The future X-ray Sun

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Stellar activity currently experiences an enormous increase in interest due to its relevance for exoplanetary atmospheres and habitability. Stellar activity has long been thought to decay continuously with age. Recent studies of chromospheric activity tracers, however, cast doubt on a further decrease after an initial settling phase. X-ray emission is a prime activity indicator and has, compared to chromospheric emission, the benefit of lacking basal emission. To measure how the activity of solar analogs evolves with age, we obtained the first systematic X-ray survey of solar analogs with ages between five and ten Gyrs. I will present initial results from XMM-Newton observations suggesting that old Suns are surprisingly weak X-ray emitters. Comparing coronal with chromospheric activity tracers of the very same stars further suggests that the X-ray to chromospheric emission ratio is potentially evolving with age.

Activity and rotation of the X-ray emitting Kepler stars

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The relation between magnetic activity and rotation periods in late-type stars provides fundamental information on the stellar dynamo and spin evolution. In spite of its importance for stellar physics, homogeneous samples of stars with accurate and sensitive measurement of both rotation period and magnetic activity have been hard to come by. The Kepler mission represents a significant step forward, providing high-cadence optical light curves for thousands of stars, from which the rotation period can be measured observing the brightness modulation due to star spots. A cross-match of the Kepler Input Catalog with the 3XMM-DR5 Catalog and subsequent careful inspection for likely non-stellar sources yields more than 100 late-type stars. We have developed an algorithm which identifies rotation periods and white-light flares in the Kepler light curves. We have calculated the X-ray luminosity from the 3XMM-DR5 count rates, and searched the light curves provided by the EXTraS (Exploring the X-ray Transient and variable Sky) FP-7 project for X-ray flares. Here we discuss the correlation between various measures for coronal and photometric activity (from the XMM-Newton and the Kepler data, respectively) and the Kepler rotation periods and Rossby number.