

ANALYSIS OF HiRISE DTM FOR STUDYING TOPOGRAPHIC CHANGE BY MASS WASTING AT THE NORTH POLAR SCARPS OF MARS

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1. ABSTRACT

We evaluated Digital Terrain Models (DTMs) of the north pole of Mars that we generated using NASA's software Ames Stereo Pipeline (ASP) (Moratto et al., 2010) and High Resolution Imaging Science Experiment (HiRISE) images (McEwen, 2007). Ultimately our goal is to detect and quantify 3D changes caused by active mass wasting processes, which are very common at the north polar steep scarps (Russell et al., 2014).

Although HiRISE images of the north pole of Mars are numerous, there is currently no location covered by more than one DTM. We selected a test area which displays signs of activity and is covered by an existing DTM produced by the HiRISE Team (Mattson et al., 2011). After analysing the area in terms of coverage through time, occurrence of mass wasting events and stereo coverage, we produced several DTMs from HiRISE stereo pairs with ASP.

To validate our results, we visualised the intersection error and the disparity maps of each DTM and computed the height deviation from the existing DTM and from Mars Orbiter Laser Altimeter (MOLA) (Smith et al., 2001). In addition we reproduced the existing HiRISE DTM with ASP for comparison.

Furthermore we examined height changes due to boulder movements. Specifically, we investigated the possibility of detecting such movements by comparing two DTMs: one before the event and another, after the event. We are also investigating automated 2D change detection on ortho-rectified images and the assignment of 2D to 3D changes in order to quantify related volumes and erosion rates.

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