

On the Martian Atmosphere: New Observations by Spicam on Mars Express

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SPICAM, a light-weight (4.8 kg) UV-IR dual spectrometer on board Mars Express orbiter, is dedicated primarily to the study of the atmosphere and ionosphere of Mars, but is also providing important results on the surface albedo of Mars. A UV imaging spectrometer (118 - 320 nm, resolution 1.5 nm, intensified CCD) operates in nadir viewing, limb viewing and atmospheric vertical profiling by stellar and solar occultation. An IR spectrometer (1.0-1.7 microns, resolution 0.5-1.2 nm, or = 1300, mass 0.8 kg) is dedicated primarily to nadir measurements of H₂O and O₂ abundances. Night glow emissions from NO recombination and aurora over crustal magnetic anomalies have been discovered. Several hundreds of atmospheric vertical profiles by UV star occultation were obtained. The main absorbers are CO₂ (below 200 nm) and aerosols/dust (above 200 nm). The atmospheric pressure and temperature are retrieved from 150 km down to 25-40 km, for the construction of an empirical model of the atmosphere. In 60 % of cases there is a detached layer of dust, or cloud. Ozone is also measured and compared to model predictions. The UV absorption of ozone is well identified in routine reflectance nadir viewing. The ozone vertical quantity is recovered along the orbital track, and compared to the water vapour distribution measured by SPICAM in the near Infra-red around 1.38 μ m. SPICAM has thus obtained for the first time from an orbiter simultaneous measurements of ozone and H₂O, which are found to be somewhat anti-correlated as expected on the ground of chemistry consideration: catalytic destruction of ozone from OH and HO₂ radicals. We observed also the O₂ Airglow at 1.27 μ m in nadir and limb viewing produced by photo-dissociated ozone, and all UV limb dayglow emissions that were observed by Mariner spacecraft