

Following the Flows:

coordinated observations of stellar
supergranulation with EPRV facilities
across the globe

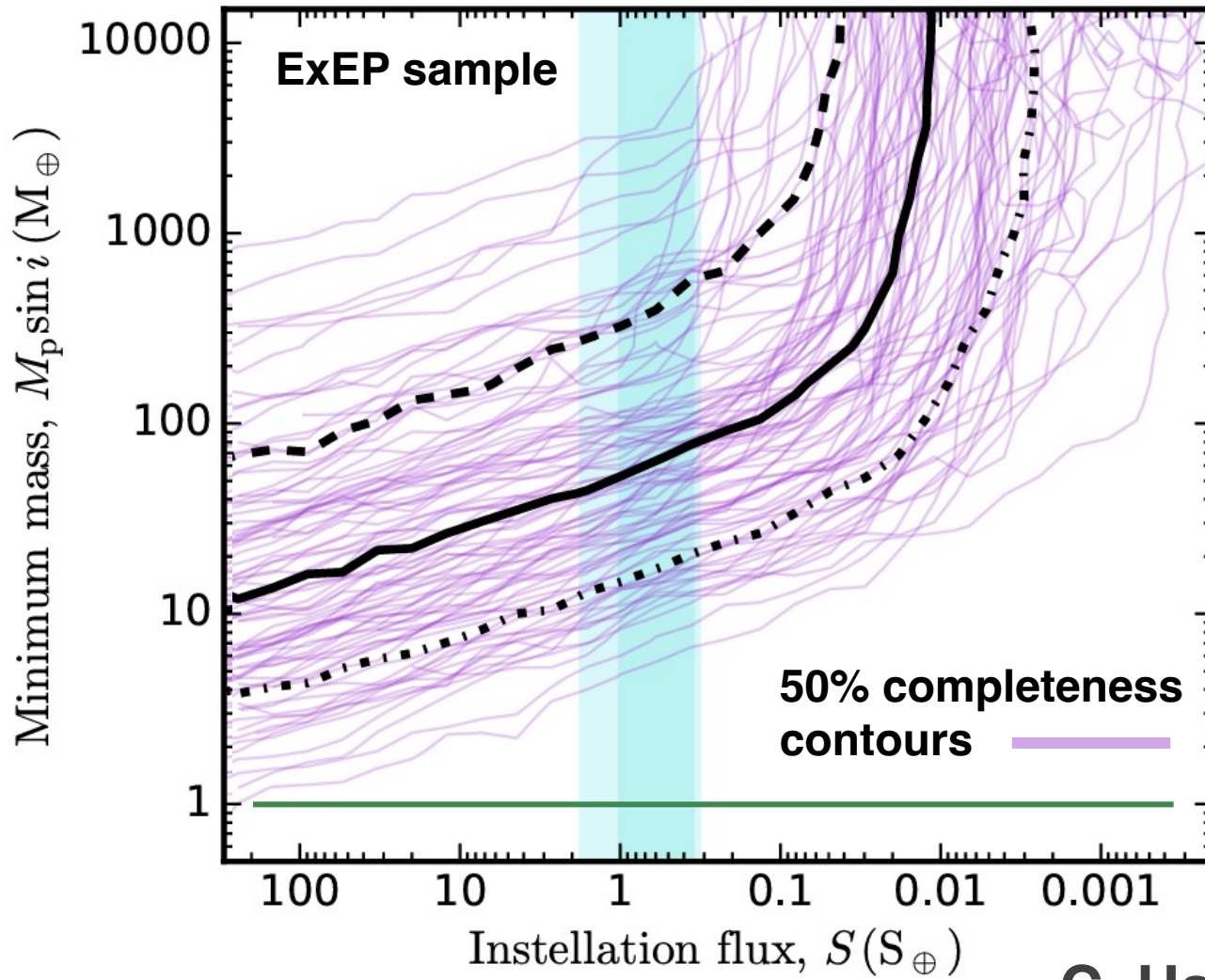
ARVIND GUPTA | FEBRUARY 4, 2025

KNOW THY STAR, KNOW THY PLANET 2

Jacob Luhn, Jennifer Burt, Niamh O'Sullivan, Alejandro Suarez-Mascareño, David Latham, EPRV RCN Standard Stars group



