



ExoClock Newsletter

Dear ExoClock participants,

Hope you are all doing well! This newsletter is shorter than other times as we will have our annual meeting very soon and we plan to share at that time more detailed updates!

We would like also to welcome the new members!

We send out a newsletter like this at the beginning of every month, while you can read the past newsletters, watch the past meetings, and have access to other educational material at:

www.exoclock.space/users/material

We organise meetings dedicated to new ExoClock members. These meetings are held just after our regular monthly meeting. The beginner's meeting is usually held on the Friday after our regular meeting or the week after. In these meetings, newcomers can ask questions of any level related to the operation of the website, observations of transits, data analysis etc. Note that these meetings are not recorded.

Finally, we **have a Slack channel** for more direct communication and if you want to join, follow this link:

https://join.slack.com/t/exoclock/shared_invite/zt-1t5l875v6-x0s8s553kT8nbCvbyo7boA

In this newsletter, we discuss:

1. Announcements

1.1. Meetings and activities

1.2. Next ExoClock Annual Meeting

2. Highlighted Observations

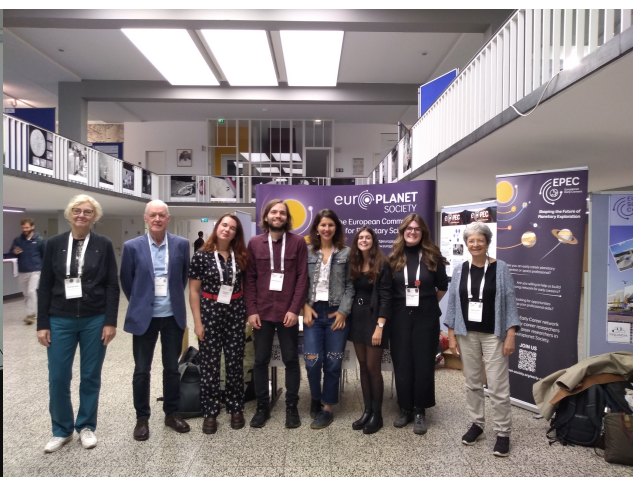
3. Exoplanet CV of HAT-P-12b

1. Announcements

1.1 meetings and activities

EPSC 2024 meeting

The EPSC 2024 (European Planetary Science Congress) is the largest Planetary Science Conference that takes place in Europe every year. This year the congress took place in Berlin, Germany from the **8th to the 13th of September**. There were several sessions dedicated to exoplanets and ExoClock was presented in multiple presentations. The link for the conference: <https://epsc2024.eu/>
A keynote talk was given by Mercedes Correa- active ExoClock member- and it was among the highlighted moments of the congress. The presentation was dedicated to the use of the Europlanet Network telescopes for ExoClock observations. Moreover, Anastasia Kokori, Georgia Pantelidou, Adrian Jones and Florence Libotte had presentations related to ExoClock. Below you can find some pictures.



If you have done an outreach activity related to ExoClock/ Ariel or you would like to organise something in your local area, please contact us. We would love to hear and help with material!

1.2 Next Annual meeting – Lisbon, 26th and 27th of October

The 4th Annual ExoClock Meeting is approaching, and we are really excited! The meeting will be hosted by the Faculty of Sciences in **Lisbon during the 26th and 27th of October** and it will be in hybrid format -both in person and online. Please save the dates and share the link with interested communities!

Our annual meeting will occur just before the Ariel Consortium meeting which means that this is a great opportunity to meet in person some Ariel consortium members! Registration will close on the **20th of October for in-person attendance and on the 25th of October for remote attendance.**

Note that there is a small fee of 50€ for in-person attendance, to cover expenses (rooms, technical support and catering). Please send us an email as soon as you have made the payment.

