks to financial resources from MUR special program and from COMETA/PI2S2 program funds at OAPA.

3.7 Experimental Astrobiology

In 2004, taking advantage of the capabilities of OAPA X-ray laboratories, a group of OAPA researchers, in collaboration with other Italian scientists have studied the effects of soft X-rays radiation on free and clay (montmorillonite, kaolinite) adsorbed DNA. The DNA samples were exposed to X-rays of 1.49, 4.51 and 8.04 keV for exposure times ranging from 2 min up to 16 h. The biological transformation technique was used to estimate the damage of the DNA molecules. Free and clay adsorbed DNA resulted to be differently affected by X-rays. The former was damaged by X-rays and the level of damage was related to the energy dose rather than to the hardness of the radiation. The clay adsorbed DNA was not damaged by X-rays for energy doses up to 5.8104 erg. On this basis it was suggested that clays materials could have protected the building blocks of life on the primordial Earth when the solar X-ray emission was much stronger than today. This was the first result of a new research line on experimental astrobiology started in 2003 by using in focused way some of the basal research funds (cf. sect. 5) together with financial resources of Sicilian Regional Government. As of today the main aim of this project is to study the competitive role of X-ray and UV radiation from very young solar-like stars in causing destruction and/or formation of pre-biotic molecules. At this scope, a dedicated laboratory has been set-up and, in particular, is under construction an experimental apparatus to attempt the synthesis of pre-biotic material in conditions similar to those of a proto-planetary environment. The plan is to see if it is possible to synthesize pre-biotic matter, and in particular amino-acids, by irradiation of analogs of interstellar ices with UV and X-ray radiation with intensities similar to those found around young stars.

This program capitalizes on the expertise of involved scientists in the field of solar and stellar X-ray emission and its effects on planetary atmosphere as well as on the laboratory experience of some of the OAPA scientists. In 2006 this program has been presented, approved and funded within the framework of INAF National programs in collaboration with researchers of INAF-Osservatorio Astronomico di Cagliari and IASF/Palermo. As part of this research line a joint research unit of OAPA and Oss. Cagliari is par-

ticipating in a UE Network Proposal, led by C. Ceccarelli (France), that, after a first positive selection of stage-1 proposal, is waiting for final evaluation of stage-2 proposal.

In the last couple of years about 1.5 person/year have worked on this research line, part of the technician human resource has been acquired with a small ad-hoc contract. A successful participation to UE program should allow recruiting a graduate student.

3.8 History of Astronomy

History of Astronomy is one of the field of research carried out at the INAF/OAPA since the 1980s. It is strictly connected with the work of preservation, restoration and exploitation of the valuable and unique collection of scientific instruments and books kept at the Observatory, which testifies the over-two-centuries scientific activity of this institution, established in 1790 by the astronomer Giuseppe Piazzi (1746-1826).

The historical research at the Palermo Observatory is mainly focused on 19th century Astronomy and Astrophysics, with special attention to the birth and development of the astrophysics in Italy and in Europe; other subjects of interest are the Carte du Ciel international project and the history of the Palermo Observatory. The most important means used to carry out this kind of research is the exploration of archival materials and documents. The product of this research activity is, usually, the participation in conferences and the publication of monographs and papers in specialized refereed journals.

In the three-year period 2005-2007, biographical studies have been centered on some of the most important Italian protagonists of the birth of Astrophysics, such as Angelo Secchi S. J. (1818-1878) (see: Chinnici, 2005) and Pietro Tacchini (1838-1905) (see: Chinnici, 2006) rightfully considered among the pioneers of solar physics. Additional studies on the Carte du Ciel project have been carried out (see: Chinnici, 2006; Randazzo, 2006). Moreover, the state-of-the art of the historical archives in the Italian Observatories has been presented at the recent IAU General Assembly in Prague (see: Chinnici, Mandrino & Bonoli, 2006) and at LISA-V Meeting in Cambridge (US) (see: Mandrino, Randazzo & Schiavone, 2006) and that of the historical collections at the XXV Scientific Instrument Symposium in Krakow (see: Chinnici, Bonoli, Calisi, Strano & Zanini, 2006). At present, the work in progress concerns the scientific correspondence related to total solar eclipse of 1870 observed in Sicily, the reconstruction and cataloguing of Piazzi's library and the exploitation through the web of the rare books collection.

Research in history of astronomy at the Palermo Observatory is therefore well-qualified and inserted in a national and international network of collaborations, such as that with the Paris Observatory, which is one of our important partners in the historical research. Moreover, in May 2006, Anita Mc Connell (Cambridge University, UK) and Alison Morrison-Low (National Museum of Scotland, UK) spent some time at the Observatory studying the unique collection of historical instruments made by Jesse Ramsden (1735-1800) and Matthew Berge (?-1819) kept in the Observatory Museum. The potential of this research line is limited by the current number of people involved (1 researcher + 1 librarian). The modest financial resources required by this program are covered by the OAPA basal research funds (see sec. 5 for further details).

4 Personnel

Table 2 summarizes the OAPA personnel in 2004 and as of today and shows that in the last 3 years the number of OAPA personnel has remained stable.

The picture remains unchanged if one extend the analysis to include the graduate students, the university professors and post-doc fellows of the Astronomy Section of the DSF&A of the University of Palermo,

Table 2: Summary of Personnel working at the OAPA+Astronomy Section System

	2004		October 2007	
	Permanent	Temporary	Permanent	Temporary
OAPA Personnel				
Senior Scientist (Chair Level)(1)	2		2	
Senior Scientist (Associate Level)	2		3	
Researcher	7		8	
Post-Doc Fellow or equivalent(2)		6		6
Subtotal Scientist	11	6	13	6
Computer System Specialist	2	1	3	
Museum Specialist(3)	1	1		1
Laboratory and Machine Shop Specialist	3		3	1.0(4)
General Service	5		4	
Secretarial Service		1		1
Librarian	2		2	
Administration	5	1	5	1
Meteo Specialist(5)		1		
Subtotal Non-Scientist	18	5	17	3.5
OAPA Personnel Subtotal	29	11	30	9.5
Graduate Student		6		5
University Personnel of the Astronomy Section of DSF&A – Associate to INAF				
Professor	4		3	
Post-Doc Fellow		1		2
Univ. Personnel Subtotal	4	1	3	2
GRAND TOTAL	33	18	33	17

Notes -

(1) - Since April 2004, one of the two (R. Pallavicini) is working at the INAF Central Offices in Rome as Director of Structure Department. The other (S. Sciortino) is the Director of OAPA.

(2) - Two of them are post-doc positions payed by the COMETA/PI2S2 project.

(3) - This position refers to a unity of personnel assigned to OAPA from a service cooperative. Personnel cost is covered by local government.

(4) - Those are 2 part-time temporary positions one devoted to the X-ray laboratory activity and the other to the Experimental AstroBiology laboratory

(5) - This position was covered by a specific contract with the Palermo local government for a finalized analysis of OAPA series of rainfall data.

listed in the bottom part of Table 2. As discussed below some of the graduate student fellowships are covered with central INAF or INAF-OAPA external funds. The listed graduate students, university professors and post-doc fellows are all associated to INAF and work in synergy with OAPA staff.

The analysis of table 2 shows also that there are areas, such as for the secretarial services and for administration, in which a chronic lack of personnel continues to require the need of temporary staff (that as of today can be paid only on research grants and contracts). Since 2004, indeed since 2001, the single area in which it has been possible to improve the ”service” staffing situation is that of computer system. Within the limit of the analysis that is possible to conduct with small numbers, there is a trend to improve the average qualification of both scientific and non-scientific staff. While an effort is made to keep limited the number of temporary staff, some of the temporary positions have not been renovated just for the lack of enough external finalized funds, not for lack of need.

Taking apart the graduate students, as of today we have 33 permanent staff and 12 temporary positions (2 post-docs paid on COMETA/PI2S2 funds), with 24 people doing research and 21 people providing support. All the temporary positions are paid with external funds. Limiting the analysis to the OAPA staff the women are 36% of the staff support personnel, 39% of the entire support personnel, 31% of the staff researchers, 33% of the post-doc fellows. The age distribution of people working at the OAPA+Astronomy Section system is summarized in figure 1.

In table 3 we provide the names of all scientific staff with positions, areas of responsibility and expertise. We provide also for each of them relevant information on their publications and measure of their impact as deduced from ADS bibliographic information.

5 Budget Structure and Analysis

In order to describe and attempt the analysis of OAPA budget is necessary to provide as a framework a brief description of the structure of the entire INAF budget. INAF is a single legal entity and its budget is unique since 2005, while until 2004 each research structure had its own budget within the overall INAF budget. Since 2005 the INAF budget is organized, following (and interpreting) a national law valid for all public institutions, in several sub-entities, named Center of Administrative Responsibility (CRA), each of them under the responsibility of a given single person[7]. The many CRAs of the INAF budget (over 350 as of today) are organized in 3 main branches (1-st Level Expenditure Centers): Administrative Direction, Structure Department, Project Department, under the direct responsibility and control of their three distinct directors. They are the only persons (alone or by their combined decisions) that can implement or authorize inter-CRA budget variations. The research structures are only 2-nd level expenditure centers, their directors can autonomously perform only budget changes within a given CRA, all other changes are subject to (one or more) central director formal approval. Intra-CRA adjustments are required since each CRA is organized in several detailed expenditure items (running costs, personnel, hardware, etc.).

INAF has a yearly based budget both of competence and cash. Research structure budget is still yearly based but is only a cash budget.

OAPA budget, like that of any INAF research structure, is composed of two main funding streams: internal funds coming from transfer from the Italian research ministry (MUR) to INAF and then to OAPA, and external funds coming from transfer of resources from other Italian ministries (i.e. Economy and Finance Ministry [MEF] or Industry Ministry [MI], etc.), Italian Space Agency (ASI), European Union (UE), local (regional, town, etc.) governments, industries, etc. The internal funds are assigned to OAPA (as well as to all other structures) to cover its yearly running cost and the cost of basal research activity. The

[7]While each CRA is under the complete responsibility of a person, only the Directors, including the Structure Directors, can formally authorize the use of any funds. In several cases a given CRA is for a project active in several research structures, in these cases each structure can access and use only its own fraction of funds.

Table 3: Scientific Personnel working at the OAPA+Astronomy Section System as for 30 September 2007

Name	Position	Expertise	Responsibility	Bibliographic Data: Source ADS			
				H-index	Ref. Paper	Citation	N. Citat./N. Paper
Bocchino Fabrizio	Ricer. Astr.	Multi-wavelength SNR Studies	PON OAPA Network Project	10	36	290	8.1
Chinnici Ileana(1)	Ricer. Astr.	History of Astronomy	Chair: INAF National Museum Service OAPA Museum Visit Program	-	9	-	-
Ciaravella Angela	Ricer. Astr.	Solar Coronal Physics & Experimental AstroBiology	Exp. AstroBiol. Laboratory PRIN-INAF PI	16	39	1208	31.0
Collura Alfonso	Astr. Associato	Optics and Detectors for X-ray Astronomy, X-ray Mission Studies	XACT & Rel. Machine Shop PRISMA & ASTROSFERA Projects PI	9	20	913	56.6
Damiani Francesco	Ricer. Astr.	Pre-Main Sequence Star Studies		15	32	657	20.5
Flaccomio Ettore	Ric. Astr.	Pre-Main Sequence Star Studies	PRIN-INAF Local PI	17	31	731	23.6
Franciosini Elena	Ric. Astr	Stellar Coronae & Multi-wavelength Stellar studies		10	25	255	10.2
Orlando Salvatore	Ric. Astr.	Stellar Coronae, ISM & Plasma Numerical Modeling	M. Curie PHOENIX Project leader	12	34	396	11.6
Maggio Antonio	Astr. Assoc.	Coronal Physics & X-ray Spectroscopy	OAPA Annual Report, Outreach for Secondary Schools, Local ASI Project PI	20	53	1104	20.8
Micela Giuseppina	Astr. Assoc.	Multi-wavelength studies of Stellar & Planetary Systems, X-ray Mission Studies	ASI-INAF National Contract PI ISHERPA and Constellation leader	30	153	2910	19.0
Pallavicini Roberto(2)	Astr. Ordinario	Multi-wavelength Stellar studies & Optical Spectroscopy	INAF Structure Depar. Director XSHOOTER Italian PI	35	147	3431	23.3
Sciortino Salvatore	Astr. Ordinario	Multi-wavelength studies of young and PMS star, X-ray Mission Studies	OAPA Director Local ASI Project PI	31	135	3308	24.5
Stelzer Beate	Ric. Astr.	Multi-wavelength Studies of Very Low Mass Stars		18	42	892	21.2
Barbera Marco	Ass. Professor	Optics and Detectors for X-ray Astronomy, X-ray Mission Studies	PON OAPA XACT-related project PI Micro-calorimeter Lab.	10	20	913	45.7
Reale Fabio	Ass. Professor	Solar Physics & Plasma Numerical Modeling	INAF-PRIN PI, Local ASI PI	22	80	1327	16.6
Peres Giovanni	Full Professor	Solar Physics & Plasma Numerical Modeling	Chair: Physics Laurea Board, Local ASI PI	25	123	2092	17.0
Argiroffi Costanza	Post-Doc UNIPA	Solar & Stellar X-ray Emission		4	5	63	12.6
Miceli Marco	Post-Doc COMETA	Multi-wavelength SNR Studies & SNR Numerical Modeling		2	7	12	1.7
Penz Thomas	Post Doc M. Curie	High Energy Effects on Planetary Atmosheres		3	16	27	5.3
Pillitteri Ignazio	Post-Doc UNIPA	Multi-wavelength Stellar studies		7	14	102	7.3
Prisinzano Loredana	Post-Doc	Optical Photometry & Spectroscopy of Stars		4	8	47	5.9
Sacco Germano	Post-Doc COMETA	Optical Spectroscopy		1	1	4	4
Scelsi Luigi	Post-Doc	Multi-wavelength Stellar studies		6	13	107	8.2
Yelenina Tatiana	Post-Doc M.Curie	Numerical Modeling of PMS Jets		1	1	1	1

Notes

(1) Given the specific field of activity ADS is not adequate to measure the impact of I. Chinnici's work. She has given 25 invited talks and is co-author of 4 monographys.

(2) - Since April 2004, R. Pallavicini is working at the INAF Central Offices in Rome as Director of Structure Department.

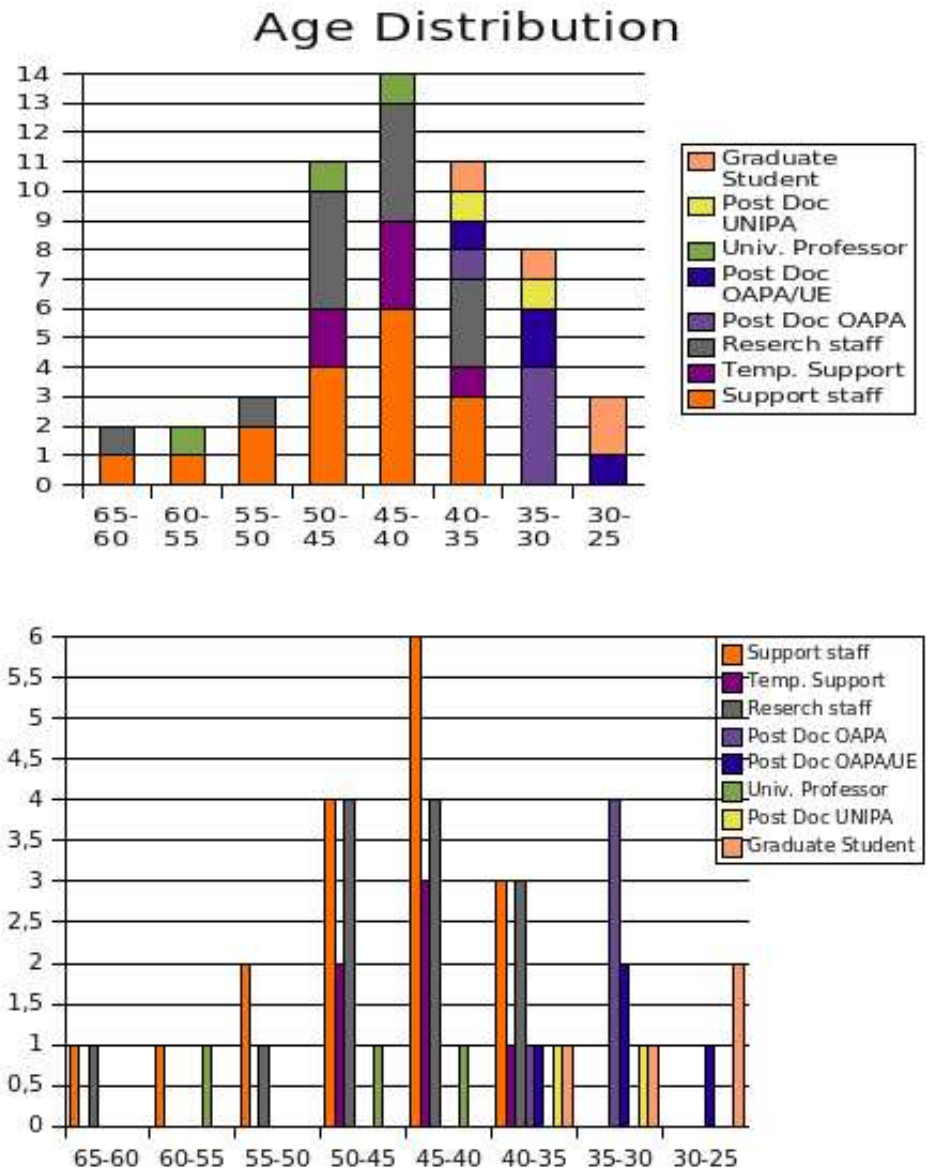

Figure 1: Upper panel: Age distribution of people working at the OAPA+Astronomy section system represented as a stacked barplot. Lower Panel: The same data represented as side-by-side barplots.

case of external funds is more complex since, in some cases they come from INAF nation-wide contracts, in others from contracts or agreements at OAPA structure level. In the essence the external funds are obtained by funding agencies or other funding entities in reply to a proposal presented by OAPA scientists and accepted after a comparative evaluation.

The residuals of external funds, if properly included[8] in the INAF new year planning budget, become again available and expendable around end of January, begin of February of the new year. Instead the residuals of Basal Research and Running Cost CRAs return to the INAF general budget. They can be used at will of INAF Board in late June, July after the approval of the INAF yearly closing budget. This prevents that the Director's structure can plan any multi-annual expenditure on Basal Research and Running Cost funds.

Table 4 summarizes the funds (all in thousands of euro) that have been available yearly during the 2004-2007 time frame. In reading this table is important to consider that in the majority of cases the external funds are for programs extending over more than a single year, but, since INAF has a competence budget, when a multi-annual grant or contract is formally acknowledge the entire sum is written[9] in the budget becoming then available to the research structure.

