

Mosaic of Martian North Pole and Ice Cap from MOM

The North Pole of Mars has a large ice cap on it. Mars Colour Camera (MCC) on-board MOM captured many images of north pole of Mars. Topographically corrected MCC reflectance mosaic is prepared using nine MCC images observed during 16 December 2015 to 26 January 2016. This time of observation corresponds to the solar longitude (L_s) from 82° to 100° of 33rd Martian year. To keep the track of time on Mars, the position of Mars in its orbit around the Sun is used, it's kind of longitudinal system that goes from 0 to 360 degrees, therefore solar longitudes (L_s) is used to keep track of the seasons on Mars, so the $L_s=0^\circ$ is the start of northern spring likewise solar longitudes equals $L_s=180^\circ$ is the start of southern spring. The individual images are converted to top of atmosphere reflectance (I/F) and then Minnaert topographic correction is applied. The image shown is projected into Sample Azimuthal Equal Area, the resulting pieces were mosaicked for full view of the polar cap. The seasonal martian polar caps wax and wane in response to the condensation and sublimation of CO_2 resulting from seasonal insolation changes on Mars. In northern winters ($L_s=270-360^\circ$), the polar cap grows much larger in area since atmospheric carbon dioxide freezes and deposits a layer of dry ice (frozen CO_2) on top of the ice cap and the surrounding terrain. When summer returns ($L_s=90-180^\circ$), warm temperatures cause the dry ice to sublimate away, and the polar cap shrinks in size. The period of north pole observation from MCC belongs to the end of northern spring and early summers, showing seasonal sublimation. The northern ice cap on Mars extends about 1,100 km from pole. Major topographic and surface albedo features are easily seen in this mosaic. It has a huge canyon, called Chasma Boreale, slicing through it. The edge of the ice cap is surrounded by "polar layered terrain", a series of layers of ice and dust. The ground throughout the polar regions appears to have lots of ice in or under the soil. Winds caused by temperature differences between the ice cap and its surrounding blow throughout the polar regions. They carve interesting grooves into the ice cap, and build up sand dunes in areas around the pole. Light brown areas are a mix of ice and dust and are called "polar layered terrain". Dark brown areas around the ice cap are sand dunes. There is a big canyon in the ice cap on the left side of the picture; it is called Chasma Boreale.

