



# ExoClock Newsletter

Dear ExoClock participants,

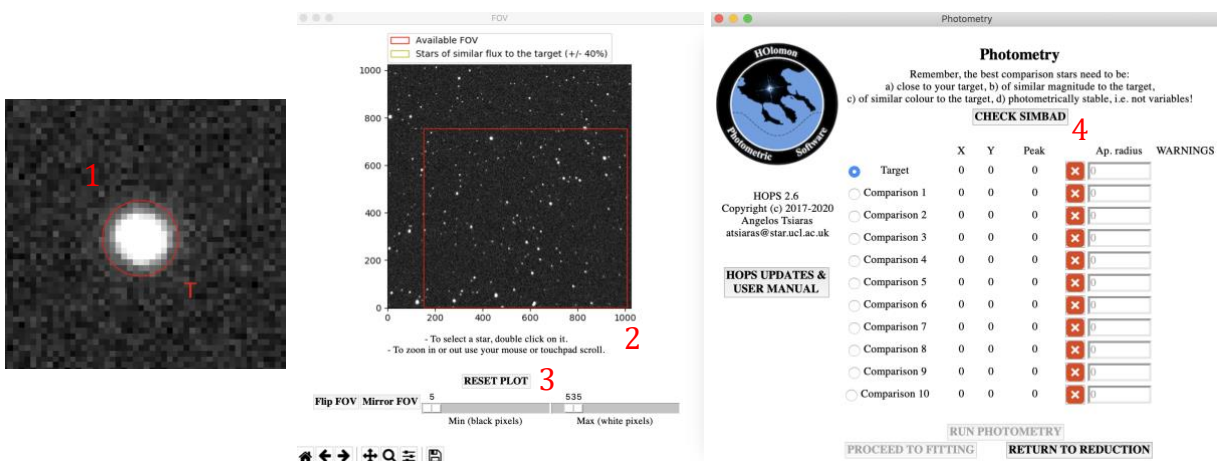
Hope you are all well and safe during these unprecedented times. Although the current situation is affecting our normal lives, we can think this period as an opportunity to be productive and the ExoClock team is continuing actively its role. Recently, in order to empower the community, we organised a web meeting where many different interesting topics were discussed. Many thanks to everyone that participated, and we will organise more such meetings especially for those that did not have the chance to join. In this newsletter, we share some key points of this discussion. Moreover, we have developed some updates on HOPS, on the website.

## Updates on HOPS

We continue to update the software to further assist you in the analysis process. You can download and install the latest version and the new manual (version 2.6.0), from: [www.exoworldsspies.com/en/software](http://www.exoworldsspies.com/en/software)

In this version we added a few helpful features related to the aperture photometry:

1. a circular aperture has now been implemented;
2. on the FOV graph you can zoom-in or out using your mouse scroll;
3. you can adjust the contrast of the FOV image to decide the best aperture size (see also the new HOPS manual for a few tips on selecting your aperture);
4. you can clear a star using the X button next to it.



NOTE: If you have sent already a message regarding issues with HOPS and we have not respond yet (more than a week), please send us again your message.

## Updates on the website

### 1. ExoClock status for the targets

We have included the ExoClock status for each planet on the “Ephemerides” tab ([www.exoclock.space/database/planets](http://www.exoclock.space/database/planets)). On this page you can see **how many** observations per planet we have so far, **when** was the last observation taken, and what is the current **O-C** (observed-calculated time) identified. The same page includes the basic observing parameters: coordinates, mag, depth, duration, and ephemeris, as before.

By clicking on a planet you can see more information about the system and the individual observations, together with the respective O-C for each one. See the screenshot below and examples – the red circle indicates the total observations; the blue circle shows the date of the last observation and the green circle shows the O-C in minutes.

Planet	ExoClock Status				Star		Transit		Ephemeris	
	Priority	Total obs.	Last obs.	O-C minutes	RA/DEC J2000	Mag <sub>R</sub> mag	Depth <sub>R</sub> mmag	Duration hours	T <sub>0</sub> BJD <sub>TDB</sub>	Period days
HAT-P-21b	MEDIUM	0	-	-	11:25:05.9858 +41:01:40.669	11.71	11.21	3.2	2454996.41389 ± 0.00069	4.124481 ± 7e-06
HAT-P-22b	HIGH	2	2020-03-04	15.8 +/- 2.1	10:22:43.5924 +50:07:42.063	9.44	14.41	2.88	2454930.22078 ± 0.00025	3.21222 ± 9e-06
HAT-P-23b	MEDIUM	0	-	-	20:24:29.7235 +16:45:43.810	12.27	17.39	2.38	2454852.26548 ± 0.00017	1.2128867 ± 2e-07
HAT-P-24b	MEDIUM	2	2020-02-24	6.9 +/- 0.7	07:15:18.0194 +14:15:45.409	11.71	12.0	3.68	2455216.97744 ± 0.00028	3.35524 ± 7e-06

The O-C shifts are also reported on the “ExoClock” -> “Observations” page (<https://www.exoclock.space/database/observations>) for your convenience, as many of you requested.