In steady and stable conditions one should expect that the number of contracts/grants that come to the end is replaced by new contracts/grants, in other words one would expect, within some fluctuations, a more or less stable level of yearly available resources. The simple analysis of Table 4 shows instead that the OAPA available resources have diminished constantly since 2004. The resources have diminished notwithstanding the successful proposals (and associated funds) within the Marie Curie UE program and a partial recovery from the big ASI fund crisis of the years 2002-2004. Indeed the resource decline has several origins:

- the drastic reduction of research resources from MUR is explained by the lack of new AOs for special or MUR-PON (National Program for the UE Objective-1 regions) grants (that have been an important source of financial resources for OAPA in the years 2004-2006) as well as by the very limited success of astrophysical programs in reply to recent MUR-PRIN (National Research Programs) AOs. In 2006, only 3 MUR-PRIN astrophysics programs have been approved in Italy and the 2007 AO has been issued only in late September and, contrary to initial expectations and political claims, INAF researchers (and all scientists of research institutions) cannot fully apply for those resources, but can only have a marginal role in a funding program mainly devoted to the professors and researchers of universities. While in recent past the ex-OOAA scientists had the possibility to apply for those funds, this has not been more the case from 2004. Since former OOAA, now INAF, researchers outnumber the university professors (cf. Table 1) the net result is a lack of critical mass of astrophysics with respect to other research fields and the observed decrease of success rate;

- the decline of available INAF resources at OAPA for basal research – distributed in a non-competitive basis to research structures according to structure size – from more than 300 keuro in 2004 to just 70 keuro in 2007 due to the severe shrinking of those resources in the INAF budget;

- the decline of available INAF funds at OAPA for scientific and technological projects assigned on competitive basis. Those have declined from about 400 keuro in 2004 to just 200 keuro in 2007[10].

[8] Since the planning budget for year "i+1" is prepared at the end of October of year "i", an accurate projection of the expenses to be performed in November and December is required for a correct residual prediction.

[9] Indeed we had cases in which, due to an interpretation of INAF Central Office, in presence of milestonei advancement reports and associated transfer of fund trances, only the initial trance was included in the budget.

[10] A substantial part of the 2004 resources, and in particular those for the XSHOOTER VLT instrument, were a left over of resources made available by the CNAA.

Table 4: Schematic of OAPA Budget (in thousands of euro) Organized for Funding Sources

Fund Source & Scope	2004		2005		2006		2007	
	Available	Used	Available	Used	Available	Used	Available	Used(*)
INAF - Running Cost	223	181	242	242	196	191	189	150 (187)
INAF - Basal Research	301	115	178	175	102	101	71	54 (71)
INAF - Lab & Machine Shop Building Annual Rent	56	55	90	90	102	102	104	104
INAF - Library(1)	68	62	12	12	12	12	9	5
INAF - Xshooter(2)	395	94	301	85	328	181	121	10
INAF - PRIN(3)	16	8	6	6	69	10	110	48
INAF - Tech. Transfer (i.e. MEF- PRISMA)					148	145	11	7
MUR - PRIN	386	116	290	147	145	138	7	7
MUR - Special Programs	163	26	137	63	74	35	39	14
MUR - PON XACT & OAPA LAN	711	399	312	178	134	116	18	0
ASI/INAF - Data Analysis & Future Missions	208	150	239	93	311	154	311	153
UE - Marie Curie Programs	640	86	554	258	759	174	617	140 (255)
Local Government (mainly for hardware acquisition)	150	130	90	15	76	7	104	22 (32)
MUR - Public Outreach	20	20	20	20	20	20	15	15
Local Gover. - Public Outreach							10	0
OAPA - Museum and Visit Income	34	6	32	10	30	17	19	3
TOTAL without the Building Realization Program	3371	1448	2503	1394	2506	1403	1755	732 (911)
MUR - Building Realization Program(4)	1710	22	1697	424	1273	133	612	44
GRAND TOTAL	5081	1470	4200	1818	3779	1536	2367	776 (955)

NOTES

(*) - For 2007 in few cases we can reasonably extrapolate the expenditures till the end of year. Those estimates are given in parentheses.

(1) - Until 2004 the entire library cost was covered on the OAPA budget. Since 2005 this cost is covered by a national service on Structure Dep. budget. A fraction of funds is transferred to OAPA to cover the acquisition of local interest journals and all books. The library cost have been listed separately to ease comparison.

(2) - This item includes the residual of CNAA funds for the realization of a VLT spectrograph subsequently evolved in the XSHOOTER spectrograph.

(3) - In 2003 and in 2004 no AO has been issued for the PRIN-INAF, the 2004 and 2005 resources were a left over of the program approved as part of 2002 AO whose funds were made available in 2003. The 2005 AO resources have appeared in 2006 budget.

(4) - Those are ad-hoc MUR funds devoted to building renovation, realization, etc. that have been asked from OAPA for the realization of the new building. MUR ad-hoc resources have stopped to be available since 2004. Given the amount of available resources INAF board has not included any resource for this activity in the INAF budget since 2003. In 2006 about 500 keuro have been taken from OAPA available resources to cover urgent expenses of other INAF structures. This explains the abrupt decrease of available resources in 2007 for this spending line.

This can be explained with the limited amount of those resources in the INAF budget; the funds distributed in 2006 were about 1.25 Million euro and have allowed funding about 20 biennial projects. The 2007 AO has been released October 1-st 2007 with a yet unknown budget[11]. At OAPA part of this resource contraction has been compensated by resources from UE, and from MEF (this latter resources however are strongly finalized to the transfer of knowledge toward the industries), from ASI (for programs finalized to the data analysis of space missions) as well as from funds for high performance computation that are channeled through the COMETA Consortium outside the OAPA budget. However there are research activities that have suffered and are suffering drastic resource reduction.

Table 5 presents a summary of resources available to the major on-going research activities or projects. It is evident that the scientific & technological researches for X-ray instrumentation have suffered a decrease of available funds well below the survival level. Part of the decrease was the natural consequence of the closure of the MUR-PON project for the extension/re-qualification of the XACT facility and related activities[12]. More or less at the same time this research line suffers the closure of a MUR-PRIN program that was covering the running and temporary personnel costs and, more critically, the stop of funding of R&D programs of space related activities decided by the past ASI president. In order to partly overcome this crisis OAPA Director has taken the decision to continue to support these research activities with a substantial fraction of basal research funds. Apart for a minor fraction for general support, OAPA Director has decided to focus the basal research resources on starting new promising research activity/line and/or to support qualified research lines that have suffered an unpredictable (and not motivated) fund crisis. The severe reduction of these resources and the impossibility to plan their use on a time scale of 2-3 years is hampering the possibility of a Director's intervention and is questioning the Director's role as a driver and regulator of the activity of a research structure.

6 Technical Infrastructures and Working Space

OAPA premises are hosted in the upper floors of Palazzo dei Normanni, likely the oldest and certainly the most beautiful historical Norman palace in Sicily, and in an ex-industrial building in v. Ingrassia near the premises of Department of Physical and Astronomical Sciences (DSF&A) and of other Departments of Science Faculty of the University of Palermo. Palazzo dei Normanni belongs to the public regional government. The available space in Palazzo dei Normanni is about 1000 sq.m.. However given the historical nature of these spaces their use can hardly be optimized. About 25% is used – and cannot be used differently – for the museum. Those spaces have been assigned in use to the University of Palermo (UNIPA) in 1923. The INAF-OAPA can use them thanks to an agreement between UNIPA and OAPA – agreement signed in 1988 when OAPA was an independent public legal entity – and now acting between UNIPA and INAF. This agreement permits the UNIPA and OAPA reciprocal use of all resources (rooms, laboratories, and all other logistic resources) and the proper sharing of associated costs[13]. The administration, the direction, general services, the library, the museum and the majority of scientists are compressed in the spaces of Palazzo dei Normanni[14]. As of today at the Palazzo dei Normanni premises are working 48 person plus

[11]The INAF resources that have been available to this purpose where 0.75 Meuro in 2002, 0 in 2003, 0 in 2004, 1.1 Meuro in 2005, and 1.25 Meuro in 2006. In the last two INAF triennial plans the needed resources for this action have been estimated in 2.5 Meuro/year. In real spending value, this latter amount is comparable to the level that was made available in the past by the CNAA at the OOAA.

[12]This program has covered only the cost of infrastructure renovation without any provision for running or personnel costs.

[13]UNIPA covers the conspicuous electric power cost, while OAPA covers the phone and cleaning expenses plus the ordinary maintenance.

[14]The space problem has become even more dramatic as a result of an earthquake that occurs in September 2002 and that has made unsafe two rooms at the corner of "Torre Pisana" where were accommodated the direction and part of the administration.

Table 5: Schematic of OAPA Budget (in thousands of euro) Organized for major Research Activities/Programs(1)

Program/Research Line	2004		2005		2006		2007(2)	
	Available	Used	Available	Used	Available	Used	Available	Used
XSHOOTER	494	94	400	98	413	261	121	10
Public Outreach	54	26	52	30	50	37	44	18
High Performance Computing & Information Technology(3)	440	123	307	166	578 (328)	376 (126)	541 (241)	382 (122)
Scientific & Technological Research for X-ray Instrumentation	781	543	288	222	269	229	118	74
Experimental AstroBiology	20	10	60	55	65	57	95	56
Solar Physics	40	30	17	5	63	31	102	77
Multi-wavelength SNR Studies(3)	69	32	34	19	55 (30)	45 (20)	42 (17)	40 (15)
Multi-wavelength studies of stellar & Planetary Systems	1053	280	853	361	884	289	679	235
Total	2951	1138	2011	956	2377 (2103)	1325 (1050)	1742 (1418)	892 (607)

Notes

(1) - In most cases the exposed financial resources are best estimates since it has been necessary to evaluate the subdivision of resources from a single funding source on more than a single ongoing research activities.

(2) - The figures for 2007 refer to the status at the middle of October. At the best of Director's knowledge no further additional financial resources are foreseen during the last 3 months of 2007 while additional expenses will surely occur.

(3) - In the case of these two research lines starting from 2006 OAPA has advantaged of the quote of PI2S2 project of COMETA Consortium in Palermo. The PI2S2 project has brought fresh additional financial resources for about 750 keuro at INAF in Palermo. About 500 keuro have been invested for the acquisition of new hardware, the rest in personnel. Just for completeness of information those fresh resources have been included in the above budged table, the number in parentheses indicate the resource coming directly from the OAPA budget. We stress that the PI2S2 resources for hardware acquisition are beneficial of research activities of both the two INAF research structures in Palermo.

Table 6: Breakdown of OAPA annual expenditures (in thousands of euro)

Description	2004	2005	2006	2007
Staff Personnel(1)	1216	1201	1420	1462
Temporary Research Personnel(2)	319	387	275	273
Temporary Non-Research Personnel	66	76	72	45
Building Maintenance & Utilities	152	165	161	160
Laboratories: Rent, Maintenance & Utilities(3)	84	167	132	133
Research Investment(4)	484	346	544	135
Other Expenditure for Research(5)	222	155	206	140

Notes
(1) - The substantial cost increase in 2006 is mostly due to the increase of salary level as for the new national contract. The 2007 cost is estimated starting from the 2006 value assuming a prudential yearly cost increment of 3%.
(2) - The exposed costs do not include the 2 post-docs and 1 computer specialist paid on the COMETA/PI2S2 project funds since October 2006. Their cost is about 72.000 euro per year.
(3) - The 2005 peak is due to the moving of laboratories in the building in Via Ingrassia.
(4) - In 2006 the increase of expenditure for research investment is accounted for by the acquisition of the XSHOOTER components, that cost about 200 keuro.
(5) - This listed values do not include the expenditures for the library listed in table 4.

about 3 to 4 undergraduate students, plus 3 to 4 people devoted to the outreach program. The building in Via Ingrassia has been rented in the middle of 2005 and (partly) adapted for the INAF-OAPA use during 2005. On December 31-st 2005 all the equipment has been moved in Via Ingrassia where a (slow) restart of the laboratories and machine shop has begun. The restart has been largely completed by the end of 2006. The available space in Via Ingrassia is about 600 sq.m.. This latter space is organized, at the moment, in a single big open space of 400 sq.m. hosting both the XACT facility (see Figure in the cover page) and the machine shop, plus half a dozen small and medium size rooms (all together of 150 sq. m.) hosting few specific laboratories, the XACT control room, the parallel computer system, and very few office spaces. In Via Ingrassia are stably working 8 persons, plus a couple of undergraduate students. When the XACT is used from external visiting team of scientists, the office space crisis becomes even worst.

Both the Palazzo dei Normanni as well as the Via Ingrassia premises are equipped with a fast network infrastructure that has been recently completely renovated thanks to funds from a MUR-PON program approved in reply to a national AO. The OAPA program has been led by F. Bocchino in collaboration with the staff of OAPA computer center. The two sites are interconnected with a dedicated fast optical link. The entire OAPA internal network is connected with state of the art firewall protection to the external worldwide network. The administration, as well as all other activities, makes large use of computer support. Each user has access to his/her own workstation that, up to now, has been possible to renovate when obsolete.

On top of the OAPA premises at Palazzo dei Normanni is installed a modern automatic meteorological station whose data are regularly collected and made available to a dedicated regional service as well as to interested researchers. The OAPA meteorological data constitutes one of the longest meteorological series in the Mediterranean area, has been recently included in the study of long term climate change in Europe, and several scientists have shown interest to include it in their studies. So far this activity has been taken

To guarantee the functioning of the activity we have sacrificed the lecture room to host the administration and have relocated the direction in a much smaller office. Only a couple of weeks ago we got information on the starting of planning for the post-earthquake restoration of Palazzo dei Normanni.

care by a university researcher that is near to retire. Notwithstanding OAPA meteorological series seems to be scientifically valuable and its value would, at least, ask for continuing data collection it is hard to conceive, both in the current INAF and UNIPA assets, a way to support this activity even with minimal human and financial resources.

Returning for a moment to the issue of working space, OAPA has started many years ago a program for the realization of a new building. In 2002 INAF has acquired for the future OAPA premise an old industrial pasta-maker factory building in the surroundings of the area where is located the DSF&A of the University of Palermo. In 2004 the (new) INAF Board, within the framework of a reorganization of the INAF structure research network (i.e., fusions of structures of the same geographic area), has started discussing the case of Palermo and has decided to support, in principle, the realization of a INAF new premise taking advantage of the program started by OAPA. As of today due to several difficulties a new building project prepared by the selected architect team has been submitted in the spring of 2007. The new project solution plans to destroy the old building and build a new one on the same area. If approved as proposed, the new building will have 6000 sq.m. over 4 levels, could host both the OAPA and IASF-PA activities except the laboratories and machine shop that should remain in the rented space of via Ingrassia, just few hundred meters apart. The overall cost of the new building is estimated to be about 10-11 Meuro.

7 Scientific Infrastructures, Facilities and Laboratories

OAPA premises at Palazzo dei Normanni host a library consisting of about 30.000 volumes, half of which are monographs. It constitutes the most important library devoted to astronomy and astrophysics of western Sicily (the other being the Catania one in eastern Sicily) with specific sections devoted to general physics, public outreach and history of science. The library of OAPA is very old dating back to more than 200 years ago at the time of Observatory foundation by G. Piazzi, its first director. As a result the historical collection is conspicuous and it can now be easily accessed since it has been re-ordered in the 90's thanks to the effort of D. Randazzo and G. Fodera'-Serio (now retired). The current library gives electronic access – thanks to the INAF national library service – to all relevant astrophysical professional journals, as well as paper access to a sizeable fraction of them. The current library, taken care by F. Martines, has a rich collection of monographs that is regularly kept updated with the acquisition of about 100 new titles per year. The OAPA library has an electronic catalog that can be accessed on line using a simple WEB search interface. The library is suffering a big space problem whose (temporary) solution will require an already planned increase of the available bookshelves.

At Palazzo dei Normanni is also installed a computer system fully devoted to research activities. The core of the scientific system is composed of a Linux cluster in "load balancing" configuration consisting of four 2-processor servers (3 with AMD Opteron and 1 with INTEL EM64T). This system can deliver about 30 Gflops of computational resources. Two SANs (Storage Area Network) – acquired thanks to the MUR-PON for the OAPA network upgrade – permit to have on-line access to about 6 TBytes (with replication). Two other 2-processor servers provide access, through remote client connections, to Microsoft Window applications.

Printing services are provided by B/W printers, 2 color printers, a large volume B/W printing/copying system, and a large area color printer. Some of the printers are hosted in the building in Via Ingrassia.

OAPA premises at via Ingrassia hosts SCAN (Computer System for Numerical Astrophysics) consisting of two Linux clusters of 24 and 12 AMD core processors, respectively. Those systems deliver 105 Gflops and 48 Gflops, respectively. The 24-core cluster is equipped with a fast interconnection network with small communication latency perfectly suited, and constantly used, for the solution of 2-D and 3-D numerical hydro-dynamical and small size magneto-hydrodynamical problems.

In the same building OAPA hosts the XACT (X-ray Astronomy Calibration and Testing) facility and

the machine shop. Both have been recently renovated/upgraded thanks to a MUR-PON program we have already discussed.

XACT has started to be operative since 1993 and various upgrades have been performed since then. The latter and major upgrade has been performed in the 2004-2006 period and has allowed to extend the beam line from 17 to about 35 meters (cf. Figure in the cover page), to add a sophisticated monochromator based on Bragg double diffraction that covers the energy band 0.5-30 keV, to add a test chamber for mirror test, to improve and rationalize all the acquisition and control systems, to develop and install a new vacuum-qualified micro-movement system for testing of optics.

As of today XACT consists of a vacuum beam line with at one extreme an X-ray source (micro-focus with multi-anodes) emitting a narrow beam, just after the source there is a small chamber hosting the X-ray monochromator, at the other extreme of the beam there is a 1 meter diameter chamber with reading detectors and some micro-movement systems. A 2 meter chamber in the middle of beam line is thought for the testing of X-ray optics. The vacuum pumping system, based on state of the art magnetic levitation turbomolecular pumps, is totally oil-free (i.e. carbon contamination free) and does not introduce any vibration on the overall beam-line. All vacuum equipments (pumps, valves, pressure and temperature gauges) are remotely controlled by one of the computers of the X-ray laboratory. All micro-movement systems are remotely controlled by computers. The reading detectors are 2 commercial proportional counters, 1 gas scintillation proportional counter built in house, a single pixel solid state detector sensible up to 30 keV, and a micro-channel detector with spatial resolution of 100 μm. The test chamber at one end of the beam line is hosted in a class 1000 clean room. An UV/Visible beam line, used mainly for testing the transmission properties of filters, is attached to this chamber and completes the XACT.

