Planetary Systems in CAUP

Nuno C. Santos
(CAUP)

Present team

- **PhD researchers:** Nuno C. Santos (PI), Sérgio G. Sousa, Pedro Figueira
  - More soon: Gwenael Boué, Isabelle Boisse, and 2 more candidates answered FCT June call for pos-doc fellowships

- **PhD students:** Xavier Dumusque, Pedro Almeida, Vasco Neves, João G. Silva, Mahmoudreza Oshagh
  - More soon: Diana da Cunha, Gerasim Khachatryan, Annelies Mortier

- **MSc and undergrads:** Pedro Silva, Ana Pinho

Main research lines

- Extra-solar planet searches, mostly using radial velocity method

- Study of stellar "noise" contribution for the detection of planets using radial velocities: towards the detection of other Earths

- Star-planet connection: comparing stellar and planet properties

- Properties of young stars: metallicity and binarity as probes of planet formation

- Planetary transit detection (PhD project with U. Hawaii)

- Participation in instrumental projects (ESO and ESA)

Examples of recent results (I)
Discovery of 32 new exoplanets from the HARPS sample
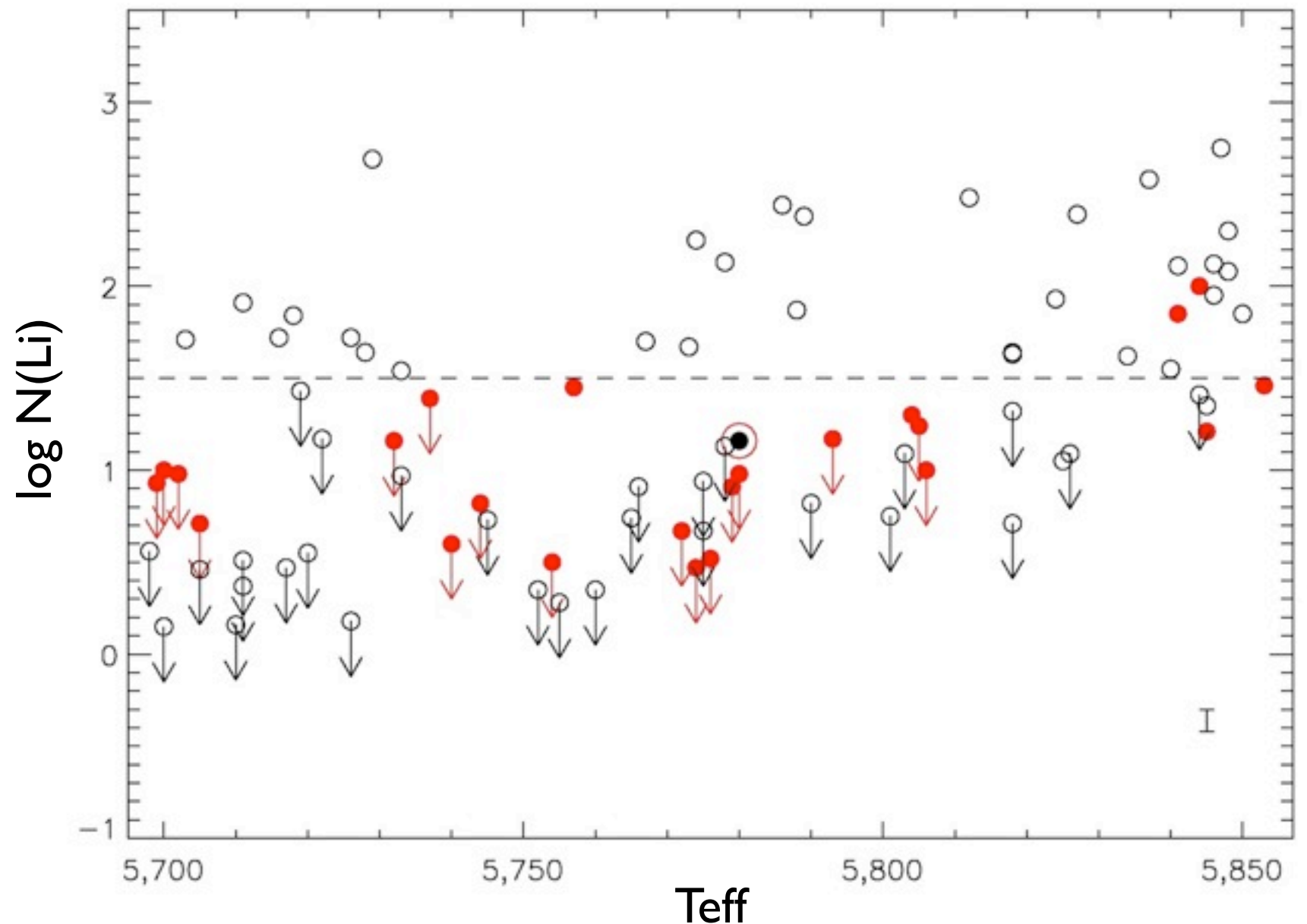
- 32 new planets found (announcement in Oct. 2009)