HWO targets: RV planet sensitivity

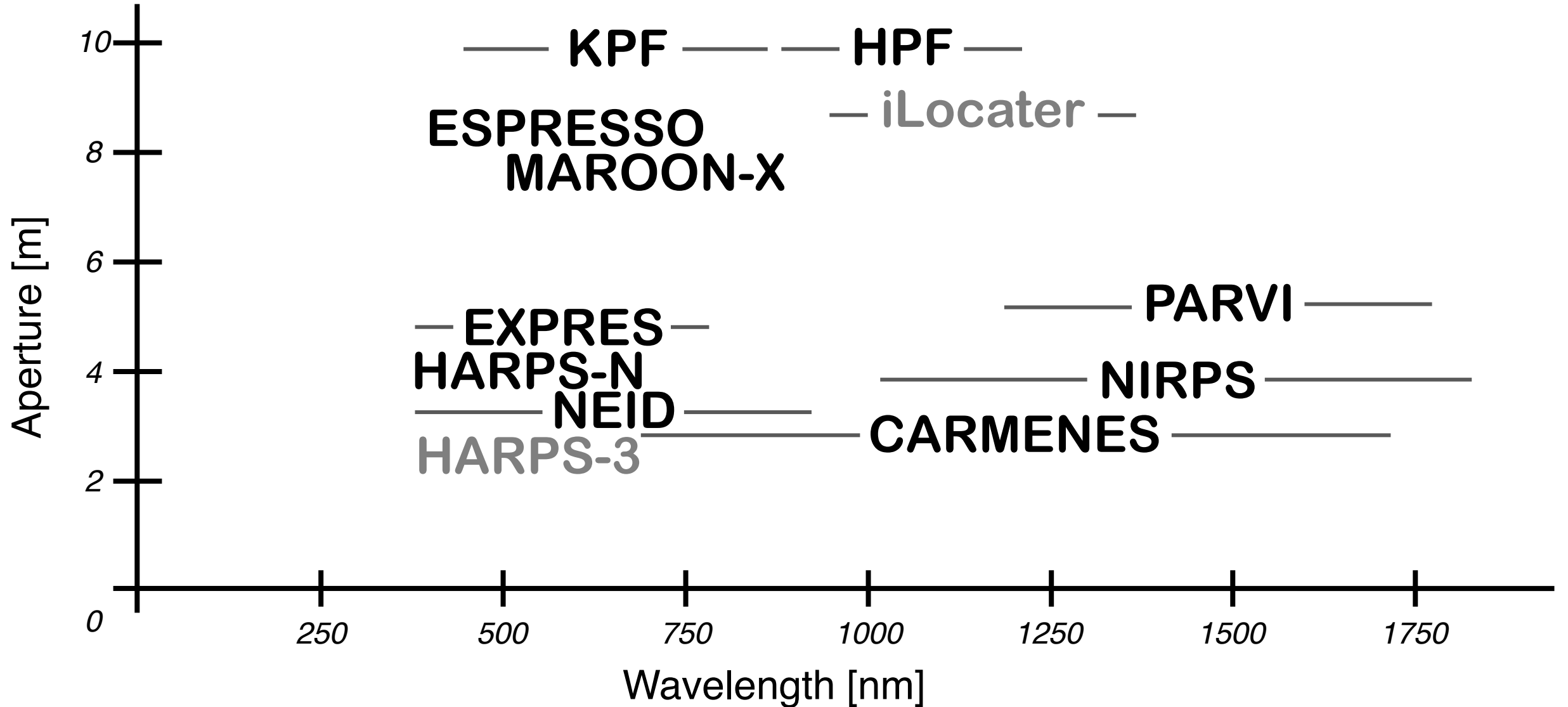


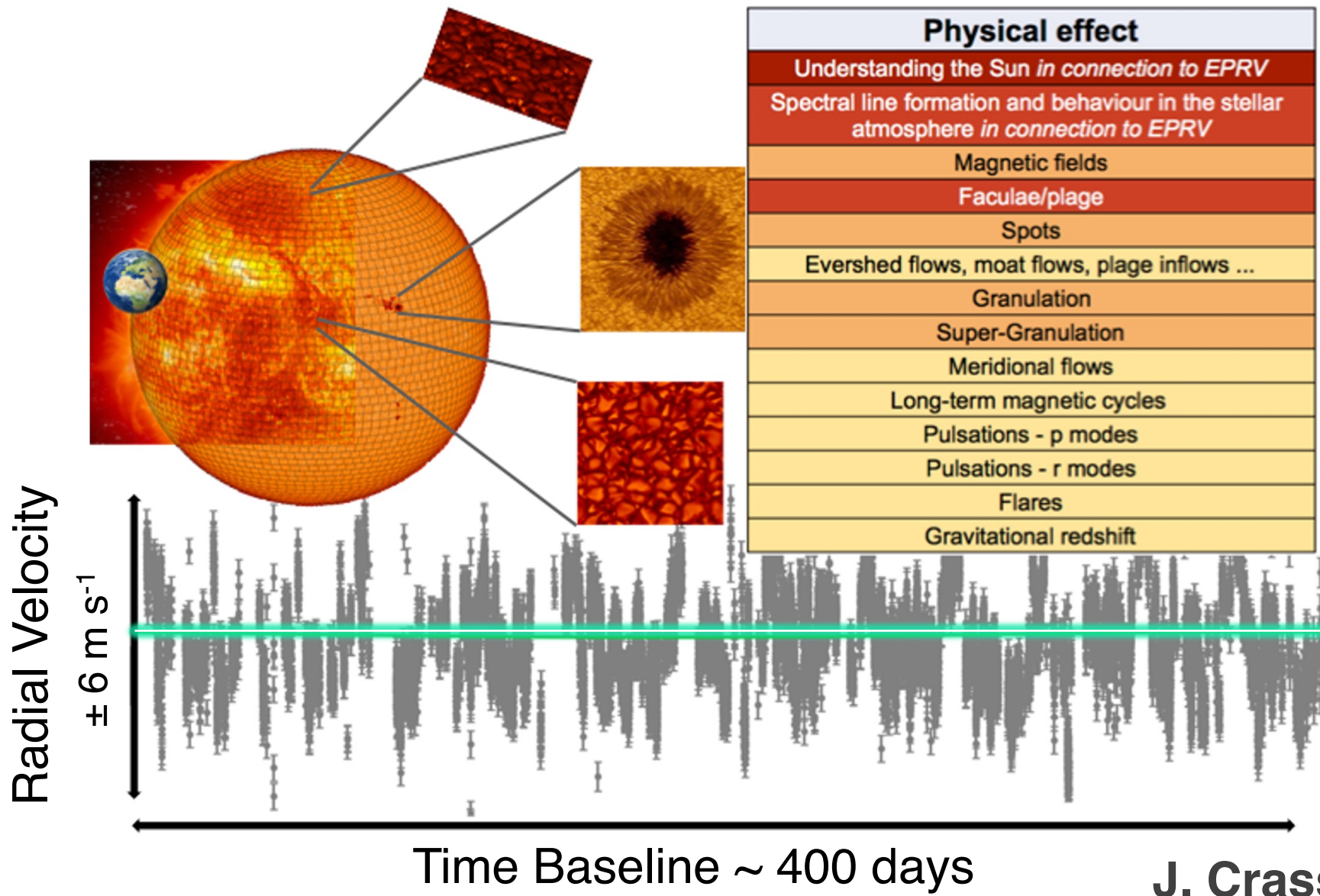
Earth-mass, habitable-zone planets are well out of reach with available RV measurements

(based on archival data from HARPS and HIRES)

C. Harada et al. (2024)

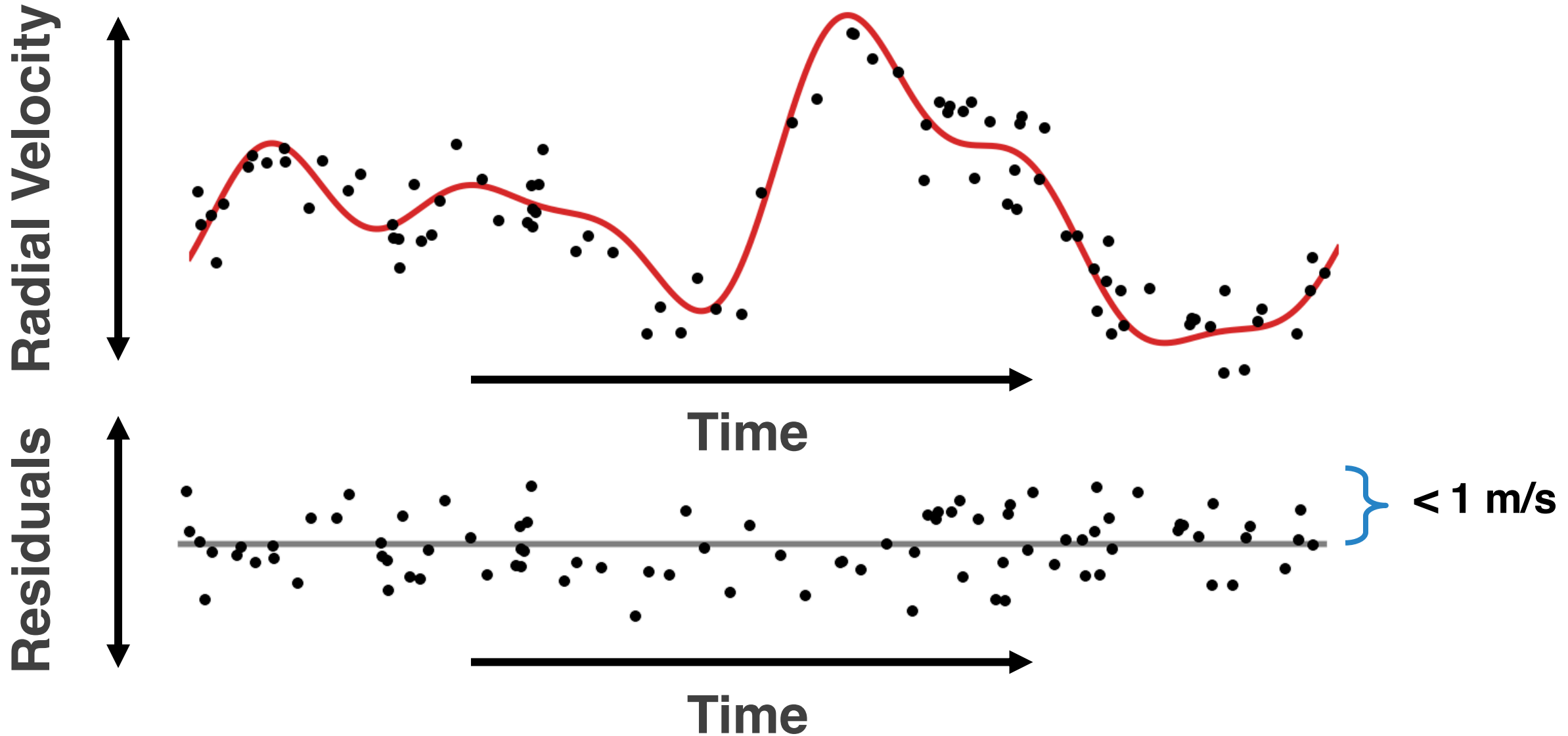
Extreme Precision Radial Velocity Spectrographs





