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Summary of the Season 2018 - 2019 Exoplanet Observations in Taurus Hill Observatory

H. Haukka[1,2], V-P. Hentunen[1], M. Nissinen[1], T. Salmi[1], H. Aartolahti[1], J. Juutilainen[1], E. Heikkinen[1] and H. Vilokki[1]
(1) Taurus Hill Observatory, Varkaus, Finland (veli-pekka.hentunen@kassiopeia.net), (2) Finnish Meteorological Institute, Space Research and Observation Technologies, Helsinki, Finland

Abstract

Taurus Hill Observatory (THO) [1], observatory code A95, is an amateur observatory located in Varkaus, Finland. The observatory is maintained by the local astronomical association Warkauden Kassiopeia. THO research team has observed and measured various stellar objects and phenomena. Observatory has mainly focused on exoplanet light curve measurements, observing the gamma rays burst, supernova discoveries and monitoring [2]. We also do long term monitoring projects [3].

The results and publications that pro-am based observatories, like THO, have contributed, clearly demonstrates that pro-amateurs are a significant resource for the professional astronomers now and even more in the future.

1. High Quality Measurements

The quality of the telescopes and CCD-cameras has significantly developed in 20 years. Today it is possible for pro-am's to make high quality measurements with the precision that is scientifically valid. In THO we can measure exoplanet transits < 10 millimagnitude precision when the limiting magnitude of the observed object is 15 magnitudes. At very good conditions it is possible to detect as low as 1 to 2 millimagnitude variations in the light curve.

2. Winter 2018/2019 Exoplanet Transit Observations in THO

THO research team has made 13 years transit and light curve measurements about the exoplanets. To this date the team has measured over 70 different exoplanet light curves, some of them several times. Most of the transit measurements have been stored in the EDT (Exoplanet Transit Database) maintained by Variable Star and Exoplanet of Czech Astronomical Society.

Here are some examples of the exoplanet measurements from THO. In Figure 1 below is the exoplanet measurement from HAT-P-32b, discovered November 2011, and so far it has been observed three times in THO. First time in September 2013 and most recently in October 2018.

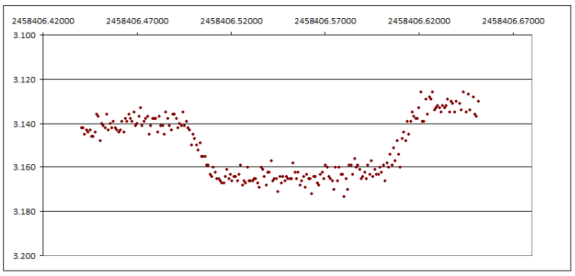

Figure 1: HAT-P-32b light curve 14./15.10.2018; C-14, Paramount MEII, SBIG ST-8XME.

Second example concerns KELT-16b, a highly irradiated and ultra-short period hot Jupiter transiting the relatively bright star TYC 2688-1839-1/KELT-16. THO team observed this exoplanet transit on 10./11.10.2018 (Figure 2).

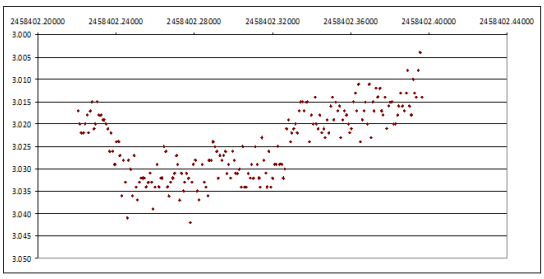

Figure 2: KELT-16b light curve 10./11.10.2018; C-14, Paramount MEII, SBIG ST-8XME.

3. TrES-5 b and possible existence of the exoplanet TrES-5 c

Some deviations in transits of known exoplanet has been discovered and by detecting these deviations as much as possible, it is possible to find out whether the deviation is caused by another planet in the system or not. This is the case with the TrES-5b exoplanet. It seems that there are disturbances caused likely by another planet (TrES-5c) with mass of 0.24x MJup. This and other candidates, and the findings of the TrES-5b and possible TrES-5c that are introduced in the article [4], have been observed between 2013 and 2016. Observations have, of course, continued until these days.

In addition to the TrES-5b, there are some dozens of other promising candidates on the Pulkovo Observatory list, and outside of it, that THO has observed. THO is also involved in an Italian group of enthusiastic astronomers (GPX) led by Paul Benni trying to find exoplanets from very small area of the sky. This group also includes researchers from the Pulkovo Observatory. Potential area is first investigated with the RASA telescope, and then promising candidate areas will be measured more accurately. Pro-am photographic observations are supported by the observations made by professional observatories on the spectrum of potential targets. Target list is updated regularly and there are new target candidates all the time and there are simultaneously 10 to 20 targets under investigation.

At the THO location (Eastern Finland), the target objects are always high on the northern sky, so they can be observed throughout the year in excellent weather conditions.

TrES-5b observation campaign [4] includes several participants from Russia, Belgium, Finland, USA, Canada, UK, France, North Cyprus, Greece, Spain and Ukraine, altogether 17 institutes or organizations.

4. Summary and Conclusions

Taurus Hill Observatory and other similar pro-amateur based observatories have a good record in field of astronomy and especially in the light curve measurements and photometric monitoring.

The research teams have the knowledge for making a good and high quality photometric light curve measurements. The publication records are one of the good examples from this knowledge. In the future the THO research team aims for more challenging astronomical research projects with professional astronomers and observatories.

As a conclusion it can be stated that it is possible to do high quality astronomical research with pro-amateur astronomy equipment if you just have the enthusiasm and knowledge to use your equipment in the right way.

Acknowledgements

The Taurus Hill Observatory will acknowledge the cooperation partners, Pulkova Observatory, Finnish Meteorological Institute and all financial supporters of the observatory.

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