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The HELLAS2XMM survey: properties of the stellar population

G. MICELA[1], A. BALDI[2], F. COCCHIA[3], F. FAVATA[4], F. FIORE[3], S. MOLENDI[2], and S. SCIORTINO[1]

[1] INAF - Osservatorio Astronomico di Palermo, Piazza del Parlamento 1, 90134 Palermo, Italy
[2] IASF - Sezione di Milano - CNR
[3] INAF - Osservatorio Astronomico di Roma
[4] Astrophysics Division - Research and Science Support Department - ESA

1. Survey and model predictions

The HELLAS2XMM survey is a medium-deep X-ray survey spanning galactic latitude between 27° and 84°. The present analysis is based on the observations reported by Baldi et al. (2002) in the 0.5-2 keV bandpass. The sensitivity of these observations and their pointing directions allow observing stars up to distances much larger than in previous X-ray surveys, well beyond the scale heights of the young population. As a consequence the number of detected stellar sources is strongly dependent on the directions, making this survey very well suited to test stellar spatial distributions.

We present the properties of the stellar predictions obtained with the model of the stellar X-ray component of the Galaxy XCOUNT (Favata et al. 1992, Micela et al. 1993) for the HELLAS2XMM. The core of XCOUNT is the stellar spatial distribution that, in the present version, includes disk stars modeled by a set of exponential disks, as in the Bahcall & Soneira (1980) model, with a star density on the Galactic plane and a scale height function of mass *and age*. The X-ray properties of the stars are embodied in the X-ray luminosity functions. Since the stellar L_{x} decreases up to three order of magnitude between the Zero Age Main Sequence and the solar age, and, since also the scale height is a function of age, we need to consider separately stars of different age. We consider three age ranges, each characterized by different X-ray luminosity functions and coronal temperature.

At our typical sensitivities, for a constant stellar birthrate, we expect a spread as function of latitude in the predicted number of sources up to a factor five. Of course, if the scale heights of the stellar populations were very different than assumed, the latitude dependence would thus be very different.

The predicted properties of the detected stellar populations depend on sensitivity and pointing directions. The total expected numbers differ by a factor three between the lowest and highest latitude fields. The stellar detections are dominated by dK-dM stars. In particular, in the high latitude field the dM stars alone account for the $\sim$ 40% of the stellar population and they can have high f_x/f_v ratio, comparable with the values for extragalactic X-ray sources. Old stars dominate with the intermediate-age stars contributing no more than 23%, while the contribution of very young stars is negligible. This age composition is due to the relatively high sensitivity of the observations and their high latitude. In practice with HELLAS2XMM we should have detected all the young stars in the field of view – since we have reached distances larger than young star scale height – and most of the intermediate-age stars, while the distances at which we detect old stars are still smaller than their scale height.

2. Initial Results

Optical work on PKS0537-286 field has already started. The photometric observations cover $\sim$ 2/3 of the XMM field of view and their analysis indicate that 24 X-ray sources have possible stellar counterparts (3 have another possible counterpart in the error circle). Extrapolating to the entire field of view we expect $\sim$ 35 stellar X-ray sources, about 40% of our predictions. This discrepancy is consistent with the results obtained in the *Chandra* Deep Field North where we have observed a factor $\sim$ 3 less dG-dK stars than predicted, while the observed number of dM stars agrees well with the predictions (see Micela et al., these proceedings). Possible explanations of this discrepancy could involve the assumed stellar spatial distributions. In particular the true density distribution can decrease with the distance from the Galactic plane much more steeply than the assumed exponential shape (e.g. in the Besançon model by Haywood, Robin & Crézé, 1997). We will test this hypothesis with the complete analysis of the HELLAS2XMM survey, that will require a careful identification process, using also X-ray spectral data to correctly identify the sources with multiple counterparts.

References

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