- Includes some of the "lightest" planets found to date
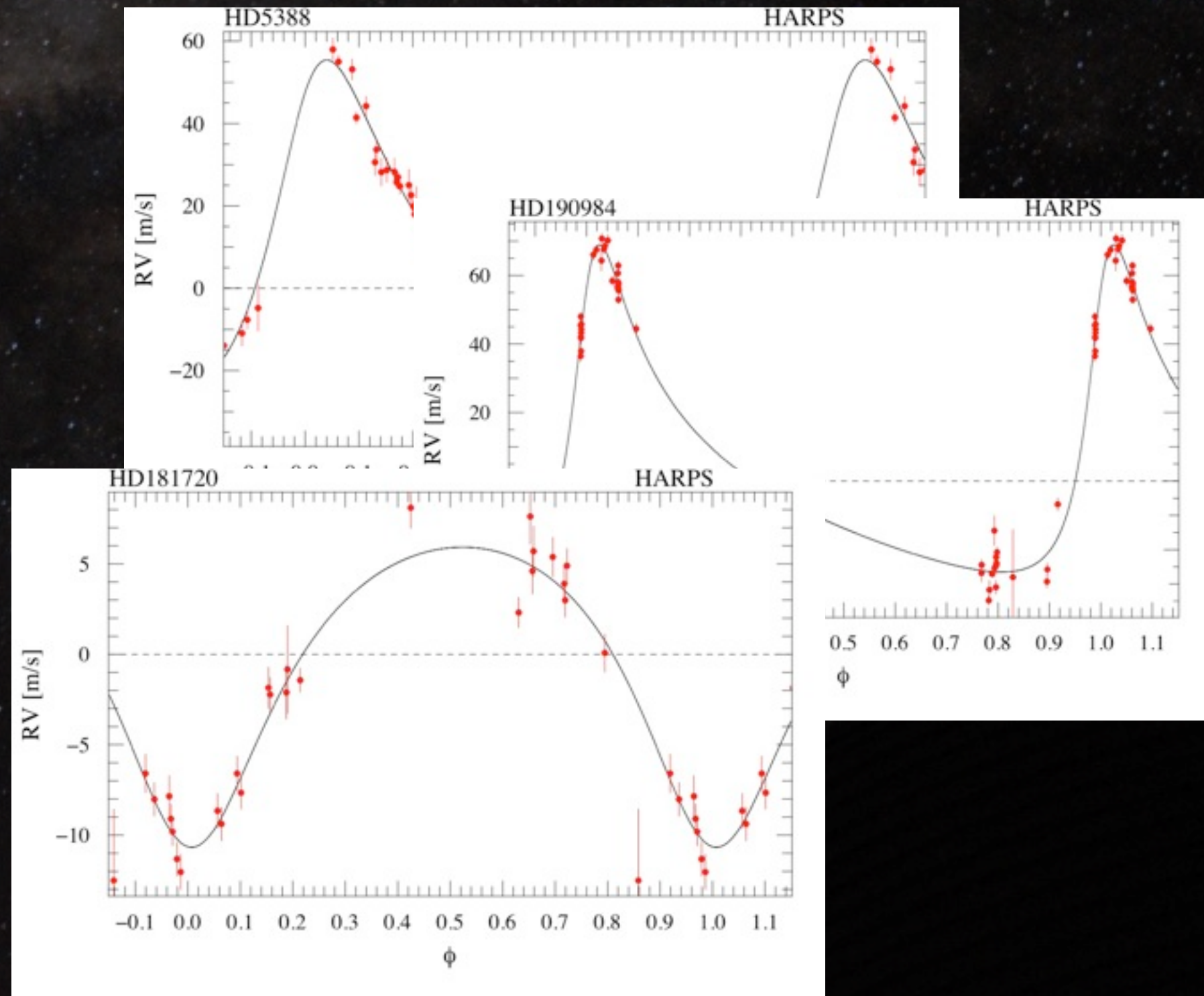
