FEATURES OF CRATER MAGNETIC ANOMALIES: VIEW FROM NUMERICAL MODELING.

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Introduction: Shock-induced demagnetization of early Mars associated with impacts was thoroughly investigated in [1]. Links of martian and lunar magnetism with crater magnetic anomalies on the Earth are discussed in [2].

Transient and final crater diameter dimensions are critical for estimations of energy released in impacts. Magnetic survey data show that disruption cavity size can be inferred from magnetic anomaly character [3]. Generally, craters are characterized by circular magnetic low and short-wavelength intense anomalies produced by impact melt sheets and/or suevite deposits. Here I follow the work [4], where success in modeling of crater anomaly was demonstrated.

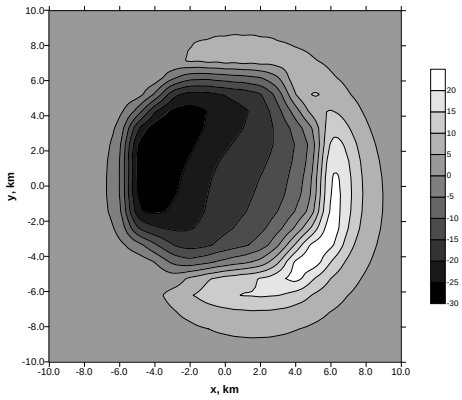

Fig. 1 A post-impact anomaly of a magnetic cavity

Results of simulations: Three-dimensional magnetostatic calculations of crustal magnetic field have been performed. After-impact magnetic anomalies associated with a magnetic cavity (Fig.1), with a melt sheet (Fig.2) and with a suevite deposit (Fig.3) have been simulated for 10 km diameter crater with depth of 3 km.

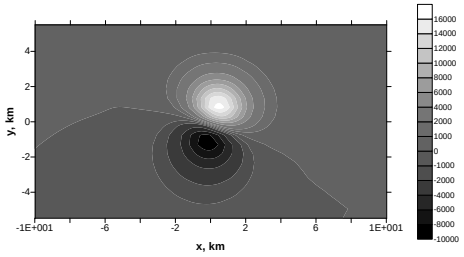

Fig. 2 A magnetic anomaly, produced by a melt sheet in a magnetic cavity

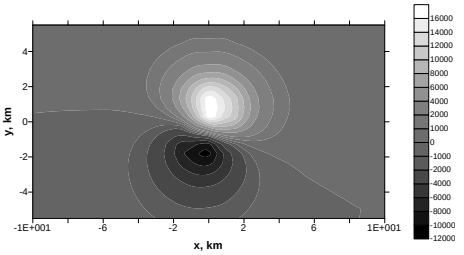

Fig. 3 A magnetic anomaly produced by a suevite deposit in a magnetic cavity

Plane schematic patterns of magnetic anomalies are shown on the figures. Magnetic properties of rocks in simulations were determined according [4], for melt and suevite only NRM were considered.

The magnetic cavity looks like a circular structure slightly shifted from the center of the crater (a zero point), its diameter is less than an estimated rim diameter. Intensity of the magnetic anomaly depends on magnetic properties of the target rocks.

Strong magnetic melt sheet and suevite deposit, presented like 200 m diameter disks inside the cavity demonstrate similar characters of the magnetic anomalies within the radius of the cavity.

Due to plate tectonics the present geomagnetic field at the crater location differs of this one at epoch when the primary crust was created, as well as of the field of the impact time. This differences exibit in twist of these cavity, melt and suevite dipoles.

Discussion: It is also supposed important to simulate influence of features of complex crater morphology on magnetic anomaly characters. Influence of crater erosion was demonstrated in [4].

References:

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