Stars

Stellar physics

Optical and infrared spectrum observations allow the physical properties of stars and their atmospheres to be studied.

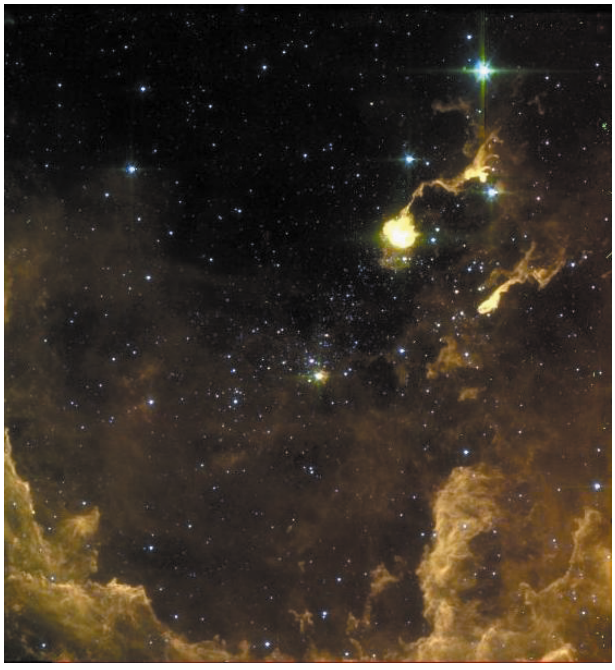
The main stellar research field at OAPa concerns star clusters, i.e. groups of stars born from the same gas cloud and thus sharing characteristics such as age and chemical composition.

Our researchers carry out photometric and spectroscopic studies by means of external facilities, to which they have access upon approval of observation proposals made at an international and competitive scale.

The most commonly used telescopes are at the European Southern Observatory (ESO) in Chile - La Silla and Paranal - and at the Telescopio Nazionale Galileo (Galileo National Telescope) in the Canary Islands, at the Observatory of Roche de los Muchachos. In some cases space-based telescopes are also used: they allow extremely clear observations, unaffected by the terrestrial atmosphere.

Optical and infrared photometry

The mass, age and temperature of stars can be determined by optical photometry, whereas infrared photometry highlights the cold material constituting the gas disks which surround the youngest stars, whose study is essential to understanding stellar formation processes. Disk evolution and lifetime depend on the environmental conditions at star birth and influence the formation of planetary systems.



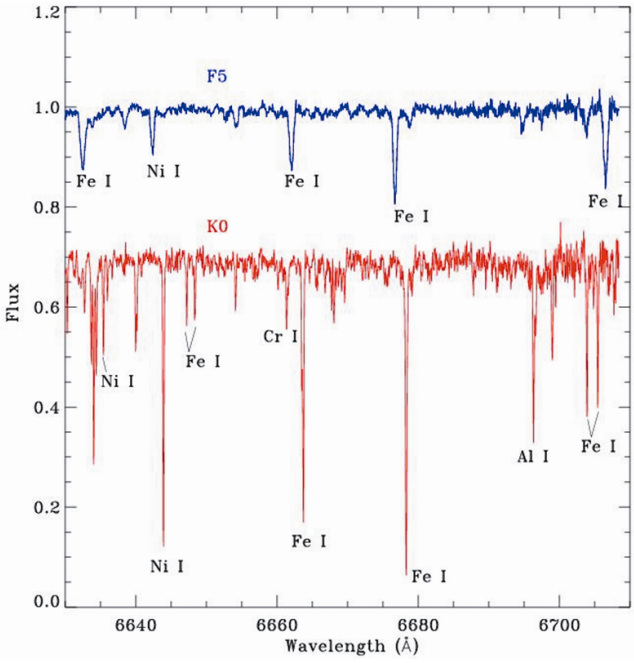
To understand these processes, INAF-OAPa researchers have started several systematic studies of the sky regions where new stars have recently formed.

The picture down on the left was taken during infrared observations carried out by OAPa researchers with the Spitzer space telescope, in the star formation area NGC 1893, on the edge of our galaxy. Besides the recently born star cluster it is also possible to observe the remnants of its original gas cloud.

High-resolution spectroscopy

By optical high-resolution spectroscopy atmospheres can be examined in detail, focusing on chemical abundances, stellar gravity, rotation, atmospheric motions and turbulences. Spectroscopy also allows the study of magnetic fields on the stellar chromosphere and surface, phenomena which in active stars can be more intense than in the Sun. By analysing the spectrum of very young stars, and in particular by observing calcium and hydrogen emission lines, it is possible to study the increase of matter coming out of the source generating them, a crucial occurrence for the subsequent evolution of the star.

The picture below shows the spectra of two active stars having different temperatures, as obtained from the SARG equipment (high-resolution spectrograph for observations in the visible band) of the Telescopio Nazionale Galileo. In particular, this part of the spectrum shows iron, nickel, aluminium and chrome lines.



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