



ExoClock Newsletter

Dear ExoClock participants,

Hope you are all doing well! First of all, we would like to wish you Happy Summer as we are getting close to the Summer Solstice!

We would like 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 also 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 have the opportunity to 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-1t51875v6-x0s8s553kT8nbCvbyo7boA

In this newsletter, we discuss:

1. Announcements

1.1. Ariel Consortium Meeting update

1.2. Upcoming meetings (beginners, HOPS and monthly)

1.3. Updates on other meetings

1.4. Author information for the next publication

1.5. Recognition Certificates to ExoClock participants

1.6. Google calendar

2. Observing campaigns

3. Highlighted Observations

4. Exoplanet CV of TOI-1181b

1. Announcements

1.1 Ariel Consortium meeting updates

Recently, between the 6th and 9th of June, the Ariel Consortium meeting was held in Tenerife and hosted by the IAC (Instituto de Astrofísica de Canarias).

In the meeting, we presented the recent ExoClock project updates and results. We also shared our upcoming efforts for the new planets from TESS, synchronous campaigns, space observations, follow up of planets with TTVs and the joint effort with the stellar activity group. ExoClock has become a vital part of Ariel and the consortium members are impressed with the outcomes and the continuous activity. The ExoClock presentations initiated several discussions on how the ExoClock prototype and organisation should be used to handle other parts of the preparation of the mission. Thanks everyone and congratulations!

Other updates from the mission overall included the end of the PDR (Ariel Payload) and the ESA team has officially confirmed that all objectives have been met.

Special updates on the spacecraft development

Ariel mission development is continuing to progress at full steam. In May the Ariel payload formally passed an important milestone known as the Preliminary Design Review (PDR). This in-depth review confirmed that the payload design meets the scientific performance needs and is also able to withstand the environmental challenges of a space mission, such as the launch and the in-orbit environment. The payload now has the green light to go to the next phase. The next step involves building test models to be used to test and validate the payload design and performance. The first set of these models, called Structural Models, are already being built and will be shipped to Airbus during the course of the next few months. Airbus is the company which has been contracted as Prime Contractor to ESA to provide the fully built Ariel spacecraft. Airbus will use these Structural Models in a mock-up of the spacecraft, which will be put through tests to replicate the vibration that Ariel will be subjected to during the launch and hence make sure that the structural design is sound. As well as this, various parts of the optics and the electronics of the payload are also already being built to the standard that is expected to be on the real spacecraft. These will be used in a so-called Engineering Model of the complete payload (including the telescope, all the instruments and their electronics) to be put together next year. This will be used to check the optical and thermal performance before building the real thing (called the “Flight Model”). Overall, this is a very exciting and crucial time in which Ariel moves from a design on paper to real hardware!

Thanks to **Salma Fahmy**, Ariel Mission Payload & AIV Manager for providing this news!

Visit to Teide Observatory

We also visited the Teide Observatory where there are several telescopes that contribute to ExoClock: the MUSCAT telescope from the IAC, telescopes from LCO (Las Cumbres Observatory) and also telescopes from the Open University! It was really a pleasure to see together ExoClock contributing telescopes!

Finally, we held an ExoClock outreach talk, and we met some ExoClock participants from Tenerife in person!

Below you can see some photos from the Teide observatory.



Figure 1: photos from the telescopes IAC80 (left) and MUSCAT (right) at the Teide Observatory. Both telescopes have observed for ExoClock!



Figure 2: View of the Teide volcano from the observatory (left) and image with several telescopes (right).

1.2 Upcoming meetings

Our next monthly meeting will be happening on Thursday **the 29th of June at 16:00 BST**. Please send us any questions or topics for discussion soon so we can include them in our agenda.

The beginners' meeting will happen on Friday **the 30th of June at 16:00 BST**. Similarly, please send us any questions you might have for the beginners' meeting agenda before that date.

The HOPS technical issues meeting will happen on **Monday the 10th of July at 16:00 BST** and it will be the last for the summer. Send us please any related issues for discussion.

You can find the link and details for the meetings in your google calendar, but separate emails will be sent as well.

1.3 Updates on other meetings

5th European Variable Star Meeting (EVS)

The 5th EVS meeting took place in Barcelona on the 27th and 28th of May. During the meeting there was a dedicated session on exoplanets and ExoClock was featured with talks by Florence Libotte (ExoClock Spanish contact), Yves Jongen (active ExoClock observer) and Philip Walter (ETD contact for the ETD-ExoClock collaboration).



