EPSC Abstracts
Vol. 17, EPSC2024-119, 2024, updated on 27 Jan 2025
https://doi.org/10.5194/epsc2024-119
Europlanet Science Congress 2024

The UMR: Uranus Multi-Experiment Radiometer for Haze and Clouds Characterization

Víctor Apéstigue[1], Daniel Toledo[1], Ignacio Arruego[1], and the UMR Team[*]
[1]Instituto Nacional de Técnica Aeroespacial (INTA), Space Science and Payloads, Madrid, Spain (apestiguepv@inta.es)
[*]A full list of authors appears at the end of the abstract

The present understanding of Uranus and Neptune has been derived primarily from terrestrial observations and observations conducted using space telescopes. Furthermore, a brief flyby conducted by the Voyager 2 spacecraft nearly three decades ago has contributed to our knowledge of these celestial bodies. Recently, the Decadal Survey [1] has identified a mission to Uranus as a high-priority objective for NASA's space exploration program and its ongoing missions to Mars and Europa.

The main mission study [2] establishes the scientific priorities for an orbiter, including analyzing the planet's bulk composition and internal structure, magnetic field, atmosphere circulation, rings, and satellite system. On the other hand, the mission includes a descent probe, whose primary mission is obtaining data on the atmospheric noble gas abundances, noble gas isotope ratios, and thermal structure using a mass spectrometer and a meteorological package.

Investigation of the vertically distributed aerosols (hazes and clouds) and their microphysical and scattering properties is required to comprehend the thermal structure and dynamics of Uranus' atmosphere. These aerosols play a crucial role in the absorption and reflection of solar radiation, which directly influences the planet’s energy balance. In this work, we present a lightweight radiometer instrument [3] to be included in the descent probe for studying the aerosols in the first km of the Uranus’ atmosphere.

The UMR, the Uranus Multi-experiment Radiometer, takes its heritage from previous missions for Mars exploration [4-6], where its technology, including mixed-signal ASICs radiation hardened by design [7-8], has demonstrated its endurance for extreme environments of operation, using limited resources in terms of power consumption, mass and volume footprints, and data budget. These characteristics make this instrument a valuable probe’s payload for studying Uranus’ atmosphere with a high scientific return.

In this contribution, we will present the actual design of the instrument and the future perspective before a possible announcement of opportunity.

References:[1] National Academies of Sciences, Engineering, and Medicine 2022. Origins, Worlds, and Life: A Decadal Strategy for Planetary Science and Astrobiology 2023-2032 [2] Simon et al. [3] Apéstigue et al 2024. Space Science Reviews. [4] I. Arruego et al. DREAMS-SIS. ASR 2017. 60 (1):

103-120. [5] Apestigue, V. et al 2022. Sensors [6] Pérez-Izquierdo, J., Sebastián, E, et al. 2018 [7] S. Sordo-Ibáñez et al 2016. [8] S. Sordo-Ibáñez et al 2015.

UMR Team: P. Irwin2, P. Rannou3, A. Gonzalo1, J. Martínez-Oter1, J. Ceballos-Cáceres5, J. Azcue1, J.J. Jiménez1, J.R. de Mingo1, F. Serrano1, J. Nuñez1, S. Andres1, J. Torres-Redondo1, A. Martín-Ortega, M. Yela1, M. Sorribas1, E. Sebastian1,4, D. Vázquez-García de la Vega5, S. Espejo5, A. Ragel5, I. Arruego1