THE ONDRŽEJOV EXOPLANET GROUP

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Abstract. Ground-based telescopes are an integral part of exoplanetary space missions. Our poster presented results from the high-resolution Ondřejov Echelle Spectrograph (OES) installed at the Perek 2-m telescope in Ondřejov, Czech Republic and operated by the Czech Academy of Sciences. We focussed on results from monitoring Kepler/K2 and TESS objects during 2018–2019, and other activities and collaborations carried out by the group.

Keywords: Telescopes, Instrumentation: spectrographs, Planetary systems, Eclipses.

1 Introduction

The exoplanet group at the Astronomical Institute of the Czech Academy of Sciences was formed in 2015; more than ten members belong to the group. The research is dedicated to radial-velocity (RV) follow-up observations of exoplanetary candidates, and the characterisation of exoplanetary atmospheres.

The main scientific topics are:

• Radial-velocity follow-ups
• Detection and characterisation of exoplanetary atmospheres
• Space missions and ground-based instrumentation

2 Radial-velocity follow-ups

We are using the 2-m Perek telescope and its échelle spectrograph to characterise the host star of a candidate system and to measure RVs. We are following up planetary candidates from Kepler/K2 missions. In 2019 we started to perform ground-based follow-up observations for the TESS space mission, and in the future we plan to follow up candidates from the PLATO space mission too.

The main characteristics of the OES are as follows:

• Spectral resolving power: 50,000
• Wavelength coverage: 370–850 nm
• Detector: CCD 2048 × 2048 pix
• Calibration lamp: Th/Ar

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We also plan a ground-based RV follow-up facility at the 1.52-m telescope at La Silla. A state-of-the-art échelle spectrograph PLATOSpec will be built and operated by a consortium led by the Astronomical Institute of the Czech Academy of Sciences, with Thüringer Landessternwarte Tautenburg and Universidad Catolica de Chile as partners. This new instrument, which will have a spectral resolving power of 70,000, will be dedicated to ground-based support of TESS, PLATO, and (later) ARIEL. More information about PLATOSpec can be found at https://stelweb.asu.cas.cz/plato/index.html.

To highlight the most recent results, we mention the discovery of the first brown dwarf, observed by TESS, which is orbiting a metallic-line A star. A paper on this discovery has been submitted to the AJ (Subjak et al. 2019), and is the result of a collaboration between Harvard University, PRL India, and the KESPRINT consortium. We have also published an article about the Ap star HD 99458 as being the first ever δ Scuti pulsator in a short-period eclipsing binary. That research was mainly based on observations with the OES (Skarka et al. 2019, see also Skarka et al., [PAGE]).

Fig. 1. Left: The Ondřejov 2-m telescope, Czech Republic. Right: Part of the spectrum of HD 109358 (G0V, $V = 4.25$ mag) obtained with the OES in an exposure of 600 seconds.

Fig. 2. Left: Example of a radial-velocity curve obtained with the OES (blue circles) and other instruments. Right: Residuals from the same RV curve, after removing the orbital model.

3 Exoplanetary atmospheres

Our group uses large telescope facilities (such as ESO Paranal) to detect and characterise exoplanetary atmospheres via transmission spectroscopy and emission photometry (Kabáth et al. 2019, Kabáth et al. 2019b, Zák et al. 2019, Blázek et al., in prep.). We are also involved in investigating the profiles of spectral lines and their impact on those characterizations.

4 Space missions

Our group is involved in the PLATO scientific programme. We are members of the PLATO Mission Consortium and are coordinating the Czech contribution to PLATO. The OES will be used to observe planetary candidates in the northern hemisphere, and will act as a follow-up instrument for that mission. We will also perform an initial screening of the candidates and the characterisation of hot Jupiters.
5 Collaborations

We are collaborating with Tautenburg Observatory (Germany) on RV follow-ups of TESS targets (Sabotta et al. 2019). We are also working closely with AI SAS (Gajdoš et al. 2019; Skarka & Kabáth 2019; Kabáth et al. 2019a), and are a member of the KESPRINT consortium (Gandolfi et al. 2019; Persson et al. 2019).

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References

Kabáth, P., Skarka, M., Sabotta, S., & Guenther, E. 2019a, Contributions of the Astronomical Observatory Skalnate Pleso, 49, 462
Skarka, M. & Kabáth, P. 2019, Contributions of the Astronomical Observatory Skalnate Pleso, 49, 137