Highlights of Astronomy, Volume 15
XXVIIth IAU General Assembly, August 2009
Ian F. Corbett, ed.

doi:10.1017/S1743921310011257

Accretion dynamics and star-disk interaction in NCG 2264

Silvia H. P. Alencar[1], Jérôme Bouvier[2], Claude Catala[3], Matilde Fernandez[4], Jorge Filipe Gameiro[5], Nathalia Fonseca[1], Marcelo Medeiros Guimarães[1], Jane Gregorio Hetem[6], Pauline Telles McGinnis[1], Estelle Moraux[2] and Paula Teixeira[7]

[1]Departmento de Física, ICEx, UFMG, Belo Horizonte, MG, 31270-901, Brazil
email: silvia@fisica.ufmg.br

[2]Laboratoire d'Astrophysique de Grenoble, BP 53, F-38041 Grenoble, France

[3]Observatoire de Paris-Meudon, 61 Av. de l'Observatoire, 75014 Paris, France

[4]Instituto de Astrofisica de Andalucia, Apartado 3004, 18080 Granada, Spain

[5]Universidade do Porto, Rua das Estrelas, 4150-762 Porto, Portugal

[6]Universidade de São Paulo, IAG/USP, São Paulo, SP, 05508-090, Brazil

[7]ESO, Karl-Schwarzschild-Strasse 2, D-85748 Garching, Germany

The Corot satellite observed the young stellar cluster NGC 2264 during 23 days in March 2008. This was the first time a group of young accreting stars, classical T Tauri stars (CTTS), were followed ininterruptedly with high photometric accuracy for such a long run. Before the Corot observations, AA Tau (Bouvier *et al.* 2003, *A&A*, 409, 169 and Bouvier *et al.* 2007, *A&A*, 463, 1017) was one of the few CTTS systems that had been analysed synoptically over several consecutive rotational periods. Its analysis suggested a highly dynamical star-disk interaction mediated by the stellar magnetic field, as predicted by magneto-hydrodynamical simulations of young accreting systems.

NGC 2264 is a well studied young stellar cluster and we were therefore able to obtain a good estimate of cluster membership among the observed stars. We could also separate accreting from non-accreting systems, using indicators such as Hα equivalent width, Hα width at 10% intensity and $U-V$ excess. A total of 97 CTTS that belong to the cluster were observed by Corot. Among those, 26 were classified as possible AA Tau-like systems, which we defined as systems that present periodical light curve variability with an almost constant maximum interrupted by minima that can vary both in depth and width from one rotational cycle to the other. This type of light curve is believed to be due mostly to obscuration by material from the inner disk region. The data analysis shows that the AA Tau-type of light curve appears to be quite common among CTTS, which opens a good perspective to study the interaction between the stellar magnetic field and the inner disk region.

Corot and Spitzer IRAC data of 56 CTTSs were compared and it was shown that both datasets give coherent information about the evolution of the inner circumstellar disk. We used the $\alpha_{\rm IRAC}$ index, the inclination of the spectral energy distribution between 3.6 μm and 8 μm, to classify the inner disk region. CTTS that present $\alpha_{\rm IRAC} < -2.56$, naked photosphere systems, also presented spot-like light curves with no hint of obscuration by circumstellar material. As the $\alpha_{\rm IRAC}$ index increases, corresponding to systems with anemic and thick disks, the percentage of spot-like light curves decreases rapidly and most of the Corot light curves present clear signs of obscuration by circumstellar material.