Examples of recent results (II)
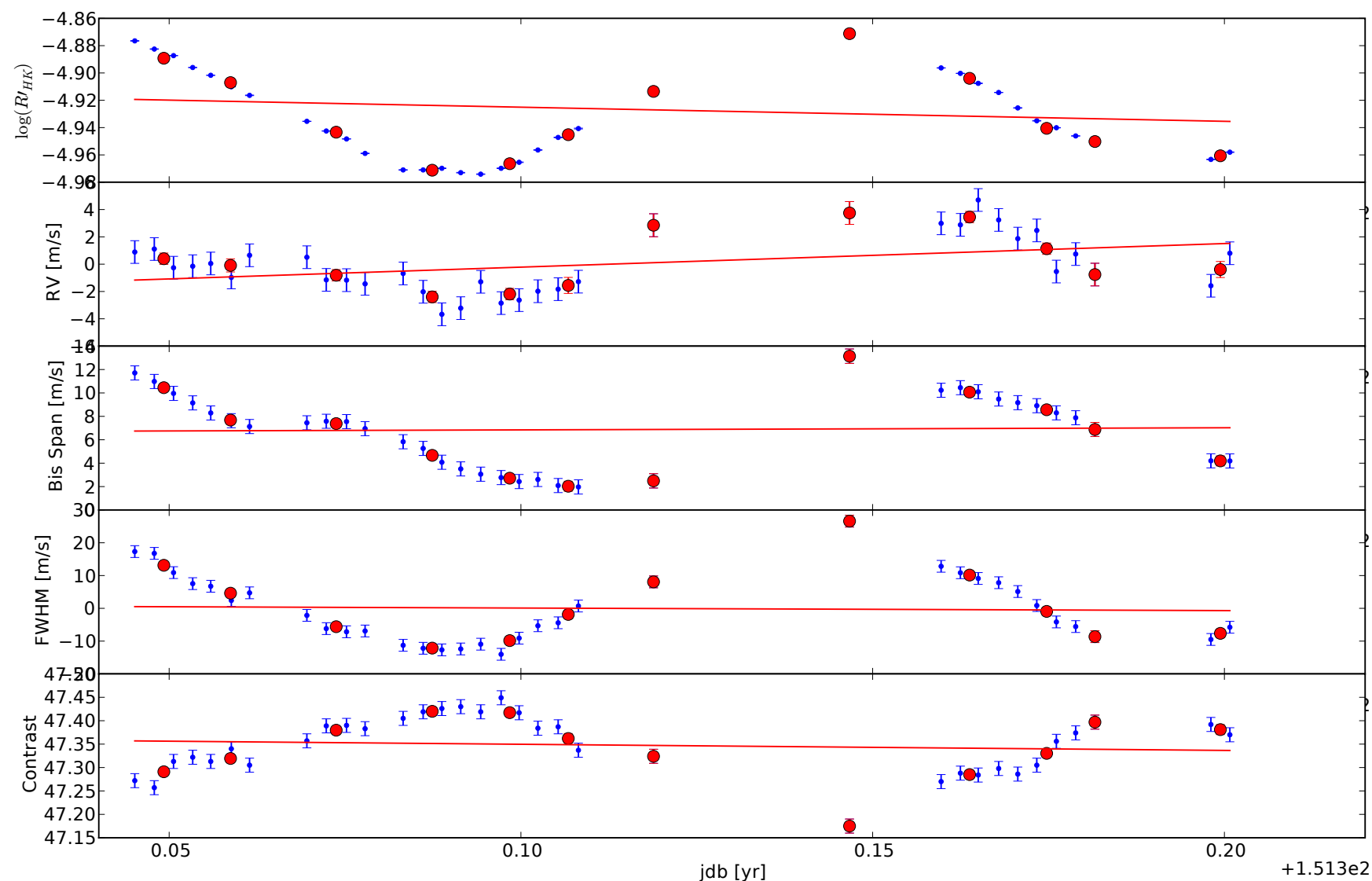## Lithium and the presence of planets

