

CHARACTERIZATION OF THE MARTIAN HUMMOCKY TERRAINS BASED ON ANALOGUES FROM EARTH. A. Machado¹, T. Barata¹, J. Saraiva², C. Lira², P. Pina², I. Alves¹, C. Mora³, G. Vieira³, ¹CGUC, Coimbra, Portugal (adrianemachado@ci.uc.pt), ²CERENA/IST, Lisboa, Portugal, ³CEG/IGOT, Lisboa, Portugal.

Introduction: Areas on Mars described as hummocky terrains [1] also known as basketball terrains [2-3] have been characterized based on shape, size and texture. [1] mentions the presence of small hummocks on Mars, associated with LT-type polygons, and classifies them as type S3. These hummocks show associations inside non-sorted polygons which are similar to mud boils occurring inside terrestrial polygons [1].

The present work aims to identify hummocks and putative mud boils on Martian hummocky terrains based on Earth analogues from Adventdalen Valley, Longyearbean, Spitsbergen Island, Svalbard. This is a starting point for the development of an algorithm to automatically extract these micro-features from remote sensing imagery, geometrically and texturally characterizing them in the process.

Results: Svalbard mud boils were explored by us during field work on June 2010. Adventdalen Valley mud boils were described according to size, shape, composition, granulometry, plant cover extension and presence/absence of superficial rock clasts. Soil samples were collected for XRD analyses to identify primary and secondary mineralogies. A new field campaign will take place in the summer of 2011 to sample hummocks that occur, irregularly, in a small area of Adventdalen Valley.

Up to now, we have compared images of hummocky terrains on Mars (MOC image #M00-00602, 65.7° N, 232° W, $L_s = 120.1^\circ$ - Figure 1; MOC image #M03-04266, 54.1° S, 229.5° W, $L_s = 174.9^\circ$ - Figure 2, [1]) and images of terrestrial mud boils, including those acquired during the field work, and images from other sources such as Bayelva area, Leirhaugen Hill, close to end moraines of the Brøggerbreen Glacier, Spitsbergen (Figure 3 - [4]) and Howe Island, Alaska [1].

Image comparison and the analysis of field data suggest that Martian hummocks and putative mud boils are located within well-delimited polygons, unlike on Adventdalen Valley where those features usually appear outside polygons and are much smaller (1 to 3 m versus 1 to 15 m). On Martian imagery hummocky terrains seem to be composed of very fine material; hummocks are dark whereas putative mud boils seem to be inscribed within hummocks and are lighter in color. According to [1], the darker areas between micro-features are shadows. In Adventdalen Valley, the few mud boils that are contained within polygons are those which display the closest resemblance to the putative Martian mud boils, being light in color but, unlike them, their shapes are less rounded. Adventdalen Valley mud boils outside of

polygons are rounded and show sparse vegetal coverage around shallow depressions that form the rims (1 to 3 m in diameter). Their centers are slightly elevated (80 to 150 cm), often with randomly located clasts (2 to 20 cm). Putative Martian mud boils are similar to those on Howe Island and on the Bayelva area.

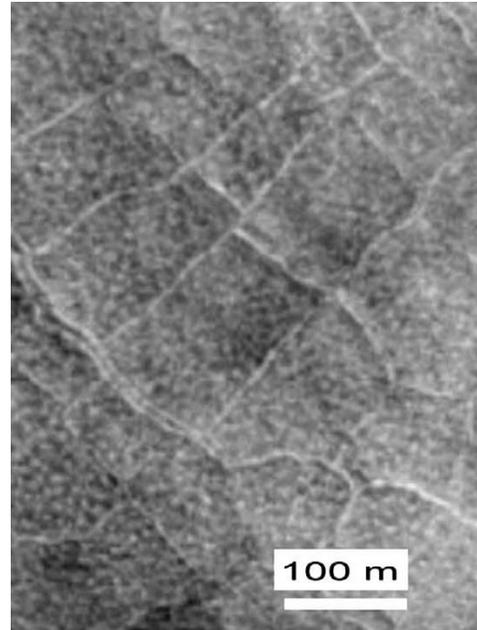


Figure 1 - Martian hummocky terrain - MOC image #M00-00602, 65.7° N, 232° W, $L_s = 120.1^\circ$, [1].

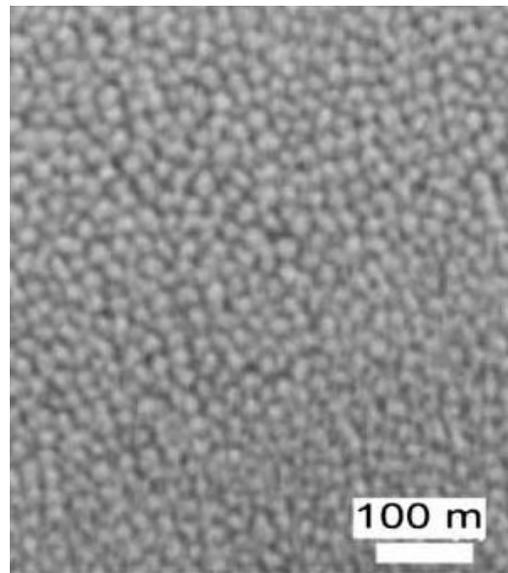


Figure 2 - Martian hummocky terrain - MOC image #M03-04266, 54.1° S, 229.5° W, $L_s = 174.9^\circ$, [1].



Figure 3 - Mud boils in Leirhaugen Hill close to Brøgger-breen Glacier, Spitsbergen Island, [4].

Conclusions: The information just described, together with new data to be collected in 2011, will be used to develop an algorithm for the detailed automatic characterization of Martian hummocky terrains so as to distinguish, identify and characterize hummocks and mud boils according to their size, shape and texture.

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