



## **The investigation of yardang field over Medusa Fossae Formation by the very high resolution stereo topography**

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Yardangs are elongated wind-eroded ridges that develop at a range of scale from micro (centimeter scale) to megayardangs that are tens of meters high and kilometers in length. Megayardangs have been recorded in a number of locations including Lop Nor in Central Asia and Lut desert in Iran on Earth (Goudie, 2007) and are known to be best developed in resistant material and extremely arid environment. Megayardangs are significant to understand the geomorphic history of the Martian surface. Ward (1979) firstly identified individual ridges in the equatorial region of Mars that were tens of kilometers long, with valleys nearly 1 km wide between ridges. Bradley (2002) reported Martian yardangs in Medusae Fossae Formation (MFF), which spread across the Martian Equator in the Amazonian and Elysium Planitiae regions. Satellite images enable the identification of Megayardangs on Earth, which is the case with the Mars. Diverse aeolian landforms including sand dunes, transverse aeolian ridges and wind streaks have been investigated by using the Martian orbital images with diverse resolutions. However researches on the vertical structure of landforms are limited owing to the shortage of stereo image pairs available and the insufficient grid spacing of DTM (Digital Terrain Model) products.

This is one of the first studies of vertical structure of Martian yardangs by using very high-resolution stereo images. The photogrammetric techniques that are based on a non-rigorous sensor model and hierarchical image-matching scheme have been applied to extract DTMs from HRSC (High Resolution Stereo Camera) of Mars Express, CTX and HiRISE for full utilization of stereo image coverage over the yardangs in MFF. Further technical details are presented in Kim and Muller (2008, 2009). Since yardangs in the target study area of this research are covered by a CTX stereo pair with the high SNR (signal to noise ratio > 100:1) (Malin et al., 2007), CTX DTM with 12m grid spacing was successfully constructed. Then HiRISE DTM with 1.5 m grid spacing was also extracted in eastern portion of MFF yardangs.

In some areas of the MFF, yardangs reach 40-80m in height and 2-6 kilometer in length according to our measurement. Joint systems or other geological fractures in the easily erodible MFF volcanic deposits may play an important role in establishing yardang orientation in Mars. Dense network of joints may channelize the wind. Yardangs are closely related with sand dunes or sand seas in the downwind region, which suggest the existence of mono-directional airflow charged with sand particles as an erosional and depositional agent. Ridges and swales are best exposed in a zone of Medusae Fossae Formation and sand dunes are best demonstrated in the southern part of study area. Comparative analysis with the magayardangs on Earth such as yardangs in Lut desert and High Andes formed in ignimbrite or in lava origin employing multi spectral image analysis will be done.