

GEOLOGIC MAP AND STRATIGRAPHY OF THE EASTERN MICHELANGELO QUADRANGLE (H12), MERCURY. F. Prüsse¹, V. Galluzzi², H. Hiesinger¹ and C. H. van der Bogert¹. ¹Institut für Planetologie, Westfälische Wilhelms-Universität, Wilhelm-Klemm-Str. 10, 48149 Münster, Germany (f.pruesse@uni-muenster.de); ²Istituto di Astrofisica e Planetologia Spaziali, Rome, Italy.

Introduction: Geologic maps of Mercury were created from NASA Mariner 10 images at 1:5M scale [1] and from NASA MESSENGER images at 1:15M scale [2]. However, the MESSENGER mission provided a global average resolution better than 200m/pixel, thus, higher-scale geologic maps can be produced and new insights gained. Our current mapping effort contributes to the first 1:3M quadrangle geologic map series of Mercury [4], which will provide scientific context for upcoming missions, including ESA's Bepi-Colombo.

Data: We are preparing a geological map of the eastern part of the Michelangelo quadrangle (H12) in the southern hemisphere spanning from 20° to 70° S between 90° and 180° W. We extend the map prepared for the Beethoven basin in the north of H12 [4]. The linework was digitized at 1:600k-scale to generate a 1:3M-scale geologic map, mainly using 166m/pixel monochrome Mercury Dual Imaging System (MDIS) basemaps. Other MDIS data was also used, e.g., the 665m/pixel Digital Elevation Model (DEM) and an enhanced color mosaic, also with 665 m/pixel resolution (constructed using MDIS frames captured in the 1000, 750 and 430 nm bands, placed in the red, green and blue channels, respectively).

Methods: We created our map (*Fig. 1*) using ESRI's ArcGIS software. We applied a three-class system for plains units that were defined for the global mapping effort [5]. Based on morphological characteristics, mercurian plains belong to one of three types: Intercrater plains (*icp*), intermediate plains (*imp*), or smooth plains (*sp*). *Icp* are defined as 'level to gently rolling ground between and around large craters and basins' [6]. *Imp* are defined as 'planar to undulating surfaces that have higher crater density than *sp*, but are less heavily cratered than *icp*' [7]. The *sp* are defined as 'relatively flat, sparsely cratered material' [6].

Craters larger than 5 km in diameter are marked, while crater larger than 20 km in diameter are also classified according to their state of degradation. Again, a three-class system was applied: The oldest and most degraded craters are of type *C1*. Subsequent emplacement of material due to large impacts or lava flows may cover these, resulting in a 'buried' crater. *C2*

craters are 'degraded' with rounded rims, overprinting of subsequent impact craters on their ejecta, and debris on their crater floors. *C3* craters are 'well-preserved', describing the youngest and sharpest craters. These barely show any overprinting of younger craters and they have distinct rims and boundaries to adjacent units. Central peaks or peak rings in crater class *C3* sharp and distinct.

Using the resulting geologic map, crater size-frequency distribution (CSFD) measurements were made to determine an absolute model age framework for the stratigraphy. For the first results, we use the lunar-derived production and chronology functions of Ivanov [8].

Results: The entire eastern half of the H12 quadrangle is comparatively hilly. Most of the map is covered by *icp* with local *imp* and rare *sp* exposures. The boundaries of the *sp* and *imp* units are smooth and arcuate, suggesting they were emplaced as flows. Many studies attribute the *sp* to volcanic activity [e.g., 9]. Generally, *sp* are mostly observed in the northern part of H12 in topographic lows. Notably, *Michelangelo* crater shows the same type of *sp* within, suggesting subsequent infilling after crater formation. Although in the same size-category as *Michelangelo*, *Matisse* crater in the northwest does not exhibit infilling by *sp*. However, the very young crater *Hawthorne*, south-west of *Michelangelo*, shows a crater floor much like the *sp* outside of it. This may be due to later infilling, like *Michelangelo*, implying recent volcanic activity on Mercury, or the preservation of an impact melt that appears morphologically similar to other *sp*.

