Blind Radial Velocity searches for planets around M dwarfs with NIRPS

Salomé Grouffal, Lucile Mignon, Xavier Delfosse and the NIRPS consortium

Univ. Grenoble Alpes, CNRS, IPAG

The NIRPS spectrograph

Near infra Red Planet Searcher

Mounted on the 3.6 m telescope at La Silla

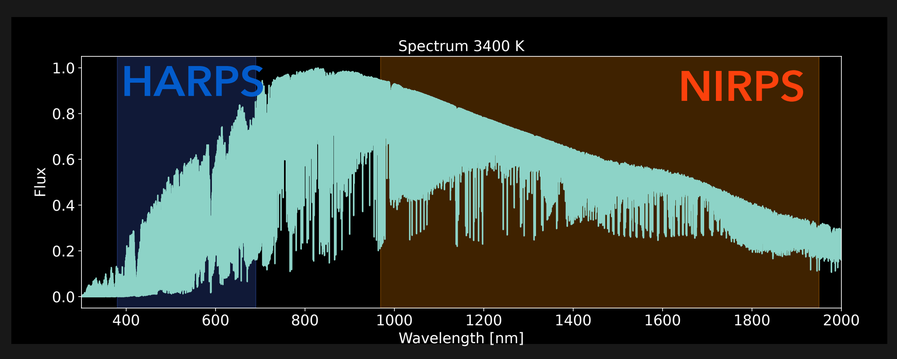
Y, J, H bands

Simultaneous operation with HARPS

Fiber feed Adaptative Optics

High RV precision (1 m/s) and high spectral fidelity

Resolution > 80 000 (High efficiency mode R ~75000)



Why searching for exoplanets around M dwarfs ?

M-dwarfs : 80% of the Solar neighbourhood

Prevalence of low-mass planets around M dwarfs : occurrence rate of 120% for planets with a mass between 0.75 and 3 M⊕ (Mignon et al. 2025)

An Earth-mass planet in the habitable zone of a 0.25 M⊙ dwarf produces a radial velocity signal that is over an order of magnitude larger than that of the Earth on our Sun → Easier to detect, Easier to characterise

BUT

M dwarfs emit most of their energy in the near-infrareds

Stellar activity introduces signals that can mimic those of planets, making them more difficult to detect

NIRPS Garanted Time Observation (GTO)

725 nights over 5 years April 2023 - April 2025

Detection of exoplanets around M dwarfs, active stars and young stars

Mass and density (Transit follow-up)

Atmospheres

NIRPS main science cases

★ Mitigation of stellar activity

★ Sun as a star in both visible + nIR

★★ NIRPS AO to identify nearby stellar component and/or rule out blended EBs

Work package 1 - Blind Radial Velocity Searches

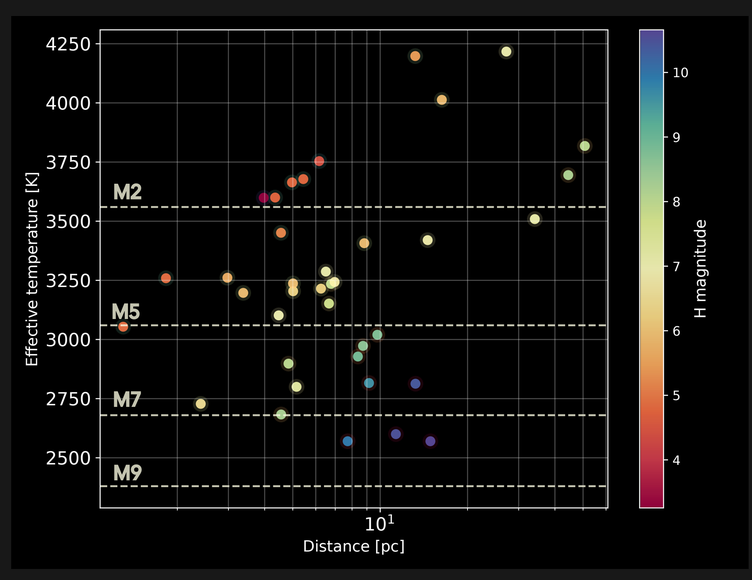
225 nights over 5 years

New detections: Close Binary, Ultra cool dwarfs, very young active stars (~20 Myrs)

