Reinterpreting the Impact Craters of the North Polar Layered Deposits, Mars

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Summary

The North Polar Layered Deposits (NPLD) on Mars record the recent climate history of the planet. The NPLD preserves a series of stratigraphic layers, and dating these layers holds significant promise for understanding recent Martian climate change. This work revisits the impact crater record described in [1] with an impact production function taken directly from measuring small, recent impacts on Mars [2]. The conclusions we reach are that the NPLD surface has a single age on the order 1Kyr.

Methodology

Crater diameters were measured using the ArcMap Crater Helper Tools, available from the United States Geological Survey. Where crater clusters were present, the effective diameter was calculated according to the formula

\[ \left( \sum D_i^3 \right)^{1/3} \]

[1,2]. Where multiple images existed for a site, the diameters were measured and averaged.

Following [1], we took crater counts above a diameter of ~40m to be statistically complete. There are 38 craters fitting this criterion (e.g. Figure 2), eight of which have since had their diameter measurements refined through newly acquired HiRISE data.

The updated diameter data was on average 2±5m smaller than the diameters reported in [1]. This translated to at most a 10% difference between updated diameters from the diameters reported in [1].


Results

The scenario that is most supported by our results is that a resurfacing event ~1Kyr ago reset the surface of the NPLD and all visible craters formed afterwards.