In the same building are hosted also an established, but still growing, laboratory for the development of microcalorimetes for applications in the X-ray domain and a, still under development, Laboratory for Experimental AstroBiology (LEAB). The first is equipped with an adiabatic demagnetization cryostat developed in house, control temperature system, cold reading electronics, a small matrix of microcalorimeters, etc..

The LEAB consists of a high vacuum ($< 10^{-10}$ mbar) chamber containing 14 ports, besides those dedicated to the vacuum pumping system, so that X-ray (1.5 - 10 keV) and UV (HI Lyα) sources, IR spectrometer, detectors can be added to the chamber. The chamber also includes a cold finger integrated with a temperature controller to provide a control of temperature, with absolute accuracy of $\pm$ 1 K, from 10 K up to room temperature and a HIDEN mass spectrometer system.

Other scientifically notable hardware includes a couple of clean benches, a couple of optical tables, a Fizeau interferometer (now on temporary loan to Osservatorio Astronomico di Brera for the integration of XSHOOTER instrument), a vacuum leak finder, dewars for liquid helium and nitrogen, etc..

8 Junior Scientists and Guest Scientists

During 2004 B. Stelzer, from Germany, and T. Morel, from France, have worked at OAPA as post-doc fellows of the UE Marie Curie TOK FP5 programm entitled *The Interplay between coronae and stellar structure along the evolutionary path*. This program, led by G. Micela, has lasted from 2000 to 2004 during which three 2 year post-doc fellows have been recruited (the third fellow was J. Sanz-Forcada from Spain, now returned in Spain with a five year tenure track contract). B. Stelzer is now a staff researcher of OAPA, while T. Morel is a post-doc at the University of Leuwen (Belgium) working on the analysis of Corot data.

Starting in July 2004, following a national level announcement of opportunity by MUR and subsequent selection, OAPA has obtained a three year special grant that has been employed, following the selection committee recommendation, for graduate student fellowships or post-doc contracts. We have activated a 30 month fellowship for a graduate student (M. Miceli, now post-doc with a contract of COMETA

consortium), a 2 year post-doc contract initially assigned to B. Stelzer and subsequently, when B. Stelzer has become a OAPA staff member, to L. Prisinzano, a 6 month fellowship assigned to M. Guarcello (now graduate student of the Ph.D. Course in Physics) and part of the biennial post-doc contract recently assigned to L. Scelsi.

In July 2004, just at the end of the FP5 Marie Curie program mentioned above, we have started *ISHERPA (The Influence of Stellar High Energy Radiation on Planetary Atmospheres)*, a four year project selected as part of the Marie Curie TOK FP6 UE program. *ISHERPA* is led by G. Micela and consists of three 2 year post-doc fellowships plus two grants for short-term (2 month each) visits of two senior scientists. Two of the post-doc fellowships have been assigned by the end of 2004 to Facundo Albacete Colombo, from Argentina, and to Javier Lopez-Santiago, from Spain. Both have already finished their two year stay in Palermo and have returned to their countries where F. Albacete Colombo got a permanent position and J. Lopez-Santiago has obtained an UE Marie Curie Re-integration Grant. The third two year fellowship has been assigned to T. Penz, from Austria, who will work at OAPA until the end of June 2008. F. Albacete-Colombo has studied the Cyg-OB2 region, revealing its low mass stellar population and characterizing the spectral and variability properties of its X-ray emission. J. Lopez-Santiago has worked on the properties of the stellar sample of the XMM-Newton Bright Source Sample, and more generally to the X-ray properties of stellar moving groups in solar neighborhood. T. Penz is working on the effects of stellar high energy radiation and its evolution on planetary atmospheres with particular attention to heating and mass loss.

With the spring 2006 started *PHOENIX (A European Program for the Transfer of Knowledge on Young Stellar Objects, their Surroundings and Jets)*, another project approved as part of the Marie Curie TOK FP6 UE program. *PHOENIX* is led by S. Orlando and consists of two 2-year post-doc fellowships. After some initial recruiting problem the first fellow, T. Yelenina, has started her activity in the spring 2007. The selection of the second fellow is still open. Tatiana Yelenina's main research area is the MHD numerical modeling of the ambient medium surrounding YSOs: from the interaction between the stellar magnetosphere with the inner accretion disk to the propagation of protostellar jets.

At the end of 2006 it has been approved *Constellation: The Origin of Stellar Masses*, an FP6 UE Training and Mobility Network, involving 12 research institutes of 7 EU countries. INAF-OAPA and INAF-Oss. Astr. di Arcetri are among the participant research institutes. The program has started in December 2006. Since INAF is a single legal entity the INAF participation is formally run by INAF-OAPA under the leadership of G. Micela. As a matter of fact the INAF-OAPA and INAF-Arcetri co-run the program and the INAF-Arcetri activity is under the responsibility of D. Galli. As part of the planned activity, a two year post-doc fellow, E. Hopewell, has already been recruited for working at OAPA and she will start her activity during October 2007.

Apart those already mentioned, other junior scientists have worked as post-doc fellows (assegno di ricerca) at OAPA during the period from 2004 till October 2007. Their post-doc fellowships were mainly covered by external funds from ASI and MUR-PRIN. We had 3 people (M.A. Artale, C. Pelliciari and E. Perinati) that have worked at the scientific/technological activities of the X-ray laboratories (material transmission properties, X-ray light optics, bolometer detectors, upgrade of XACT facility instrumentation). One has left at the end of 2004, another at the beginning of 2006 and the third just few months ago. In at least a couple of cases they have left since they have not seen any possible employment opening within INAF-OAPA. We had also 2 post-docs that have left: N. Pizzolato (he has left in 2004 and is now working at the DIFTER of UNIPA) and A. Marino (she has left in 2006 and is now a post-doc at the INAF-Oss. Astr. of Padua). L. Prisinzano is working with an Italian post-doc fellowship since December 2003. She works mainly on optical/IR photometry and spectroscopy of stars in clusters and young associations and is now near the end of the maximum 4 year post-doc fellowship. In the last 6 months, she has studied the SED of possible YSO members and has classified them according to evolutionary status, after

having assembled the deepest photometric catalog of the Orion Nebula Cluster from UV to 8 μm using data from the HST Orion Treasury Program, WFI@ESO, ISPI@CTIO and IRAC/Spitzer. By comparing the properties of their X-ray emission, deduced by a further analysis of the COUP data, she has shown, for the first time and on solid observational basis, that the X-ray emission of YSOs in the earlier evolutionary phase is lower than in the subsequent evolutionary phases.

Since January 2007 L. Scelsi is working with an of Italian post-doc fellowship on the coronal properties of pre main sequence stars in nearby star forming regions; more specifically, on their chemical abundances and temperature stratification. He has been deeply involved with the XEST project and has been involved in the simulations of X-ray spectra of pre-main sequence stars during the preparation phase of the XEUS proposal.

We have also to consider other post-docs who work as part of the OAPA+Astronomy Section system: (a) M. Miceli and G. Sacco that, after having concluded their PhD course, are now working within the COMETA Consortium at the PI2S2 project on research lines of OAPA and S. Bonito with a contract on PI2S2 funds for research at the Astronomy Section. M. Miceli is working on the analysis of X-ray data of SNRs and on the numerical modelling of the observed emission, G. Sacco is working on the analysis of optical emission of young Sigma and Lambda Orionis clusters observed with FLAMES and he has started a training on GRID computing and hydrodynamic modelling of accreting stellar systems, S. Bonito is working on the X-ray and HST spectral observations of YSO jets and on the numerical modelling of the observed emission ; (b) I. Pillitteri and C. Argiroffi whose fellowships are covered by funds of the University of Palermo. I. Pillitteri is working on the analysis of X-ray and optical data of nearby star forming regions. In the last year he has devoted most of his efforts to the XEST project and to the data gathered with the DROXO project, while C. Argiroffi is working on the X-ray emission from classical and weak-lined T Tauri stars, and on the modelling of the accretion shock X-ray emission. She is also determining the solar coronal emission measure vs. temperature of flares and, separately, of the quiescent corona in order to evaluate their relative role and the difference of the global (quiescent plus flaring) emission measure with respect to that of various active stars. By connecting solar and stellar physics she has also worked in simulating, starting from solar evidence, the thermal and non-thermal hard X-ray emission from stellar coronae in preparation of the Simbol-X mission.

Since 2006, 3 graduate students (P. Pagano, M. Caramazza, L. Affer) have their fellowships covered by INAF, 1 by INAF national funds and 2 by INAF-OAPA specific funds. P. Pagano is working on MHD modelling of shock fronts and flux rope eruptions generated during Coronal Mass Ejections, using the MHD version of the adaptive mesh refinement FLASH code. M. Caramazza is working on the low mass star formation and properties at different galactocentric distances, i.e. in different environmental conditions. The specific goal is the determination of initial mass function, disk frequency and coronal properties in a star forming region at the edge of the Galaxy. L. Affer is working on the young stellar population in the solar neighborhood through spectroscopic observations of X-ray selected samples. The final goal of this study is the determination of the history of stellar formation in the solar neighborhood. Finally, since January 1st 2007, M. Guarcello has entered on the graduate school and he is working on the effects of the environment on the evolution of circumstellar disks with particular attention to the photo-evaporation induced by the UV radiation from massive stars in star forming region.

In many cases the Italian junior scientists working at OAPA have had the possibility to perform extended visits to work with other colleagues in Italy or abroad. In the recent past those visits have concentrated at the INAF - Osservatorio di Arcetri, at the Harvard-Smithsonian Center for Astrophysics, at the Spitzer Science Center, at the LAEFF (Spain), at the University of Toronto, and at the UniSternwarte Hamburg.

In the time frame covered by this report OAPA has hosted the visits of many colleagues of other research institutions all over the world. We here just mention the more extended or recurrent visits, namely:

in 2004, H. Schnopper (SAO, Cambridge, USA), C. Cecchi-Pestellini (Dip. di Fisica, Univ. Lecce) and F. Favata (ESA/ESTEC RSSD); in 2005, F. Favata (ESA/ESTEC RSSD), J. Sanz-Forcada (ESA/ESTEC RSSD), Ines Crespo Chacon (Universidad Complutense Madrid, Spain), Jeremy Drake (SAO and Chandra X-ray Center, Cambridge, MA, USA), and Hugh Hudson (Space Science Laboratory, Univ. of California, Berkeley, USA); in 2006, F. Favata (ESA/ESTEC RSSD), C. Cecchi-Pestellini (INAF-Oss. Astr. di Cagliari), Susan Hojnacki (Center for Imaging Science, Rochester Institute of Technology, Rochester, NY, USA), Oleh Petruk (institute for Applied Problems in Mechanics and Mathematics, Livn, Ucraina), Anita Mc Connell (Cambridge University, UK), and Alison Morrison-Low (National Museum of Scotland, UK); in 2007, J. Sanz-Forcada (LAEEF, V. del Castillo, Spain), C. Cecchi-Pestellini (INAF - Oss. Astron. di Cagliari), J. Lopez-Santiago and I. Crespo-Chanon (Universidad Complutense Madrid, Spain), and extended visit at XACT from Zhang Chengmo, Wang Huanyu, Yang Jiawei, Cao Xuelei, Liang Xiaohua, Cui Xingzhu (Institute of High Energy Physics of Chinese Academy of Sciences, Beijing, China) for the calibration of LOXIA instrument on-board of CHANG'E-1 space mission, and from M. Kowalinski and S. Gburek (Space Research Centre of Polish Academy of Science) for the calibration of SphinX space instrument.

9 Relation with University and other research institutions

The OAPA scientists are involved in various activities of high level formation. In the period covered by this report OAPA has hosted about 30 stages of students of Physics, of Enviromental Engineer and Informatics degrees as well as summer stages of several foreign students in the field of optical spectroscopy, design of optical spectrographs, and technologies and calibration of X-ray instrumentation. OAPA scientists have given lectures in about 3 distinct courses per year of the University of Palermo. A. Ciaravella has taught one Physics course of the "Conservation and Restoration of Beni Culturali" degree of University of Palermo in the years 2004-2005 and 2005-2006;

The OAPA scientists work in close collaboration with the four professors of the Astronomy Section of Department of Physical and Astronomical Science of University of Palermo. The four professors (M. Barbera, G. Peres, F. Reale and S. Serio [recently retired]) are associated to INAF and have a cost-free research contract with the INAF-OAPA for the programs of common interest. From the scientific point of view, the OAPA and the Astronomy Section of DSF&A act as a single entity trying to optimize the use of resources, spaces, etc.

From 2004 to 2006 10 Laurea theses and 7 Ph.D. theses have been held at the OAPA+Astronomy Section system. In more than 60% of cases those thesis are jointly supervised by a OAPA scientist and a professor of the Astronomy Section. Starting with 2005 G. Micela, a senior scientist of OAPA, is a member of the board of Ph.D. Physics School of the University of Palermo and she is currently supervising two Doctorate theses. During 2006 7 PhD students have worked within the OAPA+Astronomy Section system, 3 of them have finished their three-year doctorate degree course and have presented for final evaluation their Doctorate Thesis. Three of the four remaining students have obtained a fellowship (or equivalent economical help) on OAPA grants or contracts. A new graduate student, selected in 2006, has started his three year course with the beginning of 2007.

Since 2005 A. Maggio, another senior scientist of OAPA, is involved with the project "Scientific Degrees (Lauree Scientifiche)" run by the Science Faculty of the University of Palermo, aiming to revitalize the interest of secondary school students in hard science degrees, such as Physics, Chemistry, Mathematics, etc.

OAPA has a long tradition of collaborations with scientists of Harvard-Smithsonian Center for Astrophysics (Cambridge, MA, USA) in the field of solar and stellar physics as well as in the field of X-ray instrumentation development. This latter is an heritage of the participation to the program for the Chandra

HRC realization. Moreover we have active collaborations with scientists of the Department of Astronomy of Chicago University, the X-ray Group of Penn State University, the stellar group at the Hamburger Sternwarte, the MIT X-ray Group, the Max-Planck Institut für Extraterrestrische Physik, the X-Ray Astronomy Group of Leicester University, the RSSD of ESA-ESTEC, the Paul Scherrer Institut of Zürich, the Observatoire de Grenoble, the Spitzer Center a IPAC-Caltech, the stellar group at the University of St Andrews, etc. as well as national collaborations with colleagues of other INAF research structures or other Universities (as discussed in the Research Program section).

Several OAPA scientists (G. Micela, M. Barbera, A. Collura, F. Bocchino) are part of the Italian collaboration that is working for the phase A study of the French/Italian/German Simbol-X mission. OAPA scientists (S. Sciortino and M. Barbera) are part of large international collaborations that have submitted in June 2007 the EDGE and the XEUS proposals to the ESA Cosmic Vision program. In particular, S. Sciortino has led the effort of writing the ”Dynamics and chemistry of cosmic plasmas” science section of the XEUS Cosmic Vision proposal to ESA.

10 Transfer of knowledge to non-astronomical enterprises

In the last few years there has been growing attention to the issue of transferring knowledge developed within research institutions to the Italian productive system. Since 2004 INAF has tried to transfer technologies developed for specific astrophysical applications to the non-astronomical world, specifically to the industries. In order to stimulate this process the Italian Government has devoted specific financial resources to research and innovation activities of industries to be performed with participations of research institutes and universities.

In 2004 the office for technological innovation (UIT) of INAF has presented to the Italian Minister of Economy (MEF) a national program, named PRISMA, for the Innovation and Development of Industries of Southern Italy. The OAPA has presented, under the responsibility of A. Collura, a sub-project for ”High Vacuum System for X-ray measurements” to be realized in collaboration with the small Sicilian company BELTEC. As a result of the project realization, BELTEC has increased its skill in the realization of high vacuum systems for other non-astrophysical research activities or for industrial applications, and OAPA has improved the capability of XACT in view of possible non-astrophysical applications. The project has been approved within INAF and then presented to the MEF and has been funded. The project has successfully concluded in February 2007, and its results presented at the May 2007 final PRISMA meeting in Rome at MEF. The OAPA sub-projects has been funded for about 155 keuro.

With the successful conclusion of PRISMA project the INAF-UIT has started a process to present a new more ambitious program to MEF. The project, named ASTROSFERA, is part of the program for the formation and evolution of industries in Southern Italy. OAPA has presented, under the responsibility and coordination of A. Collura, a project for realizing a prototype of an industrial non-dispersive, high energy resolution X-ray spectrometer with imaging capability based on micro-calorimeters. Two small Sicilian companies are involved in the project. The OAPA sub-project has been included in the INAF proposal to MEF that is currently under evaluation.

Finally it is worth to remember that the COMETA Consortium, as part of the PI2S2 project of which OAPA is one key actor in Palermo, is acting to disseminate the knowledge on, and the possibilities offered by massive parallel computation within the GRID paradigm for base and applied research as well as for improving industrial products.

11 Organization of Scientific Events

Contrary to the previous three years during which OAPA has organized several national and international meetings, in 2004-2007 this activity has been less conspicuous and OAPA has organized just few events, namely:

- Public Meeting with the President and Upper Management of INAF for presenting the status of INAF activities in Palermo, 10-11 March 2004, Room A of DSF&A, UNIPA and Room Cocchiara of CNR Research Area, Palermo
- Solar Coronal Loops Workshop and SOLAR-B Discussion, 1-3 September 2004, Hotel La Torre, Mondello, Palermo
- DROXO Collaboration Meeting, Palermo, September 2005
- XEUS Italian Community Workshop, 11-12 May 2005, Hotel Mediderraneo, Palermo
- Collaboration Meeting of INAF-PRIN PANCA Project, Palermo, April 2007

In December 2007 a meeting will be held in Palermo to present to the scientific, industrial and public body communities the realization of the computer facility of the COMETA consortium in Palermo as well as to illustrate some of the ongoing research programs, etc. This meeting is currently co-organized by INAF-OAPA, INAF-IASF/PA and UNIPA.

Depending on the ongoing interaction between ASI and INAF, OAPA is planning to organize in Palermo a national INAF-ASI meeting to present the scientific achievements obtained within the INAF-ASI contract I/035/023, run by INAF under the national scientific responsibility of G. Micela. We are also starting to plan an international school on stellar X-ray astronomy techniques as part of the Constellation UE network.

One major limitation in the organization of small-medium size events is the lack of an adequate meeting room as an effect of the 2002 earthquake that required to relocate the administration office in the former OAPA meeting room.

12 Public Outreach Activities

The scientific and technological activities are accompanied by a program of public outreach in which many of the OAPA scientists are involved. Those program includes public conferences, special observatory openings in the occasion of local (”Palermo Apre le Porte”), national (”Settimana della Cultura Scientifica”), and international (”The Researcher’s Night”, The Year of Physics) events as well as in the occasion of astronomical events (Sun or Moon Eclipses, Venus Transit, etc.) of special public interest. Some of the public conferences held by invited speakers have been attended by hundreds of participants, some of the public events, such ad those held at the Botanic Garden or in front of the Cathedral in the occasion of the two recent Venus transits, have seen the participation of several thousands of people. Some of those activities have been and are made in close collaboration with scientists of INAF/IASF-PA, the other INAF structure in Palermo, with the University of Palermo, and especially with researchers and professors of DSF&A, as well as with teachers of secondary schools of Palermo and surrounding area.

