Observation of the polar caps of Mars by OMEGA/Mex from January 2004 to July 2006.

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The Vis/NIR OMEGA imaging spectrometer on-board Mars Express has been operating in Mars orbit since January 2004. The spectral range of OMEGA (352 channels from 0.35 to 5.1 μm) makes it possible to identify H_2O and CO_2 ices and frosts from their characteristic signatures in the near IR. Constraints on grain size and the volume fraction of dust and ice inclusions can be obtained from the relative depth of the ice absorption bands. Temperatures $>$ 200 K can be determined from the radiance at 5 μm. The role of ice free aerosols can be assessed from the radiance factor at wavelengths corresponding to saturated ice bands.

In early 2004, observations at a resolution of 2.5 to 3 km made it possible to identify small regions dominated by H_2O ice at the edge of the permanent cap, dominated by CO_2 ice. Observations at a higher resolution (0.5 to 1 km) in late 2005 confirmed these results. The North permanent cap observed after solstice in late 2004 and early 2005 is completely dominated by H_2O ice. OMEGA observed major evolutions in terms of grain size and dust contamination from an early phase (Ls 90° - 100°) during which residual H_2O frost plays a major role to a late phase (110° - 180°) during which a large grained H_2O ice component which is representative of the permanent cap becomes dominant.

The north seasonal cap has been observed during spring for two consecutive Martian years, in 2004 and 2006. H_2O ice signatures are ubiquitous, even if the seasonal cap is dominated by CO_2 ice in terms of volume fraction until Ls 60°. By contrast, H2O ice plays a very limited role for the South seasonal cap observed in 2005 during mid to late spring. Contrarily to the north seasonal cap, the link between temperature, albedo and ice composition is very complex, with an important role of sub-pixel areal mixing.

The OMEGA results constitute important constraints on the role of seasonal and permanent caps on atmospheric species during the seasonal cycle, with a less important role of H_2O in the gas and solid phase for the southern hemisphere.