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MIXING OF STELLAR CLUSTERS IN CANIS MAJOR R1

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We have studied the history of star formation in the Canis Major R1 star-forming region (CMa R1), by using X-ray data, complemented by optical and near-IR data.

CMa R1 includes the arc-shaped ionized nebula S2-296 (suggested to be an old supernova remnant), as well as several very young (<5 Myr) clusters and emission line stars (Shevchenko et al. 1999, MNRAS, 310, 210). Gregorio-Hetem et al. (2009, A&A 506, 711, hereafter GH09) discovered, near to GU CMa, a stellar cluster that is older, by at least a few Myr, than the previously known cluster, around Z CMa, where star formation is very active. Also, the GU CMa cluster is away from any molecular cloud, implying that star formation must have ceased. GH09 suggest that CMa R1 region has undergone at least two distinct star formation episodes. Only the current star formation activity around Z CMa seems related to the S2-296 nebula and possibly triggered by it.

A multi-wavelength study has been developed by us in the area between Z CMa and GU CMa to confirm the existence of a mixed population from both older and young clusters around S2-296, corresponding respectively to a fossil, and to an ongoing, star formation episode. About a hundred of new X-ray sources were recently detected by *XMM-Newton* in the Z CMa-GU CMa area. Figure 1 shows the position of these sources compared to *ROSAT* data (Zinnecker & Preibisch 1994, A&A, 292, 152).

Aiming to investigate the nature of the optical counterparts, *Gemini* observations are scheduled to acquire multi-object spectra (*GMOS*), covering typical features of young stars (Hα and Li I (6708 Å), for instance). One of the *GMOS* pre-imaging is presented in Figure 2, showing the position of the new X-ray sources and the near-IR sources from the 2MASS catalog, detected around FZ CMa. Most of them possible are low-mass young stars for which we intend to derive mass and age from the optical and the IR data. These results can bring new insights on the sequential star formation in CMaR1 that is possible related to molecular clouds "pinched" between SN cavities (Hartmann et al. 2001, ApJ, 562, 852).

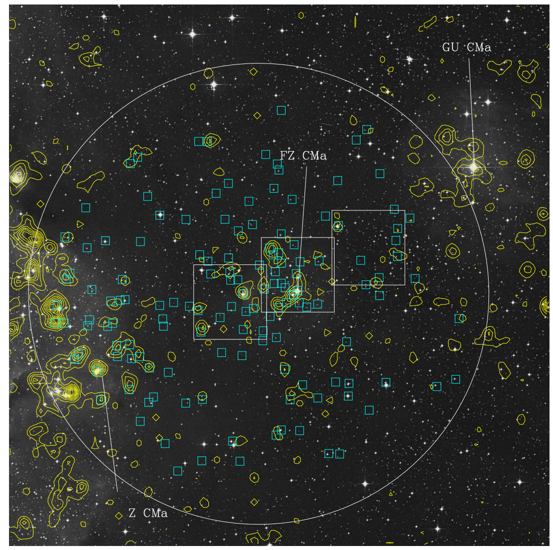

Fig. 1. Optical (DSS-R) image of CMa R1 and X-ray sources detected by *XMM-Newton* (squares) and *ROSAT* (contours). Large squares show the FOVs of upcoming *Gemini* spectra. See details of the FZ CMa field in Figure 2.

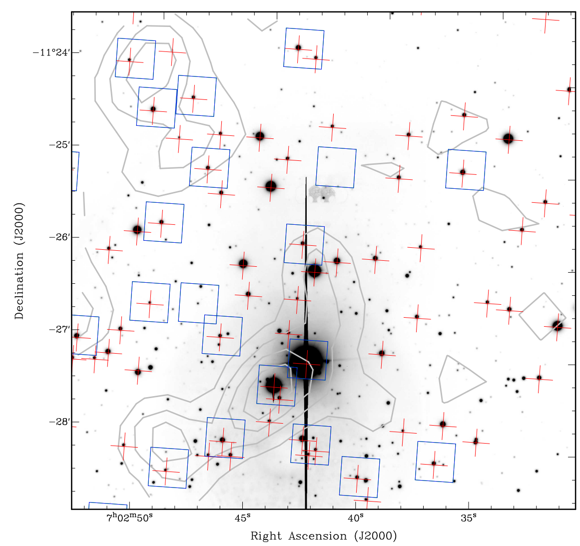

Fig. 2. Position of the sources: *XMM-Newton* (squares), *ROSAT* (contours), and *2MASS* (crosses) present in the *GMOS* optical image of the FZ CMa field.

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