ID de Contribution: **103** Type: **Talk**

Spectrum of a Cold Exoplanet around a White Dwarf

mercredi 21 mai 2025 11:15 (15 minutes)

The study of the atmosphere of exoplanets orbiting white dwarfs is a largely unexplored field. With WD 0806-661 b, we present the first deep dive into the atmospheric physics and chemistry of a cold exoplanet around a white dwarf. We observed WD 0806-661 b using JWST's Mid-InfraRed Instrument Low-Resolution Spectrometer, covering the wavelength range from 5 to 12 μm, and the Imager, providing us with 12.8, 15, 18, and 21 μm photometric measurements. We carried the data reduction of those data sets, tackling second-order effects to ensure a reliable retrieval analysis. Using the TauREx retrieval code, we inferred the pressure–temperature structure, atmospheric chemistry, mass, and radius of the planet. The spectrum of WD 0806-661 b is shaped by molecular absorption of water, ammonia, and methane, consistent with a cold Jupiter atmosphere, allowing us to retrieve their abundances. From the mixing ratio of water, ammonia, and methane we derive C/O = 0.34 ± 0.06,
, and N/O = 0.023 ± 0.004 and the ratio of detected metals as a proxy for metallicity. We also derive upper limits for the abundance of CO and CO2 (1.2 × 10−6 and 1.6 × 10−7, respectively), which were not detected by our retrieval models. While our interpretation of WD 0806-661 b's atmosphere is mostly consistent with our theoretical understanding, some results—such as the lack of evidence for water clouds, an apparent increase in the mixing ratio of ammonia at low pressure, or the retrieved mass at odds with the supposed age—remain surprising and require follow-up observational and theoretical studies to be confirmed.

Speaker information

PhD 2nd year

Author: VOYER, Maël (UPC / CEA)

Co-auteur: Dr EXOMIRI TEAM

Orateur: VOYER, Maël (UPC / CEA)

Classification de Session: Charting the Cosmos: Waves, Particles, Stars and Life

Classification de thématique: Physics of the Universe: Particle Physics