Census of the Solar neighbourhoods

Exploring the architecture of planetary systems

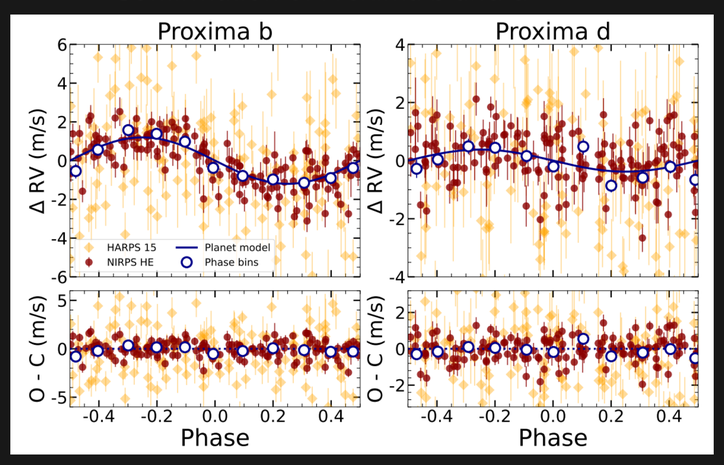
Stellar activity and controversial systems



Stars observed currently for the WP1 of NIRPS

First results of the NIRPS blind radial velocity search

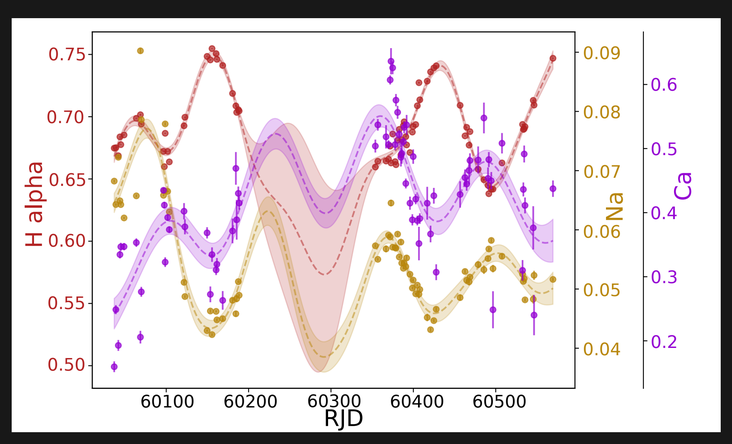
Proxima Confirmation of Proxima b and d



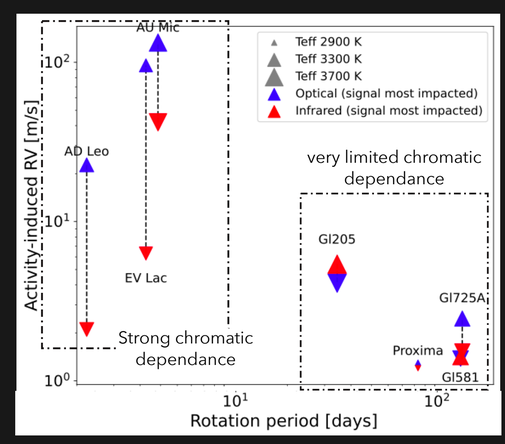
First demonstration of the potential of NIRPS to measure precise RV in the near-infrared

