

# New challenges in transiting exoplanet atmosphere observations with JWST

**Marine Martin-Lagarde<sup>1</sup>**, Pierre-Olivier Lagage<sup>1</sup>, René Gastaud<sup>1</sup>, Alain Coulais<sup>1,2</sup>,  
Christophe Cossou<sup>3</sup>, Giuseppe Morello<sup>1</sup>, Dan Dicken<sup>1</sup>

<sup>1</sup> AIM, CEA, CNRS, Université Paris-Saclay, Université Paris Diderot, Sorbonne Paris Cité, F-91191 Gif-sur-Yvette, France

<sup>2</sup> LERMA, Observatoire de Paris, CNRS, F-75014, Paris, France

<sup>3</sup> Institut d'Astrophysique Spatiale, CNRS/Université Paris-Sud, Université Paris-Saclay, bâtiment 121, Université Paris-Sud, 91405 Orsay Cedex, France

Since the first exoplanet detection in 1995, more than 4000 planets have been discovered. In the past twenty five years, the observations tools have greatly improved, increasing the statistics and revealing the diversity of planets. With the upcoming space telescopes such as James Webb and Ariel, detailed knowledge of exoplanet atmospheres will become possible. This opens up new challenges in data treatment, to detrend the signal of planets atmosphere from other sources of signal, especially systematic noise and drifts from the instrument. Good knowledge and modelling of these characteristics are necessary, in addition to that of the astrophysical properties. To meet this challenge, new methods are being developed in the community. In order to evaluate their performances and to study the ultimate performance of the instrument, we created realistic synthetic observations. This includes detailed astrophysical properties, as well as the detector response and the systematic behaviour of the instrument. This work allows us a better understanding of the influence of the instruments behaviour on the data quality and sensitivity of the observation. With this information, we can investigate which physical properties of the star and the planet are significant for the expected performance. The synthetic data produced will be used for the MIRI-ERS data challenge next year.

**Keywords:** Instrumentation — Exoplanets — Modelling — Planetary atmospheres