

New Insights into Mars Atmosphere Provided by SPICAM on Mars Express

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After 6 years of operations around Mars orbit, the UV-near IR spectrometer SPICAM stills delivers results of significance for our understanding of the Mars atmosphere and to a larger extent of Mars climate. In particular, it has now achieved an extensive water vapor profile climatology which has filled a considerable gap in the long-term track of water vapor on Mars. In the pre-Mars Express era, such data was limited to a few, extremely sparse measurements. The vertical distribution of water vapor nonetheless allows to get otherwise unobtainable information on important characteristics of the Martian water cycle, such as the role of sources and sinks, phase changes, and the influence of clouds. The infrared channel of the SPICAM spectrometer onboard Mars Express, used in solar occultation mode, allows to retrieve simultaneously the vertical profile of water vapor, carbon dioxide, and aerosol properties. This dataset is perfectly suited to address the water cycle seasonal and interannual evolution on the previously unobserved vertical dimension, covering more than three full Martian years with good temporal and spatial distribution. Some important phenomena, such as the presence of supersaturation, the deposition of water vapor in the layer just below the saturation height, the formation of ice particles and water ice clouds, can be observed and studied in detail for the first time. The first phenomenon is actually quite ubiquitously observed and tends to show that Mars water cycle is not controlled by its saturation state as severely as previously thought. This implies a change in our perception of the dominant characteristics of the water cycle and forces the community to revisit the driving assumptions when modeling it.

In addition, a tentative search for SO₂, possibly indicative of geophysical activity, has been undertaken, whose results will be presented during this presentation.