### 2. My Schedule

The “**ALERTS**” page now includes by default all the HIGH PRIORITY targets, in addition to the alerts. This schedule is for 6 months but it is updated on current observations that may show an unexpected drift (like XO-3b). Please check the alerts regularly and plan these observations if possible, as they are of a higher value.

Also, the ExoClock status for each planet is shown on the scheduler, to help you get an idea of the current status while deciding which planet to observe. Again, by clicking on a planet you can see more information about the system and the individual observations, together with the respective O-C for each one.

Finally, for every observation you will see a note on the expected variability during the night. For example, if the increase factor is 50% it means that the counts of your target will become 1.5 times higher at some point during the observation. Thus, when you start your observation, you will need to keep the counts relatively low, in order to avoid saturation of the target during the observation. You will also find information about the Moon illumination and the angular distance between the Moon and the target. See the screenshot below for an example:

Planet & ExoClock status	Star		Transit		Observing times [ UTC+0.0 ] and target position				
	RA/DEC J2000	Mag <sub>R</sub> mag	Depth <sub>R</sub> mmag	Duration hours	1h Before Ingress	Transit Start	Mid Transit	Transit End	1h After Egress
<b>WASP-85Ab</b> Priority: <b>MEDIUM</b> Total obs.: 0 Last obs.: - O-C (min): -	11:43:38.006 +06:33:49.43	10.34	23.75	2.59	2020/03/31 13:05 52° N	2020/03/31 14:05 50° N	2020/03/31 15:23 40° NW	2020/03/31 16:41 27° NW	2020/03/31 <b>17:41</b> <b>15° W</b>
					Max counts increase during observation: R:0% V:0% Moon illumination: 42.4%, Moon distance: 82.0°				
<b>WASP-104b</b> Priority: <b>MEDIUM</b> Total obs.: 5 Last obs.: 2020-03-14 O-C (min): -13.3 +/- 0.7	10:42:24.6020 +07:26:06.294	11.3	16.59	1.77	2020/04/01 <b>08:17</b> <b>23° NE</b>	2020/04/01 09:17 34° NE	2020/04/01 10:10 43° NE	2020/04/01 11:03 49° NE	2020/04/01 12:03 51° N
					Max counts increase during observation: R:12% V:26% Moon illumination: 50.5%, Moon distance: 57.5°				

## Key points from the web meeting

During the recent virtual meeting that we had, these were the highlighted topics that were discussed.

### ➤ Comparison stars selection for different FOVs

An important topic is selecting the proper comparison stars: making sure that they are not variable, have a similar magnitude with the target and have a similar colour with the target. We plan at some point in the future to integrate GAIA catalogues in HOPS for multiple purposes. Currently, the best suggested option is to use recommended stars by AAVSO, HOPS or other users. If your FOV is different or the suggested stars were not good enough, look for other options and when you find the proper ones, make a note of these comparison stars. In line with this, when you upload your observations to ExoClock, there will be an option for you to upload an additional file (a picture of your FOV indicating the comparison stars you used).

Roger Dymock, the Assistant Director of the ARPS Exoplanets Division organised by the BAA (British Astronomical Association), has kindly prepared a meticulous document which includes various guidelines and among these, suggestions on comparison stars for some of the targets. We encourage you to have a look on this and try using the suggested comparison stars, especially if you are struggling to find some proper ones. Many thanks to Roger and of course, if you use this guide, you can share feedback with us to develop this guide further. (For example, was the suggested comparison star a good choice and within your FOV? If not, let us know so that we can have a look for other stars and make different suggestions).

The file can be accessed from here:

<https://britastro.org/sites/default/files/ARIEL%20Space%20Mission%20V2.pdf>

### ➤ The use of CMOS cameras for observing exoplanet light curves

Currently, there is very limited research on conducting transits with CMOS cameras. However, there is an increase of these cameras in the market and since some you have such cameras, it would be useful to get some observations and evaluate their efficiency on producing exoplanet light curves.

➤ *The use of different filters*

In general, the recommended filter to use is the **Rc (R Cousins)** photometric filter. If you don't have this, the second option is the **V<sub>J</sub> (V Johnson)**. Otherwise, Luminance or clear would be acceptable. Please avoid using narrower red filters, as they won't give you the expected same S/N ratio.

Also, the **Astrodon ExoPlanet-BB** filter was mentioned and this can be used, too. Please share with us any experience you might have from using this specific filter, so that we can properly evaluate its efficiency.

