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Type: Oral presentation

From Mars to Mercury : ice spectroscopy and implications for the origin and evolution of water in the inner Solar System

mercredi 28 février 2024 14:30 (15 minutes)

Understanding the presence, characteristics, and origin of water within the inner solar system can be enhanced by analyzing the properties (composition, dynamics) of ices present on terrestrial planets such as Mars and Mercury. This analysis, conducted through infrared spectroscopy, relies on data collected by instruments such as CRISM (Compact Reconnaissance Imaging Spectrometer for Mars) aboard the Mars Reconnaissance Orbiter (MRO), OMEGA (Observatoire pour la Minéralogie, l'Eau, les Glaces et l'Activité) on the Mars Express mission, and VIHI (Visible Infrared Hyperspectral Imager Channel) aboard the Bepi-Colombo mission.

In the initial phase, the analysis focuses on Martian ices, particularly in areas near the South and North Poles where the presence of active flows has been observed. These flows are thought to be related to the seasonal formation of surface ice. The conceivable mechanisms to explain these flows depend on the properties of the ice, such as its composition in water, CO₂, and contaminants, or its physical and optical properties (grain size, transparency). The aim of this work is to characterize these properties using spectroscopy, in order to differentiate among proposed mechanisms, which span from CO₂ geysers to dry avalanches, and even to flows implicating a transition of water ice to a liquid state.

In a subsequent phase, the analysis will extend to Mercurian ices with the prediction of data expected from the Bepi-Colombo mission, set to orbit Mercury by the end of 2025. Simulating the expected spectral signatures involves experiments with mixtures of CO₂/H₂O/carbonaceous contaminants and irradiation tests to replicate the conditions on Mercury (analog production). The optical model developed for Mars will be adapted to predict spectral outcomes for Mercury. These predictions will subsequently be compared with the actual data after their analysis in early 2026.

Astrophysics Field

Planetology (including small bodies and exoplanets)

Day constraints

Je suis désolée, mais je ne pourrai pas être disponible soit le 28, soit le 29 matin. Serait-il possible de planifier la présentation en après-midi ? Ou sinon, le vendredi matin. Merci de votre compréhension.

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