Search for Surface Magnetic Fields in Mira Stars

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Abstract

In order to complete the knowledge of the magnetic field and its influence during the transition from Asymptotic Giant Branch to Planetary Nebulae stages, we present the first spectropolarimetric observations collected on Mira stars. Our main goal is to constrain - at this stage of stellar evolution - the surface magnetic field (presence and strength) and to verify whether the magnetic field strength is varying along a 1/r law above the photosphere and across the circumstellar enveloppe of cool and evolved stars.

We used spectropolarimetric observations collected with NARVAL (at Télescope Bernard Lyot, Pic du Midi, France) in order to detect a Zeeman signature in the visible part of the spectra of Mira stars. The detection of a polarimetric signal in the Stokes V spectra (probing circular polarisation) of the S-type Mira star chi Cyg is reported, representing, to date, the first detection of a weak magnetic field at the stellar surface of a Mira.

The presence of this magnetic field is investigated in the framework of shock waves periodically propagating throughout the atmosphere of such radially pulsating stars.

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