

Workshop

Imaging of Stellar Surfaces

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Title:

Revealing stellar surface structure behind transiting exoplanets

Abstract:

During exoplanet transits, successive stellar surface portions become hidden and differential spectroscopy between various transit phases provide spectra of small surface segments temporarily hidden behind the planet. Line profile changes across the stellar disk offer diagnostics for hydrodynamic modeling, while exoplanet analyses require stellar background spectra to be known along the transit path. Since even giant planets cover only a small fraction of any main-sequence star, very precise observations are required, as well as averaging over numerous spectral lines with similar parameters. Spatially resolved Fe I line profiles across stellar disks have now been retrieved for HD209458 (G0V) and HD189733A (K1V), using data from the UVES and HARPS spectrometers. Free from rotational broadening, spatially resolved profiles are narrower and deeper than in integrated starlight. During transit, the profiles shift towards longer wavelengths, illustrating both stellar rotation at the latitude of transit and the prograde orbital motion of the exoplanets. This method will soon become applicable to more stars, once additional bright exoplanet hosts have been found.