### **Survey on creating profile pages**

Some of you have asked for having a form of discussion in order to get useful information and share best practices. We would like to ask your opinion on creating a profile page where you, the observers, can share information about your equipment, location, sky conditions etc. This would help other observers contact each other to ask questions or share useful information. This at the moment just an idea, and before we start working on this, we would like you to fill this very short survey, it is simple and straightforward:

[https://docs.google.com/forms/d/e/1FAIpQLSdtiNNEr5llsoAVEOromKDjxemVlySQQC1jKNweUBudByJmgw/viewform?usp=sf\\_link](https://docs.google.com/forms/d/e/1FAIpQLSdtiNNEr5llsoAVEOromKDjxemVlySQQC1jKNweUBudByJmgw/viewform?usp=sf_link)

### **Highlighted observations**

There are quite many interesting observations thanks to all of you. For this month's issue, two are the highlighted ones, for WASP-104b.

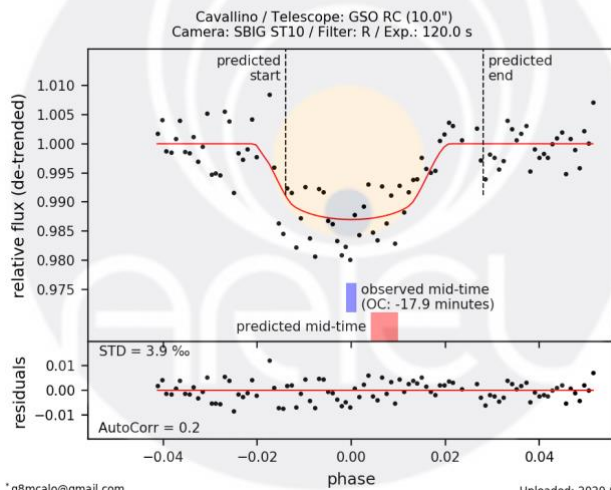
This is a planet that was marked with a medium priority and there are only few observations since its discovery. The two observations were carried out at the same date by two observers at different locations. The uncertainty on the predicted mid-time (shown with red) was quite high. Both observations show a time shift of roughly 15 minutes. This is a good example of how simultaneous observations can contribute to cross calibrate the results. We will reanalyse the data to achieve the highest possible precision.

**Congrats to our members Mauro Calo from Italy and Mark Phillips from the UK for their observations!**

## WASP – 104b

2020-02-06

Mauro Calo\*\* (TBD)

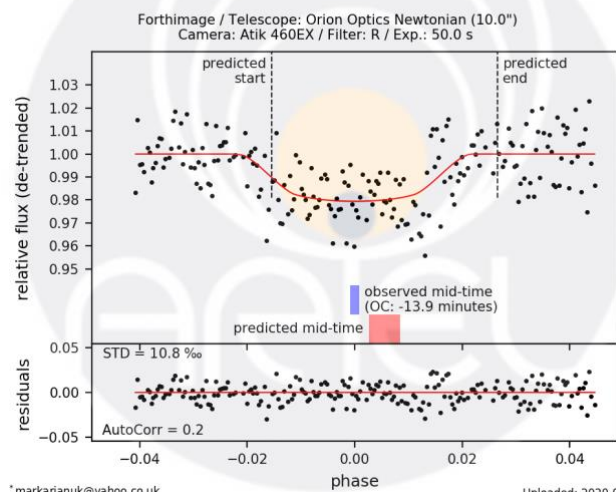


\*q8mcalo@gmail.com

## WASP – 104b

2020-02-06

Mark Phillips\* (BAA Exoplanet Division, Astronomical Society of Edinburgh)



\*markarianuk@yahoo.co.uk

Uploaded: 2020-02-07

## ALERTS

Thanks to everyone that reacted to the **Alert system** during the last month. The current **alerts** are for the planets below. Please check your personalised alert schedule and if you get a clear sky, observe them!

<https://www.exoclock.space/schedule/alerts>

- KELT-15b
- HAT-P-17b
- HAT-P-54b
- HAT-P-41b
- WASP-54b
- WASP-83b

We remind you to send us at [exoclockproject@gmail.com](mailto:exoclockproject@gmail.com):

- Your feedback on the website
- Suggestions for new features
- Questions on the observations or the analysis
- Ideas for topics you would like to see in the newsletters

Stay positive and healthy!

Clear Skies,  
the ExoClock team

## CHECK this out!

Thank you all for uploading your past light curves! This is the last notice to upload any old **light curves** you might have. We decided to extend the deadline for this to **mid-April 2020**. This is important, as our team needs time to re-analyse the data and finalise the results for the publication. Of course, any other observations you might get in the meantime or later on **will** also be published, but in the second round. So please, make sure to upload any old data you might have.