The registration page:

<https://www.eventbrite.com/e/4th-exoclock-annual-meeting-tickets-947090181227>

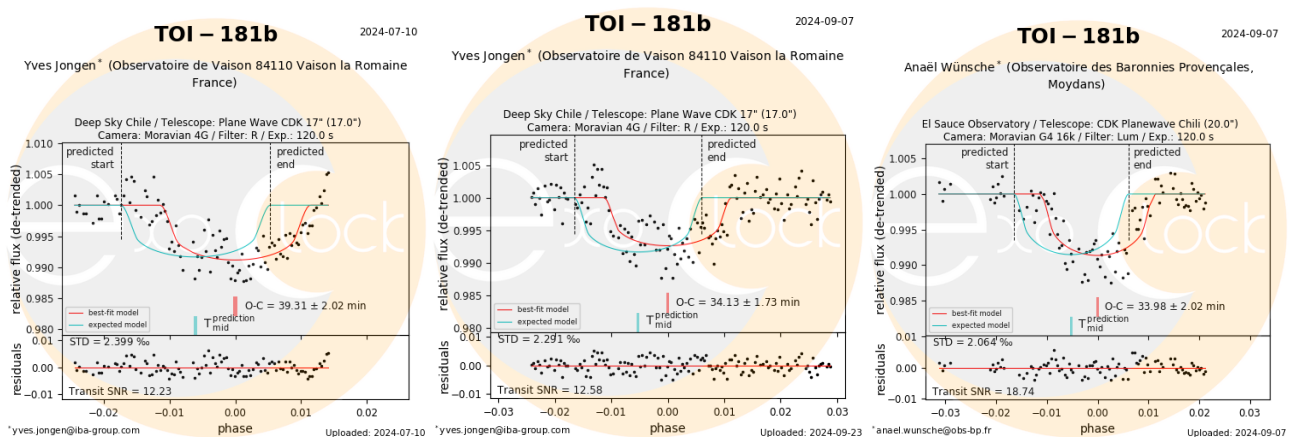
We are looking forward to meeting as many of you as possible in person!

The agenda of the meeting has been released and can be found here:

https://www.exoclock.space/annual_meetings

2. Highlighted target of the month

We would like to thank you all for the observations you contributed during the previous months! We have selected **TOI-181b, an ALERT target**. The target was firstly observed on the 10th of July by Yves Jongen showing a **shift of 35 minutes**. This shift is shown also in more recent observations during the same night. The target is still flagged as alert as it needs additional observations in different nights for the flag to change to low. So, if it appears in your scheduler, certainly you can observe it! Below you can see the light curves.



Congratulations and thank you for your efforts!

3. “Exoplanet CV of HAT-P-12b”

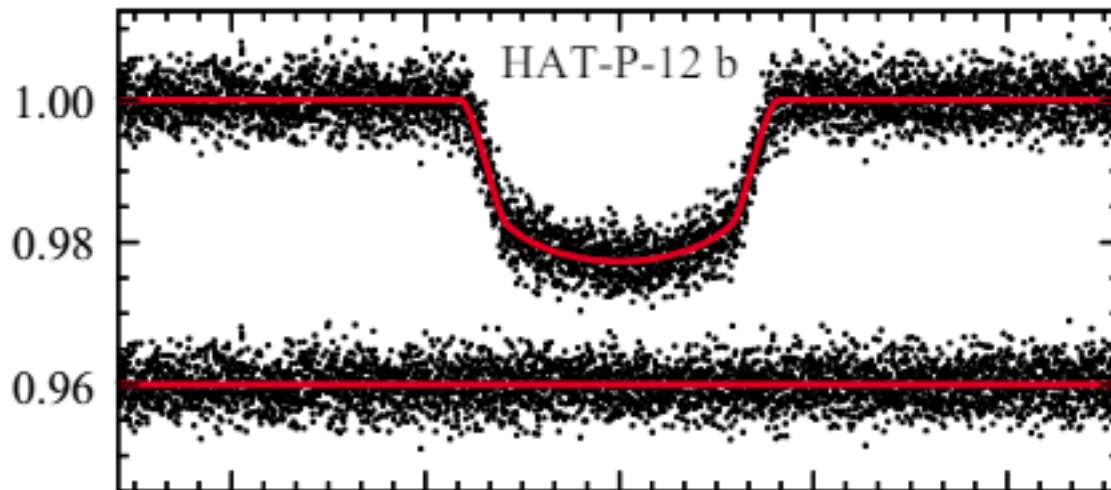
These CV articles aim to enrich your background knowledge on the Ariel candidates. The articles feature one exoplanet each month and are written by our literature team. This month we are featuring **HAT-P-12b**. The article is attached in the next page. Enjoy!