Figure 3: Florence Libotte giving a talk for ExoClock at the 5th EVS

Photometry School by the French Astronomical Society

Between the 23rd and 25th of June a photometry school will take place in Strasbourg in French. More information can be found here:

<https://saf-astronomie.fr/programme-atelier-pro-am-et-ecole-de-photometrie/>

Anaël Wünsche (ExoClock French contact) will deliver a photometry workshop of HOPS. Below you can find the link to apply for the photometry session:

<https://proam-gemini.fr/%C3%A9v%C3%A8nement/ecole-de-photometrie-2023/>

1.4 Author information for the next publication

Paper IV - Data Release D (Sept 2023) – Final list of co-authors

It is time to finalise the list of the observers that will be co-authors in our upcoming publications. The list we have currently can be found here:

https://www.exoclock.space/users/material/data_release_d_observers

If you are an observer and you have contributed with observations in **2022**, please check if your name and affiliation are correct. You can change this information here:

https://www.exoclock.space/users/my_author_information/

We remind you that you can request co-observers to be added in the list. However, **remember that the rule is that each observer should have at least one observation.**

This is your last chance to ask for changes in your name or affiliation. Please note that at the end of June we will close the list and it will not be possible to do any further changes.

1.5 Recognition certificates to ExoClock participants

In ExoClock every observation counts! Apart from the acknowledgments of observers in both publications and the website, we recognise the contribution of observers that have provided a large number of observations, through a recognition certificate.

New awards go to:

- Silver observers (100+ observations): **Claudio Lopresti**
- Bronze observers (50+ observations): **David Arnot, Bryan Eric Martin**

Special thanks and congratulations!

Observers will receive their certificate via e-mail.

1.6 Google Calendar for meetings – reminder

We remind you that we have created two Google calendars where you can see all the ExoClock meetings and campaigns.

Meetings:

<https://calendar.google.com/calendar/u/1?cid=NGVmMmUzM2YxNTg2MzE1N2Y5MzdIOTczZTgwNGZmZWZWRkOTcyOTVIYTMzODQ2MzFhMjBhNGE0MmY0MTI4ZDIjN0Bncm91cC5jYWxlbmRhei5nb29nbGUuY29t>

Observing calls:

<https://calendar.google.com/calendar/u/1?cid=MzU4YTFiMGJhZjllMzg4ZTdlMWJhMGZlMGQwOTZlYjVlZWZiY2ZmNzY1MjJlNTYyZWQzZTY1MThmMDFlNWY5OUBncm91cC5jYWxlbmRhei5nb29nbGUuY29t>

