Geology of Isidis based on study of mascon and chains of cones

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Introduction:

We consider the surface structures and geological history of Isidis Planitia on Mars. It is a plain located inside a large impact basin of ~1500 km in diameter. Its age is ~3.8 Ga ago [1, 2]. Geologic history of Isidis Planitia (or at least some of its parts) is quite complicated and many details remain unclear. We believe that better analysis of surface structures (especially chains of cones) and large deep structures (e.g. mascon) will allow a better understanding of the origin of Isidis.

Formation of basin and mascon:

One of the large Martian mascons is located under Isidis. This is an anomalously high mass concentration below the surface. Such structures were discovered during the Apollo missions on the Moon. The formation of mascon is possible only under special physical conditions. Therefore, its existence is an important source of information about past conditions and can help us determine thermal conditions in the past of the basin.

We use numerical models to this problem. Our model is based on the equation of thermal conductivity and the equation of motion. Preliminary results point that the model allows to determine thermal conditions and some tectonic processes in the period when the mascon was formed.

The possibility of comparing processes on different celestial bodies is important for our research. Mars is a body of intermediate mass and size between Earth and the Moon. Therefore, it can be
expected that some geological processes on Mars are similar to processes on Earth (e.g. volcanism) or the Moon (e.g. mascon's formation).

**Role of distributed volcanism and chains of cones:**

We are examining the volcanic system of cones on Isidis Planitia. Many of these chain forms have a characteristic furrow through the center, suggesting that fissure volcanism along circumferential dikes was common the Isidis area. The cones have diameters of 300–500 m and heights of ~30 m. These imply slopes of 7–11° consistent with explosive type of volcanism. Similar cones are known from Iceland. Some of the Isidis cones keeping the cone shape without a furrow. We recognize this type of volcanism on the volcanic archipelago of the Canary Islands and in particular on Lanzarote. The cones on Isidis have been divided into three types depending on their building. Currently, we are working on determining the duration and age of this volcanic activity, as well as the size related magma plumbing system, which might be related to Syrtis Major.

Instability of water in the upper layers of the regolith could cause rapid degassing of the regolith. The result may be mud volcanism or geysers [3].

**References**