Clear Skies,
the ExoClock team

“CV” of HAT-P-12b

by Vasiliki Michalaki (University of Ioannina, Greece), ExoClock literature team member

HAT-P-12b, a sub-Saturn mass exoplanet, was discovered in 2009 by Hartman et al. using the HAT-5 telescope (located in Arizona) of HATNet (Bakos et al. 2004). It experiences moderate levels of irradiation and has low density. The planet was found to transit a moderately bright ($V \sim 12.8$), metal-poor K4 dwarf within a period of ~ 3.21 days. The host star has a mass of $0.73 \pm 0.02 M_{\odot}$, a radius of $0.70 \pm 0.02 R_{\odot}$, an effective temperature of 4650 ± 60 K, and a metallicity $[Fe/H] = -0.29 \pm 0.05$ (Hartman et al. 2009). (Fig.1)



“Fig. 1. Phase-folded transit light curves observed with TESS and the best-fitting models for the planets of the sample, x : Time from transit midpoint (d) y : Normalised flux” (Maciejewski et al. (2023)).

At the time of its discovery, it had the lowest mass among the gas giant planets. Due to these different characteristics from Jupiter-mass close-in exoplanets, HAT-P-12b was studied using radial velocity measurements, photometric transit observations and transmission spectroscopy by various groups. The parameters of the system were refined in the follow-up photometric studies conducted by Lee et al. (2012), Mallonn et al. (2015b), Sada & Ramón-Fox (2016), Mancini et al. (2018), Öztürk & Erdem (2019), and Wang et al. (2021).

Using transmission spectrum data from the Hubble Space Telescope and Spitzer Space Telescope, Sing et al. 2016 found a strong optical scattering slope from blue to near-IR wavelengths. However, Line et al. (2013), Mallonn et al. (2015b), Turner et al. (2017), and Yan et al. (2020) concluded that HAT-P-12b is covered by a cloudy-hazy atmosphere ruling out the presence of the Rayleigh scattering. (Arfaux et al. 2022) (Fig.2) A completely clear atmosphere scenario was also refuted by Alexoudi et al. (2018). Finally, Wong et al. (2020) detected both Rayleigh scattering produced by small particles and the clouds inferred from weakened water vapor absorption. However, Jiang et al. (2021) noticed that conflicting results of previous atmospheric studies could be attributed to stellar contamination from unocculted stellar spots and faculae. Wong et al. (2020) also provided evidence that heat within the planet’s atmosphere is effectively redistributed between the day and night hemispheres.

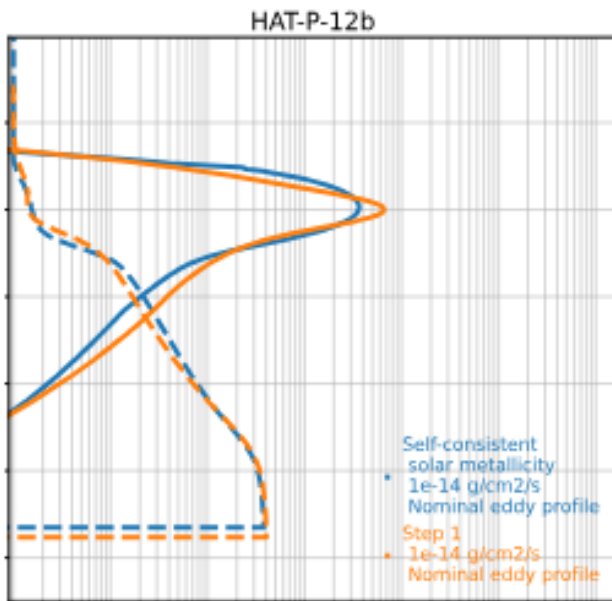


Fig. 2. Step 1 (orange lines) and Self-consistent (blue lines) haze distributions. The solid lines correspond to the particle number densities and the dashed lines are the mean particle radii.” (Arfaux et al.2022)