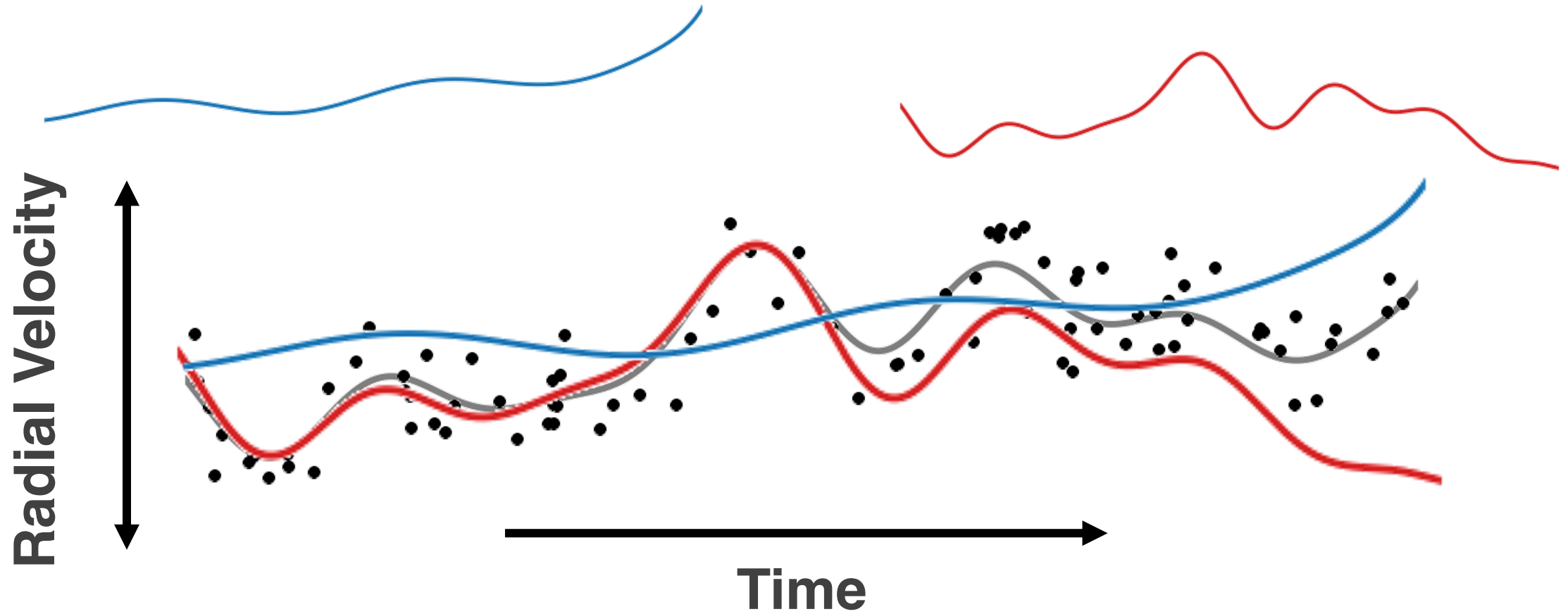
J. Crass et al. (2021)

Stellar Variability Mitigation



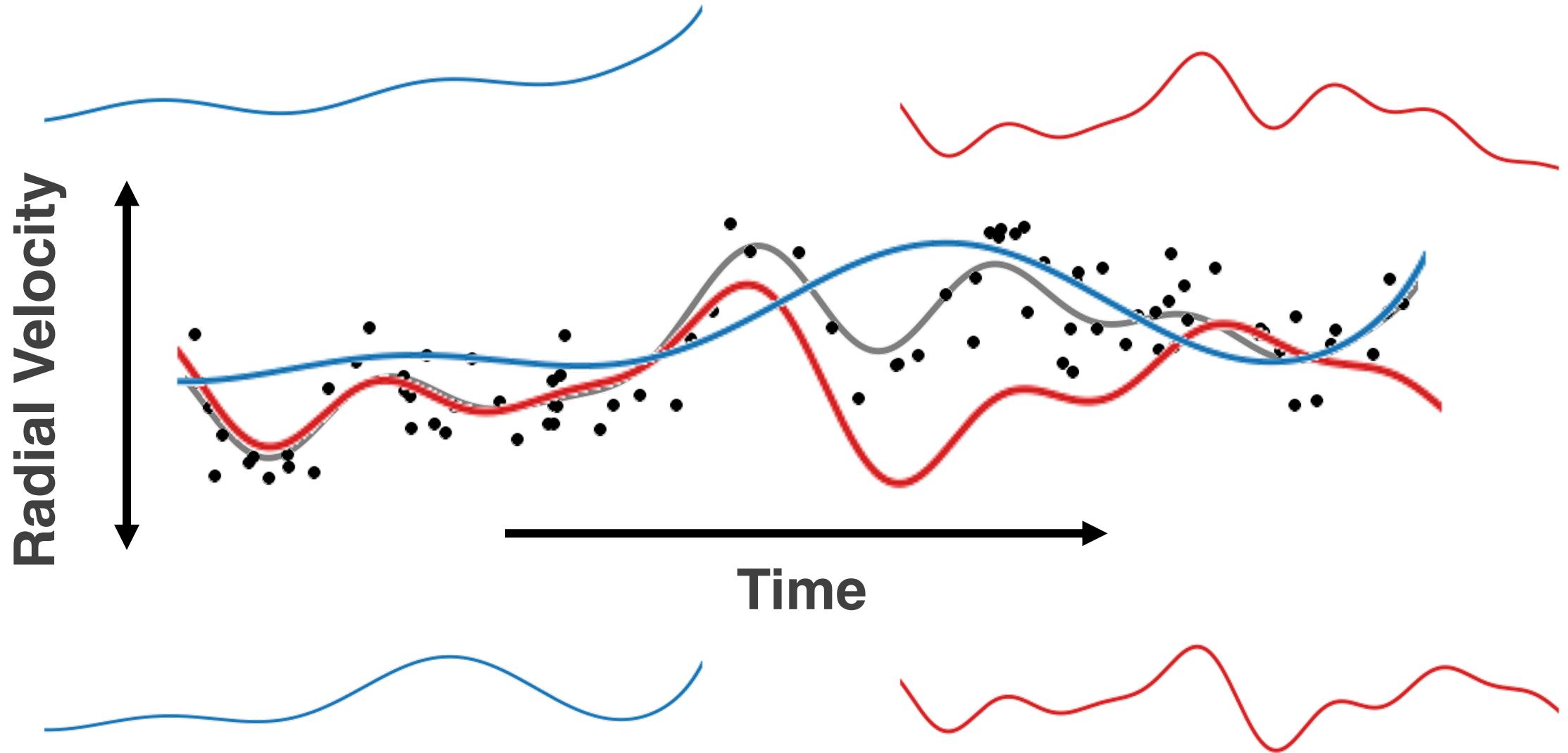
Instrument Drift

Stellar Variability



Instrument Drift

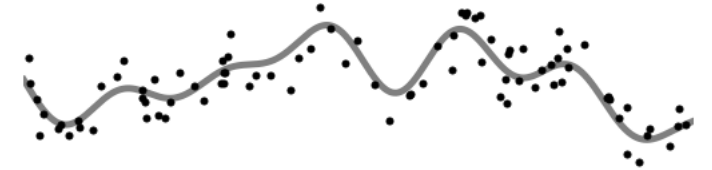
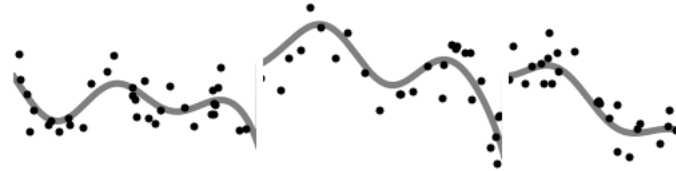
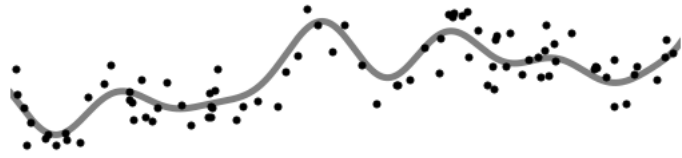
Stellar Variability



