



Landform assemblage in Isidis Planitia, Mars: Evidence for a 3 Ga old polythermal ice sheet.

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The floor of Isidis Planitia, a giant impact basin located close to the martian equator, exhibits a landform assemblage, nicknamed Thumbprint Terrain, made of Arcuate Ridges, Aligned Cones, Isolated Cones, Cone Fields, associated with a peripheral network of Sinuous Ridges, Linear Depressions, and Mounds. From a new comprehensive mapping initiative of these landforms and from comparisons with terrestrial analogues (ribbed moraines, dirt cones, kettle holes, eskers, tunnel valleys and moraine plateaux), we demonstrate that this distinctive assemblage is a glacial landsystem inherited from the presence of a massive polythermal ice sheet over the basin during the Hesperian. The flow of the ice sheet was controlled by its basal thermal regime. Wet-based conditions led to the formation of Arcuate Ridges and Aligned Cones in most parts of the basin, while a negative geothermal anomaly due to impact-related crustal thinning was responsible for cold-based conditions in its central part, where only Isolated Cones and Cones Fields are present. Sinuous Ridges, Linear Depressions and Mounds at the basin margins are interpreted as relicts of a radial network of subglacial channels, which drained the glacial meltwater produced within the interior of the ice sheet across its cold-based periphery.