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# Morphometric analysis and mapping: ways to apply the new global catalog of Mercury's craters

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Morphometric parameters allow us to categorize relief features and create maps of geological and geomorphological formations on Earth and other celestial bodies. Catalogs of impact craters can be extremely useful for these purposes, since diameter, shape and other characteristics of craters should be taken into account in most cases when morphometric parameters are calculated.

We work on automation of geomorphological analysis and mapping. To achieve it we used supervised classification method and MESSENGER's data – global mosaic of Mercury, images and several DEMs [1, 2]. Supervised classification method implies training samples which are necessary to find ranges of values, associated to a certain relief form, and define boundaries between the different types of surface, which training samples represent: smooth plains, hummocky inter-crater plains, etc.

In order to analyze and zone the surface at the global level, we calculated the following morphometric parameters:
1. Interquartile range of the second derivative of heights [3]. This parameter gives us the global patterns of planetary relief – distribution of smooth and rough areas.
2. Relative topographic position (RTP) [4]. This parameter is suitable for automatic detection of concave/convex objects.
3. Vertical curvature. It is a measure of relative deceleration and acceleration of gravity-driven flows. Maps of vertical curvature show terraces and scarps [5].

Additionally we studied craters included in the catalog. We calculated various morphometric parameters for all of them, such as: depth, relative depth (the ratio of depth to diameter of craters), rim's volume to bowl's volume ratio and steepness of craters' slopes.

As result we created thematic maps based on all of these parameters. At the detailed level, craters with complex structure (terraces and central peaks), craters located next to unusual textures [6] and multi-ringed basins were selected as objects of mapping. At the global level, we show regional differences in density of different categories of craters (with various degrees of their preservation).

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