Evolving Models of Stellar Photospheric and Coronal Magnetic Fields

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Abstract

We present results from an ongoing effort to model the evolving photospheric and coronal magnetic fields of cool stars. In this project, we run a series of surface flux transport (SFT) models of starspot evolution. SFT models are used as lower boundary conditions to drive evolving models of stellar coronal magnetic fields. The coronal magnetic fields are modeled by magnetofriction (MF), which allows us to construct force-free coronal fields evolving in response to starspot evolution. The combined SFT/MF simulations are used to synthesize dynamic Stokes spectra to serve as inputs for Zeeman Doppler Imaging (ZDI) inversions. Photometric light curves modulated by starspot evolution and stellar rotation are also synthesized. The aims are to test the validity of inversions, and to examine the correspondence between inferred stellar magnetic properties with the input SFT parameters governing flux emergence, differential rotation and turbulent dispersal. This project is part the Solar-Stellar Connection Focus Science Team funded by NASA's Living With A Star program.

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