Issue 16 – May 1, 2021

ExoClock Newsletter

Dear ExoClock participants,

we hope that you are doing well! First of all, let's welcome the new members. We are very happy to see that the community is growing continuously, counting now more than 270 members. The last month we received again a large number of observations, 120 new and 90 previously observed from new members, thanks to all of you!

In this newsletter, we are discussing:

1. ExoClock virtual meeting – April 2021

Thank you all for attending the meeting and sharing your ideas/updates with us!
For those who could not make it, this meeting, together with all the previous ones is accessible from:

www.exoclock.space/users/material

During this meeting we discussed several topics and here we briefly share the main points:

- General announcements / activities
  - The Ariel red book has been published recently and it is a formal document describing all aspects related to the mission. The maintenance of the ephemerides and the ExoClock project is part of the book. If you are interested, you can find it at:

    http://arxiv.org/abs/2104.04824

  - Last year, as part of the EPSC2020 (European Planetary Science Conference) we organised a session dedicated to open planetary science to highlight the importance of applying an open framework in scientific efforts. We strongly believe that science is a collaborative effort, and such sessions are vital to share best practices and encourage more communities working towards this direction. After last year's success we decided

to organise it again in EPSC2021. The session's title is "*Open planetary science for effective knowledge co-creation and dissemination".*

We will certainly present ExoClock as an example of an open scientific effort and we would really like to see other examples in other fields. We encourage scientists, stakeholders or other practitioners to submit an abstract. The conference will be virtual. **Please share it with people who may be interested!**

The abstract submission is now open and the deadline is on the **26th of May**:

https://meetingorganizer.copernicus.org/EPSC2021/session/41659

- Recently we organised two workshops: one dedicated to data analysis with HOPS and another one on data analysis with Python. Thank you all for your interest and your participation! We had more participants than expected and the recordings are now available on the website through the "material" page:

  www.exoclock.space/users/material

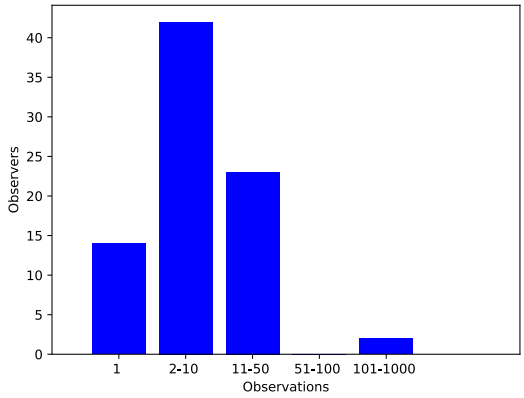
- If you have done an outreach activity related to ExoClock, please share it with us and we can share it with the rest of the community! Or, if you are planning to have an activity / event let us know if you would like any support. We would be very happy to assist your efforts with outreach/educational material.

- Publication updates

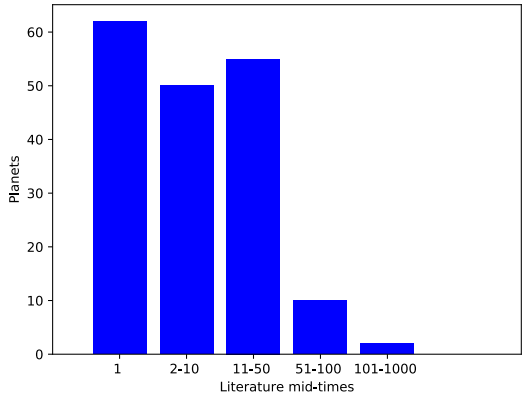
We have completed the initial analysis of all the data for the upcoming publication and we shared representative figures with statistics. The publication will include ~1600 observations and also 2500 mid-time points from the literature. This data will be used in combination to update the ephemerides of 180 planets. The author list will include roughly 90 co-authors from whom, 66% are amateur astronomers. We will send a separate message to all co-authors within this month to read the publication and provide feedback before we submit it. We will also contact all co-authors to confirm their names and affiliations but please, try to fill in this information as soon as possible through the "author information" page:

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

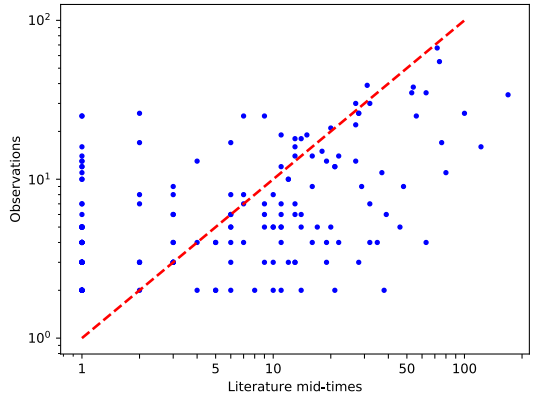
Below you can see some of the figures we shared regarding the data and the observers.



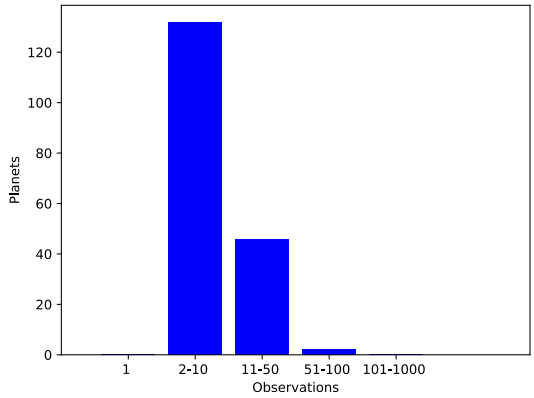
The first figure shows the distribution of the observations across the observers. On average, most observers have between 2 and 10 observations and some observers have a larger number (11-50). You will notice also that there is a smaller number of observers that have only one observation. As we have promised, all observers become co-authors even if they have submitted only one observation until a given date. Finally, there are two observers, Yves and Anael who have provided a very high larger number of data (more than 100!).



The second figure shows the relationship between the mid-times derived from the literature and the planets. Although there is a considerable number of planets that had follow-up observations (11-50), most of them had very few (2-10) or no follow-up observations at all (only 1 mid-time which is the discovery one!).



The third figure shows the relationship between the literature mid-times and the observations provided by the ExoClock network. On the left-hand side of the graph, you can clearly see that there are many cases where the ExoClock observers have added observations to planets that had none or very few! The main point we would like to highlight here is that thanks to the dedicated efforts by ExoClock observers, many planets now have some observations, and an ephemeris update is possible.



The last figure shows the distribution of the ExoClock observations across the planets – without the mid-times from the literature. The majority of the planets has less than 10 observations (2-10), whereas many planets have 11-50 observations. An ephemeris update will be made for all these planets no matter how many observations they have (above 1).

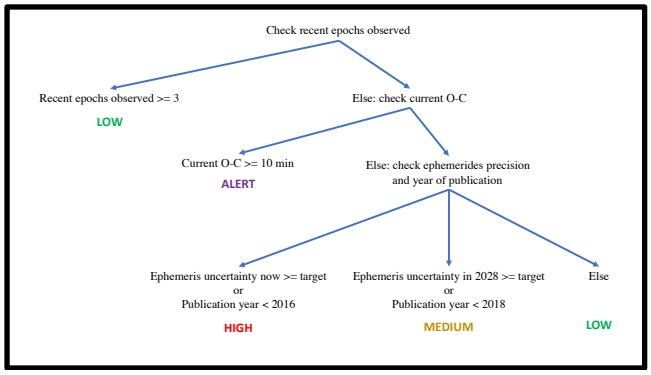
With this last diagram we want to remind you how our priority system works. Briefly in our current system:

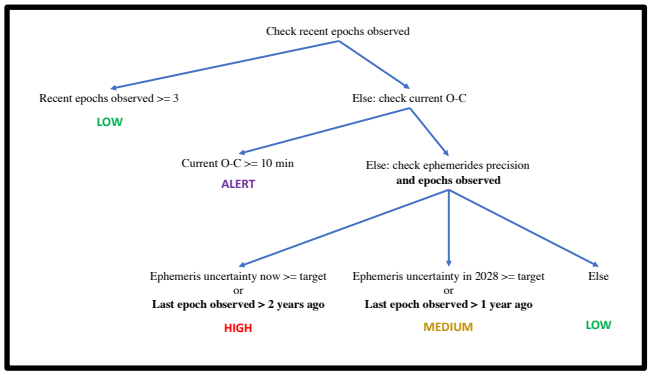
1. Low priority planets are those with recent or precise ephemerides
2. Medium priority are those with less recent or precise ephemerides
3. High priority are those with old ephemerides or high uncertainty

However, the priority system does not take into account the **total number of observations** for a planet. As a result, if planets have a recent ephemeris will end up in the same category no matter how many observations they have. For example. Qatar-1b has 60 observations, HAT-P-21b has only 2 observations and HAT-P-31b has none but they are all marked as low priority. We realise that we have to modify the system because:

1. The low-priority targets with few or no observations the next year will need more observations.
2. When we started the system we had no observations to consider and also a recent ephemeris was considered to be of 2019. Both arguments do not apply anymore!

The following diagrams show a summary of the previous (top) and our recommendation for a new, more dynamic priority system (bottom). The new system is in action to test its performance (you will probably see more targets of high priority). As always, we are waiting for your feedback!





- Working groups updates

During our recent meeting, members of the working groups gave brief updates on the current status of their work. These are the main points:

Synchronous Observations Working Group – coordinated by Alessandro Nastasi

The group has now created a dedicated scheduler to organise the effort of sunchronous observations. They plan to start by observing the **transit of HD97658 b on the 6th of May**. The group makes an open call to all ExoClock observers, to try and follow this transit. The transit will probably appear on your scheduler as the star is very bright (~7th magnitude) but the transit depth is very small (~1.5 mmag). With these observations we would like to test methods of combining observations and test if the transit is detectable.

Some suggestions if you give it a try:

- Use a red filter or luminance if you have a small telescope (< 10-inch)
- Make sure you have at least one good comparison star in the field of view

Note that this is an experiment, and we don't have any expectations from you! If you are available, give it a try and let us know if you have more questions. We will send also a reminder closer to the date.

CMOS Working Group – coordinated by Roland Casali and David Rees

The group has prepared a dedicated document for CMOS users, including testing methods and practical results. It's aim is to help CMOS users calibrate their instruments but also to get a more general idea on the performance of this cameras on exoplanet transits.

The group has done a really professional job – beyond any expectations – and this document can be proved very vital for current and future CMOS users. The document is open and public for everyone (not only ExoClock users). It is available at:

https://www.exoclock.space/cmos_testing_campaign

If you have a CMOS camera you can perform the tests but also you can share the document with other CMOS users as the group would really like to have feedback from as many observers as possible.