In the upper floor of the OAPA premise at Palazzo dei Normanni is hosted the ”Museo della Specola”, which exhibits a rich collection of scientific historical instruments. This collection, illustrating the two century history of the Osservatorio di Palermo and, in general, of astronomy in Palermo, is regularly visited by at least two school classes for 4 days a week (during school time). The running cost of this program is

partly covered by entrance fees, the rest of cost, and specifically that of one person devoted to the needed secretarial and reservation work, is covered by external funds found on yearly basis by the OAPA. A program of night observations has been started on an experimental basis in spring 2005. The additional running cost associated with the observing night program is covered by event fees. Observing night and museum visit reservations are dealt with by the same person. In the period from January 1-st to July 31-st 2007 we have had about 3000 people visiting the museum, 600 people taking part in Sun observations, 1500 people taking part to night observations. Increasing limitation imposed by Italian national law on the recruitment of external personnel is forcing to deeply revise the functioning of the visit program, especially the night observation one.

The position of OAPA on-top of Palazzo dei Normanni, where seats the Sicilian Regional Parliament, limits the access to OAPA and to the Museo della Specola. As a result, the running of these activities, some of which involve graduate students and post docs, requires help of external auxiliary staff; during 2006 we have employed two volunteers from the Italian Civil Services (at no-cost for OAPA) as well as members of the ”Associazione Amici dei Musei” (Museum Friend Association). In view of the events planned for 2009, Year of Astronomy, in 2006 we have requested, in agreement with UNIPA, that OAPA be included among the sites regularly employing volunteers from the Italian Civil Service for museal and outreach programs starting from 2008. The proposed program is under evaluation by the Italian Civil Service.

All outreach activities as well as the scientific activities are on-line on the OAPA web-page and are advertised by press-releases and/or news reports in local newspapers and radio/tv stations. When possible the OAPA scientists made their best efforts to give international visibility to their scientific activities taking advantage of NASA, ESA and INAF press-release systems. Finally it is worth mentioning that during the last 2 years three A&A issues had in cover page a figure taken from papers of OAPA researchers (Favata, Bonito, Micela et al., A&A 2006 450, L17; Miceli, Bocchino, Maggio, Reale A&A 2005, 442, 513; Flaccomio, Micela, Sciortino A&A 2006 455, 903).

13 Ph.D. Theses and Laurea Theses at OAPA

Below are listed the Ph.D. Theses that have been written as results of research done within the OAPA+Astronomy Section system from 2004.

- I. Pillitteri, *X-ray Emission and Variability of stars in young open cluster*, September 2004
- P. Testa, *Solar and Stellar Coronal Structures: X-ray and EUV Observations, and Hydrodynamic Modelling*, September 2004
- C. Argiroffi, *Coronal properties of X-ray bright stars in young associations: abundances, temperatures, and variability*, December 2005
- P. Spano’, *Part I: X-SHOOTER: design and development of an ample band, high efficiency, and intermediate spectral resolution spectrograph for the VLT. Part II: The lithium in the open clusters of age greater than 1 Gyr: new FLAMES observations at VLT*, December 2005
- M. Miceli, *The interaction between the Supernova Remnant Shock Fronts and the Interstellar Medium: Models and Observations*, December 2006
- G. Sacco, *Optical Spectroscopy of late-type stars in the young stellar cluster σ Orionis and λ Orionis*, December 2006
- L. Scelsi. *Magnetic Activity of Young Late-Type Stars: The Taurus-Auriga Star Forming Region*, December 2006

Below are listed the Laurea Theses since 2004 that have resulted in at least one published referred publication. Original Italian titles have been translated in English.

- S. Bonito, *Protostellar plasma jets: interaction with the interstellar medium; emission mechanisms. Diagnostics and models*, July 2004
- M. Caramazza, *X-ray variability of low-mass stars in the Orion nebula*, July 2005
- P. Pagano, *Magnetohydrodynamical study of CME*, July 2005
- E. Troja, *The thermal X-ray emission of the SNR IC 443 seen with XMM-Newton*, July 2005
- M. Guarcello, *Circumstellar disks in the star formation region NGC 6611: optical, NIR and X-ray observations*, April 2006

14 Publications

Below is enclosed the list of publications of all 25 scientists (staff and post-doc fellows) working at the OAPA+Astronomy Section system. In the period from January 1-st 2004 to September 30 2007 155 referred papers have been published or are in press, the normalized counts of publications is 6.2, those publications have been cited 1323 times and the normalized number of citations is 270. If we strictly perform the above analysis considering only the 18 OAPA staff and post-doc fellows we have 145 referred papers with a normalized counts of 8.0, 1203 total citations and 240 normalized citations. Given the size of OAPA and the strong integration of the various research lines computing above figures separately for research groups, etc. would have little meaning and we refrain to attempt it. Analytical information on each researcher is however provided in Table 3.

Personnel of the INAF - Osservatorio Astronomico di Palermo is indicated in bold, while researchers and Ph.D. students at the Astronomy Section of the DSF&A of the University of Palermo, associated to INAF, are underlined.

Refereed papers
2004

[1] C. Argiroffi, J.J. Drake, **A. Maggio**, G. Peres, **S. Sciortino**, and F.R. Harnden. High resolution X-ray spectroscopy of the post-T Tauri star PZ Tel. *ApJ*, 609(2):925, 2004.

[2] M. Audard, A. Telleschi, M. Guedel, S.L. Skinner, **R. Pallavicini**, and U. Mitra-Kraev. Some like it hot: X-ray emission of the giant star YY Mensae. *ApJ*, 617:531, 2004.

[3] R. Bandiera and **F. Bocchino**. The X-ray halo of G21.5-0.9. *Advances in Space Research*, 33:398, 2004.

[4] M. Barbera, **E. Perinati**, S. Serio, and E. Silver. Spectral broadening by quasiparticle pile-up in X-ray microcalorimeters with superconducting absorber. *Nucl. Inst. & Meth. A*, 520:220, 2004.

[5] **F. Bocchino**, M. Miceli, and **A. Maggio**. Shock-cloud interaction in the Vela SNR: preliminary results of an XMM-Newton observation. *Adv. Space Res.*, 33:381, 2004.

[6] R. Bonito, **S. Orlando**, G. Peres, F. Favata, and R. Rosner. The X-ray emission mechanism in the protostellar jet HH 154. *A&A*, 424:L1, 2004.

[7] **A. Ciaravella**, F. Scappini, M. Franchi, C. Cecchi-Pestellini, M. Barbera, **R. Candia**, E. Gallori, and **G. Micela**. Role of clay on adsorbed DNA against X-ray radiation. *IJAsB*, 3:31, 2004.

[8] **F. Damiani**, **E. Flaccomio**, **G. Micela**, **S. Sciortino**, F.R. Harnden Jr., and S.S. Murray. Deep Chandra X-ray observation of the rich young cluster NGC6530. I. The X-ray source catalog and the cluster population. *ApJ*, 608:781, 2004.

[9] F. Favata, **G. Micela**, S.L. Baliunas, J. Schmitt, M. Guedel, F.R. Harnden Jr., **S. Sciortino**, and R. A. Stern. High-amplitude, long-term X-ray variability in the solar type star HD 81809: the beginning of an X-ray activity cycle? *A&A*, 418:L13, 2004.

[10] E.D. Feigelson, A.E. Hornschemeier, **G. Micela**, F.E. Bauer, D.M. Alexander, W.N. Brandt, F. Favata, **S. Sciortino**, and G.P. Garmire. The Chandra Deep Field-North Survey: XVII. evolution of magnetic activity in old late-type stars. *ApJ*, 611:1107, 2004.

[11] M. Fernandez, **B. Stelzer**, A. Henden, K. Grankin, J.F. Gameiro, V.M. Costa, E. Guenther, P. Amado, and E. Rodriguez. The weak-line T Tauri star V410 Tau. II. a flaring star. *A&A*, 427:263, 2004.

[12] G. Giardino, F. Favata, and **G. Micela**. Chandra observations of the massive star-forming region S106. X-ray emission from the embedded massive protostellar objects IRS 4. *A&A*, 424:965, 2004.

[13] G. Giardino, F. Favata, **G. Micela**, and F. Reale. A large X-ray flare from the Herbig Ae star V892 Tau. *A&A*, 413:669, 2004.

[14] M. Guedel, M. Audard, F. Reale, S.L. Skinner, and J.L. Linsky. Flares from small to large: X-ray spectroscopy of Proxima Centauri with XMM-Newton. *A&A*, 416:713, 2004.

[15] V. La Parola, G. Fabbiano, M. Elvis, F. Nicastro, D.W. Kim, and G. Peres. Long term X-ray spectral variability of the nucleus of M81. *ApJ*, 601:831, 2004.

[16] **A. Maggio**, J.J. Drake, V. Kashyap, F.R. Harnden Jr., **G. Micela**, G. Peres, and **S. Sciortino**. X-ray spectroscopy of the unsteady quiescent corona of AD Leo with Chandra. *ApJ*, 613:548, 2004.

[17] **T. Morel** and **G. Micela**. On the determination of oxygen abundances in chromospherically active stars. *A&A*, 423:677, 2004.

[18] **T. Morel**, **G. Micela**, F. Favata, and D. Katz. The photospheric abundances of active binaries III. abundance peculiarities at high activity levels. *A&A*, 426:1007, 2004.

[19] W. Orchiston, B. Corbin, **I. Chinnici**, S. Débarbat, W. Dick, D. Green, and A. Perkins. The IAU astronomical archives working group. 2: progress report. *JAHH*, 7:61, 2004.

[20] **S. Orlando**, G. Peres, and F. Reale. The Sun as an X-ray star: Active region evolution, rotational modulation, and implications for X-ray stellar variability. *A&A*, 424:677, 2004.

[21] R.A. Osten, A. Brown, T.R. Ayres, S.A. Drake, **E. Franciosini**, **R. Pallavicini**, G. Tagliaferri, K.L. Jones, R.T. Stewart, S.L. Skinner, J.L. Linsky, and B. Deeney. A multi-wavelength perspective of flares on HR 1099: four years of coordinated campaigns. *ApJS*, 153:317, 2004.

[22] **R. Pallavicini** and S. Randich. Unsolved problems in observational astronomy. I. Focus on stellar spectroscopy. *Astronomische Nachrichten*, 325:462, 2004.

[23] A. N. Parmar, G. Hasinger, M. Arnaud, X. Barcons, D. Barret, H. Böhringer, A. Blanchard, M. Cappi, A. Comastri, T. Courvoisier, A. C. Fabian, F. Fiore, I. Georgantopoulos, P. Grandi, R. Griffiths, A. Hornstrup, N. Kawai, K. Koyama, K. Makishima, G. Malaguti, K. O. Mason, C. Motch, M. Mendez, T. Ohashi, F. Paerels, L. Piro, T. Ponman, J. Schmitt, **S. Sciortino**, G. Trinchieri, M. van der Klis, and M. Ward. Studying the evolution of the hot universe with the X-ray evolving universe spectroscopy mission - XEUS. *Advances in Space Research*, 34:2623, 2004.

[24] G. Peres, **S. Orlando**, and F. Reale. Are late type stars coronae made of solar-like structures? the Fx-HR diagram and the pressure-temperature correlation. *ApJ*, 612:472, 2004.

[25] **E. Perinati**, M. Barbera, **A. Collura**, S. Serio, and E. Silver. Spectral broadening by incomplete thermalization of the energy in X-ray microcalorimeters with superconducting absorber. *NIMPA*, 531:459, 2004.

[26] **E. Perinati**, M. Barbera, S. Serio, and E. Silver. Spectral broadening by spatial effects in X-ray microcalorimeters with superconducting absorber and NTD-Ge thermal sensor. *Nucl. Inst. & Meth. A*, 520:216, 2004.

[27] I. Pillitteri, **G. Micela**, **S. Sciortino**, **F. Damiani**, and R. F. Harnden Jr. XMM observation of the young open cluster Blanco 1. I. X-ray spectroscopy and photometry. *A&A*, 421:175, 2004.

[28] R.K. Prinja, Th. Rivinius, O. Stahl, A. Kaufer, B.H. Foing, J. Cami, and **S. Orlando**. Photospheric and stellar wind variability in eps Ori (B0 Ia). *A&A*, 418:727, 2004.

[29] **L. Prisinzano**, **G. Micela**, **S. Sciortino**, and F. Favata. Parameter properties and stellar population of the old open cluster NGC 3960. *A&A*, 417:945, 2004.

[30] J.C. Raymond and **A. Ciaravella**. Density and velocities in fast coronal mass ejections: Radiative pumping of the O VI doublet. *ApJL*, 606:L159, 2004.

[31] F. Reale, M. Guedel, G. Peres, and M. Audard. Modeling an X-ray flare on Proxima Centauri: evidence of two flaring loop components and of two heating mechanisms at work. *A&A*, 416:733, 2004.

[32] J. Sanz-Forcada, F. Favata, and **G. Micela**. Coronal versus photospheric abundances of stars with different activity levels. *A&A*, 416:281, 2004.

[33] J. Sanz-Forcada, **E. Franciosini**, and **R. Pallavicini**. XMM-Newton observations of the sigma Ori cluster. I. The complex RGS spectrum of the hot star sigma Ori AB. *A&A*, 421:715, 2004.

[34] L. Scelsi, **A. Maggio**, G. Peres, and P. Gondoin. X-ray spectroscopy of the Hertzsprung-gap giant star 31 Com, observed with XMM-Newton. *A&A*, 413:643, 2004.

[35] P. Sestito, S. Randich, and **R. Pallavicini**. Lithium evolution in intermediate age and old open clusters: NGC 752 revisited. *A&A*, 426:809, 2004.

[36] **B. Stelzer**. Quiescent X-ray emission from an evolved brown dwarf? *ApJ*, 615:L153, 2004.

[37] **B. Stelzer**, **G. Micela**, and R. Neuhauser. XMM-Newton probes the stellar population in Cha I south. *A&A*, 423:1029, 2004.

[38] **B. Stelzer** and J.H.M.M. Schmitt. X-ray emission from a metal depleted accretion shock onto the classical T Tauri star TW Hya. *A&A*, 418:687, 2004.

[39] K.G. Strassmeier, **R. Pallavicini**, J.B. Rice, M.I. Andersen, and F.M. Zerbi. The science case of the PEPSI high-resolution echelle spectrograph and polarimeter for the LBT. *AN*, 325:278, 2004.

[40] P. Testa, J. J. Drake, and G. Peres. The Density of Coronal Plasma in Active Stellar Coronae. *ApJ*, 617:508, 2004.

[41] P. Testa, J. J. Drake, G. Peres, and E. E. DeLuca. Detection of X-Ray Resonance Scattering in Active Stellar Coronae. *ApJ*, 609:L79, 2004.

[42] S.J Wolk, F.R. Harnden Jr., S.S. Murray, N.R. Adams, **F. Damiani**, **E. Flaccomio**, **G. Micela**, **S. Sciortino**, and R.D. Jeffries. Coronal variability in the young cluster NGC 2516. *ApJ*, 606:466, 2004.

2005

[43] **L. Affer**, **G. Micela**, **T. Morel**, J. Sanz-Forcada, and F. Favata. Spectroscopic determination of atmospheric parameters and chemical abundances of 6 K-type stars. *A&A*, 433:647, 2005.

[44] C. Argiroffi, **A. Maggio**, G. Peres, **B. Stelzer**, and R. Neuhaeuser. XMM-Newton spectroscopy of the metal-depleted T Tauri star TWA-5. *A&A*, 439(3):1149, 2005.

[45] **F. Bocchino**. Detection of thermal X-ray emission in the halo of the plerionic supernova remnant G21.5-0.9. *Adv. Sp. Res.*, 35:1003, 2005.

[46] **F. Bocchino**, E. van der Swaluw, R. Chevalier, and R. Bandiera. The nature of the X-ray halo of the plerion G21.5-0.9 unveiled by XMM-Newton and Chandra. *A&A*, 442:539, 2005.

[47] A.M. Bykov, **F. Bocchino**, and G.G. Pavlov. Hard extended X-ray source in the IC 443 SNR resolved by Chandra: a fast ejecta fragment of a new pulsar wind nebula? *ApJL*, 624:L41, 2005.

[48] **A. Ciaravella**, J.C. Raymond, S.W. Kahler, A. Vourlidas, and J. Li. Detection and diagnostics of a coronal shock wave driven by a partial-halo coronal mass ejection on 2000 june 28. *ApJ*, 621:1121, 2005.

[49] F. Favata, **G. Micela**, B. Silva, **S. Sciortino**, and M. Tsujimoto. A survey for Fe 6.4 keV emission in young stellar objects in ρ Oph: The strong fluorescence from Elias 29. *A&A*, 433:1047, 2005.

[50] F. Favata, **E. Flaccomio**, F. Reale, **G. Micela**, **S. Sciortino**, H. Shang, K.G. Stassun, and E.D. Feigelson. Bright X-ray flares in Orion young stars from COUP: evidence for star-disk magnetic fields? *ApJS*, 160:469, 2005.

[51] **E. Flaccomio**, **G. Micela**, **S. Sciortino**, E.D. Feigelson, W. Herbst, F. Favata, F.R. Harnden Jr., and S.D. Vrtilek. Rotational modulation of X-ray emission in Orion nebula young stars. *ApJS*, 160:450, 2005.

[52] K.V. Getman, E.D. Feigelson, N. Grosso, M.J. McCaughrean, **G. Micela**, P. Broos, G. Garmire, and L. Townsley. Membership of the Orion nebula population from the Chandra Orion Ultradeep Project. *ApJS*, 160:353, 2005.

[53] K.V. Getman, **E. Flaccomio**, P.S. Broos, N. Grosso, M. Tsujimoto, L. Townsley, G.P. Garmire, J. Kastner, J. Li, F.R. Harnden Jr., S. Wolk, S.S. Murray, C.J. Lada, A.A. Muench, M.J. McCaughrean, G. Meeus, **F. Damiani**, **G. Micela**, **S. Sciortino**, J. Bally, L.A. Hillenbrand, W. Herbst, T. Preibisch, and E.D. Feigelson. Chandra Orion Ultradeep Project: Observations and source lists. *ApJS*, 160:319, 2005.

[54] N. Grosso, E.D. Feigelson, K.V. Getman, L. Townsley, P. Broos, **E. Flaccomio**, M.J. McCaughrean, **G. Micela**, **S. Sciortino**, J. Bally, N. Smith, A.A. Muench, G. Garmire, and F. Palla. Chandra Orion Ultradeep Project census of X-ray stars in the BN-KL and OMC-1S regions. *ApJS*, 160:530, 2005.