2. Observing campaigns

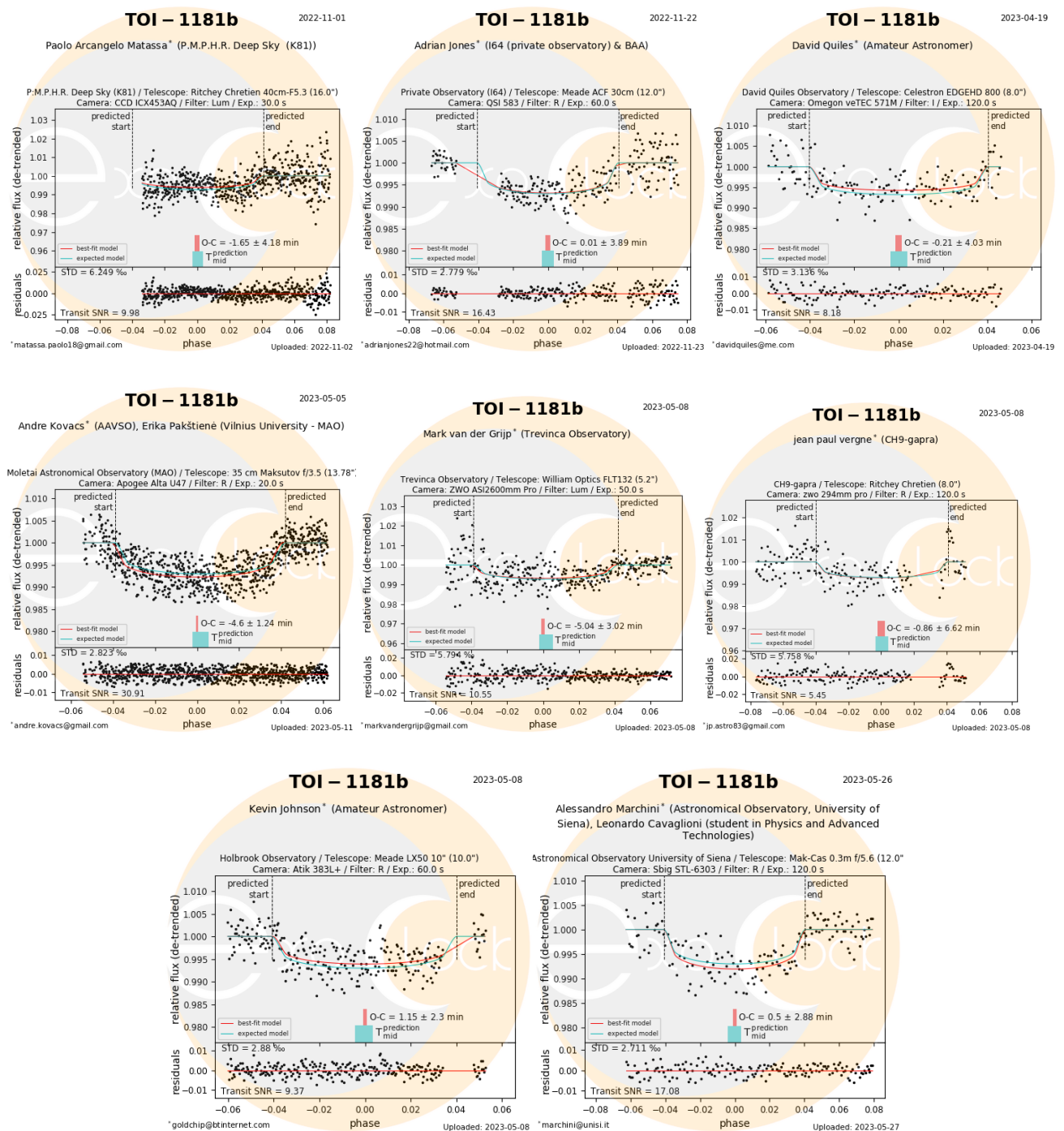
As we are approaching the summertime, the days are getting very long and therefore it is harder to observe transits. This affects our synchronous observations campaigns, too. Therefore, we will have a break until the nights become longer again (~August). Of course, you can still observe individually any transits that are observable from your places!

3. Highlighted Observations

We would like to thank you all for the observations you contributed to the previous months!

We have selected **TOI-1181b**, a TESS planet that has been flagged as **HIGH** priority. The first observations were made by Paolo Arcangelo Matassa and Adrian Jones in the past November. More recent observations in April and May 2023 were made by David Quiles, Andre Kovacs, Mark van der Grijp, Jean Paul Vergne, Kevin Johnson and Alessandro Marchini. Thanks to your observations the target has been marked now as **LOW** priority!

Thank you all for your observations and congratulations!



4. “Exoplanet CV of TOI-1181b”

As we mentioned in the previous newsletter, we started a new series of articles to enrich your background knowledge on the Ariel candidates. These articles feature one exoplanet each month and are written by our literature team. This month we are featuring a TESS discovered planet, **TOI-1181b**, the planet which is featured in our highlighted observations. The article is attached in the next page. Enjoy!

Clear Skies,
the ExoClock team

“CV” of TOI-1181b

by Leon Bewersdorff (RWTH Aachen University), ExoClock literature team member

The system's age is estimated to be around 2.59 billion years. The system is also relatively young, which makes it particularly interesting for studying the formation and evolution of hot Jupiters. TOI-1181b is located at a close distance to its host star, orbiting within one stellar diameter from the star's surface, the photosphere (Kabáth et al., 2022).