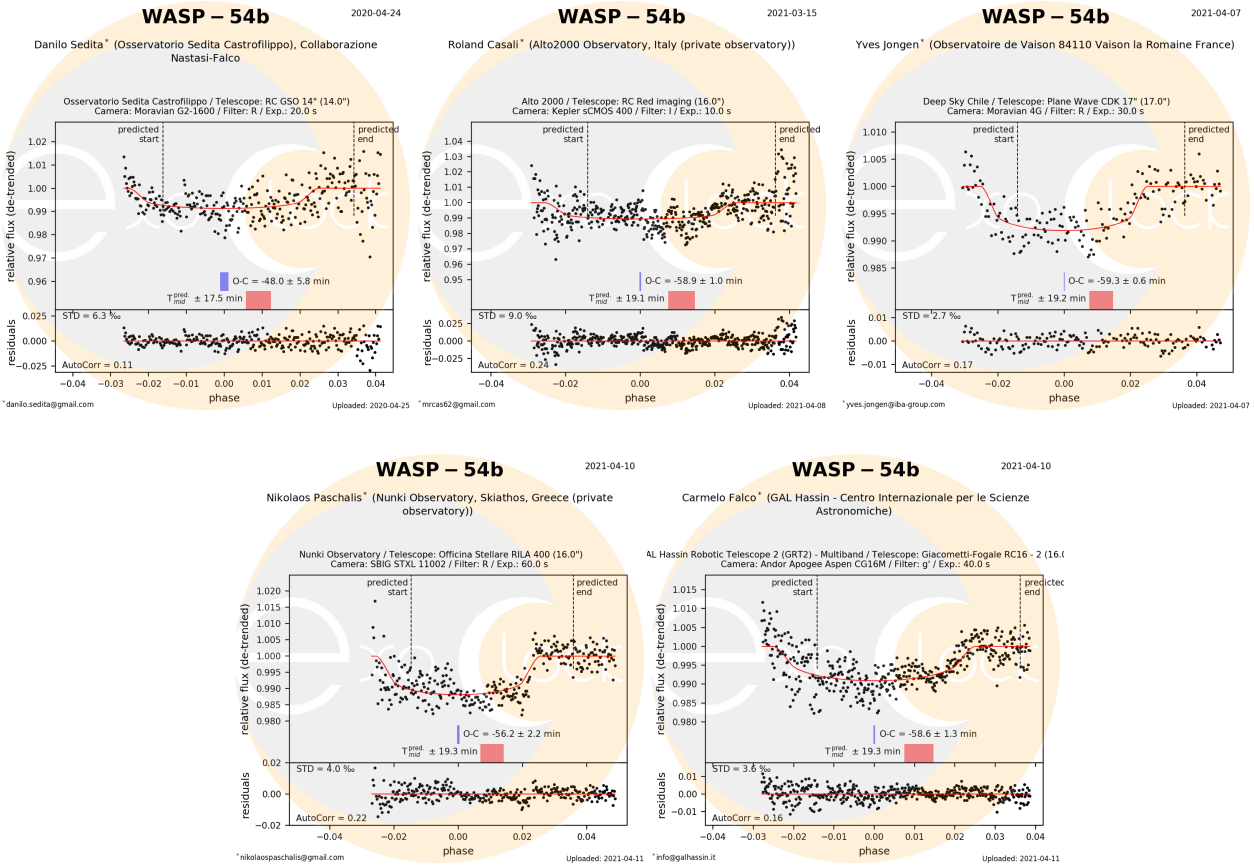
Multi-colour observations Working Group – coordinated by Steve Futcher

Steve has observed the WASP-54 b with RGB filters and presented the different light curves. If you are interested furthermore, you can find the results through the Slack channel.

If you would like to join Slack and/or one of the groups, please send us an email.

2. Highlighted observations

For this month, we have selected **WASP-54b,** a target that was flagged as an ALERT. A shift of **~50 minutes** was initially identified a long time ago by Danilo Sedita – in April 2020. Recently, one year later this shift has been confirmed with more observations by Roland Casali, Yves Jongen, Nikolaos Paschalis and Carmelo Falco. In reality, the sift increased to **~60 minutes** since last year**.** One hour is a really long time and some years later we would have missed the transit. Below you can see these light-curves. Congratulations everyone for your efforts!



3. ALERTS

The following targets are in the current **alert system**:

- WASP-156b
- K2-237b
- HATS-33b
- NGTS-2b
- HAT-P-56b
- HAT-P-55b
- HAT-P-40b
- KELT-4Ab
- Kepler-5b
- HD17156b

Please check your personalised alert schedule at:

www.exoclock.space/schedule/alerts

and if you get a clear sky, and a long-enough night, you can try observing them!

We remind you also that many targets were not in the alert list, before an unexpected shift was identified by you, the ExoClock participants. This highlights the importance of observing targets that are also of low and medium priorities.

Clear Skies,
the ExoClock team