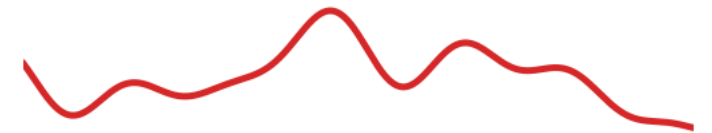
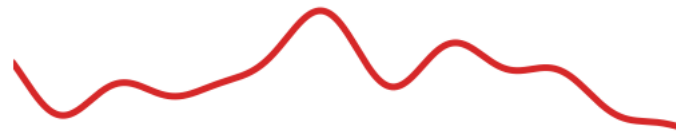
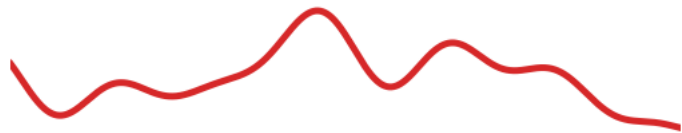
Instrument A

Instrument B

Instrument C



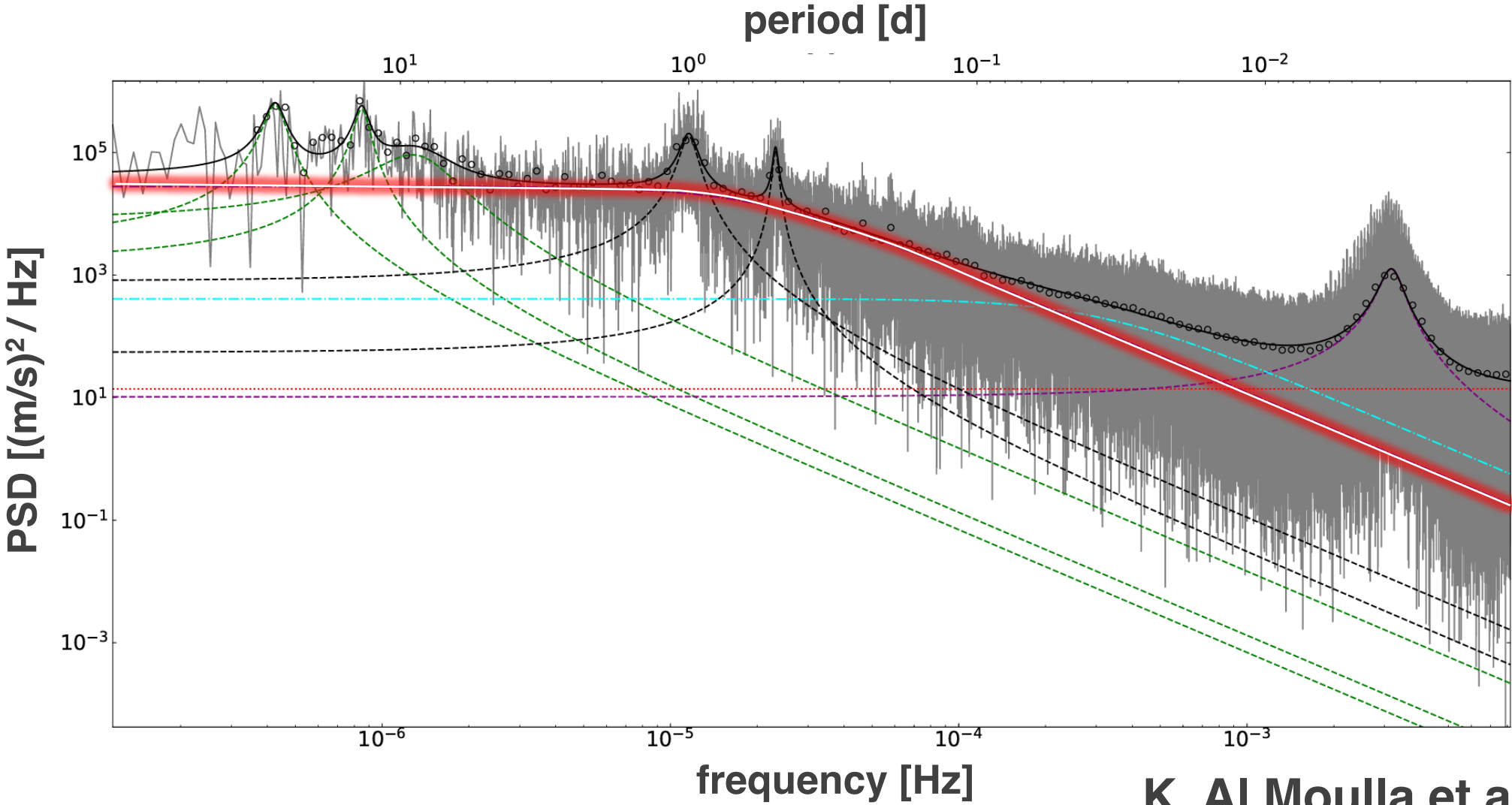
Common features (stellar)



Distinct features (instrumental)