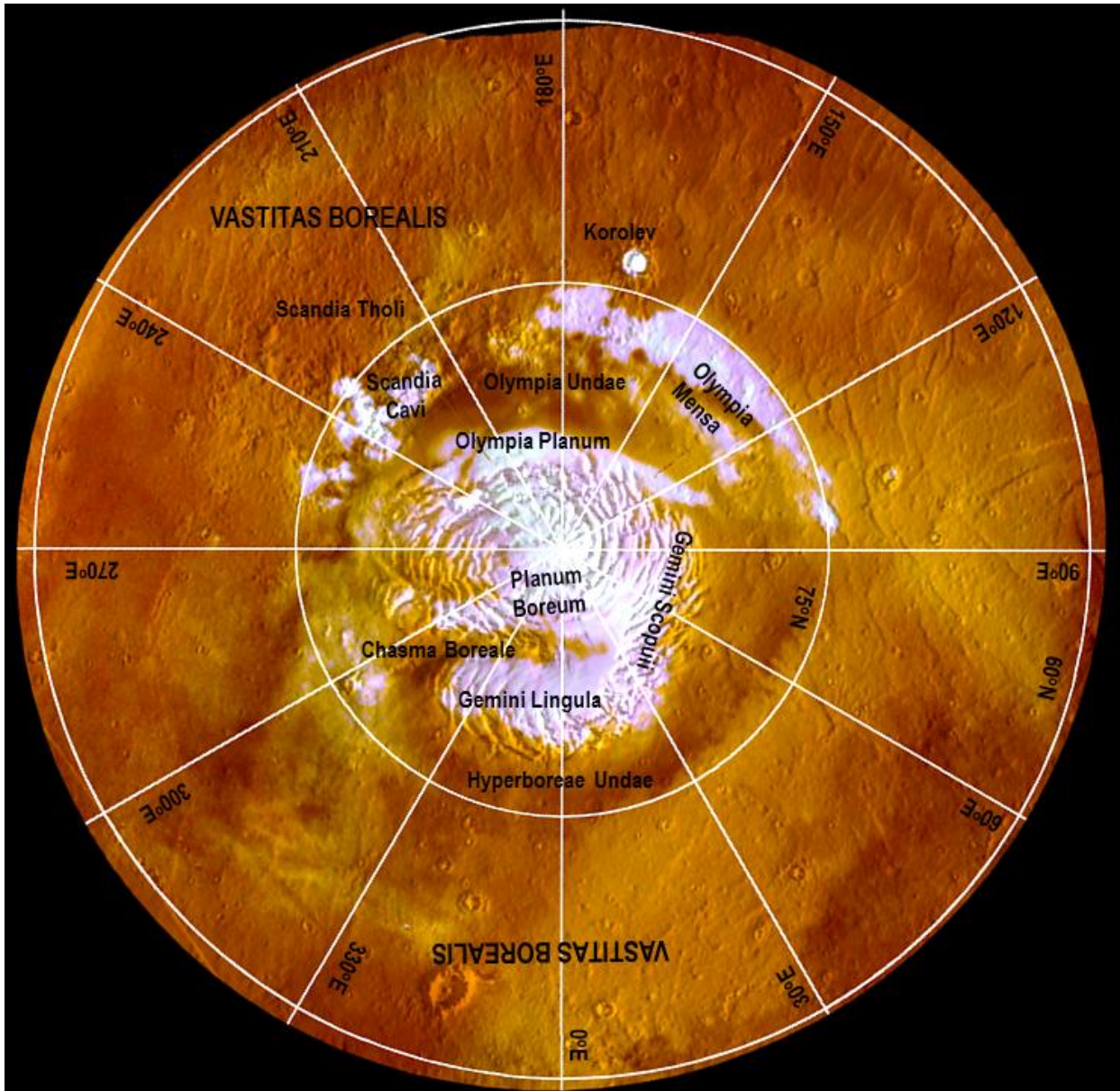


Figure: MCC mosaic of the Martian North Polar Region, Azimuthal equal area projected from 60°N to 90°N, during Ls=82-100° (Martian Year 33). Major topographic and surface albedo features (*Tanaka et al., 2008*) are labeled.

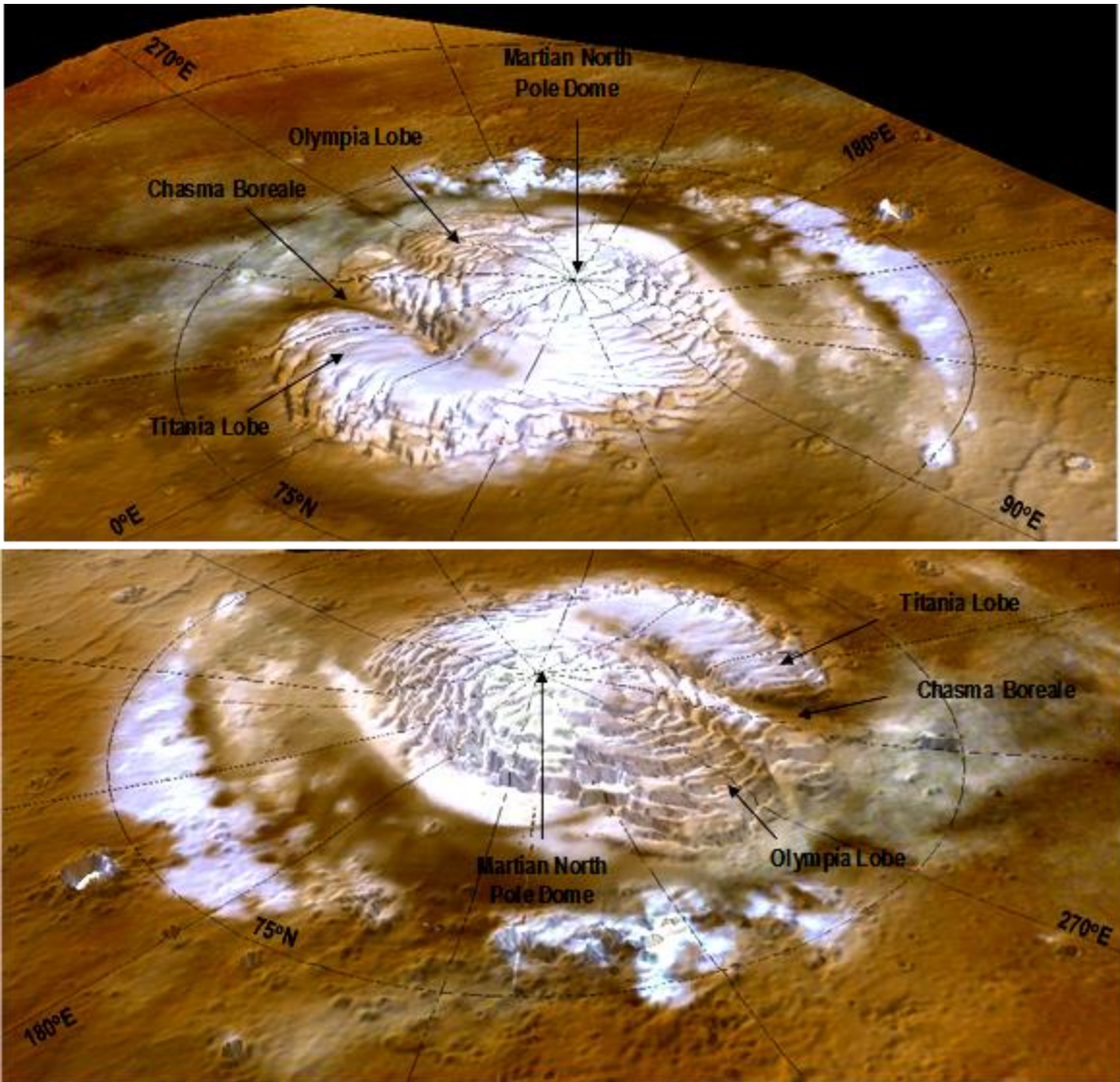


Figure: Three-dimensional view of Martian North Pole and Ice Cap from MOM.