[55] K. Hamaguchi, M.F. Corcoran, R. Petre, N.E. White, **B. Stelzer**, K. Nedachi, and N. Kobayashi. Discovery of extremely embedded X-ray sources in the R Coronae Australis star forming core. *ApJ*, 623:291, 2005.

[56] **A. Maggio** and J.-U. Ness. Spectral indications of density variability in the corona of AD Leonis. *ApJL*, 622:57, 2005.

[57] V. Mangano, E. Massaro, **F. Bocchino**, T. Mineo, and G. Cusumano. The extended hard X-ray emission from the Vela plerion. *A&A*, 436:917, 2005.

[58] **A. Marino**, **G. Micela**, G. Peres, I. Pillitteri, and **S. Sciortino**. X-ray spectral and timing characteristics of the stars in the young open cluster IC 2391. *A&A*, 430:287, 2005.

[59] M. Miceli, **F. Bocchino**, **A. Maggio**, and F. Reale. Multi-phase interstellar clouds in the Vela SNR resolved with XMM-Newton. *Adv. Sp. Res.*, 35:1012, 2005.

[60] M. Miceli, **F. Bocchino**, **A. Maggio**, and F. Reale. Shock-cloud interaction in the Vela SNR observed with XMM-Newton. *A&A*, 442:513, 2005.

[61] **T. Morel** and Y. Grosdidier. Near-infrared identification of the counterpart to X1908+075: a new OB-supergiant X-ray binary. *MNRAS*, 356:665, 2005.

[62] **S. Orlando**, G. Peres, F. Reale, **F. Bocchino**, R. Rosner, T. Plewa, and A. Siegel. Crushing of interstellar gas cloud in supernova remnants. I. The role of thermal conduction and radiative losses. *A&A*, 444:505, 2005.

[63] F. Palla, S. Randich, **E. Flaccomio**, and **R. Pallavicini**. Age spreads in star-forming regions: the lithium test in the Orion Nebula Cluster. *ApJ*, 626:L49, 2005.

[64] I. Pillitteri, **G. Micela**, F. Reale, and **S. Sciortino**. XMM-Newton observation of the open cluster Blanco 1. II. X-ray time variability and flares. *A&A*, 430:155, 2005.

[65] T. Preibisch, Y.-C. Kim, F. Favata, E.D. Feigelson, **E. Flaccomio**, K. Getman, **G. Micela**, **S. Sciortino**, K. Stassun, **B. Stelzer**, and H. Zinnecker. The origin of T Tauri X-ray emission: New insights from the Chandra Orion Ultradeep Project. *ApJS*, 160:401, 2005.

[66] T. Preibisch, M.J. McCaughrean, N. Grosso, E.D. Feigelson, **E. Flaccomio**, K. Getman, L.A. Hillenbrand, G. Meeus, **G. Micela**, **S. Sciortino**, and **B. Stelzer**. X-ray emission from young brown dwarfs in the Orion nebula cluster. *ApJS*, 160:582, 2005.

[67] **L. Prisinzano**, **F. Damiani**, **G. Micela**, and **S. Sciortino**. The star formation region NGC 6530: distance, ages and initial mass function. *A&A*, 430:941, 2005.

[68] F. Reale, G. Nigro, F. Malara, G. Peres, and P. Veltri. Modeling a coronal loop heated by MHD-turbulence nanoflares. *ApJ*, 633:489, 2005.

[69] L. Scelsi, **A. Maggio**, G. Peres, and **R. Pallavicini**. Coronal properties of G-type stars in different evolutionary phases. *A&A*, 432:671, 2005.

[70] J.H.M.M. Schmitt, R. Robrade, J.-U. Ness, F. Favata, and **B. Stelzer**. X-ray from accretion shocks in T Tauri stars: The case of BP Tau. *A&A*, 432:L35, 2005.

[71] **B. Stelzer**, **E. Flaccomio**, T. Montmerle, **G. Micela**, **S. Sciortino**, F. Favata, T. Preibisch, and E.D. Feigelson. X-ray emission from early-type stars in the Orion nebula cluster. *ApJS*, 160:557, 2005.

[72] P. Testa, G. Peres, and F. Reale. Emission measure distribution in loops impulsively heated at the foot-points. *ApJ*, 622:695, 2005.

[73] M. Tsujimoto, E.D. Feigelson, N. Grosso, **G. Micela**, Y. Tsuboy, F. Favata, H. Shang, and J.H. Kastner. Iron fluorescent emission from young stellar objects in the Orion nebula. *ApJS*, 160:503, 2005.

[74] S.J. Wolk, F.R. Harnden Jr., **E. Flaccomio**, **G. Micela**, F. Favata, S. Shang, and E.D. Feigelson. Stellar activity on the active young suns of Orion: COUP observations of K5-7 pre-main-sequence stars. *ApJS*, 160:423, 2005.

2006

[75] C. Argiroffi, F. Favata, **E. Flaccomio**, **A. Maggio**, **G. Micela**, G. Peres, and **S. Sciortino**. XMM-Newton survey of two Upper Scorpius regions. *A&A*, 459:199, 2006.

[76] D. Cecchi-Pestellini, **A. Ciaravella**, and **G. Micela**. Stellar X-ray heating of planet atmospheres. *A&AL*, 458:L13, 2006.

[77] **I. Chinnici**, A. Mandrino, and F. Bonoli. Historical archives in italian astronomical observatories: the Specola 2000 project. *JAHH*, 9:200, 2006.

[78] **A. Ciaravella**, J.C. Raymond, and S.W. Kahler. UV properties of halo CMEs: doppler shifts, angles, shocks and bulk morphology. *ApJ*, 652:774, 2006.

[79] S. Covino, F. M. Zerbi, **R. Pallavicini**, P. Conconi, R. Cosentino, V. DeCaprio, A. DeUgarte Postigo, P. Di Marcantonio, M. Riva, P. Santin, P. Spanó, and A. Zacchei. The X-shooter Spectrograph: A Second Generation Instrument for the VLT. *Chinese Journal of Astronomy and Astrophysics Supplement*, 6:361, 2006.

[80] I. Crespo-Chacon, D. Montes, D. Garcia-Alvarez, M.J. Fernandez-Figueroa, **J. Lopez-Santiago**, and B.H. Foing. Analysis and modeling of high temporal resolution spectroscopic observations of flares on AD Leonis. *A&A*, 452:987, 2006.

[81] **F. Damiani**, **G. Micela**, and **S. Sciortino**. Chandra X-ray observations of the stellar group near the Herbig Be star MWC 297: a revision of the X-ray properties of MWC 297. *A&A*, 447:1041, 2006.

[82] **F. Damiani**, **G. Micela**, **S. Sciortino**, N. Huelamo, A. Moitinho, F.R. Harnden, and S.S. Murray. The young cluster NGC 2362: low-mass population and initial mass function from a Chandra X-ray observation. *A&A*, 460:133, 2006.

[83] **F. Damiani**, **L. Prisinzano**, **G. Micela**, and **S. Sciortino**. The rich young cluster NGC 6530: a combined X-ray-optical-infrared study. *A&A*, 459:477, 2006.

[84] F. Favata, R. Bonito, **G. Micela**, M. Fridlund, **S. Orlando**, **S. Sciortino**, and G. Peres. The discovery of an expanding X-ray source in the HH 154 protostellar jet. *A&A*, 450:L17, 2006.

[85] **E. Flaccomio**, **G. Micela**, and **S. Sciortino**. ACIS-I observations of NGC 2264. membership and X-ray properties of PMS stars. *A&A*, 455:903, 2006.

[86] **E. Franciosini**, **R. Pallavicini**, and J. Sanz-Forcada. XMM-Newton observations of the sigma Ori cluster. II. Spatial and spectral analysis of the full EPIC field. *A&A*, 446:501, 2006.

[87] G. Giardino, F. Favata, B. Silva, **G. Micela**, F. Reale, and **S. Sciortino**. X-ray and optical bursts and flares in YSOs: results from a 5-day XMM-Newton monitoring campaign of L1551. *A&A*, 453:241, 2006.

[88] **J. Lopez-Santiago**, J. Montes, I. Crespo-Chacon, and M.J. Fernandez-Figueroa. The nearest young moving groups. *ApJ*, 643:1160, 2006.

[89] V. Mangano, **F. Bocchino**, G. Cusumano, E. Massaro, and T. Mineo. The hard X-ray emission from the Vela pulsar wind nebula. *Adv. Sp. Res.*, 436:917, 2006.

[90] **A. Marino**, **G. Micela**, I. Pillitteri, and G. Peres. X-ray variability of NGC 2516 in the XMM-Newton observations. *A&A*, 456:957, 2006.

[91] M. Miceli, A. Decourchelle, J. Ballet, **F. Bocchino**, J.P. Hughes, U. Hwang, and R. Petre. The X-ray emission of the supernova remnant W49b observed with XMM-Newton. *A&A*, 453:567, 2006.

[92] M. Miceli, F. Reale, **S. Orlando**, and **F. Bocchino**. Shock-cloud interaction in the Vela SNR. II. Hydrodynamic model. *A&A*, 458:213, 2006.

[93] A. Moberg, P. D. Jones, D. Lister, A. Walther, M. Brunet, J. Jacobeit, L.V. Alexander, P. Della-Marta, J. Luterbacher, P. Yiou, D. Chen, A.M.G. Klein Tank, O. Saladie, J. Sigro, E. Aguilar, H. Alexandersson, C. Almarza, I. Auer, M. Barriendos, M. Begert, H. BeRGStroem, R. Boehm, J. Butler, J. Caesar, A. Drebs, D. Founda, F-W. Gerstengarbe, **G. Micela**, M. Maugeri, H. Oesterle, K. Pandzic, M. Petrakis, L. Srnec, R. Tolasz, H. Tuomenvirta, P.C. Werner, H. Linderholm, A. Philipp, H. Wanner, and E. Xoplaki. Indices for daily temperature and precipitation extremes in europe analysed for the period 1901-2000. *JGR - Atmospheres.*, 111:D22106, 2006.

[94] **T. Morel**, **G. Micela**, and F. Favata. Photospheric abundance peculiarities in RS CVn binaries. *Ap&SS*, 304:185, 2006.

[95] **S. Orlando**, **F. Bocchino**, G. Peres, F. Reale, T. Plewa, and R. Rosner. Crushing of interstellar gas cloud in supernova remnants. II. X-ray emission. *A&A*, 457:545, 2006.

[96] **R. Pallavicini**, **E. Franciosini**, **A. Maggio**, L. Scelsi, and J. Sanz-Forcada. XMM-Newton spectroscopy of stars in open clusters and star forming regions. *AdspR*, 38:1509, 2006.

[97] M. Pick, T.G. Forbes, G. Mann, H.V. Cane, J. Chen, **A. Ciaravella**, H. Cremades, R.A. Howard, H.S. Hudson, A. Klassen, K.L. Klein, M.A. Lee, J.A. Linker, D. Maia, Z. Mikic, J.C. Raymond, M.J. Reiner, G.M. Simnett, N. Srivastava, D. Tripathi, R. Vainio, A. Vourlidas, J. Zhang, T.H. Zurbuchen, N.R. Sheeley, and C. Marqué. Multi-wavelength observations of CMEs and associated phenomena. *SSRv*, 123:341, 2006.

[98] I. Pillitteri, **F. Damiani**, **G. Micela**, and **S. Sciortino**. Deep X-ray survey of the young open cluster NGC 2516 with XMM-Newton. *A&A*, 450:993, 2006.

[99] S. Puccetti, F. Fiore, V. D'Elia, I. Pillitteri, C. Feruglio, A. Grazian, M. Brusa, P. Ciliegi, A. Comastri, C. Gruppioni, M. Mignoli, C. Vignali, G. Zamorani, F. La Franca, N. Sacchi, A. Franceschini, S. Berta, H. Buttery, and J. E. Dias. The XMM-Newton survey of the ELAIS-S1 field. I. Number counts, angular correlation function and X-ray spectral properties. *A&A*, 457:501, 2006.

[100] S. Randich, P. Sestito, F. Primas, **R. Pallavicini**, and L. Pasquini. Element abundances of unevolved stars in the open cluster M 67. *A&A*, 450:557, 2006.

[101] F. Reale. Flare diagnostics from loop modeling of a stellar flare observed with XMM-Newton. *Adv. Sp. Res.*, 38:1520, 2006.

[102] F. Reale and **A. Ciaravella**. Analysis of a multi-wavelength time-resolved observation of a coronal loop. *A&A*, 449:1177, 2006.

[103] L.M. Rebull, J.R. Stauffer, S.V. Ramirez, **E. Flaccomio**, **S. Sciortino**, **G. Micela**, S.E. Strom, and S.C. Wolff. Chandra X-ray observations of young clusters. III. NGC 2264 and the Orion flanking fields. *AJ*, 131:2934, 2006.

[104] J. Sanz-Forcada, F. Favata, and **G. Micela**. A compact flare eclipsed in the corona of SV Camelopardalis. *A&A*, 445:673, 2006.

[105] R. Schwenn, J.C. Raymond, D. Alexander, **A. Ciaravella**, N. Gopalswamy, R. Howard, H. Hudson, P. Kauffman, A. Klassen, D. Maia, G. Munoz-Martinez, M. Pick, M. Reiner, N. Srivastava, D. Tripathi, A. Vourlidas, Y.-M. Wang, and J. Zhang. Coronal observations of CMEs. *SSRv*, 123:127, 2006.

[106] P. Sestito, A. Bragaglia, S. Randich, E. Carretta, **L. Prisinzano**, and M. Tosi. Old open clusters as key tracers of galactic chemical evolution. I. Fe abundances in NGC 2660, NGC 3960, and Berkeley 32. *A&A*, 458:121, 2006.

[107] P. Spanò, F.M. Zerbi, C.J. Norrie, C.R. Cunningham, K.G. Strassmeier, A. Bianco, P.A. Blanche, M. Bougoin, M. Ghigo, P. Hartmann, L. Zago, E. Atad-Ettedgui, B. Delabre, H. Dekker, M. Melozzi, B. Snyders, R. Takke, and D.D. Walker. Challenges in optics for extremely large telescope instrumentation. *AN (Astronomical Notes)*, 327:649, 2006.

[108] K. G. Stassun, M. van den Berg, E. Feigelson, and **E. Flaccomio**. A Simultaneous Optical and X-Ray Variability Study of the Orion Nebula Cluster. I. Incidence of Time-correlated X-Ray/Optical Variations. *ApJ*, 649:914, 2006.

[109] **B. Stelzer**, **G. Micela**, **E. Flaccomio**, R. Neuhaeuser, and R. Jayawardhana. X-ray emission of brown dwarfs: Towards constraining the dependence on age, luminosity and temperature. *A&A*, 448:293, 2006.

[110] **B. Stelzer**, **G. Micela**, K. Hamaguchi, and J.H.M.M.M. Schmitt. On the origin of the X-ray emission from Herbig Ae/Be stars. *A&A*, 457:223, 2006.

[111] **B. Stelzer**, J.H.M.M. Schmitt, **G. Micela**, and C. Liefke. Simultaneous optical and X-ray observations of a giant flare on the ultracool dwarf LP412-31. *A&A*, 460:L35, 2006.

[112] **B. Stelzer**, N. Huélamo, **G. Micela**, and S. Hubrig. Testing the companion hypothesis for the origin of the X-ray emission from intermediate-mass main-sequence stars. *A&A*, 452:1001, 2006.

[113] E. Troja, **F. Bocchino**, and F. Reale. XMM-Newton observations of the supernova remnant IC443: 1. soft X-ray emission from shocked interstellar medium. *ApJ*, 649:258, 2006.

2007

[114] **J.F. Albacete Colombo**, M. Caramazza, **E. Flaccomio**, **G. Micela**, and **S. Sciortino**. X-ray flaring from the young stars in cygnus ob2. *A&A*, in press, 2007.

[115] **J.F. Albacete Colombo**, **E. Flaccomio**, **G. Micela**, **F. Damiani**, and **S. Sciortino**. Unveiling the Cygnus OB2 stellar population with Chandra. *A&A*, 464:211, 2007.

[116] C. Argiroffi, **A. Maggio**, and G. Peres. X-ray emission from MP Muscae: an old classical T Tauri star. *A&A*, page V 465 5, 2007.

[117] K. Arzner, M. Guedel, K.R. Briggs, A. Telleschi, M. Schmidt, M. Audard, **L. Scelsi**, and **E. Franciosini**. Unbinned maximum-likelihood estimators for low-count data. applications to faint X-ray spectra in the Taurus molecular cloud. *A&A*, 468:501, 2007.

[118] M. Audard, K. Briggs, N. Grosso, M. Guedel, **L. Scelsi**, J. Bouvier, and A. Telleschi. The XMM-Newton optical monitor survey of the Taurus molecular cloud. *A&A*, 468:379, 2007.

[119] **F. Bocchino**, R. Bandiera, and Y. Gallant. XMM-Newton survey of non-thermal shell candidates: preliminary results on DA 530. *AdSpR*, in press, 2007.

[120] **F. Bocchino**, A.M. Krassilchtchikov, P. Kretschmar, A.M. Bykov, Yu.A. Uvarov, and S.M. Osipov. INTEGRAL observations of the SNR IC443 region. *AdSpR*, in press, 2007.

[121] R. Bonito, **S. Orlando**, G. Peres, F. Favata, and R. Rosner. X-rays from protostellar jets: emission from continuous flows. *A&A*, 462:645, 2007.

[122] K. Briggs, M. Guedel, A. Telleschi, T. Preibisch, **B. Stelzer**, J. Bouvier, L. Rebull, M. Audard, **L. Scelsi**, **G. Micela**, N. Grosso, and F. Palla. The X-ray activity-rotation relation of T Tauri stars in Taurus-Auriga. *A&A*, 468:413, 2007.

[123] A.M. Bykov, A.M. Krassilchtchikov, Yu.A. Uvarov, H. Bloemen, **F. Bocchino**, G.M. Dubner, E.B. Giacani, and G.G. Pavlov. Isolated X-ray and infrared sources in the region of interaction of the supernova remnant IC443 with a molecular cloud. *ApJ*, in press, 2007.

[124] M. Caramazza, **E. Flaccomio**, **G. Micela**, F. Reale, S.J. Wolk, and E.D. Feigelson. X-ray flares in Orion low mass stars. *A&A*, 471:645, 2007.

[125] I. Crespo-Chacon, **G. Micela**, F. Reale F., M. Caramazza, J. Lopez Santiago, and I. Pillitteri. X-ray flares on the UV ceti-type star CC eri: a peculiar time-evolution of spectral parameters. *A&A*, 471:929, 2007.

[126] **E. Franciosini**, I. Pillitteri, **B. Stelzer**, **G. Micela**, K. Briggs, **L. Scelsi**, A. Telleschi, M. Audard, F. Palla, and M. Guedel. Spectral properties of X-ray bright variable sources in the Taurus molecular cloud. *A&A*, 468:485, 2007.