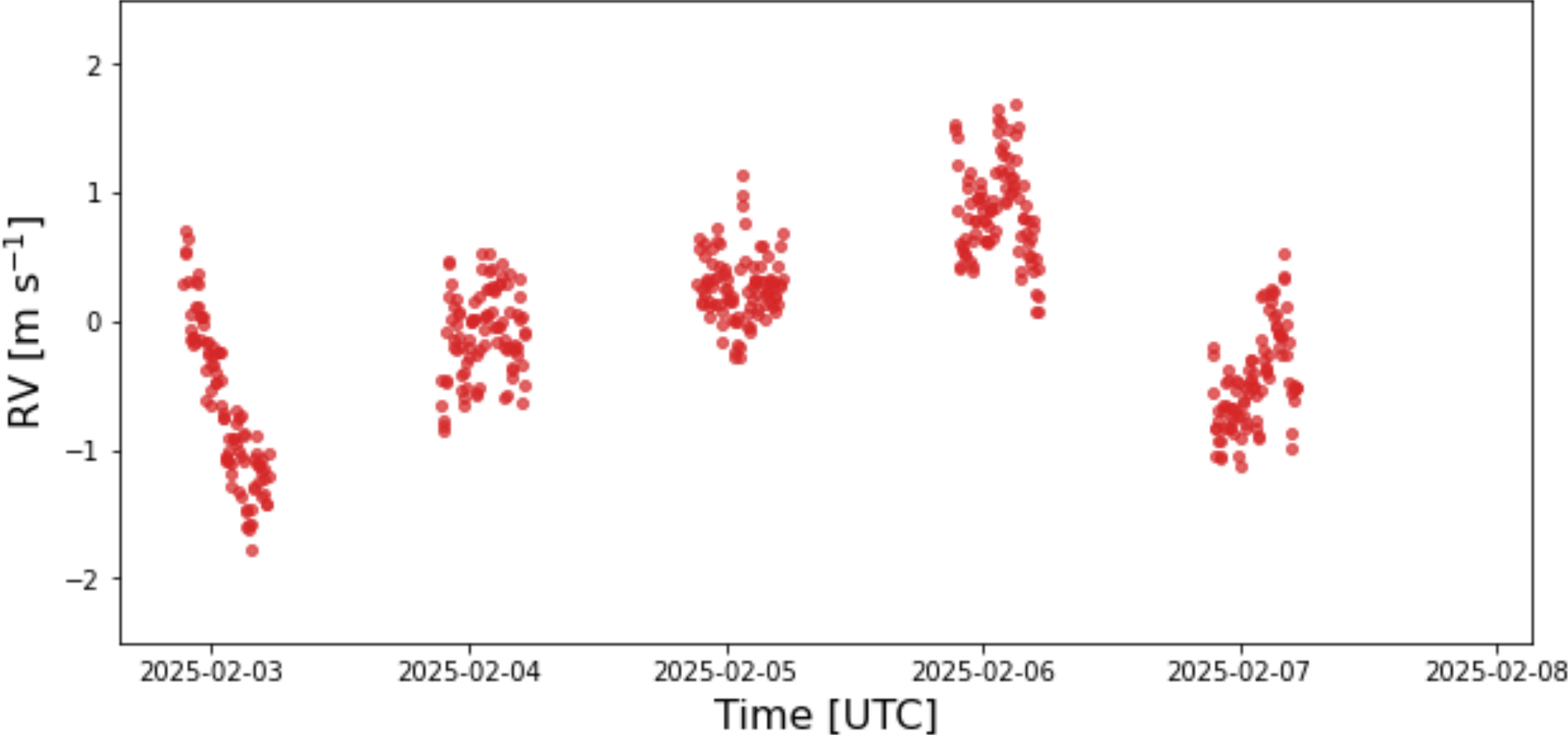


Solar velocity power spectrum

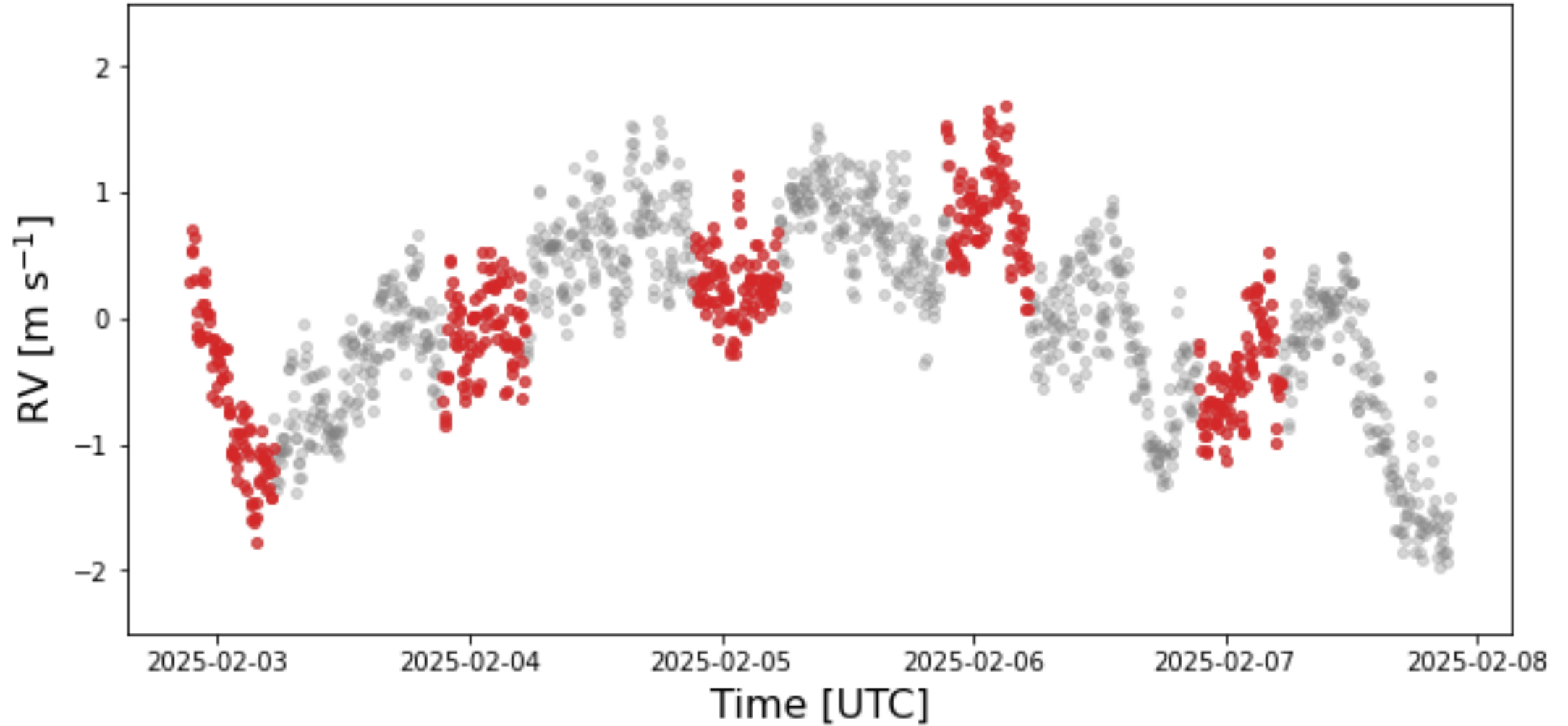


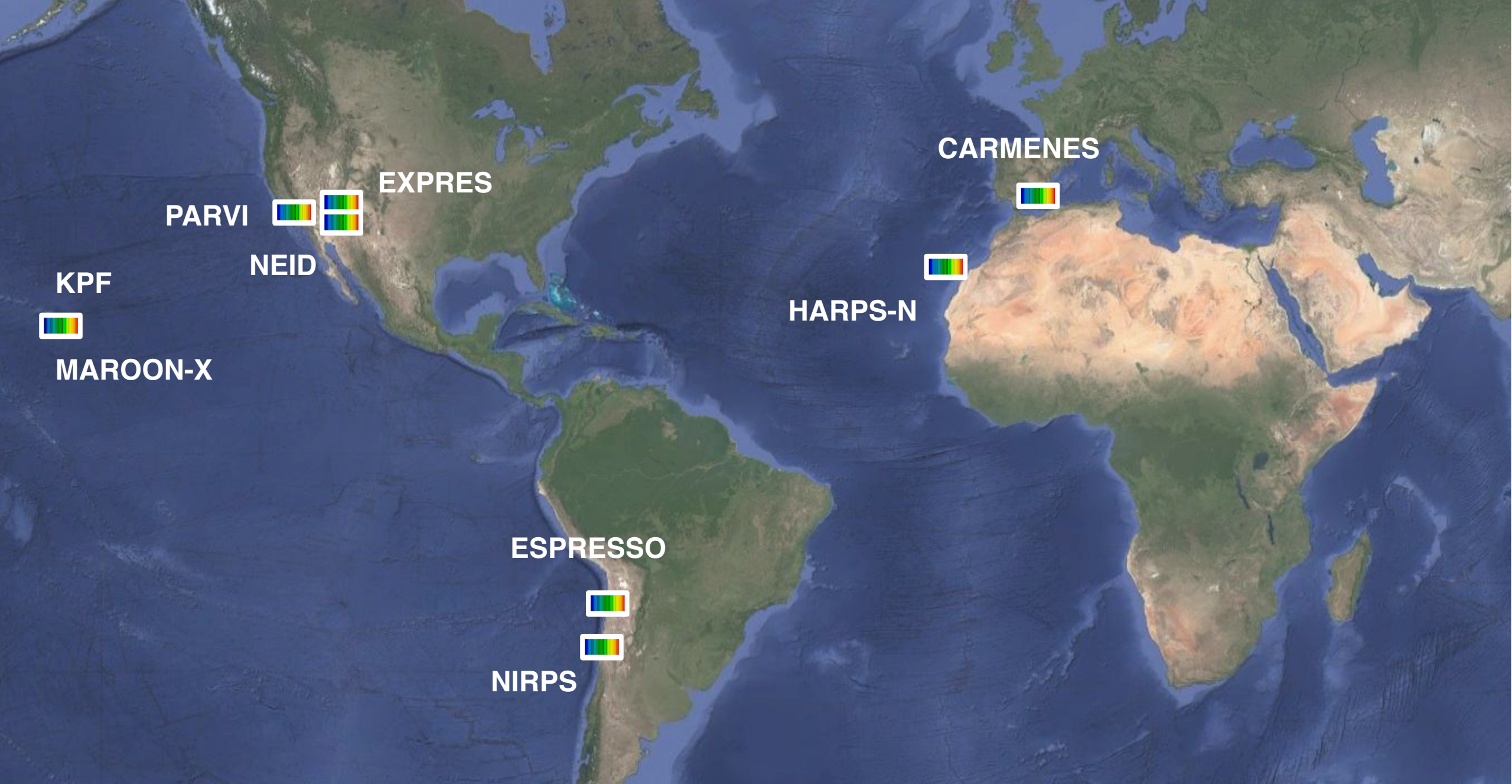
K. Al Moulla et al. (2023)

Stellar supergranulation (simulated)

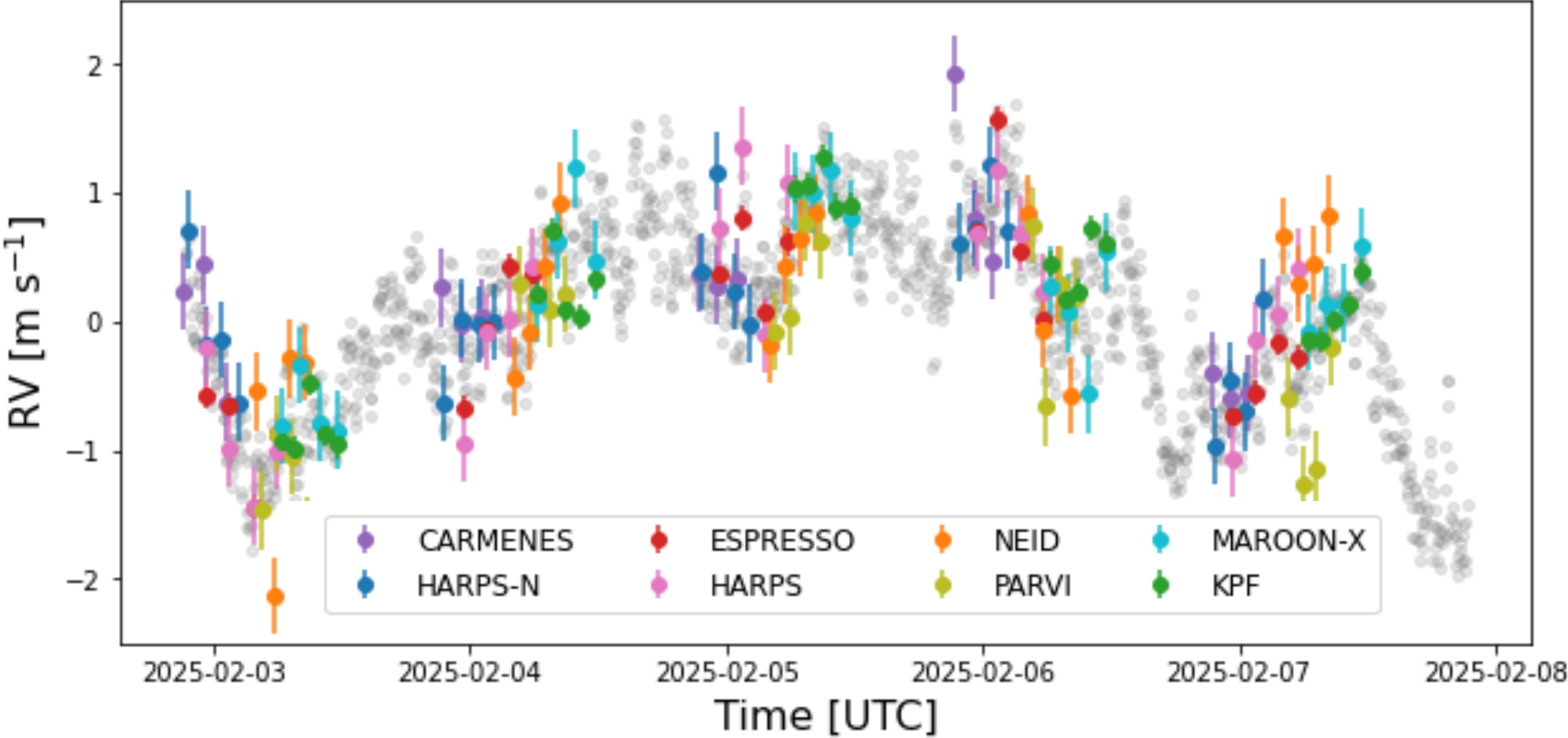


Stellar supergranulation (simulated)





Stellar supergranulation (simulated)



EPRV Research Coordination Network

Standard Stars Working Group

Separate proposals to observe 4 stars* over a 5-night baseline with:
NEID, MAROON-X, ESPRESSO, KPF (+ APF);
additional contributions from EXPRES & HARPS-N science teams,
CARMENES DDT