- Discovery that stars with planets may burn Li more easily

- Important information for models of planet formation and Li burning in solar type stars
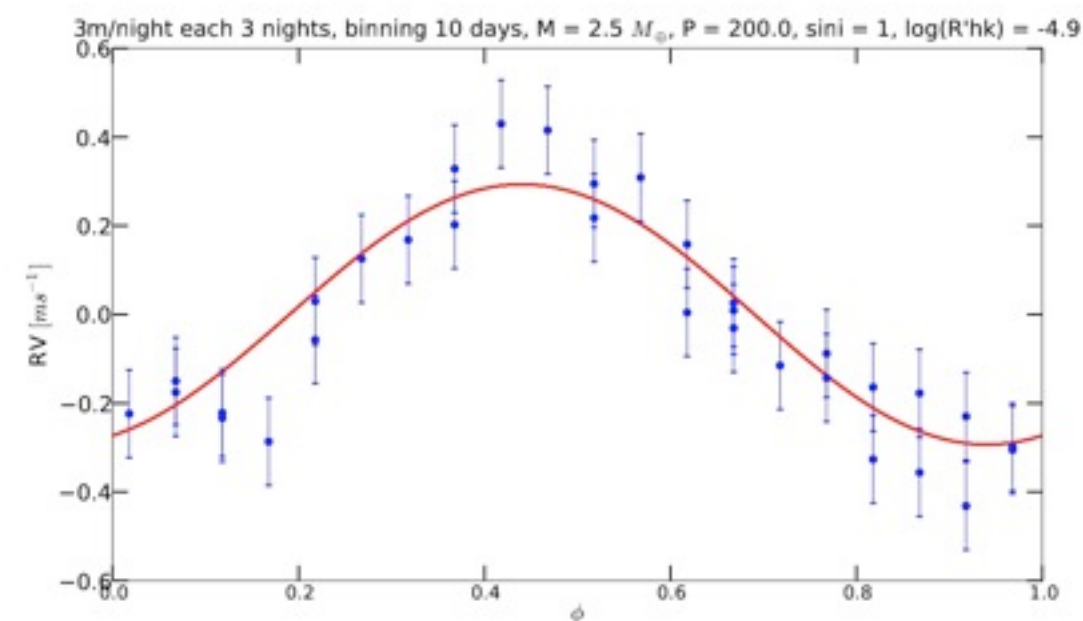
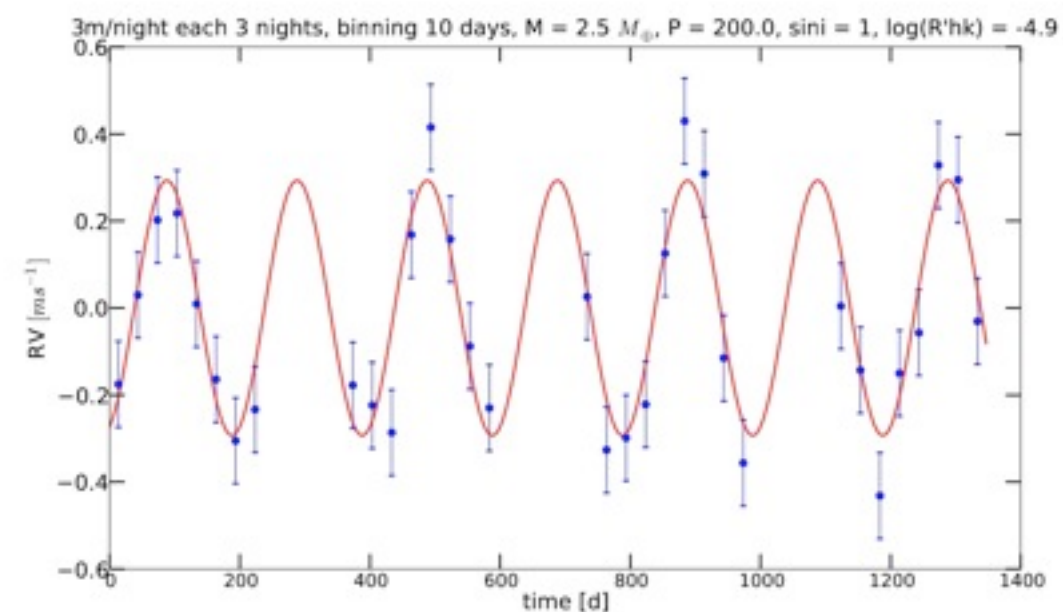## Stellar magnetic cycles and radial velocity