[127] **E. Franciosini**, **L. Scelsi**, **R. Pallavicini**, and M. Audard. XMM-Newton observations of the classical T Tauri star SU Aur and the surrounding field. *A&A*, 471:951, 2007.

[128] G. Giardino, F. Favata, **G. Micela**, **S. Sciortino**, and E. Winston. The onset of X-ray emission in young stellar objects. A Chandra observation of the serpens star-forming region. *A&A*, 463:275, 2007.

[129] N. Grosso, K.R. Briggs, M. Guedel, S. Guieu, **E. Franciosini**, F. Palla, C. Dougados, J.-L. Monin, F. Menard, J. Bouvier, M. Audard, and A. Telleschi. X-ray emission from the young brown dwarfs of the Taurus molecular cloud. *A&A*, 468:485, 2007.

[130] **M. Guarcello**, **L. Prisinzano**, **G. Micela**, **F. Damiani**, G. Peres, and **S. Sciortino**. Correlation between the spatial distribution of the circumstellar disks and the massive stars in the open cluster NGC 6611. *A&A*, 462:245, 2007.

[131] M. Guedel, K.R. Briggs, K. Arzner, M. Audard, J. Bouvier, E.D. Feigelson, **E. Franciosini**, A. Glauser, N. Grosso, **G. Micela**, J.-L. Monin, T. Montmerle, D. Padgett, F. Palla, I. Pillitteri, L. Rebull, **L. Scelsi**, B. Silva, S.L. Skinner, **B. Stelzer**, and A. Telleschi. The XMM-Newton Extended Survey of the Taurus molecular cloud (XEST). *A&A*, 468:353, 2007.

[132] S.M. Hojnacki, J.H. Kastner, **G. Micela**, E.D. Feigelson, and S.M. Lalonde. An X-ray spectral classification algorithm with application to young stellar clusters. *ApJ*, 659:585, 2007.

[133] C. Isola, F. Favata, **G. Micela**, and H. Hudson. The correlation between soft and hard x-rays components in flares: from the sun to the stars. *A&A*, 472:261, 2007.

[134] **J. Lopez-Santiago**, **G. Micela**, **S. Sciortino**, F. Favata, A. Caccianiga, R. Della Ceca, P. Severgnini, and V. Braito. The stellar content of the XMM-Newton bright serendipitous survey. *A&A*, 463:165, 2007.

[135] **A. Maggio**, **E. Flaccomio**, **G. Micela**, **S. Sciortino**, F. Favata, E.D. Feigelson, and K.V. Getman. Coronal abundances in Orion nebula cluster stars. *ApJ*, 660:1462, 2007.

[136] **G. Micela**, **L. Affer**, F. Favata, J.P. Henry, I. Gioia, C.R. Mullis, J. Sanz Forcada, and **S. Sciortino**. The stellar population of the ROSAT north ecliptic pole survey. *A&A*, 461:977, 2007.

[137] M. Miceli, A. Decourchelle, J. Ballet, **F. Bocchino**, J. Hughes, U. Hwang, and R. Petre. A physical interpretation of the jet-like X-ray emission from supernova remnant W49b. *AdSpR*, in press, 2007.

[138] **S. Orlando**, **F. Bocchino**, F. Reale, G. Peres, and O. Petruk. On the origin of asymmetries in bilateral supernova remnants. *A&A*, 470:927, 2007.

[139] P. Pagano, F. Reale, **S. Orlando**, and G. Peres. MHD evolution of a fragment of a CME core in the outer solar corona. *A&A*, 464:753, 2007.

[140] S. Randich, F. Primas, L. Pasquini, P. Sestito, and **R. Pallavicini**. Tracing mixing in stars: new beryllium observations of the open clusters NGC 2516, Hyades, and M 67. *A&A*, 469:163, 2007.

[141] F. Palla, S. Randich, Y. V. Pavlenko, **E. Flaccomio**, and **R. Pallavicini**. Old Stars in Young Clusters: Lithium-depleted Low-Mass Stars of the Orion Nebula Cluster. *ApJ*, 659:L41, 2007.

[142] **L. Prisinzano**, **F. Damiani**, **G. Micela**, and I. Pillitteri. VLT FLAMES observations of the star forming region NGC 6530. *A&A*, 462:123, 2007.

[143] **L. Prisinzano** and S. Randich. Lithium abundances in the old open cluster NGC 3960 from VLT/Flames observations. *A&A*, in press, 2007.

[144] J. C. Raymond, G. Holman, **A. Ciaravella**, A. Panasyuk, Y.-K. Ko, and J. Kohl. Transition Region Emission and Energy Input to Thermal Plasma during the Impulsive Phase of Solar Flares. *ApJ*, 659:750, 2007.

[145] G.G. Sacco, S. Randich, **E. Franciosini**, **R. Pallavicini**, and F. Palla. Lithium-depleted stars in the young sigma Orionis cluster. *A&A*, 462:L23, 2007.

[146] J. Sanz-Forcada, F. Favata, and **G. Micela**. Eclipsed X-ray flares in binary stars: geometrical constraints on the flare's location and size. *A&A*, 466:309, 2007.

[147] **L. Scelsi**, **A. Maggio**, **G. Micela**, K. Briggs, and M. Güdel. Coronal abundances of X-ray bright pre-main sequence stars in the Taurus molecular cloud. *A&A*, in press, 2007.

[148] **L. Scelsi**, **A. Maggio**, **G. Micela**, I. Pillitteri, **B. Stelzer**, K. Briggs, M. Guedel, N. Grosso, M.Audard, and F. Palla. New pre-main sequence candidates in the Taurus-Auriga star forming region. *A&A*, 468:405, 2007.

[149] A. Scholz, R. Jayawardhana, K. Wood, G. Meeus, **B. Stelzer**, C. Walker, and M. O'Sullivan. Evolution of Brown Dwarf Disks: A Spitzer Survey in Upper Scorpius. *ApJ*, 660:1517, 2007.

[150] **B. Stelzer**, **E. Flaccomio**, K. Briggs, **G. Micela**, **L. Scelsi**, M. Audard, I. Pillitteri, and M. Guedel. A statistical analysis of X-ray variability in pre-main sequence objects of the Taurus Molecular Cloud. *A&A*, 468:463, 2007.

[151] **B. Stelzer** and **G. Micela**. X-ray detection of the substellar twin 2MASS J11011926-7732383 AB. *A&A*, in press, 2007.

[152] **B. Stelzer**, A. Scholz, and R. Jayawardhana. Emission Line Variability of the Accreting Young Brown Dwarf 2MASSW J1207334-393254: From Hours to Years. *ApJ*, in press, 2007.

[153] A. Telleschi, M. Guedel, K. Briggs, M. Audard, and **L. Scelsi**. High-resolution X-ray spectroscopy of T Tauri stars in the Taurus-Auriga complex. *A&A*, 468:443, 2007.

[154] A. Telleschi, M. Guedel, K.R. Briggs, S.L. Skinner, M. Audard, and **E. Franciosini**. The first high-resolution X-ray spectrum of a Herbig star: the case of AB Aurigae. *A&A*, 468:541, 2007.

[155] P. Testa, F. Reale, D. Garcia-Alvarez, and D.P. Huenemoerder. Detailed diagnostics of an X-ray flare in the single giant HR 9024. *ApJ*, 663:1232, 2007.

Invited talks and publications
2004

[1] **G. Micela**. X-ray observations of young stars. *MmSAI Supplement*, 5:46, 2004.

[2] **S. Orlando**, G. Peres, F. Reale, and R. Rosner. 3-D hydrodynamics of SNR shock interaction with interstellar clouds: the OAPA/UNIPA key project. In *Proceedings 9th ScicomP Meeting, Bologna, Italy, 23-26 March 2004*, 2004.

[3] **S. Orlando**, G. Peres, F. Reale, R. Rosner, T. Plewa, and A. Siegel. Using AMR to simulate the 3-D hydrodynamic interaction of supernova shocks with interstellar gas clouds. In *Proceedings of the Meeting Adaptive Techniques in Computational Astrophysics and Biology, Catania, Italy November 12-14 2003*, volume 4, page 82, 2004.

[4] S. Serio. The improvement of science teaching and the role of the institutions to improve the quality of pre-service and in service teaching education. In M. Michelini, editor, *Quality development in teacher education and training*, page 113, Udine, 2004. Forum.

2005

[5] **I. Chinnici**. Angelo Secchi S.J. (1818-1878): a scientific and biographical profile. In *Cento anni di Astronomia in Italia 1860-1960*, volume 217 of *Atti dei Convegni Lincei*, page 87, Roma, 2005. Bardi Editore.

[6] **I. Chinnici**. Pietro Tacchini: 1838-1905. *Giornale di Astronomia*, 31:29, 2005.

[7] **I. Chinnici**. Pietro Tacchini (1838-1905): un protagonista dell'astronomia italiana post-unitaria. *Astronomia*, 4:VIII, 2005.

[8] **A. Ciaravella**. Spectroscopic Properties of Halo CMEs. In *IUGG General Assembly, Toulouse July 18-29*, 2005.

[9] **A. Ciaravella**. Spectroscopic Diagnostics of Coronal Mass Ejection Properties. In *IV Convegno della Ricerca Italiana in Fisica Solare e Relazioni Sole-Terra, Trieste 18-20 Ottobre*, 2005.

[10] F. Poppi, F. Bonoli, and **I. Chinnici**. Il progetto Tacchini e la riforma degli osservatori italiani. In *Cento anni di Astronomia in Italia 1860-1960*, volume 217 of *Atti dei Convegni Lincei*, page 123, Roma, 2005. Bardi Editore.

[11] **G. Micela**. The Chandra Orion Ultradeep Project (COUP). Presented at *Six Years of Science with Chandra*, symposium held in Cambridge, MA, November 2-4, 2005, http://cxc.harvard.edu/symposium_2005/proceedings/theme_life.html, 2005.

[12] **S. Orlando**, G. Peres, and F. Reale. Three-Dimensional hydrodynamic interaction of a supernova remnant shock with an isolated cloud. In *Proceedings IEEE CAMP'O5 International Workshop on Computer Architecture for Machine Perception, Terrasini, Palermo, Italy, 4-6 July 2005*, page 135, 2005.

[13] **R. Pallavicini**. X-ray emission from cool stars: XMM-Newton and Chandra results. Presented at *The X-ray Universe 2005* meeting, San Lorenzo de El Escorial, Spain, 26-30 September 2005.

[14] F. Reale. Substructuring, dynamics and heating in dense coronal structures. In *The Dynamic Sun: Challenges for Theory and Observations*, 11th European Solar Physics Meeting, Leuven (Belgio), 11-16 September 2005 volume 596 of *ESA-SP*, 2005.

[15] **S. Sciortino**. X-rays as a probe of yso physics: Recent XMM-Newton and Chandra results. In U.G. Briel S. Sembay A. Read, editor, *EPIC-XMM-Newton Consortium Meeting: 5 Years of Science with XMM-Newton*, volume 288 of *MPE Report*, page 13. Max-Planck-Institute fuer extraterrische Physik, 2005.

2006

[16] **I. Chinnici**. La meridiana di Piazzi nella cattedrale di Palermo. *Giornale di Astronomia*, 32:103, 2006.

[17] **I. Chinnici**. Pietro Tacchini (1838-1905), a key-figure in the post-unitarian italian astronomy. *Mm SAIt - Supplementi*, 9:28, 2006.

[18] **S. Orlando** and F. Favata. Observations and modeling of X-ray emission from jets of infant stars. *Invited Lecture to the International JETSET School, Marciana Marina, Isola d'Elba, Italy, 4-8 September 2006*, Lecture notes in Physics, in press.

[19] G. Peres, **S. Orlando**, and F. Reale. The corona of the Sun as a star. In N. Solomos, editor, *Recent Advances in Astronomy and Astrophysics*, 7th Astronomy Conference of the Hellenic Astronomical Society held in Lixourion (Kefallinia Island), Greece, 8th - 11th September, 2005, AIP Conference Series, 848:41, 2006.

[20] F. Reale. Dinamica di plasmi coronale e interstellari. Presented at the L Congresso della Societa' Astronomica Italiana, Torino 29 maggio - 1 giugno 2006. *Mm SAIt*, in press.

2007

[21] C. Blanco and **I. Chinnici**. Pietro Tacchini e i primordi dell'astrofisica in Sicilia. *Archivio Storico per la Sicilia Orientale*, in press, 2007.

[22] **I. Chinnici**. La Carte du Ciel: génèse, déroulement et issues. In *Actes de la Journeée Carte du Ciel*, in press, 2007.

[23] **I. Chinnici**. Astronomi dal Veneto alla Sicilia nella seconda meta' dell'Ottocento. In *Storia delle Scienze astronomiche nel Veneto dell'800*, page 301, 2007.

[24] **I. Chinnici**. Maurice Loewy et la Carte du Ciel. *L'Astronomie*, 121:360, 2007.

[25] **A. Maggio**. Non-thermal hard X-ray emission from stellar coronae. *Presented at the meeting "Simbol-X: the hard X-ray universe in focus", Bologna, 14-16 May 2007*, MmSAI, in press.

[26] **G. Micela**. Extreme high energy events in stars. *Invited review presented at European Planetary Science Congress 2007, Potsdam, 19-24 August 2007*.

[27] **G. Micela**. The stellar high energy radiation from the pre-main sequence to the solar age. *Invited review presented at European Planetary Science Congress 2007, Potsdam, 19-24 August 2007*.

[28] F. Reale, S. Parenti, K. K. Reeves, M. Weber, M. G. Bobra, M. Barbera, R. Kano, N. Narukage, M. Shimojo, T. Sakao, G. Peres, and L. Golub. Magnetic activity and the solar corona: first results from the Hinode satellite. Presented at the LI Congresso della Societa' Astronomica Italiana, Firenze 17 - 20 Aprile 2007. *Mem SAIt*, in press, 2007.

[29] **S. Sciortino**. Stellar X-ray emission with XEUS. *Presented at the meeting "XEUS: Vision of the Extreme Universe", Imperial College, London, 2-4 April 2007*, 2007.

[30] **S. Sciortino**. Open clusters and stellar associations: recent results of the italian community. *Presented at 51th National meeting of SAIt, Florence, 17-20 April 2007*, MmSAI, in press.

[31] **S. Sciortino**. Hard X-ray view of nearby star forming regions. *Presented at the workshop "Simbol-X: the hard X-ray universe in focus", Bologna, 14-16 May 2007*, MmSAI, in press.

[32] **S. Sciortino**. Results and perspectives of young stellar objects long look programs. In *presented at the workshop "XMM-Newton the next decade", Villafranca del Castillo, Madrid, 4-6 June 2007*, AN, in press.

Presentations at SPIE Conferences

2004

[1] M. Andersen, P. Spanò, M. Woche, K.G. Strassmeier, and E. Beckert. Optical design of the PEPSI high-resolution spectrograph at LBT. In *Ground-based Instrumentation for Astronomy*, volume 5492 of *Proceedings SPIE*, page 381, 2004.

[2] S. D'Odorico, M. Andersen, P. Conconi, V. De Caprio, B. Delabre, P. Di Marcantonio, H. Dekker, M. Downing, G. Finger, P. Groot, H. Hanenburg, F. Hammer, D. Horville, J. Hjorth, L. Kaper, J. Klougart, P. Kjaergaard-Rasmussen, J. Lizon, M. Marteaud, R. Mazzoleni, N. Michaelsen, **R. Pallavicini**, F. Rigal, A. Norup-Sorensen, P. Spanò, L. Venema, P. Vola, and F. Zerbi. X-SHOOTER: UV-to-IR intermediate-resolution high-efficiency spectrograph for the ESO VLT. In *Ground-based Instrumentation for Astronomy*, volume 5492 of *Proceedings SPIE*, page 220, 2004.

[3] G.G. Sacco, **R. Pallavicini**, P. Spanò, M. Andersen, M.F. Woche, and K.G. Strassmeier. Can we use adaptive optics for UHR spectroscopy with PEPSI at the LBT? In D. Bonaccini B. Ellerbroek R. Ragazzoni, editor, *Advancement in Adaptive Optics*, volume 5490 of *Proceedings SPIE*, page 398, 2004.

[4] P. Spanò, F. Leone, S. Scuderi, S. Catalano, and F.M. Zerbi. Optical design of CAOS: a high-resolution spectropolarimeter for the Catania Astrophysical Observatory 0.91m telescope. In *Ground-based Instrumentation for Astronomy*, volume 5492 of *Proceedings SPIE*, page 373, 2004.

2005

[5] **M. Artale**, M. Barbera, **A. Collura**, **G. Di Cicca**, G. Peres, **S. Varisco**, J. Bookbinder, P. Cheimets, M. Cosmo, E. De Luca, and M. Weber. Calibration of the XRT-SOLARB flat mirror samples at the XACT facility of inaf/OAPA. *Proc. SPIE*, 5488:440, 2005.

[6] M. Barbera, **M. Artale**, **R. Candia**, **A. Collura**, **G. Di Cicca**, **E. Perinati**, M. Serio, S. Salvatore, **S. Varisco**, E. Silver, and S. Bandler. A single stage adiabatic demagnetization refrigerator for testing X-ray microcalorimeters. *Proc. SPIE*, 5501:366, 2005.

[7] M. Barbera, **M. Artale**, **R. Candia**, **A. Collura**, G. Lullo, G. Peres, **E. Perinati**, **S. Varisco**, J. Bookbinder, P. Cheimets, M. Cosmo, E. De Luca, and M. Weber. Calibration of the XRT-SOLARB fligh filters at the XACT facility of inaf/OAPA. *Proc. SPIE*, 5488:423, 2005.

[8] G. Pareschi, V. Cotroneo, D. Spiga, D. Vernani, M. Barbera, **M. Artale**, **A. Collura**, **S. Varisco**, G. Grisoni, and G. Valsecchi. Astronomical soft X-ray mirrors reflectivity enhancement by multilayer coatings with carbon overcoating. *Proc. SPIE*, 5488:481, 2005.

[9] H. Schnopper, M. Barbera, E. Silver, S. Romaine, R. Ingram, **M. Artale**, **R. Candia**, **A. Collura**, D. Caldwell, W. Podgorski, R. Goddard, and G. Austin. Thin shell plastic optics for laboratory applications. *Proc. SPIE*, 5539, 2005.

2006

[10] M. Barbera, **R. Candia**, **A. Collura**, **G. Di Cicca**, **C. Pelliciari**, **S. Sciortino**, and **S. Varisco**. The Palermo XACT facility: a new 35 m long soft X-ray beam-line for the development and calibration of next-generation X-ray observatories. *Proc. SPIE*, 6266:101, 2006.

