

THOROUGH STUDY OF THE PHOTOSPHERIC AND MAGNETIC ACTIVITY, AND THE SOLAR-LIKE OSCILLATIONS IN SELECTED X-RAY SOURCES IN THE KEPLER FIELD OF VIEW

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Star spots are characteristics of solar-like activity observed in cool stars. They are tracers of magnetic flux tube emergence and can provide information on the different forces acting on the flux tubes during their buoyant rise from the sub-photospheric convective layer. They include information about the photospheric motions, such as the latitudinal drift of spots along the activity cycle, and about the differential rotation which are basic ingredients of the dynamo mechanism for the magnetic field intensification. The convective motions which play a key role in the generation of magnetic fields are also responsible for the excitation of solar-like pulsations. On the other hand, the magnetic field itself quenches the amplitude of those oscillations. Therefore, it is very important to study the trade-off between these two physical phenomena since they are closely related to our ability to derive physical parameters of the solar-like stars. That concerns in particular our ability of deriving the stars' radii and the radii of the planets discovered at them. Active stars in the Kepler field can be best selected on the basis of their coronal emission. Such X-ray-selected star samples shall contain a significant fraction of young stars with an age of a few 100 Myr and also stars as old as about 1 Gyr. We note that such a sample should contain also more evolved stars in binary systems, i.e., the RS CVn variables. Such stars rotate much faster than if they were single and as a consequence are visible in the X-rays. One of the best sources of the information about X-ray stellar sources is the ROSAT All-Sky Survey and the XMM-Newton (X-ray Multi-Mirror Mission - Newton). They can be cross-matched with the Kepler Input Catalog in order to produce the list of X-ray sources in the Kepler field of view. Some of such stars have been already observed with the Kepler instrument and the exquisite quality of the Kepler photometry allowed a detailed analysis of their light curves. The study of KIC 8429280 by Frasca et al. (2011) shows how many fine details of the inner structure of active stars can be derived that way. An interesting point of that study is that the solar-like oscillations are not visible in the power spectrum of the Kepler short-cadence time series of KIC 8429280. That indicates that either the convective zone of this star excites oscillations of tiny amplitude or that the very strong magnetic field suppresses the pulsations. We plan to accomplish a detailed characterization of all the X-ray sources in the Kepler field of view in terms of atmospheric parameters and activity level, and to discuss the issue of the detectability of solar-like oscillations in such stars. Since our targets will also be observed spectroscopically from the ground, we will be able to present a full picture of those issues resulting from our study.