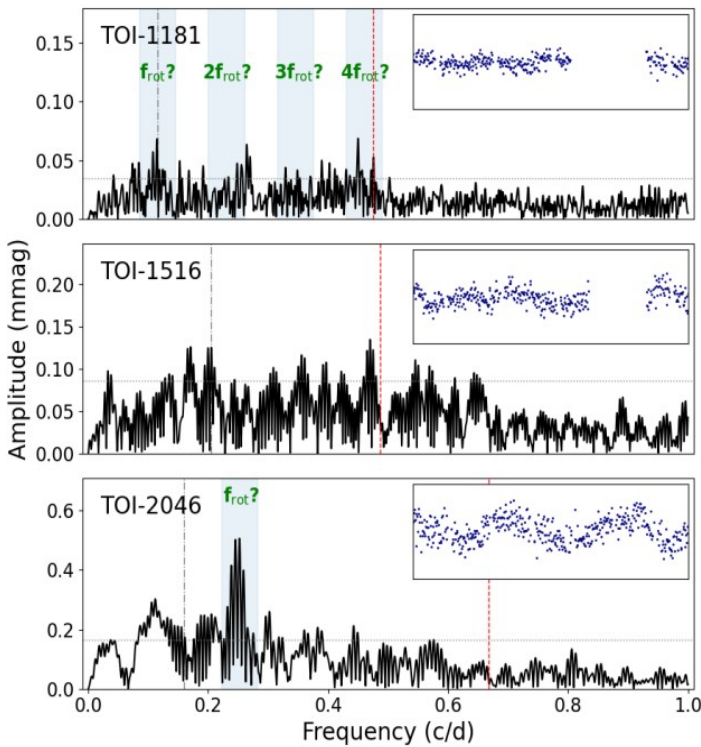


Figure 1: The top graph shows variations in a 10-day out-of-transit measurement of TOI-1181.

This proximity leads to the planet being heavily irradiated and exposed to extreme conditions in its atmosphere. The surface temperature of TOI-1181b is yet to be determined, but further spectroscopic observations with large telescopes would provide more information. This type of planet's atmosphere is likely to contain various chemical elements such as hydrogen, helium, water (vapor), carbon dioxide, and carbon monoxide, among others (Mansfield et al.2023, Heng et al. 2021). Due to the strong magnetic field of the star, the atmosphere of TOI-1181b is likely to be highly ionized, which could be an indicator for other elements as well (Siddharth et al., 2023).

Further observations are needed to determine the presence of Transit Time Variations (TTVs) in the system, while effects of stellar activity may contribute to the observed TTVs. It is plausible that the planet has a slightly

eccentric orbit and undergoes apsidal precession (Kabáth et al., 2022).

The transit is already observable with a smaller telescope, with a transit duration of just over 4 hours and an orbital period of just over 2 days.

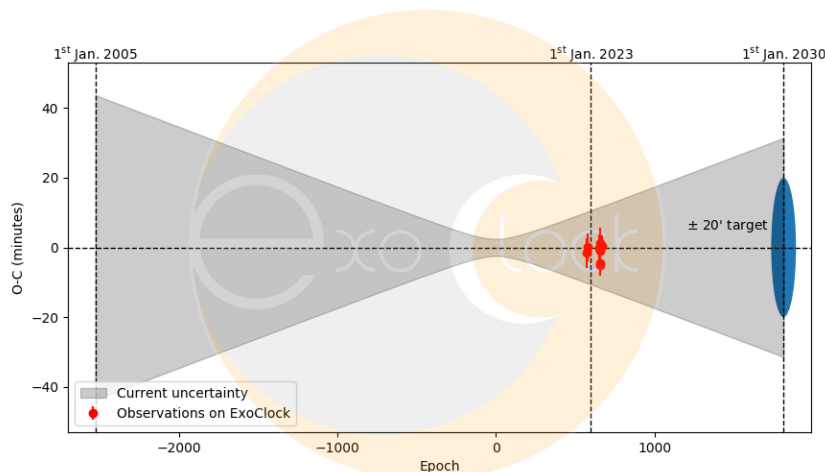


Figure 2: The O-C diagram of TOI-1181b from ExoClock.

References:

Kabáth et al., 2022: TOI-2046b, TOI-1181b and TOI-1516b, three new hot Jupiters from TESS: planets orbiting a young star, a subgiant and a normal star.

<https://ui.adsabs.harvard.edu/abs/2022MNRAS.513.5955K/abstract>

Mansfield, 2023: Revealing the atmospheres of highly irradiated exoplanets: from ultra-hot Jupiters to rocky worlds

<https://ui.adsabs.harvard.edu/abs/2023Ap%26SS.368...24M/abstract>

Siddarth et al., 2023: Retrieval Survey of Metals in Six Ultrahot Jupiters: Trends in Chemistry, Rain-out, Ionization, and Atmospheric Dynamics

<https://ui.adsabs.harvard.edu/abs/2023AJ...165..242G/abstract>

Heng et al. 2021: Carbon Dioxide in Exoplanetary Atmospheres: Rarely Dominant Compared to Carbon Monoxide and Water in Hot, Hydrogen-dominated Atmospheres

<https://ui.adsabs.harvard.edu/abs/2016ApJ...817..149H/abstract>