[11] N. Michaelsen, V. De Caprio, N.C. Jessen, J.L. Lizon, R. Mazzoleni, M. Riva, P. Spanò, A.N. Soerensen, M. Tintori, D.W. Wistisen, H. Dekker, P. Kjaergaard Rasmussen, F.M. Zerbi, and S. D'Odorico. The X-SHOOTER spectrograph: a new concept of mechanical assembly for a multiple-arm Cassegrain instrument. In *Ground-based and Airborne Instrumentation for Astronomy*, volume 6269 of *Proceeding SPIE*, 2006.

[12] **C. Pelliciari**, M. Barbera, **R. Candia**, **A. Collura**, **G. Di Cicca**, G. Pareschi, and **S. Varisco**. Study and implementation of a soft X-ray 100 eV-20 keV fixed exit monochromator system. *Proc. SPIE*, 6266:102, 2006.

[13] **C. Pelliciari**, J. Dherbecourt, M. Barbera, **R. Candia**, and H.W. Schnopper. Visible light apparatus for preliminary tests of X-ray optics. *Proc. SPIE*, 6266:104, 2006.

[14] L. Piro, L. Amati, M. Barbera, and et al. Estremo/WFXRT: extreme physics in the transient and evolving cosmos. *Proc. SPIE*, 6266:16, 2006.

[15] P. Spanò, B. Delabre, A.N. Soerensen, F. Rigal, A. de Ugarte Postigo, R. Mazzoleni, G. Sacco, P. Conconi, V. De Caprio, and N. Michaelsen. The optical design of X-SHOOTER for the VLT. In *Ground-based and Airborne Instrumentation for Astronomy*, volume 6269 of *Proceeding SPIE*, 2006.

2007

[16] M. Barbera, **R. Candia**, **A. Collura**, **G. Di Cicca**, **S. Varisco**, C. Zhang, H. Wang, J. Yang, W. Peng, X. Cui, X. Cao, and X. Liang. Calibration of the Chang'E-1 X-ray fluorescence imaging spectrometer at INAF-OAPA. In Oswald H. Siegmund, editor, *UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XV*, volume 6686 of *Proceedings of SPIE*, in press, 2007.

[17] M. Barbera, T. Mineo, **E. Perinati**, A. Taibi, and H.W. Schnopper. Thin plastic foil X-ray optics with spiral geometry. In Stephen L. O'Dell Giovanni Pareschi, editor, *Optics for EUV, X-ray and Gamma-Ray Astronomy III*, volume 6688 of *Proceedings of SPIE*, in press, 2007.

[18] **A. Collura**, P. Attinà, M. Barbera, G. Costa, A. Ferri, G. Pareschi, **E. Perinati**, and F.R. Powell. Thermal shielding of the simbol-X mirror assembly. In Stephen L. O'Dell Giovanni Pareschi, editor, *Optics for EUV, X-ray and Gamma-Ray Astronomy III*, volume 6688 of *Proceedings of SPIE*, in press, 2007.

[19] V. Cotroneo, G. Pareschi, D. Spiga, M. Barbera, S.E. Romaine, and R.J. Bruni. Light material coatings for soft X-ray reflectivity enhancement. In Stephen L. O'Dell Giovanni Pareschi, editor, *Optics for EUV, X-ray and Gamma-Ray Astronomy III*, volume 6688 of *Proceedings of SPIE*, in press, 2007.

[20] J.-W.A. den Herder, L. Piro, T. Ohashi, L. Amati, J. Atteia, S. Barthelemy, M. Barbera, [...], **E. Perinati**, [...], **S. Sciortino**, and et al. Explorer of Diffuse structures and Gamma-ray burst Explosions: EDGE. In Stephen L. O'Dell Giovanni Pareschi, editor, *Optics for EUV, X-ray and Gamma-Ray Astronomy III*, volume 6688 of *Proceedings of SPIE*, in press, 2007.

[21] A. Taibi, M. Barbera, G. Pareschi, H.W. Schnopper, G. Sironi, and R. Valtolina. Characterization of thin plastic foils for applications in X-ray optics technology. In Stephen L. O'Dell Giovanni Pareschi, editor, *Optics for EUV, X-ray and Gamma-Ray Astronomy III*, volume 6688 of *Proceedings of SPIE*, in press, 2007.

[22] Y. Tawara, I. Sakurai, J.-W. A. den Herder, G. Cusumano, T. Mineo, M. Barbera, and **E. Perinati**. Design and optimization of the wide-field spectrometer for EDGE mission. In Stephen L. O'Dell Giovanni Pareschi, editor, *Optics for EUV, X-ray and Gamma-Ray Astronomy III*, volume 6688 of *Proceedings of SPIE*, in press, 2007.

Conference proceedings and other publications 2004

[1] M. Audard, S.A. Drake, M. Guedel, R. Mewe, **R. Pallavicini**, T. Simon, K.P. Singh, S.L. Skinner, and N.E. White. Coronae of cool stars. In *Suns as Stars: Activity, Evolution, Planets*, volume 219 of *ASP Conference Series*, page 243, 2004.

[2] **E. Flaccomio**, **G. Micela**, **N. Pizzolato**, **S. Sciortino**, and P. Ventura. Activity, rotation and convection in Orion: are the data inconsistent with the MS activity-Rossby number relation? In A. Maeder P. Eenens, editor, *Stellar Rotation*, volume 215 of *IAU Symposium Series*, page 429. Astronomical Society of the Pacific, 2004.

[3] **E. Flaccomio**, S.D. Vrtilek, **G. Micela**, F.R. Harnden, **S. Sciortino**, S. Wolk, W. Herbst, F. Favata, and E.D. Feigelson. Chandra Orion Ultradeep Project sees PMS coronae rotate. *AAS Meeting Abstracts*, 205:1518, 2004.

[4] S.M. Hojnacki, J.H. Kastner, **G. Micela**, E.D. Feigelson, and N. Grosso. Automated X-ray spectral classification of young stellar sources detected in Chandra Orion Ultradeep Project observations. *AAS Meeting Abstracts*, 205:1603, 2004.

[5] **A. Maggio**. The coronae of bright late-type stars observed with EPIC and RGS. *MmSAI*, 75:444, 2004.

[6] **G. Micela**, **A. Marino**, G. Peres, I. Pillitteri, and **S. Sciortino**. Study of the young open cluster IC2391: discovery of X-ray rotational modulation in a supersaturated star. *MmSAI*, 75:442, 2004.

[7] M. Miceli, **F. Bocchino**, **A. Maggio**, and F. Reale. Shock-cloud interaction in the vela SNR: the XMM-Newton view. *MsSAI*, 75:500, 2004.

[8] **T. Morel**, **G. Micela**, F. Favata, D. Katz, and I. Pillitteri. The photospheric abundances of active binaries: First results. In K. Dupree A.O. Benz, editor, *Stars as Suns: Activity, Evolution and Planets*, volume 219 of *IAU Symposium Series*, page 259. Astronomical Society of the Pacific, 2004.

[9] **S. Orlando**, G. Peres, F. Reale, R. Rosner, T. Plewa, and A. Siegel. Hydrodynamic interaction of supernova shocks with interstellar gas clouds. In *Scienza e supercalcolo al CINECA - Rapporto 2003*, page 37. CINECA, 2004.

[10] **R. Pallavicini**, **E. Franciosini**, and S. Randich. XMM/EPIC observations of open clusters and star forming regions. *MmSAI*, 75:434, 2004.

[11] G. Peres, **S. Orlando**, F. Reale, R. Rosner, T. Plewa, and A. Siegel. Crushing of interstellar gas clouds in supernova remnants: the role of thermal conduction and radiative losses. In *Plasmas in the Laboratory and in the Universe: new insights and new challenges*, volume 703 of *AIP Conference Proceedings*, page 326, 2004.

[12] I. Pillitteri, **G. Micela**, **A. Marino**, and **S. Sciortino**. Short and medium term variability study of NGC 2516 solar type stars with EPIC. *MmSAI*, 75:440, 2004.

[13] J. Sanz-Forcada, **G. Micela**, and **A. Maggio**. Three years in the coronal life of AB Doradus. In K. Dupree A.O. Benz, editor, *Stars as Suns: Activity, Evolution and Planets*, volume 219 of *IAU Symposium Series*, page 920. Astronomical Society of the Pacific, 2004.

[14] **S. Sciortino**, **G. Micela**, F. Favata, G. Giardino, **E. Flaccomio**, and **F. Damiani**. X-ray observations of star formation regions: EPIC results in L1551 and upper Sco-Cen. *MmSAI*, 75:428, 2004.

[15] S.J. Wolk, **E. Flaccomio**, F.R. Harnden, **G. Micela**, E.D. Feigelson, and Chandra Orion Ultradeep Project (COUP) Collaboration. The young ”suns” of Orion. *HEAD*, 8:914, 2004.

2005

[16] **J.F. Albacete-Colombo** and **G. Micela**. X-ray analysis of the close binary system FO 15. In G. Rauw et al., editor, *Massive stars and hihg-energy emission in OB associations: proc. JENAM 2005, Li‘ege, Belgium, July 4-7, 2005*, page 69, 2005.

[17] M. Andersen, K.G. Strassmeier, M. Woche, A. Hoffman, and P. Spanò. Pepsi, the high-resolution optical-IR spectrograph for the LBT. In H.U. Kaufl R. Siebenmorgen A.F.M. Moorwood, editor, *High Resolution Infrared Spectroscopy in Astronomy*, ESO Astrophysics Symposia, page 57. Springer-Verlag, 2005.

[18] C. Argiroffi, J.J. Drake, F.R. Harnden, **A. Maggio**, G. Peres, **S. Sciortino**, **B. Stelzer**, and R. Neuhaeuser. High-resolution X-ray spectroscopy of pre-main sequence stars: PZ Tel and TWA-5. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 399, 2005.

[19] C. Argiroffi, F. Favata, **A. Maggio**, **G. Micela**, G. Peres, and **S. Sciortino**. XMM-Newton observations of the Upper Scorpius association. In *Meeting abstracts from the conference ”Star formation in the era of Three Great Observatories”, July 13-15, Cambridge MA*, 2005.

[20] M. Audard, S.L. Skinner, K.W. Smith, M. Guedel, and **R. Pallavicini**. High energy processes in young stars: Chandra X-ray spectroscopy of HDe 283572, RY Tau, and LKCa 21. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 411, 2005.

[21] **F. Bocchino**. XMM-Newton observations of pulsar wind nebulae interacting with supernova remnants. In U.G. Briel S. Sembay A. Read, editor, *EPIC-XMM-Newton Consortium Meeting: 5 Years of Science with XMM-Newton*, volume 288 of *MPE Report*, page 23. Max-Planck-Institute fuer extraterrische Physik, 2005.

[22] R. Bonito, M. Fridlund, F. Favata, and R. Liseau. Hst observations of L1551 IRS5 jet (HH154) proper motions and evolution of shock structures. In *Protostars and Planets V*, 2005.

[23] R. Bonito, **S. Orlando**, G. Peres, F. Favata, and R. Rosner. X-ray emission mechanisms in protostellar jets. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 185, 2005.

[24] C. Catala, C. Aerts, S. Aigrain, E. Antonello, T. Appourchaux, M. Auvergne, A. Baglin, P. Barge, M.A. Barstow, F. Baudin, P. Boumier, A.C. Cameron, J. CHRIstensen-Dalsgaard, G. Cutispoto, H. Deeg, M. Deleuil, S. Desidera, J.-F. Donati, F. Favata, B.H. Foing, J.F. Gameiro, R. Garcia, F. Garrido, K. Horne, A.F. Lanza, A.C. Lanzafame, A. Lecavelier Des Etangs, A. Léger, M. Mas-Hesse, S. Messina, **G. Micela**, E. Michel, M.J.P.F.G. Monteiro, B. Mosser, A. Noels, I. Pagano, G. Piotto, E. Poretti, H. Rauer, T. Roca-Cortes, M. Rodono, D. Rouan, T. Roxburgh, J. Schneider, K. Strassmeier, S. Turck-Chièze, S. Vauclair, A. Vidal-Madjar, W.W. Weiss, and P. Wheatley. The life of stars and their planets. In F. Favata J. Sanz-Forcada A. Giménez, editor, *9th ESLAB Symposium on Trends in Space Science and Cosmic Vision 2020*, volume 588 of *ESA-SP*, page 99, 2005.

[25] **I. Chinnici**. Omaggio a Pietro Tacchini. *Cronache Parlamentari*, N.S. a.4(53):4, 2005.

[26] **I. Chinnici**. Pietro Tacchini, nel centenario della morte, 2005. *Elementi Astronomici per l'anno 2005*, 31, 2005.

[27] **F. Damiani**, **G. Micela**, **S. Sciortino**, N. Huelamo, F.R. Harnden, and S.S. Murray. Coronal emission in the youngest stars: a deep Chandra X-ray observation of NGC 2362. In *Meeting abstracts from the conference "Star formation in the era of Three Great Observatories", July 13-15, Cambridge MA*, 2005.

[28] **F. Damiani**, **L. Prisinzano**, **E. Flaccomio**, **G. Micela**, **S. Sciortino**, F.R. Harnden, and S.S. Murray. A deep Chandra X-ray observation of the very young cluster NGC 6530. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 495, 2005.

[29] **E. Flaccomio**. Chandra observations of massive star forming regions. In R. Cesaroni et al., editor, *Massive star birth: A crossroad of Astrophysics*, volume 227 of *IAU Symposium Proceedings*, page 247, Cambridge, UK, 2005. Cambridge University Press.

[30] **E. Flaccomio**, **G. Micela**, F.R. Harnden, **S. Sciortino**, S. Wolk, W. Herbst, F. Favata, and E.D. Feigelson. Coup sees PMS coronae rotate! In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 539, 2005.

[31] **E. Flaccomio**, **G. Micela**, and **S. Sciortino**. NGC 2264: a Chandra view. In E. Corbelli F. Palla H. Zinnecker, editor, *Proceedings of the conference IMF@50*, volume 327 of *Astrophysics and Science Library*, page 171. Kluwer Academic Publishers, 2005.

[32] **E. Flaccomio**, **G. Micela**, **S. Sciortino**, E.D. Feigelson, W. Herbst, F. Favata, F.R. Harnden, and S.D. Vrtilek. Rotational modulation of X-ray emission in Orion nebula young stars. In *Star formation in the era of Three Great Observatories*, 2005.

[33] **E. Flaccomio**, **G. Micela**, **S. Sciortino**, F.R. Harnden, and L. Hartmann. NGC 2264: a Chandra view. *MmSAI*, 76:279, 2005.

[34] **E. Flaccomio**, **G. Micela**, **S. Sciortino**, F.R. Harnden Jr., and L. Hartman. NGC 2264: a Chandra view. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 543, 2005.

[35] **E. Franciosini**, **R. Pallavicini**, and J. Sanz-Forcada. The sigma Orionis open cluster observed with XMM-Newton: source detection and spectral properties. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 551, 2005.

[36] N. Grosso, E.D. Feigelson, K.V. Getman, L. Townsley, P. Broos, **E. Flaccomio**, M.J. McCaughrean, **G. Micela**, **S. Sciortino**, J. Bally J., N. Smith, A. Muench, and F. Palla. COUP census of X-ray stars in BN-KL and OMC-1S. In F. Casoli, editor, *SF2A: Scientific Highlights 2005, Strasbourg, France, 27 June - 1 July 2005*, EDP-Sciences Conference Series, page 337, 2005.

[37] S.M. Hojnacki, J.H. Kastner, S.M. LaLonde, **G. Micela**, and E.D. Feigelson. X-ray spectral classification of Chandra Orion Ultradeep Project (COUP) sources. *AAS Meeting Abstracts,*, 207:29.13, 2005.

[38] **A. Maggio**, J.J. Drake, F. Favata, and M. Güdel. Splinter session: What future for stellar X-ray spectroscopy? In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 129, 2005.

[39] **A. Maggio**, J.J. Drake, F. Favata, M. Güdel, and C. Jordan. Benchmark Exercises for stellar X-ray Spectroscopy Testing (BEXST). In R. Smith N. Brickhouse, editor, *X-ray Diagnostics for Astrophysical Plasmas: Theory, Experiment, and Observation*, volume 774 of *AIP Conference Proceedings*, page 401, 2005.

[40] **A. Maggio**, **E. Flaccomio**, **G. Micela**, **S. Sciortino**, F. Favata, and E.D. Feigelson. The COUP abundance study: spectral analysis of the X-ray brightest late-type stars in Orion. In *Meeting abstracts from the conference "Star formation in the era of Three Great Observatories", July 13-15, Cambridge MA*, 2005.

[41] **A. Marino**, **G. Micela**, G. Peres, I. Pillitteri, and **S. Sciortino**. X-ray spectral and timing properties of the IC 2391 stars. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 787, 2005.

[42] M. Miceli, F. Reale, **S. Orlando**, **F. Bocchino**, and G. Peres. Hydrodynamic simulations of the shock-cloud interaction in the Vela supernova remnant. *Scienza e supercalcolo al CINECA*, Annual Report 2005, 2005.

[43] **T. Morel**, **G. Micela**, and F. Favata. Photospheric abundance peculiarities in chromospherically active stars. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 829, 2005.

[44] P. Pagano, F. Reale, **S. Orlando**, and G. Peres. MHD-modeling of the propagation of a coronal mass ejection. In *The Dynamic Sun: Challenges for Theory and Observations*, volume 596 of *ESA-SP*, 2005.

[45] **R. Pallavicini**, S. Randich, and P. Sestito. Lithium abundances in intermediate age and old clusters. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 867, 2005.

[46] I. Pillitteri, **G. Micela**, F. Reale, **S. Sciortino**, **F. Damiani**, and F.R. Harnden Jr. X-ray observations of the young open cluster Blanco 1. the XMM-Newton view. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 879, 2005.

[47] **L. Prisinzano**, **G. Micela**, **S. Sciortino**, F. Favata, and **F. Damiani**. The initial mass function of three galactic open clusters. In E. Corbelli F. Palla H. Zinnecker, editor, *Proceedings of the conference IMF@50*, volume 327 of *Astrophysics and Space Science Library*, page 75. Kluwer Academic Publishers, 2005.

[48] S. Randich, A. Bragaglia, L. Pastori, **L. Prisinzano**, P. Sestito, P. Spanò, S. Villanova, G. Carraro, E. Carretta, D. Romano, S. Zaggia, **R. Pallavicini**, L. Pasquini, F. Primas, G. Tagliaferri, and M. Tosi. Flames observations of old open clusters: Constraints on the evolution of the galactic disc and mixing processes in stars. *The ESO Messenger*, 121:18, 2005.

[49] J.C. Raymond and **A. Ciaravella**. UV observations of solar coronal shock waves. In E.B. Fleck T.H. Zurbuchen H. Lacoste, editor, *Proceedings of the Solar Wind 11 / SOHO 16, "Connecting Sun and Heliosphere"*, volume 592 of *ESA SP*, page 9.1, 2005.

[50] L.M. Rebull, S.V. Ramirez, J.R. Stauffer, **E. Flaccomio**, **S. Sciortino**, and **G. Micela**. Rotation, disks, and X-rays in the Orion flanking fields and NGC 2264. *AAS Meeting Abstracts*, 206:810, 2005.

