Exoplanets characterization with optical long-baseline interferometry in the future

Jules Scigliuto*[1], Florentin Millour*[2], Mathis Houllé , Bruno Lopez[3], and Philippe Bério

[1]Institut de recherche en astrophysique et planétologie – Institut National des Sciences de l'Univers : UMR5277, Université Toulouse III - Paul Sabatier, Observatoire Midi-Pyrénées, Centre National de la Recherche Scientifique : UMR5277, Institut National des Sciences de l'Univers, Centre National de la Recherche Scientifique – France

[2]Laboratoire Lagrange, UMR7293, Université de Nice Sophia-Antipolis, CNRS, Observatoire de la Côte d'Azur – CNRS : UMR7293 – France

[3]+ A. Matter et al., Observatoire de la Cote d'Azur – CNRS : UMR7293 – France

Abstract

Characterizing exoplanets is starting in the mid-infrared thanks to the MATISSE instrument, after the neat successes with GRAVITY. The spectrum of exoplanets allows constraining estimates of the C/O ratio, effective temperature, surface gravity, and hints about the composition of the object. However, there is still much information to uncover, as the mid-infrared is rich in interesting molecular signatures. This is why MATISSE observations are essential to better constrain the physics of these exoplanetary atmospheres. At the same time, shorter wavelengths are yet to be unveiled at higher spectral resolution and data quality.

MATISSE's spectral bands clearly reveal the importance of filling gaps in the spectral energy distribution of the planet, constraining the contributions of methane and CO in the atmosphere, as well as signatures related to clouds (such as silicates and iron), which are crucial for understanding the evolution of brown dwarfs and young giant planets. MATISSE has already demonstrated its capabilities by extracting a spectrum of β Pic in the L and M bands, confirming a solar C/O ratio.

Today, we can ask questions such as : for already detected exoplanets, what baseline length would be necessary for their detect
planet system at very short separations and large distances from Earth? We can also consider which wavelength would be most

*Speaker