Can activity variations along stellar magnetic cycles mimic the radial velocity signature of a planet?

ESPRESSO@VLT

* An "ESPRESSO" to other Earths

Expertise of team (easily) shared

- Radial velocities from optical and infra-red high resolution spectroscopy

    - Signal processing and analysis

    - Derivation of companion's parameters

- Determination of stellar parameters (Teff, logg) and chemical abundances for solar type stars (FGK and M, dwarfs and giants) from high resolution spectra

- Study of stellar activity and activity indexes in solar type stars

- Planet dynamics (soon in collaboration with Aveiro)

- Transit photometry (soon with new Pos-Doc)

Examples of methods/Software/instruments used

- Spectroscopy:
  - IRAF
  - MOOG (radiative transfer code)
  - ARES (automatic line identification and EW determination, possibly adaptable for other uses; developed by team member)
- Radial velocities:
  - CRIRES pipeline (developed by team member)
  - HARPS pipeline
  - Fitting algorithms (using genetic approach)
- Most used astronomical instrumentation:
  - ESO VLT: UVES, CRIRES, AMBER
  - ESO La Silla: HARPS, FEROS
  - Other: SOPHIE (OHP, France), CORALIE and C2 camera (Swiss Telescope, La Silla)

Examples of national collaborations with other groups

- CAUP (stellar evolution group): asteroseismology study of solar type dwarfs and giants; analysis of Kepler data (stellar parameters)

- CAUP (star formation group): high resolution near-IR spectra (and RVs) in young stars

- CAUP (galaxies and cosmology team): participation in CODEX@ELT spectrograph (projected)

- Coimbra: derivation of stellar masses and ages for stars with planets to exclude these parameters as the cause for the Li deficiency in planet host stars

- Aveiro: co-participation in HARPS program, in particular regarding dynamics of multi-planet systems

- Lisboa: reduction of near-IR spectra of young stellar objects and participation in ESPRESSO project (instrumental side)

- Evora (CGE): planetary transits using an amateur class telescope