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Geomorphometric study of Martian scoria cones

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Compared to Earth, the surface erosion activity of Mars is low, so Martian landscapes can survive for long time, therefore Martian surface has been observed and analysed since the earliest times of Mars research. Because the planet's geological and mass wasting history can be studied with remote sensing, observations may provide deeper insight into the early evolution of the planet (Golombek & Bridges, 2000). Lack of precipitation, vegetation and human influence have preserved landforms of Mars that have disappeared on Earth. Yet, local sampling and analysis of rocks are not possible, the evaluation of DTM data can deliver information. Presumably all the terrestrial geological processes also took place on Mars, therefore comparative observations provide a great opportunity to study landforms similar to terrestrial features. The most important difference between terrestrial and Martian surface processes is the formation of impact craters; but volcanic processes create specific volcanic edifices too. Of course, due to the different gravity forces and the lack of some surface effects, larger volcanic forms can also be found than on Earth.

We focus on the less researched smaller volcanic edifices. The morphometric studies on terrestrial scoria cones have revealed interesting details (Wood 1979; Brož et al., 2015): properties often can be related to their chronology. This pilot project intends to gather similar knowledge on smaller Martian volcanoes. With the development of morphometric technology, we may get an increasingly accurate picture of the surface and geology of Mars (Mars Trek). Besides the description of the physical appearance of the edifices, parameter extraction may lead to their classification or grouping. These studies may pave the way characterisation of Martian cones.

Previously we have examined the morphometry of several terrestrial scoria cone areas; a relatively simple structure were chosen to reduce the number of the geomorphometric parameters. In this project we apply the same simplification: the varying resolution of DTMs, the lack of proper geological maps limit the evaluation to the simple parametrisation. Furthermore, the sizes and characteristic slopes are different, but the results are promising. The automated parameter extraction seems to be suitable for processing multiple and large number of terrain data. This is a work in progress towards an extensive geomorphometric evaluation of Martian scoria cones as well.

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Brož, P., Čadek, O., Hauber, E., & Rossi, A. P. (2015). Scoria cones on Mars: Detailed investigation of morphometry based on high-resolution digital elevation models. Journal of Geophysical Research: Planets, 120(9), 1512-1527.

Golombek, M. P., & Bridges, N. T. (2000). Erosion rates on Mars and implications for climate change: Constraints from the pathfinder landing site. Journal of Geophysical Research: Planets, 105(E1), 1 841- 1 853.

Mars trek. (n.d.). NASA Solar System Treks. https://trek.nasa.gov/mars/

Wood, C. A. (1979). Monogenetic volcanoes of the terrestrial planets. Proceedings of the Tenth Lunar and Planetary Science Conference, 2815-2840.