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Latest news of SPECULOOS and TRAPPIST-1

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Abstract

The nearest ultracool dwarf stars (UCDs), i.e very low mass stars with spectral type later than M6, represent a promising opportunity to make the young field of exoplanetology enter the realm of temperate Earth-sized worlds [1]. The SPECULOOS transit survey (Search for habitable Planets EClipsing Ultra cOOl Stars) [2] ventures into the largely uncharted territory of UCDs to seek for transits of temperate terrestrial planets, probe their diversity, and ultimately assess their potential habitability. The discovery of the nearby (12 parsecs) TRAPPIST-1 (aka SPECULOOS-1) system by the SPECULOOS prototype ongoing on the TRAPPIST-South telescope has proved this approach to be very promising. This system is composed of an M8-type dwarf star orbited by seven nearly Earth-sized, temperate planets, three of them being in its habitable zone. Considering their transiting nature, the infrared brightness (K=10.3) and the Jupiter-like size of their host star, these planets are extremely promising candidates for the first thorough atmospheric characterizations of temperate terrestrial worlds with upcoming facilities such as the James Webb Space Telescope (JWST) [3, 4, 5]. Nonetheless, before we can hope for any atmosphere detection all sources of limitation must be identify and quantify [6]. Notably through a multi-epoch multi-wavelengths photometric follow up of the planets' transits. In this context, we carried out an intensive space (K2 and Spitzer space telescopes) and ground based (TRAPPIST, Liverpool, UKIRT, VLT and SPECULOOS telescopes) photometric monitoring program, with a total of 365 transits observed from the optical to the infrared.
In the first part of my talk, I will present the latest news of the SPECULOOS photometric survey, notably its extension to the Northern sky and added value of a multi-longitude strategy. In the second part of my talk, I will focus on the TRAPPIST-1 system and show how we tried to make the most of our unique dataset with the aim to (1) explore the system for new transiting planets, (2) to refine the parameters of the known planets, (3) to constrain the planet's orbital dynamics and bulk compositions with the transit timing variation method, and (4) to construct a wider broadband spectra for each planet to quantify the impact of stellar effects on atmospheric characterization and habitability (namely transit light source effect and flares).

Acknowledgements

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