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Gravity and magnetic fields of Mars - new findings

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A search for water on Mars is an important part of a space program. Water is likely to be contained not only in the polar caps but also deposited further away from the polar regions, specifically in the so called “fretted terrain” (near dichotomy boundary between the lowlands and highlands), in the northern lowlands, and elsewhere. Here we attempt to reconstruct a northern paleo-ocean, using the gravity aspects and locations of features of the fretted terrain as constraints for paleo-seashore. Valles Marineris would contain water that would flow into this ocean. We use recent data on the gravity and magnetic fields of Mars and create from them the gravity aspects and magnetic field proxies computed from the recent gravity and magnetic models JGMRO_120F (Konopliv et al., 2020) and (Connerney et al., 2005; Langlais et al., 2019). We discovered that Isidis, based on gravity aspects, has many volcano-like characteristics despite the traditional view of this structure being an impact related. We note asymmetric positions of Martian polar caps that seem to be related to the magnetic field distribution and we propose a new hypothesis that polar cap accumulation relates to a plasmasphere interaction with the solar wind. Analysis of the detection of direction of the impactor arrival for Hellas impact basin along with the gravity aspects (namely the strike angles) suggested that not only the impact likely generated a reset of the global plum activity (that changed the overall unicellular convection pattern into the bicellular convection) but also note the possibility that the magnetic maxima in the polar region could be paleoindicators of the offset by this impact event so that the rotational poles have an offset from the magnetic poles.

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