[51] L. Scelsi, **A. Maggio**, G. Peres, and **R. Pallavicini**. Coronal properties of G-type stars in different evolutionary phases. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 939, 2005.

[52] **S. Sciortino**. A glimpse on the results of the Chandra Orion Ultradeep Project (COUP). *MmSAI*, 76:271, 2005.

[53] **S. Sciortino**, I. Pillitteri, **F. Damiani**, **E. Flaccomio**, **G. Micela**, **B. Stelzer**, F. Favata, G. Giardino, N. Grosso, T. Montmerle, F. Palla, and L. Testi. The Deep Rho Oph XMM-Newton Observation (DROXO): Status and initial results. In *Meeting abstracts from the conference "Star formation in the era of Three Great Observatories", July 13-15, Cambridge MA*, page 45, 2005.

[54] P. Sestito, A. Bragaglia, S. Randich, E. Carretta, and **L. Prisinzano**. Old open clusters as key tracers of galactic chemical evolution. first results: NGC 3960. In V. Cill P. Francois F. Primas, editor, *Proceedings of the conference "From lithium to uranium: elemental traces of early cosmic evolution"*, volume 228 of *IAU Symposium Proceedings*, page 409, Cambridge, UK, 2005. Cambridge University Press.

[55] K. Smith, M. Audard, M. Guedel, S. Skinner, and **R. Pallavicini**. Spot the differences: the X-ray spectrum of SU Aur compared to TW Hya. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and*, volume 560 of *ESA SP*, page 971, 2005 the Sun, 5-9 July 2004, Hamburg, Germany.

[56] P. Spanò, **R. Pallavicini**, and S. Randich. VLT/FLAMES observations of Collinder 261. In V. Hill P. Francois F. Primas, editor, *From Lithium to Uranium: Elemental Tracers of Early Cosmic Evolution*, IAU Symposium 228, page 111, 2005.

[57] **B. Stelzer**. Multi-wavelength study of X-ray emitting A- and B-stars testing the companion hypothesis. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 213, 2005.

[58] **B. Stelzer**. Studies of the coronae of the lowest-mass stars and brown dwarfs in the XMM-Newton and Chandra era. In U.G. Briel S. Sembay A. Read, editor, *EPIC-XMM-Newton Consortium Meeting: 5 Years of Science with XMM-Newton*, volume 288 of *MPE Report*, page 17. Max-Planck-Institute fuer extraterrische Physik, 2005.

[59] **B. Stelzer**. X-ray emission probing the limiting cases of stellar dynamos. *MmSAI*, 76:410, 2005.

[60] **B. Stelzer**, **G. Micela**, R. Neuhaeuser, and R. Jayawardhana. Age, mass and temperature dependence of X-ray activity on brown dwarfs. *MmSAI Supplement*, 9:273, 2005.

[61] P. Testa, J.J. Drake, and G. Peres. The structure of coronal plasma in active stellar coronae from density measurements. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun*, volume 560 of *ESA SP*, page 997, 2005, 5-9 July 2004, Hamburg, Germany.

[62] P. Testa, J.J. Drake, G. Peres, and E.E. De Luca. Size of coronal structures in active stellar coronae from the detection of X-ray resonant scattering. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 43, 2005.

[63] M. Tsujimoto, E.D. Feigelson, N. Grosso, **G. Micela**, Y. Tsuboi, and F. Favata. Chandra Orion Ultra-deep Project: a search for 6.4 keV iron fluorescent line from young stellar objects. In F. Favata G.A.J. Hussain B. Battrick, editor, *Proceedings of the 13th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, 5-9 July 2004, Hamburg, Germany*, volume 560 of *ESA SP*, page 1005, 2005.

2006

[64] **J.F. Albacete-Colombo**, **G. Micela**, **E. Flaccomio**, **F. Damiani**, and **S. Sciortino**. A Chandra X-ray view of the Cyg OB2 association. In A. Wilson, editor, *The X-ray Universe 2005*, volume 604 of *ESA SP*, page 65, 2006.

[65] **F. Bocchino**, M. Miceli, F. Reale, **A. Maggio**, **S. Orlando**, and G. Peres. X-raying the interstellar medium: the study of SNR shells at the OAPA. *MmSAI*, 9:223, 2006.

[66] R. Bonito, **S. Orlando**, G. Peres, F. Favata, and R. Rosner. X-ray emission in protostellar jets. *Scienza e supercalcolo al CINECA*, Annual Report 2005, 2006.

[67] R. Bonito, **S. Orlando**, G. Peres, F. Favata, and R. Rosner. X-ray emission mechanisms in Herbig-Haro objects. *MmSAI*, 9:226, 2006.

[68] K. Briggs, M. Guedel, A. Telleschi, L. Scelsi, **E. Franciosini**, M. Audard, I. Pillitteri, **G. Micela**, L. Rebull, and F. Palla. Exploring the evolution of young stellar coronae in Taurus. In A. Wilson, editor, *The X-ray Universe 2005*, volume 604 of *ESA ESP*, page 71, 2006.

[69] **I. Chinnici**, F. Bonoli, M. Calisi, G. Strano, and V. Zanini. Historical instruments in italian astronomical observatories: state of the art and perspective. In *Proceedings of the XXV Scientific Instrument Symposium*, p. 101, 2006.

[70] **A. Ciaravella**, J.C. Raymond, and J. Lin. UV observations of post-CME current sheets. In *36th COSPAR Scientific Assembly*, page 2109, 2006.

[71] **F. Damiani**, **G. Micela**, **S. Sciortino**, N. Huélamo, A. Moitinho, F.R. Harnden, and S.S. Murray. A deep Chandra X-ray observation of NGC 2362. *Mm SAIt*, 9:241, 2006.

[72] **E. Flaccomio**, **G. Micela**, **S. Sciortino**, E.D. Feigelson, W. Herbst, F. Favata, F.R. Harnden Jr., and S.D. Vrtilek. Rotational modulation of X-ray emission in Orion nebula young stars. *Mm SAIt*, 9:244, 2006.

[73] **E. Franciosini**, **R. Pallavicini**, and L. Scelsi. XMM-Newton observations of the Taurus-Auriga star-forming region: the field around SU Aur. In A. Wilson, editor, *The X-ray Universe 2005*, volume 604 of *ESA SP*, page 77, 2006.

[74] N. Grosso, K. Briggs, M. Guedel, S. Guieu, **E. Franciosini**, M. Audard, C. Dougados, J.-L. Monin, F. Menard, J. Bouvier, and the XEST Team. X-ray emission from the young brown dwarfs of the Taurus molecular cloud. In A. Wilson, editor, *The X-ray Universe 2005*, volume 604, page 83, 2006.

[75] M. Guedel, K. Briggs, A. Telleschi, K. Arzner, M. Audard, N. Grosso, J. Bouvier, **E. Franciosini**, **G. Micela**, I. Pilliteri, L. Scelsi, **B. Stelzer**, F. Palla, D. Padgett, and L. Rebull. A survey of young stars in the Taurus molecular cloud with XMM-Newton. In A. Wilson, editor, *The X-ray Universe 2005*, volume 604 of *ESA SP*, page 39, 2006.

[76] K. Hamaguchi, M. Corcoran, **B. Stelzer**, K. Nedachi, N. Kobayashi, A. Tokunaga, R. Petre, and N. White. The first definite detection of X-rays from an extremely young protostar. In *The X-ray Universe 2005*, volume 604 of *ESA SP*, page 33, 2006.

[77] **J. Lopez-Santiago**, **G. Micela**, R. Della Ceca, and V. Braito. The stellar content of the XMM-Newton Bright Serendipitous Survey. In A. Wilson, editor, *The X-ray Universe 2005*, volume 604 of *ESA SP*, page 95, 2006.

[78] **A. Maggio**, **E. Flaccomio**, F. Favata, M. Miceli, **S. Sciortino**, and E. Feigelson. The coronal spectral study of COUP: element abundances in the coronae of X-ray bright late-type stars in Orion. In *The X-ray Universe 2005*, volume 604 of *ESA SP*, page 97, 2006.

[79] **A. Maggio**, **S. Orlando**, J.J. Drake, F. Favata, M. Güdel, and C. Jordan. Benchmark exercises for stellar X-ray spectroscopy testing (BEXST): start of the first hare and hounds challenge. In G. Branduardi-Raymont, editor, *High resolution X-ray spectroscpy: towards XEUS and Con-X*, page E19, 2006.

[80] **A. Marino**, I. Pillitteri, **G. Micela**, and G. Peres. X-ray properties of NGC 2516 open cluster. *MemSAIt*, 9:256, 2006.

[81] **T. Morel**, **G. Micela**, and F. Favata. Some concerns about the reliability of LTE abundance analyses in cool, active stars. In *Chemical Abundances and Mixing in Stars in the Milky Way and its Satellites*, ESO Astrophysics Symposia, page 64. Springer-Verlag, 2006.

[82] **S. Orlando**, G. Peres, F. Reale, **F. Bocchino**, T. Plewa, and R. Rosner. Hydrodynamic interaction of SNR shocks with thermally conducting, radiative clouds. *MmSAI*, 9:208, 2006.

[83] **S. Orlando**, G. Peres, F. Reale, **F. Bocchino**, R. Rosner, T. Plewa, and A. Siegel. Hydrodynamic and MHD interactions of strong shocks with inhomogeneous media. *Scienza e supercalcolo al CINECA*, Annual Report 2005, 2006.

[84] **R. Pallavicini**, P. Spanò, **L. Prisinzano**, S. Randich, and P. Sestito. Multi-object spectroscopy of open clusters with FLAMES. In L. Pasquini S. Randich, editor, *Chemical abundances and mixing in stars in the milky way and its satellites, ESO Astrophysics Symposia*, page 181, Springer-Verlag, 2006.

[85] G. Peres, **S. Orlando**, and F. Reale. Stationary and flaring heating effect on the coronal emission measure. *MmSAI*, 9:97, 2006.

[86] **L. Prisinzano**, **F. Damiani**, I. Pillitteri, and **G. Micela**. FLAMES observations of the star forming region NGC 6530. In L. Pasquini S. Randich, editor, *Chemical Abundances and Mixing in Stars in the Milky Way and its Satellites*, ESO Astrophysics Symposia, page 74. Springer-Verlag, 2006.

[87] F. Reale and **A. Ciaravella**. Diagnostics of coronal loops from multi-band observations. In H. Lacoste and L. Ouwehand, editor, *SOHO-17. 10 Years of SOHO and Beyond*, volume 617 of *ESA SP*, page 106, 2006.

[88] J. Sanz-Forcada, F. Favata, and **G. Micela**. A compact flare eclipsed in SV Cam. In A. Wilson, editor, *The X-ray Universe 2005*, volume 604 of *ESA SP*, page 109, 2006.

[89] J. Schmitt, J. Robrade, F. Favata, J. Ness, and **B. Stelzer**. High resolution X-ray spectra of classical T Tauri stars. In A. Wilson, editor, *The X-ray Universe 2005*, volume 604 of *ESA SP*, 2006.

[90] **S. Sciortino**, I. Pillitteri, **F. Damiani**, **E. Flaccomio**, **G. Micela**, **B. Stelzer**, F. Favata, G. Giardino, N. Grosso, T. Montmerle, F. Palla, and L. Testi. The Deep Rho Ophiuchi XMM Observation (DROXO). In A. Wilson, editor, *The X-ray Universe 2005*, volume 604 of *ESA SP*, page 111, 2006.

[91] S. Scuderi, R.U. Claudi, J. Alcalá, M. Barbieri, A. Baruffolo, M. Belluso, G. Bonanno, P. Bruno, A. Calí, M. Cancian, L. Contri, E. Covino, S. Desidera, F. Favata, A. Fiorenzano, G. Gianesini, E. Giro, V. Granata, R. Gratton, S. Leccia, G. Martorana, F. Marzari, **G. Micela**, M. Montalto, S. Ortolani, G.P. Piotto, M. Rebeschini, and D. Strazzabosco. The RATS project. *MmSAIt*, 9:153, 2006.

[92] P. Spanò, P. Bruno, S. Catalano, F. Leone, E. Martinetti, and S. Scuderi. CAOS - the new high resolution spectrograph for the 0.91m telescope at Serra la Nave. *Mm SAIt Suppl.*, 9:481, 2006.

[93] P. Testa, J. Drake, and G. Peres. Study of X-ray optical depth in the coronae of active stars from HETG spectra. In A. Wilson, editor, *The X-ray Universe 2005*, volume 604 of *ESA SP*, 2006.

[94] P. Testa, F. Reale, and D. Huenemoerder. X-ray flare modeling in the single giant HR 9024. In A. Wilson, editor, *The X-ray Universe 2005*, volume 604 of *ESA SP*, 2006.

[95] F.M. Zerbi, **R. Pallavicini**, P. Conconi, R. Cosentino, V. De Caprio, A. de Ugarte Postigo, P. Di Marcantonio, M. Riva, P. Santin, P. Spanò, and A. Zacchei. The X-SHOOTER spectrograph for the VLT. *MmSAIt Suppl.*, 9:419, 2006.

[96] K. Zioutas, M. Davenport, K. Dennerl, M. Grande, D.H.H. Hoffmann, J. Huovelin, B. Lakic, **S. Orlando**, A. Ortiz-Carbonnell, Th. Papaevangelou, Y. Semertzidis, Sp. Tzamarias, and O. Vilhu. Indirect signatures for axion-like particles. *Journal of Physics: Conf. Series*, 39:103, 2006.

2007

[97] T. Gatti, A. Natta, S. Randich, L. Testi, and G. G. Sacco. Accretion in the star forming region sigma Orionis. In J. Bouvier, editor, *Star-disk interactions in young stars*, IUE Symposium 243, in press, 2007.

[98] N. Grosso, K.R. Briggs, M. Guedel, S. Guieu, **E. Franciosini**, F. Palla, C. Dougados, J.-L. Monin, F. Menard, J. Bouvier, M. Audard, and A. Telleschi. X-ray emission from the young brown dwarfs of the Taurus molecular cloud. *Mem. SAIt*, 78:368, 2007.

[99] N. Grosso, K.R. Briggs, M. Guedel, S. Guieu, **E. Franciosini**, F. Palla, C. Dougados, J.-L. Monin, F. Menard, J. Bouvier, M. Audard, and A. Telleschi. X-ray emission from the young brown dwarfs of the Taurus molecular cloud. In *Coronae of Stars and Accretion Disks*, MmSAI, in press, 2007.

[100] M. Guedel, K. Arzner, M. Audard, J. Bouvier, K. Briggs, C. Dougados, E. Feigelson, **E. Franciosini**, A. Glauser, N. Grosso, S. Guieu, F. Menard, **G. Micela**, J.-L. Monin, T. Montmerle, D. Padgett, F. Palla, I. Pillitteri, T. Preibisch, L. Rebull, **L. Scelsi**, B. Silva, S. Skinner, **B. Stelzer**, and A. Telleschi. Highlights from the XMM-Newton Extended Survey of the Taurus molecular cloud (XEST). In G. van Belle, editor, *Cool Stars, Stellar Systems, and the Sun, 14th Cambridge Workshop*, volume in press of *ASP Conference Series*, 2007.

[101] M. Guedel, K.R. Briggs, K. Arzner, M. Audard, J. Bouvier, C. Dougados, E.D. Feigelson, **E. Franciosini**, A. Glauser, N. Grosso, S. Guieu, F. Menard, **G. Micela**, J.-L. Monin, T. Montmerle, D.L. Padgett, F. Palla, I. Pillitteri, T. Preibisch, L. Rebull, **L. Scelsi**, B. Silva, S.L. Skinner, **B. Stelzer**, and A. Telleschi. Accretion and outflow-related X-rays in T Tauri stars. In J. Bouvier, editor, *Star-Disk Interactions in Young Stars*, volume 243 of *IAU Symposium*, in press, 2007.

[102] S.M. Hojnacki, **G. Micela**, **E. Flaccomio**, and J.H. Kastner. Spectral and temporal classification of X-ray sources in young stellar clusters. *AAS Meeting Abstracts*, 210, 2007.

[103] **A. Maggio**. Benchmark exercises for stellar X-ray spectroscopy testing: initial results. *Presented at the "X-ray Spectroscopy Workshop", Cambridge, MA, USA, 11-13 July 2007*.

[104] A. Mandrino, **D. Randazzo**, and L. Schiavone. Specola 2000: a project for the preservation of the archives of the twelve italian astronomical observatories. In M. Bishop et al., editor, *Library and Information Services in Astronomy V*, Astronomical Society of the Pacific Conference Series, in press, 2007.

[105] **S. Orlando**, F. Reale, and G. Peres. Observations and theory of coronal loops. *MmSAI*, in press, 2007.

[106] **L. Prisinzano**, **G. Micela**, **E. Flaccomio**, J. R. Stauffer, L. Rebull, T. Megeath, and M. Robberto. X-ray properties of protostars in the Orion nebula cluster: preliminary results. *Poster presented at "Star-disk interaction in young stars", IAU Symposium 243, Grenoble, France, May 21-25 November 6-10, 2007*, 2007.

[107] **L. Prisinzano** and S. Randich. Lithium abundances in the old open cluster NGC 3960 from VLT/Flames observations. In *Poster presented at "XXI Century challenges for stellar evolution", Cefalu, Italy, Aug. 29 - Sept. 2, 2007*, 2007.

[108] **L. Prisinzano**, J. R. Stauffer, **G. Micela**, L. Rebull, T. Megeath, K. Smith, M. Robberto, and D. Soderblom. Properties of the PMS stars in the Orion nebula cluster from the UV to 24 microns photometry: Age spread. In *Cool Stars, Stellar Systems, and the Sun, 14th Cambridge Workshop*, 2007.

[109] **D. Randazzo**. Carte du ciel: call for the compilation of a complete inventory of publications. In M. Bishop et al., editor, *Library and Information Services in Astronomy V*, Astronomical Society of the Pacific Conference Series, in press, 2007.

[110] G.G. Sacco, **R. Pallavicini**, S. Randich, **E. Franciosini**, and F. Palla. FLAMES multi-object spectroscopy of low mass stars in the ”twin” young clusters sigma Ori and lambda Ori. In *Cool Stars, Stellar Systems, and the Sun, 14th Cambridge Workshop*, 2007.

[111] G. G. Sacco, **E. Franciosini**, **R. Pallavicini**, and S. Randich. Accretion properties of low-mass stars in the young sigma Ori and lambda Ori clusters. In J. Bouvier, editor, *Star-disk interactions in young stars*, IAU Symposium 243, in press, 2007.

[112] **B. Stelzer**, **G. Micela**, N. Huelamo, and M. Huensch. Search for low-mass companions to X-ray emitting A-type stars. In *Multiple stars across the H-R diagram*, ESO Astrophysics Symposia, in press, 2007.