A X-ray view of the young star population in CMA R1

RevMexAA (Serie de Conferencias), **44**, 32–32 (2014)

A X-RAY VIEW OF THE YOUNG STAR POPULATION IN CMA R1

T. Santos-Silva[1,2], J. Gregorio-Hetem[1], and T. Montmerle[2]

In previous works we studied the star formation scenario in the molecular cloud Canis Major R1 (CMa R1), revealing the existence of young stellar groups near the Be stars Z CMa and GU CMa. Using data from the *ROSAT* X-ray satellite, Gregorio-Hetem et al. (2009) - GH2009 - discovered in this region young stellar objects (YSOs) mainly grouped in two clusters of different ages. In order to investigate the nature of these objects and to test a possible scenario of sequential star formation in this region, four fields (each 30' diameter, with some overlap - Fig.1) have been observed with the *XMM-Newton* satellite that has a sensitivity about 10 times better than *ROSAT*.

X-ray data is the most efficient method to find young stars since all of them, with all masses (except perhaps A stars, Stelzer et al. 2005) produce X-rays: massive stars via shocks in their winds and low-mass stars via their magnetic activity (Feigelson & Montmerle 1999; Favata & Micela 2003; Güdel 2004.)

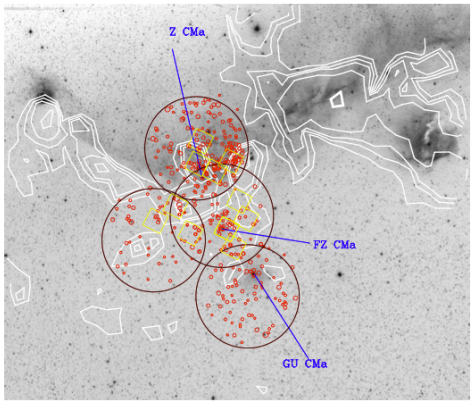

Fig. 1. A map of ^{12}CO (white contours) over imposed on the optical (DSS-R) image of CMa R1 showing the *XMM* fields (large circles - 15' radius), and the X-ray sources (small circles).

XMM-Newton data are currently under analysis. Preliminary results indicate the presence of about 342 sources, most of them apparently having one or more near-infrared counterparts showing typical colors of young stars. The youth of the *XMM* sources was indicated by the correlation of the X-ray emission and the J magnitude, similar to the trend found by GH2009. This result is illustrated in Fig.2.

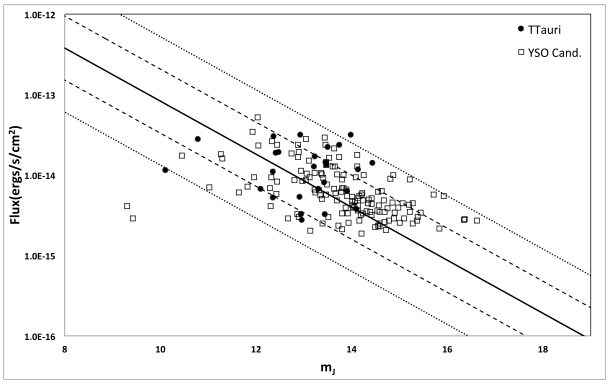

Fig. 2. X-ray flux (F_X) vs. 2MASS J magnitude (m_J): the full line represents the relation $Log(F_X) = -9.78 - 0.33 m_J$ adapted from GH2009. Dashed and dotted lines are the uncertain in 1σ and 2σ ($\sigma = 0,4\ ergs/s/cm^2$). Open squares present YSOs candidates of our sample, and full circles are T Tauri stars classified by Fernandes et al. (in prep.).

In the present work we analysed about 277 X-ray sources of which 28 are classified as YSOs by Fernandes et al. (in prep.); 8 Classical T Tauri stars; 19 Weak T Tauri Stars; 1 Herbig Ae/Be. Besides this sources we classified 136 YSO candidates, 48 field star candidate and 65 sources without infrared counterpart can not have their nature determined. On the other hand about 56 sources need to be studied with more detail because have 2 or more infrared counterparts, 3 have a prominent flare and other 6 sources possibly have small flares.

REFERENCES

Favata, F., & Micela, G. 2003, SSRv, 108, 577
Feigelson, E. D., & Montmerle, T. 1999, ARA&A, 37, 363
Gregorio-Hetem, J.; Montmerle, T.; Rodrigues, C. V.; Marciotto, E.; Preibisch, T.; Zinnecker, H. 2009, A&A, 506, 711
Güdel, M. 2004, A&AR, 12, 71
Stelzer, B., Flaccomio, E., Montmerle, T., et al. 2005, ApJS, 160, 557

[1]Universidade de São Paulo, IAG, thaisfi@astro.iag.usp.br.
[2]Institut d'Astrophysique de Paris.