In the latest analysis, Maciejewski et al. (2023), revealed no transiting planetary companions to the hot Jupiter, even though Sariya et al. (2021) suggested the presence of a possible non-sinusoidal TTV for HAT-P-12b, which contradicted the conclusions of Öztürk & Erdem (2019). Discarding the nonsinusoidal TTV signal, which was recently claimed in the literature, transit times for HAT-P-12b were consistent with the constant period model (Fig.3).

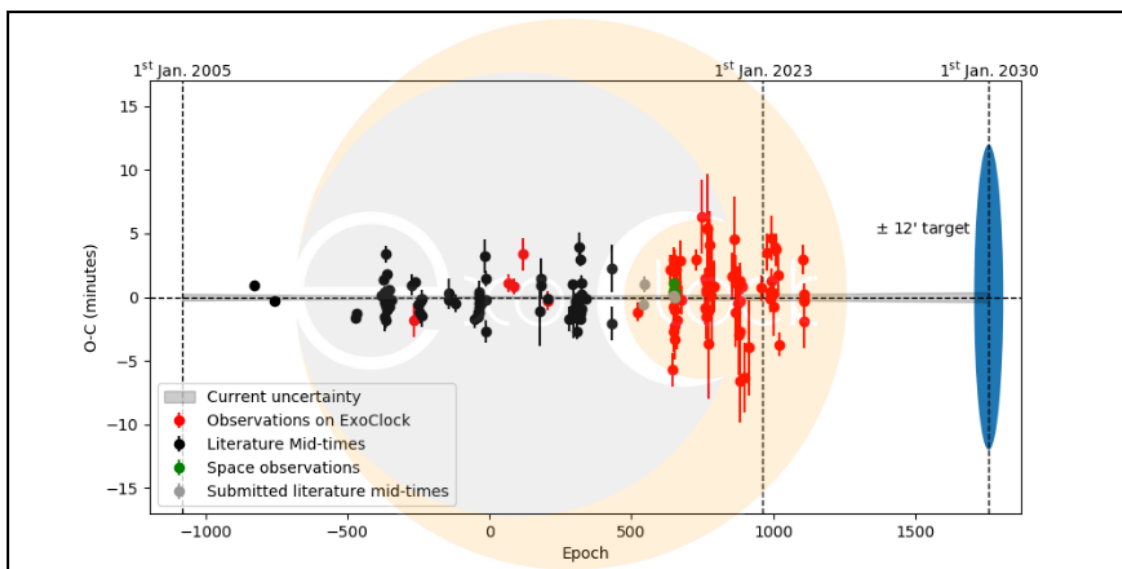


Fig. 3. The O-C diagram of HAT-P-12b from Exoclock

References:

1. [Hartman et al.2009] <https://ui.adsabs.harvard.edu/abs/2009ApJ...706..785H/abstract>
2. [Turner et al.2017] <https://ui.adsabs.harvard.edu/abs/2017MNRAS.472.3871T/abstract>
3. [Sariya et al.2021] <https://ui.adsabs.harvard.edu/abs/2021RAA....21...97S/abstract>
4. [Jiang et al.2021] <https://ui.adsabs.harvard.edu/abs/2021A%26A...656A.114J/abstract>
5. [Arfaux et al.2022] <https://ui.adsabs.harvard.edu/abs/2022MNRAS.515.4753A/abstract>
6. [Maciejewski et al.2023] <https://ui.adsabs.harvard.edu/abs/2023AcA....73...57M/abstract>