**Low activity, equatorial, G- / K-dwarfs, history of RV monitoring*

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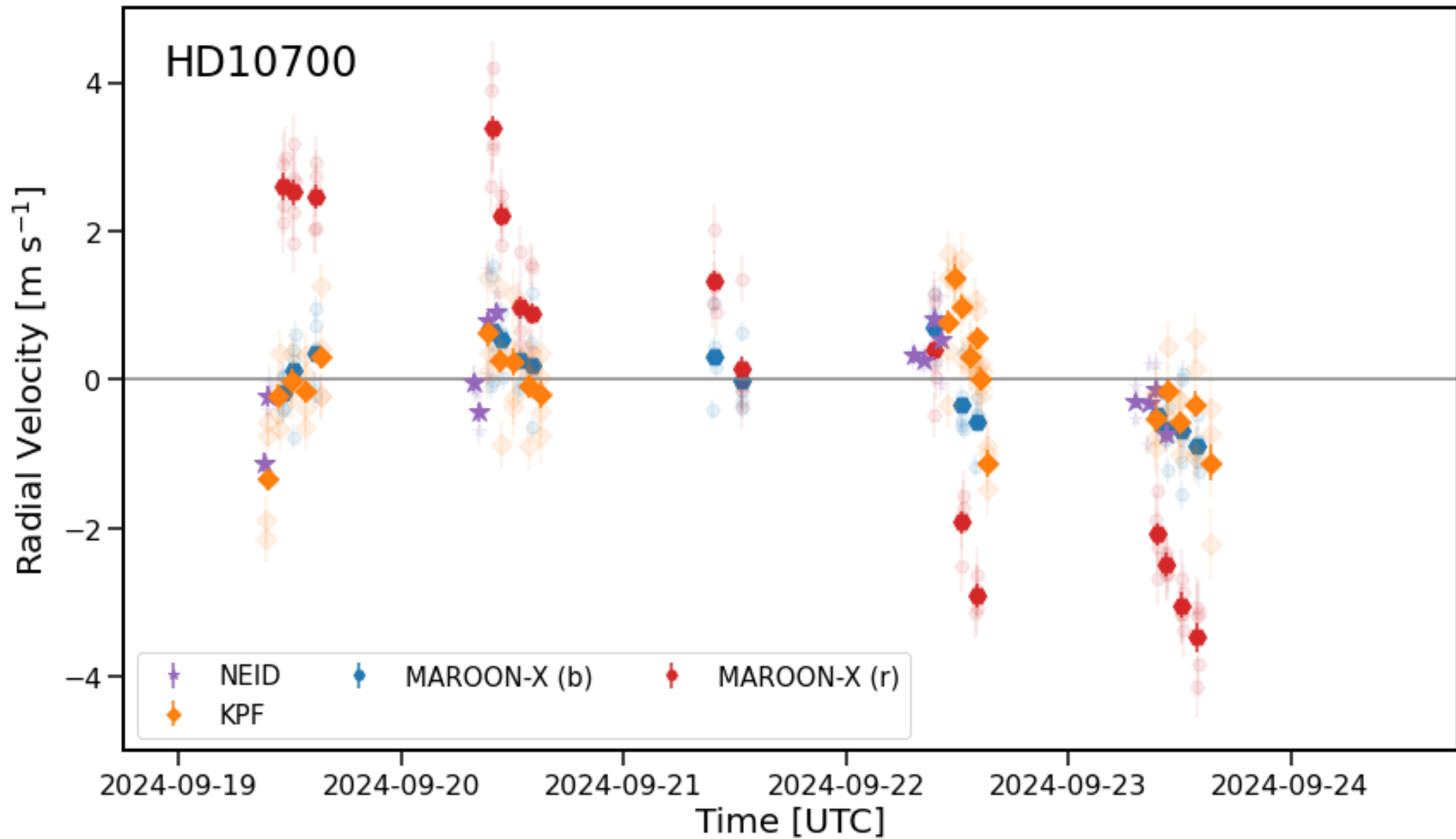
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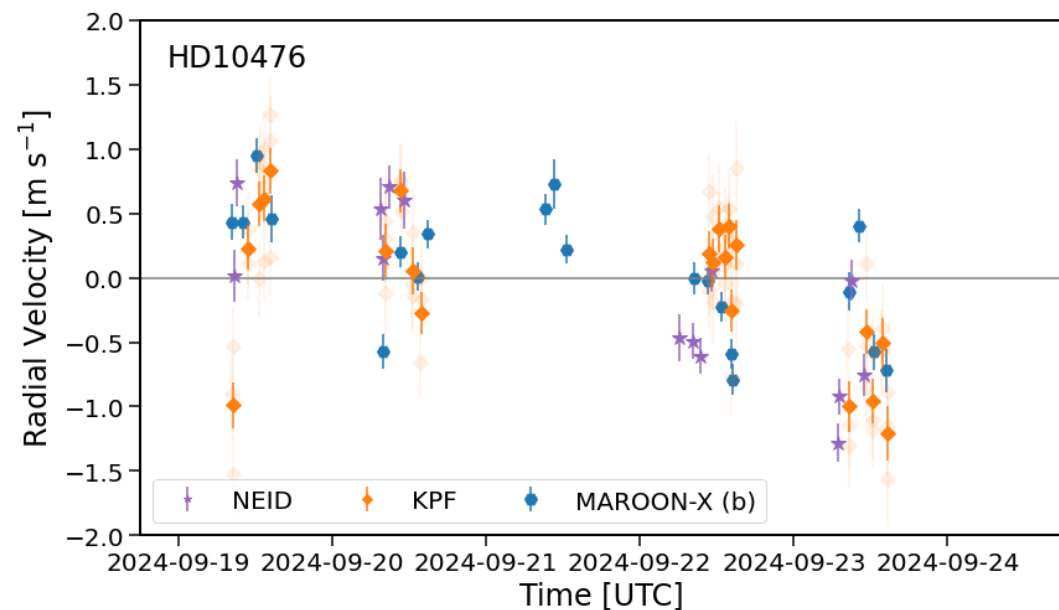
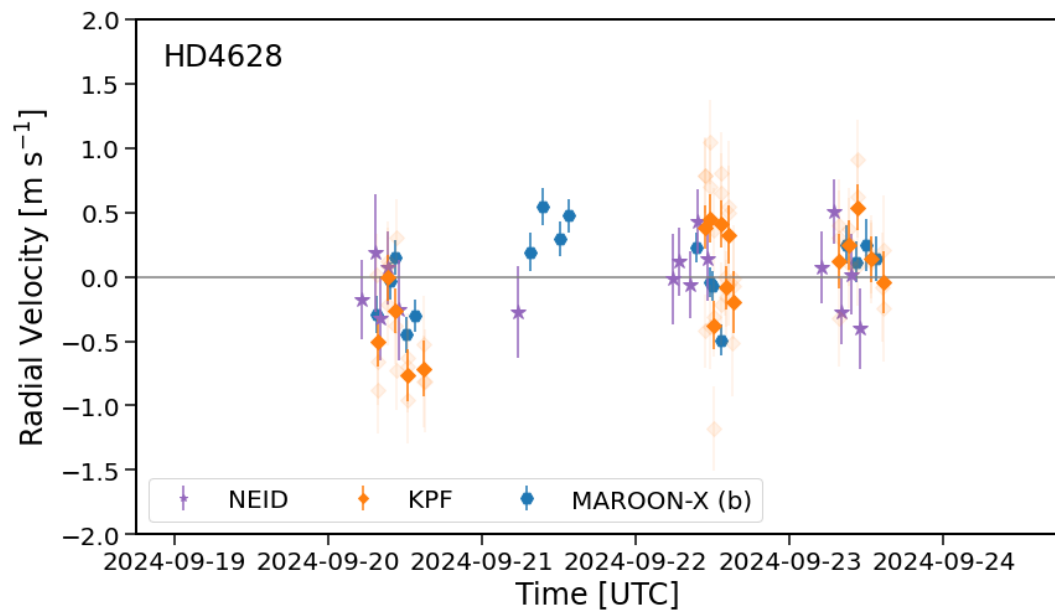
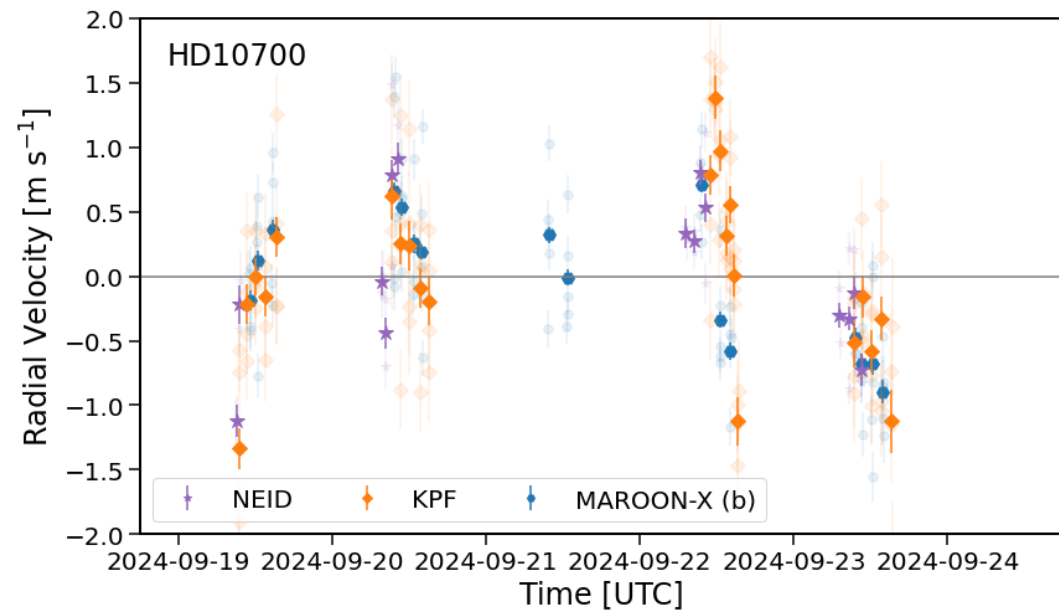
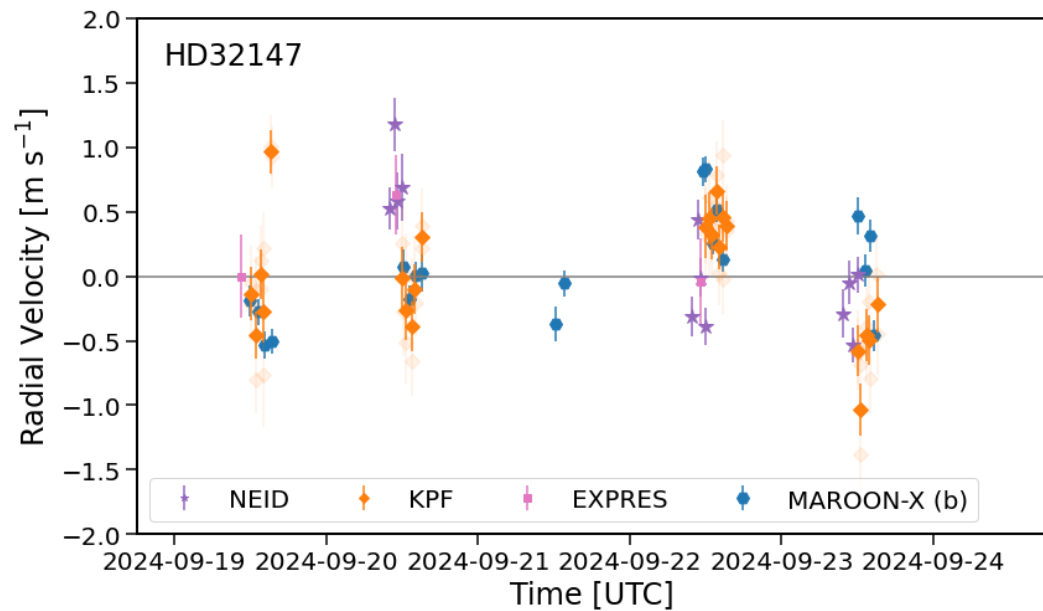
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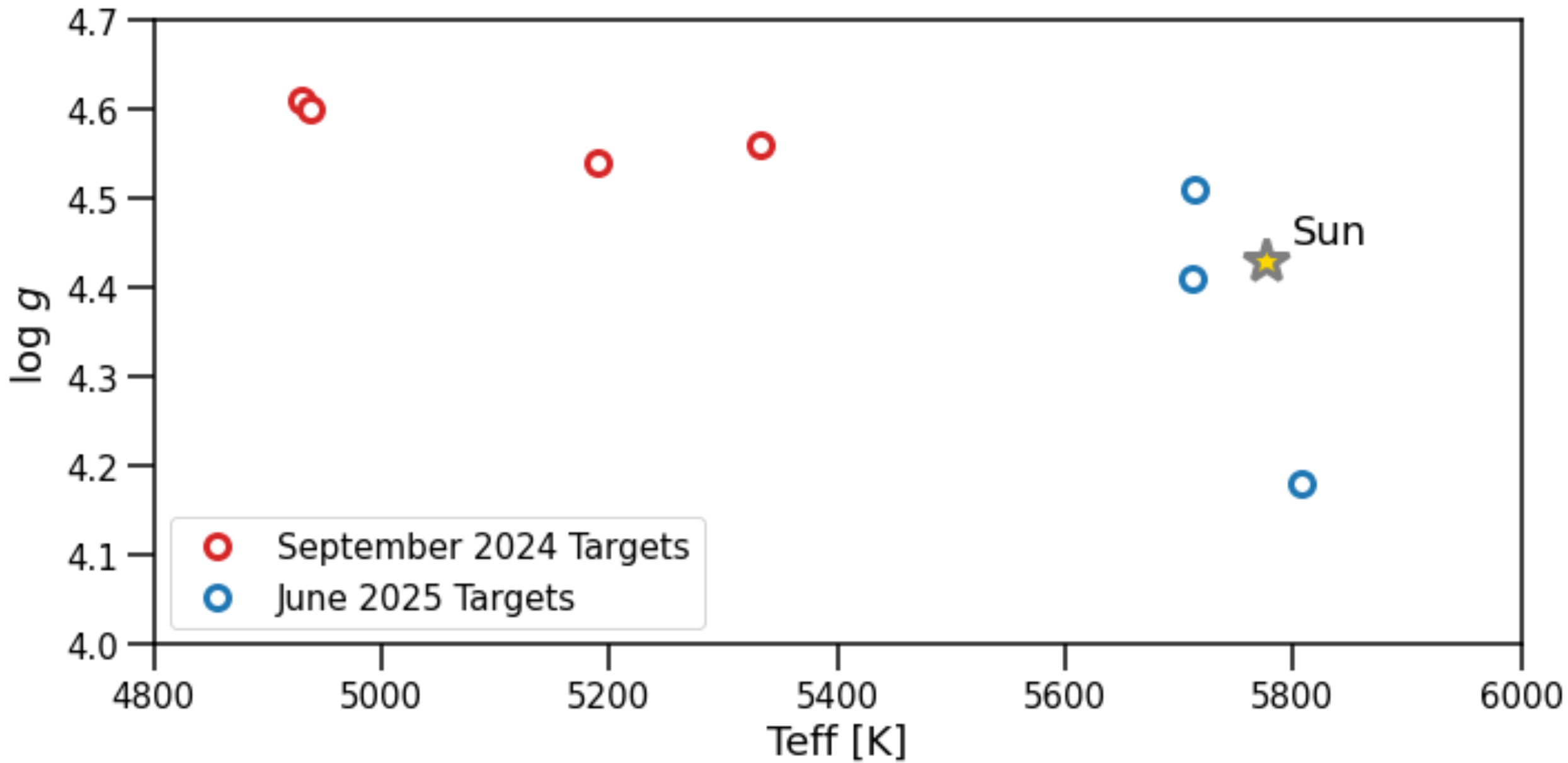
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Next steps

Current data:

(Re-)processing with improved calibrations and common pipelines; application of mitigation techniques to individual and combined data sets

June 2025:

Observations of Solar-type (early G) stars with HARPS-N, NIRPS, ESPRESSO, NEID, EXPRES, PARVI, KPF, MAROON-X

EPRV 6:

Supergranulation splinter session (lead: Niamh O'Sullivan)