



Possible crater-based karstic and lacustrine terrain in Tyrrhena Terra, Mars.

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We have identified two craters in Tyrrhena Terra, Mars (19.560 S, 67.480 E, 18.500 S, 68.340 E), where crater-floor deposits display traits that are consistent with formation by karst-driven processes. Tyrrhena Terra is located in the cratered highlands of the southern Martian hemisphere, immediately to the northeast of Hellas Planitia and to the southeast of Isidis Planitia. Crater diameters in the region vary widely, from metres to 100km. Most of these craters are moderately to highly degraded and many show bright deposits on their floors. Here, we present some of the key characteristics associated with these bright deposits and explain why a “karstic” formation hypothesis is reasonable. First and foremost amongst these characteristics are depressions that are ubiquitous within the bright deposits. They display a variety of plan forms ranging from rounded, circular, elongated, polygonal and drop-like to elliptical. Moreover, they display strong morphometric (sizes) and morphologic (shapes, bottoms, walls) similarities with the karst depressions that are common on limestone and evaporite terrains on the Earth. Some depression morphologies - rounded/elongate - could be the result of formation by coalescence. We infer that the depressions are dolines, karstic features formed polygenetically by corrosion and solution-related intra-crater processes; we also demonstrate why the formation of the depressions by aeolian, periglacial, volcanic or impact-related processes seems less plausible by karst-related ones. Interestingly, polygonal cracks whose morphology points to an origin by dessication often cross-cut the bright deposits; as such, their crater floor presence could be an important co-marker of ponded or running liquid water within the craters where they are observed.