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Exoplanets photometry with remote observatory

M. Vanhuysse (1), J.-P. Cales (1), Cales Technologie (1), A. Santerne (2), C. Moutou (2)
(1) Oversky SARL, 47 allée des palanques 33127 Saint jean d'illac FRANCE, email : contact@over-sky.fr
(2) Laboratoire d'Astrophysique de Marseille, Université d'Aix-Marseille & CNRS, 38 rue Frédéric Joliot-Curie, 13388 Marseille cedex 13, France

Abstract

As radial velocity data, photometry is very important in order to characterize an exoplanet. Photometry of long orbital period transiting exoplanet ,such as those discovered by space-based photometry (CoRoT, Kepler) or from radial velocity are difficult to obtain from the ground. Larger professional telescope cost a lot and generally are busy for observing in photometry for a large amount of nights. We are following up transiting exoplanets with the Oversky remote observatory, which is dedicate to exoplanet photometry and located at La Palma Island (canary), and tele-operate from France via internet. One year after the installation, we reach professionals precisions that permit us to start collaboration with professionals' astronomers. We will present our remote observatory as well as we will highlight our results and compare them with professional telescope accuracy.

1. Introduction

Since several years, amateur astronomers with small aperture telescope could detect exo-planetary transits based on the orbital elements obtained by radial velocity measurements or transit-dedicated mission like SuperWASP [4], HATNet [2] or CoRoT [1]. Amateur astronomers can obtain a very precise result on bright stars and deep transits (e.g. HD189733b or HD209458b). Our goal is to perform photometry with small aperture amateur telescope in a remote observatory, on stars up to magnitude 15th and to reach an accuracy of less than 1/1000eme magnitude in the depth of the exoplanet transit. We have characterized our system by measuring the transit of known exoplanets. Few months after the installation at La Palma, we were ready to start the collaboration with professionals, in regards of the results that we have obtained.

2. First results

Even if we use small aperture telescope, our system has a high sensitivity, which permit us to reach a high accuracy photometry (with adaptative optic like a tip-tilt) with a good time scale. A high accuracy was reached on august 2010 with a transit which was observed simultaneously with the OHP-1.2m telescope (see figure 1, 2), for a photometry campaign with amateur telescopes which was initiate by C. Moutou and A. Santerne. This collaboration amateur / professional has a particular success with several amateur observatory in different place in Europe. Our system reaches the accuracy of 4 mmag for this transit.

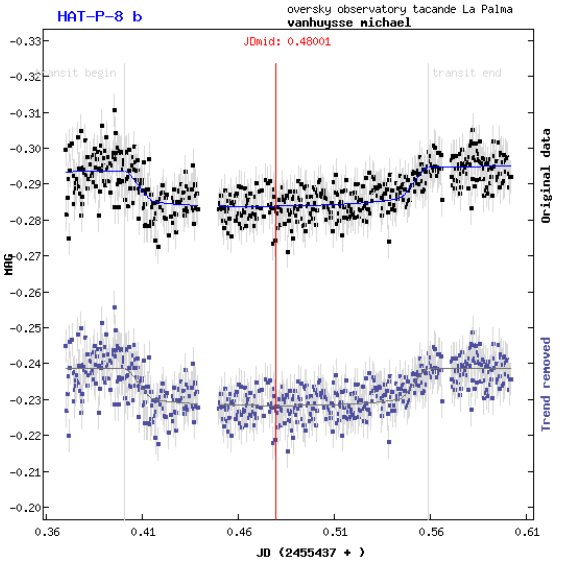

Figure 1: photometry transit of hat-p-8b.

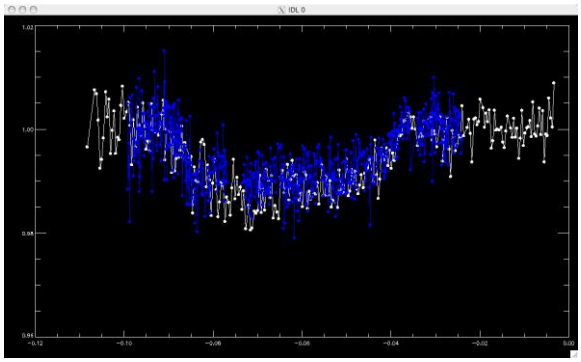

Figure 2: comparison of the light curve of hat-p-8b obtain with our system (blue points) and with 1.2m OHP telescope (white points).

We will present the goal of our observatory based on La Palma Island, our first result on known transiting planet as well as our result that was used in a scientific publication in A&A [3].

4. Future of remote photometry observatory

We can easily imagine several remote photometry observatories dispatches in the world, which permit following up transiting planets all the time with a good accuracy, low cost (one person can easily operate 4 observatories). Our equipment can obtain photometry on stars up to magnitude 15. A such equipment could be a low-cost project for professional exoplanet research. We will present in more detail our equipments and present the cost of our observatory.

6. Summary and Conclusions

In this presentation, we will present our observatory based at La Palma and our results which permit us to contribute to a scientific publication about spin-orbit alignment of the exoplanetary system HAT-P-8 [3] in collaboration with C. Moutou and A. Santerne. Finally, we discuss of the possibility to develop this type of photometry remote-observatory in the world.

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