

CRATER COUNT DATING OF THE RESURFACING EVENTS ON THE MORPHEOS BASIN, MARS.

S. Kukkonen and V.-P. Kostama

Astronomy and Space Physics, P. O. Box 3000, FI-90014 University of Oulu, Finland
email: soile.kukkonen@oulu.fi

Impact crater statistics is a useful way to estimate relative and absolute ages for the surface of Mars, or any other planetary body from which it is not yet possible to return samples. The concept is to measure the number of craters accumulated on a given surface unit, i.e. the crater size-frequency distribution, and fit a known, lunar-calibrated crater production function to it [1–2]. When the crater frequencies of certain crater sizes are compared with the chronology function of the planetary body [e.g. 3], it is possible to obtain the absolute age of the studied surface.

In this work, we use the crater counting method to date the time frame of the infilling of the Morpheos basin, a flat-floored topographic depression which separates the upper parts of the Reull Vallis channel on Eridania Planitia in the eastern Hellas rim region of Mars. Earlier, the Morpheos basin has been identified as a possible open-basin lake, infilled by the release of fluids from Waikato Vallis, the northernmost part of the Reull system. The basin has afterwards acted as a source for the flows that carved other parts of the Reull system [e.g. 4–5]. However, the exact extent and time frame of the infilling of the basin, as well as the length of its activity have still been under discussion [4–7].

The data used in this work consist of high resolution images by Mars Reconnaissance Orbiter's CTX (ConTeXt, resolution ~ 5 m/pixel) and HiRISE (High Resolution Imaging Experience, resolution ~ 0.3 – 0.5 m/pixel) cameras and Mars Express' HRSC (High Resolution Stereo Camera, resolution ~ 50 m/pixel). All image data were imported onto a GIS environment, where the crater counts and the related mapping were performed. In the case of crater counts, the crater size-frequency distributions were plotted and the model ages were measured using the Craterstats2 software [8].

This work is part of an ongoing project looking into the eastern Hellas fluvial systems, where the goal is to form a detailed picture of the drainage system evolution and to relate them to changes in the Martian climate.

- [1] CATWG, *Icarus*, 37, 467-474 (1979).
- [2] B. Ivanov, *Space Sci. Rev.* 96, 87-104 (2001).
- [3] W. K. Hartmann and G. Neukum, *Space Sci. Rev.* 96, 165-194 (2001).
- [4] V.-P. Kostama et al., *J. Geophys. Res.*, 112 (2007).
- [5] S.C. Mest and D.A. Crown, *Icarus*, 153, 89-110 (2001).
- [6] E.J. Capitoli, Master of Science thesis, University of Pennsylvania (2008).
- [7] S.C. Mest and D.A. Crown, *USGS Geol. Inv. Ser.*, Map I-3245 (2014).
- [8] G.G. Michael and G. Neukum, *Earth Planet. Sci. Lett.*, 294 (3-4), 223-229 (2010).