Semaine de la SF2A 2026

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

Title : Magnetic geometry of M dwarfs in the southern PLATO field.

Authors : $M. Diez^1, J. Morin^1, P. Petit^2$

[1] Laboratoire Univers et Particules de Montpellier, Université de Montpellier, CNRS, LUPM/UMR 5299, 34095, Montpellier, France

[2] Institut de Recherche en Astrophysique et Planétologie, Université de Toulouse, CNRS, IRAP/UMR 5277, 14 Avenue Edouard Belin, 31400, Toulouse, France

Abstract :

M dwarfs dominate the stellar population of the Galaxy and are prime targets for exoplanet research programmes. They are also key laboratories to study dynamo-generated magnetic fields and the subsequent phenomena -- starspots, flares, high-energy radiation and stellar winds -- which influence the evolution of stellar angular momentum and the environments of planets.

Despite their importance, the long-term evolution of the surface magnetic fields of M dwarfs, and the possible existence of magnetic cycles, remain as yet poorly constrained. The ESA PLATO mission will provide long-duration, high-precision photometry, offering an unparalleled opportunity to study stellar variability over several years. To exploit this potential fully, it is essential to combine PLATO measurements with spectropolarimetric monitoring, as this will enable direct measurements of the surface magnetic field (field modulus, large-scale topology) and chromospheric activity.

We have therefore initiated a long-term spectropolarimetric campaign using the SPIRou near-infrared instrument at CFHT, targeting M dwarfs in the PLATO South Field. The early M dwarf sample was selected based on activity level and rotation. It includes mainly fast and some intermediate rotators (≈1 day and ≈17 days periods respectively), probing previously unexplored regions of the mass–rotation plane.

In this contribution, we present our target selection strategy and the initial results, which include ZDI maps. Our findings provide novel constraints on the diversity and evolution of large-scale magnetic fields in low-mass stars. They also establish a physically grounded framework for interpreting PLATO photometric variability in terms of underlying magnetic activity. Furthermore, they will provide a unique boundary measurement to inform 3D wind models and assess the typical environment bathing exoplanets orbiting M dwarfs.