

#### PLATO and a groundbased support PLATOSpec

Ground-based support for exoplanetary space missions. Per

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#### Exoplanets as a topic for AV21





#### Main questions

- Physics Nobel Prize winning theme (1/2)
- Detection of the first exoplanet around a Sun like star
- Seeking for our place in the Universe
- In the Czech Republic there was no working group on the new topic



### **Exoplanetary Science Questions**

- We are eager to understand statistical distribution of exoplanets in the Universe
- How do exoplanetary systems evolve?
- How do exoplanets compare to the Solar system?
- Uniquenes (or not) of our Solar system
- Life in the Universe



#### Where are we now?





#### **Plato Space mission**



**Fig.1:** PLATO Space mission is the motivation for PLATOSpec. PLATO will need large amount of ground based support. Credit: ESA, PLATO PSM



# PLATO Space mission

stronomický

- Monitoring of 1 million bright stars
- Need for extensive RV follow-up
- *Minimum* 50 nights/year on 1-2 m facilities
- Every spectrograph on a 1-2 m class telescope will be needed!
- Thousands of planets in total
- Earth-sized planets
- Launch 2026



### PLATO setup





#### PLATO observing strategy





### PLATO mission participation

- In cooperation with SAB aerospace
- First two containers delivered 2020
- New batches of containers are on time!
- SAB is doing pretty good job even with the crisis environment and rising prices!



Courtesy of M. Florian SAB

# Ground-based support for exoplanetary space missions.

PIQEO



#### **PLATOSpec specs**

- ESO E152 telescope at La Silla
- Till 2003
  hosting FEROS
- Since 2003
  IDLE
- Operational since 2022!!!







### PLATOSpec justification - PLATO

- Monitoring of 1 million bright stars
- Need for extensive RV follow-up
- *Minimum* 50 nights/year on 1-2 m facilities
- Ground based follow-up for PLATO is recognized by ESA as a part of the mission!
- Literally every spectrograph on a 1-2 m class telescope will be needed! There are no projects like PLATOSPec!
- CZ member of PLATO since 2019







# **PLATOSPec** specs

- Stellar parameters
- Initial screening of candidates
- Rejection of false positives
- Characterization of hot Jupiters
- Exoatmospheres
- Asteroseismology
- Additional science
- RV measurements
  - accuracy 5-10 m/s
  - for stars 4-11 mag
  - SNR 30-40 in max. 1 hrs (est.)



**Fig. 2:** PLATO space mission will provide photometric measurements for about 1 million Stars in the grey area of the Figure.





#### **PLATOSpec**

- Ground based support for PLATO (not only)
  - exoplanets, stellar physics
  - other programs possible
- Precise radial velocities down to 1 m/s for PLATO stars sample
- Initial screening of PLATO sample stars
- Physics of hot Jupiters
- Physics of stellar pulsations
- Long term monitoring!



# The instrument

Astronomický

ústav

AV ČR

asu





## The instrument





Figure from: PLATO DR document 1.4



### TOI-1181b, TOI-1516b and TOI-2046b

- Three hot Jupiters orbiting a sugbiant a MS and a young star
- Period around 2 days for all three system
- Example of TESS LC and RV curve below



From Kabath et al. 2022MNRAS.513.5955K



### And how AV21 helped?

- We were able to participate in instrumentation oriented workshops, with no science
- We were able to get the PLATO project funded
- We were able to get the PLATOSPec project funded
- We are collaborating closely with colleagues from UFCHJH on ARIEL
- We started the industry collaboration with SAB aerospace, TOPTEC and ProjectSoft HK a.s.



#### Photo: Z. Bardon ESO Photo Ambassador

#### Thank you for your attention



Photo: Z. Bardon ESO Photo Ambassador