08.09.2026 11:00 - 08.09.2026 12:00

Stellar surface magnetic field: Effects on Limb Darkening and Granulation Flicker

MAX-PLANCK-INSTITUT FÜR SONNENSYSTEMFORSCHUNG

Max-Planck-Institut für Sonnensystemforschung (MPS)

Magnetic fields shape the surfaces of cool stars, even when the star appears photometrically quiet. In this seminar, I will discuss how small-scale surface magnetism affects two key stellar signals relevant for exoplanet and stellar studies: limb darkening and granulation-driven brightness variability, or flicker. Using 3D radiative magnetohydrodynamic simulations with MURaM, combined with spectral synthesis using MPS-ATLAS, we investigate how magnetic fields modify the center-to-limb intensity variation and the wavelength dependence of flicker. I will show that magnetic flux concentrations can make limb darkening shallower, alter the spectral shape of flicker, and introduce wavelength-dependent stellar signals that may affect transit and transmission-spectroscopy analyses. These results highlight the need to include realistic magnetic stellar atmospheres when interpreting high-precision observations from Kepler, TESS, JWST, and PLATO.

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Keywords

Type
Talk

Category
Research

Language
English

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