Geophysical Research Abstracts,
Vol. 10, EGU2008-A-03478, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-03478
EGU General Assembly 2008


# Morphologic Analysis of Cone Structures in Aeolis Planum, Mars

**J. K. Lanz** and M. B. Saric
Institut für Geologie und Paläontologie, Universität Stuttgart, Germany
(julia.lanz@geologie.uni-stuttgart.de)

**Introduction:** Small cone-shaped features have been identified in several regions on Mars, e.g. in Isidis Planitia, Elysium Planitia, Amazonis Planitia, Acidalia Planitia, in the Cydonia Region, in Cerberus Planum, the Phlegra Montes and on several volcanic flanks. They vary greatly in size and morphology and they have been compared to terrestrial features of various origins namely (1) cinder cones (e.g. [1]), (2) tuff cones or tuff rings (e.g. [2]), (3) rootless cones (pseudocraters) (e.g. [3], [4]), (4) pingos (e.g. [5] or (5) mud volcanoes (e.g. [6]). They are often associated with volcanic centres and large lava fields or cluster in regions where the volatile content of the Martian regolith was/is supposedly high. This led to the assumption that (ground-) water or ground ice was a trigger or driving force of cone formation. They could therefore be an important indicator for the history of water on the planet.

**Aeolis Planum Cones:** We have examined an area north of Aeolis Planum that exhibits numerous small cones of various morphologies. The cones cluster along the southern edges of a broad shallow valley that was covered by young (Amazonian) lava flows from the north and borders the Medusae Fossae Formation (MFF) sedimentary deposits of Aeolis Planum to the south. The origin of the valley is nondistinctive and could be either tectonic, fluvial (outflow event) or simply the result of the lava coverage from the north.

The cones are mostly circular, though elongated forms are common. They are of varying sizes ranging from 30 to 200 meters basal diameter though most cones have basal diameters below 100 meters. Their heights range between $\sim$ 20 m and 100 m. Most of the Aeolis Planum Cones (APC) have steep convex flanks and large summit craters with diameters about half as wide as their bases. One cone has been identified on HRSC imagery that vastly exceeds the average cone size in the area with a basal diameter of more than 2.4 kilometers and a few hundred meters in height.

*Special characteristics of Aeolis Planum Cones*. The APCs differ from cones in other regions in many aspects. Their morphology and number changes conspicuously and rapidly with distance from the valley margin, i.e. the northern margin of the MFF. Close to the strongly eroded edges of the MFF they appear more elongated with sometimes irregular sometimes oval shaped summit craters. Here the APCs often sit on top of short narrow ridges that show a pronounced NW-SE alignment. Further north circular forms dominate with a random distribution. Their number decreases rapidly with increasing distance from the valley margin. No cones can be found in the valley center and only very few along the northern margins. Some cones show double, triple and even multiple summit craters in various stages of degradation. Sometimes the summit craters are characterized by a concentric ring structure with a fresh appearing crater in the center surrounded by a more degraded crater rim.

Crater statistics and stratigraphic relationships indicate a young (Amazonian) age of the cones.

**Summary:** The most striking differences of the APCs to other described cone structures on Mars are their varying morphology on a very local scale, and their strong correlation with both lava flows from the north and the sedimentary deposits of the MFF. The appearance of APCs is limited to a narrow band along the margin of the MFF. Their changing morphologies seem to be directly linked to the decreasing thickness of the MFF residue. Recently, radar sounding of the MFF indicated that the material could be ice-rich [7]. Mobilization of volatiles in the MFF by volcanic activity might have been a trigger for APC formation. The APCs could thus be another indicator for the proposed volatile content of the MFF.

**References:** [1] Plescia J. B. (1980) *NASA Tech. Memo., 82385,* 263-265. [2] Bridges J. C. et al. (2003) *JGR, 180(E1), 5001, doi:10.1029/2001JE001820*. [3] Fagents S. A. (2002) *LPSC XXXIII,* Abstract #1594. [4] Bruno B. C. (2004) *JGR, 109, doi:1029/2004JE002273.* [5] Theilig E. and Greeley R. (1979) *J. Geophys. Res., 84,* 7994-8010. [6] Skinner J. A. and Tanaka K. L. (2006) *Icarus*, 186, 41-59. [7] Watters T. R. et al. (2007) *Sciencexpress, science.1148112,* 10.1126.