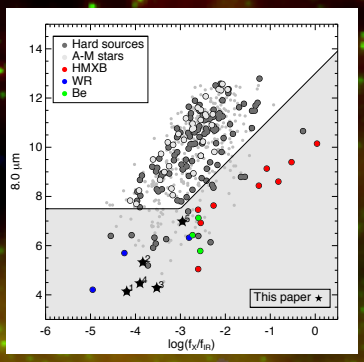
Infrared counterparts of XMM-Newton sources

A. Nebot Gómez-Morán[1] & C. Motch[1]

Observatoire Astronomique de Strasbourg

Abstract

The nature of the low to intermediate X-ray luminosity of hard (> 2 keV) sources revealed in the Galactic Plane by different X-ray missions is still poorly unconstrained. This is so due to the lack of large and representative samples and due to the high absorption in the Galactic Plane which makes the identification of the X-ray counterpart difficult. As part of the **ARCHES** project (see poster by C. Motch), we investigated the nature of the hard (> 2 keV) X-ray content of the Galactic Plane seen by XMM-Newton and conducted an infrared study of the detected sources. We report here on the results of a pilot survey in which we obtained infrared spectra of five sources in the William Herschel Telescope.



What kind of sources do we expect?

While stars dominate by numbers the low luminosity soft (< 2 keV) Galactic X-ray sky, low- and high-mass X-ray binaries account for most of the high-luminosity hard (> 2keV) Galactic sources. At intermediate luminosities different types of sources have been detected, such as cataclysmic variables and RS CVn binaries. Nevertheless the number of **O and B high-mass stars and of Wolf-Rayet** stars, isolated or in binaries, discovered in this luminosity range is constantly increasing (Mauerhan et al. 2010, Anderson et al. 2011).

Fig. 1: Infrared versus X-ray to infrared ratio of soft (small light gray) and hard (big dark gray) X-ray sources compared to stars (large light gray), HMXB (red), Be stars (green) and WR stars (blue). Targets of the pilot study are shown with a star symbol.

The Pilot Study

We studied the content of the 3XMM catalogue in the Galactic Plane. We crossmatched the detected sources with the 2MASS and the GLIMPSE catalogues and found high probability counterparts for 690 sources. The majority of the soft sources have infrared and X-ray to infrared flux ratios compatible with active coronae, while hard sources are compatible with Wolf-Rayet, Be stars and HMXB (see Figure above). We tentatively classified sources on the basis of their infrared and X-ray colors and preselected five sources for spectroscopic follow-up observations.

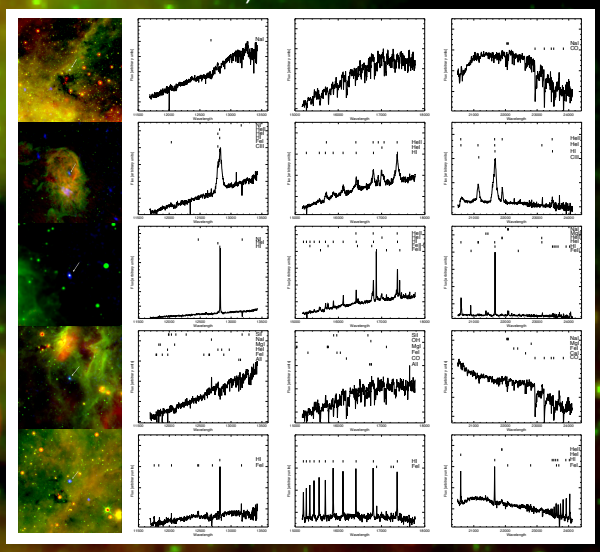


Fig. 2: Composite RGB images centered around the five observed targets and followed by their infrared WHT J, H and K spectra.

The results

Based on the infrared spectra and X-ray luminosities we classified three sources as Wind colliding binaries or Super-giant fast X-ray transients and one as a symbiotic binary. One of the five sources is likely a spurious identification. This pilot study demonstrates the validity of the selection method and should allow us to gather a significant number of hard sources for population studies.

[1]Observatoire Astronomique de Strasbourg

Contact: ada.nebot@astro.unistra.fr

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