SO2, silicate clouds, but no CH4 detected in a warm Neptune with JWST MIRI

Résumé

Our understanding of exoplanetary atmospheres is being revolutionized by the observational capabilities of the newly-operating James Webb Space Telescope (JWST) (Rigby+, 2022). More specifically, JWST-era observations provide new insights in the physical and chemical processes governing close-in exoplanetary atmospheres (Rustamkulov+, 2022; Tsai+, 2023), thus allowing the community to start constraining planetary formation and evolution theories (Turrini+, 2021). In that context, this talk places the emphasis on the remarkable super-Neptune WASP-107b, a warm close-in exoplanet (Anderson+, 2017) whose extended atmosphere constitutes a unique laboratory for atmospheric characterization through transmission spectroscopy with the Mid-Infrared Instrument (MIRI). In this talk, we (1) present the first mid-infrared detection of sulphur dioxide (SO2) and silicate clouds (2) report the notable and unexpected absence of methane in the upper atmosphere (3) provide evidence for disequilibrium chemistry and photochemistry, pointing towards a dynamically active atmosphere with a super-solar metallicity (Dyrek+, 2023).

References:


Mots-Clés: Exoplanet, Atmosphere, Transmission spectroscopy, Mid, Infrared, JWST