Suárez Mascareño et al. 2025

Gl 581 A complexe variability behaviour for a moderately active M-dwarfs



Anti-correlation between Hα emission and Ca II and Na I

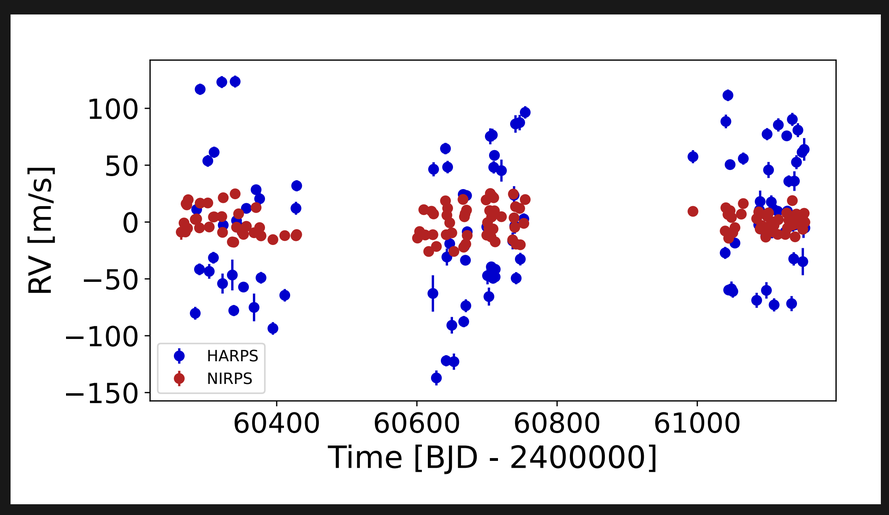


Comparison of the chromaticity of active M dwarfs.

Larue et al. 2026 (in revie

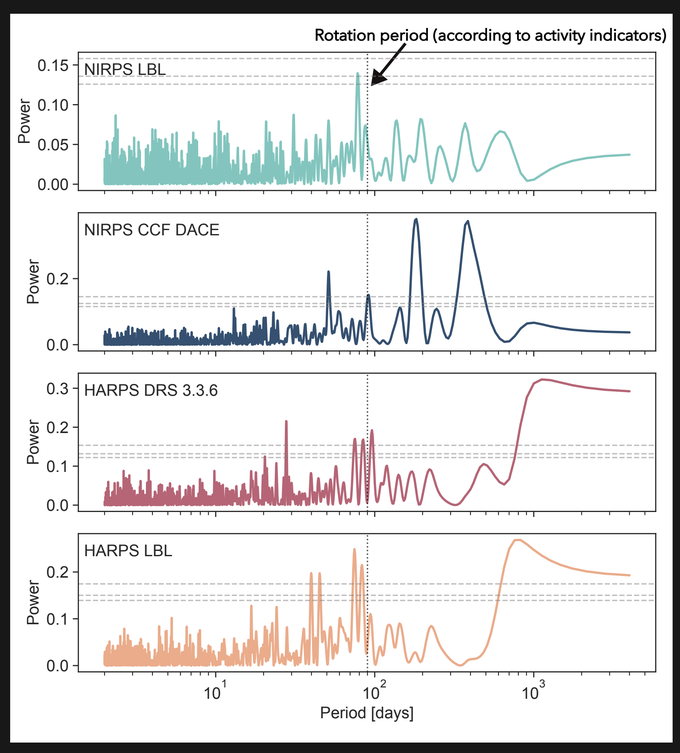
Very active stars - Strong chromaticity

Easier to detect small signals with near infra red



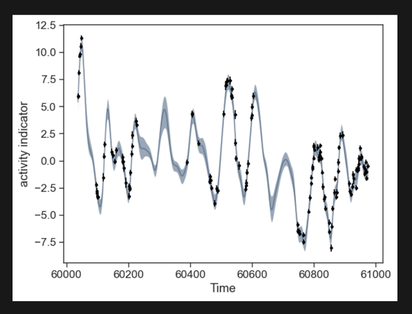
Paper in prep

Stars with complexe signals



Analysis with APERO + LBL (first developped for SPIRou, Artigau et al. 2022)

Several pipelines to analyse complexe systems



Rotation period of stars with the disk-averaged temperature variations (dTemp) activity indicator.

Artigau et al. 2024

Paper in prep

Contact

salome.grouffal@univ-grenoble-alpes.fr