Semaine de la SF2A 2025

Session S03 : Atelier général de l'Action Thématique Physique Stellaire

Title : Magnetic cycles of cool stars.

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<u>Abstract :</u>

Magnetic fields play a key role in the evolution of cool stars. They are responsible for activity phenomena such as spots, eruptions, or coronal mass ejections, and influence planetary environments through stellar winds or high-energy radiation. Generated by an internal dynamo effect, their geometry and intensity evolve over time, sometimes in a cyclic manner.

Spectropolarimetry allows us to access these fields via the Zeeman effect and, through Zeeman-Doppler imaging (ZDI), reconstruct their large-scale configurations. Magnetic properties can thus be linked to stellar parameters such as rotation or effective temperature.

The ESA PLATO mission aims to detect and characterize exoplanets, particularly Earth-like planets orbiting Sun-like stars. It will also deliver long-term photometric and seismic monitoring of stellar activity. In this context, identifying and studying target stars in advance is essential to optimize the use of future PLATO data, especially for investigating stellar magnetic cycles.

We have initiated a spectropolarimetric observation campaign on a sample of cool stars chosen for their spectral type (FGK and M), their activity, and their relevance to the study of magnetism. The observations are carried out with ESPaDOnS and SPIRou at the Canada-France-Hawaii Telescope (CFHT), and with Neo-Narval at the Bernard Lyot Telescope (TBL), observing magnetic signatures from the visible to the infrared.

The obtained data allow us to characterize the intensity and topology of surface fields. The goal is to better understand the diversity of magnetic field configurations and their temporal evolution, a crucial element for assessing the impact of stellar activity on exoplanetary environments.

We will present the target selection and the first results of this campaign, including the detection and analysis of magnetic fields, focusing on M dwarfs observed with SPIRou, with the reconstruction of ZDI maps for key targets.