In the enhanced color image we used, the eastern half of the quadrangle is almost entirely orange, implying a high reflectance area. This has been interpreted to indicate volcanically influenced areas, e.g., remnants of pyroclastic vents [10]. Many impact craters exhibit pits on their floors [10]. These irregular, rimless depressions are also proposed to result from volcanic activity. Age determinations for the geomorphological units are still ongoing and will be presented at the conference. Our preliminary ages of the plains ages are, so far, in agreement with those found in the literature [11].

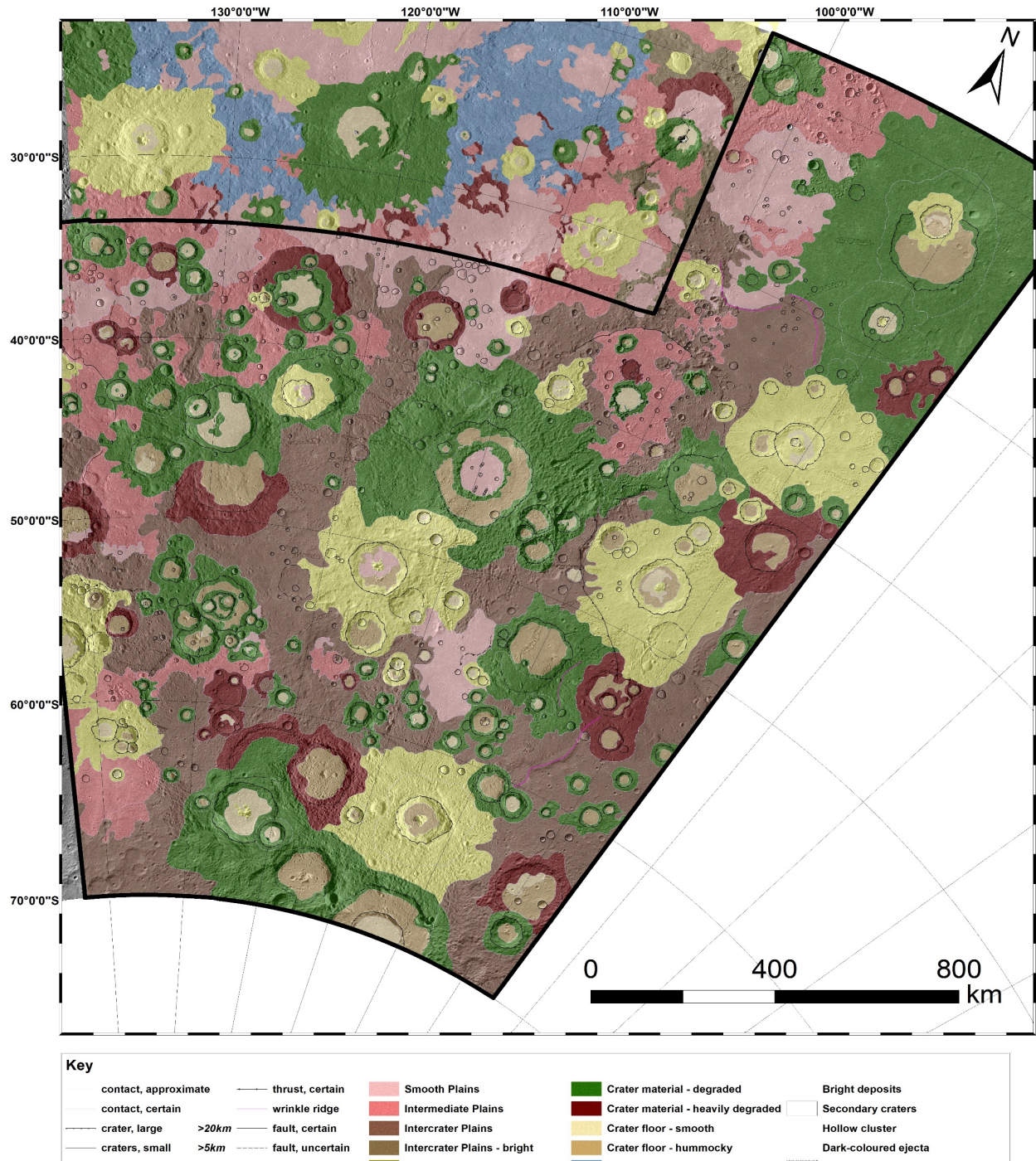


Figure 1. Geologic map of the eastern half of Michelangelo quadrangle (H12) on Mercury. Black borders indicate the study area. In the northeast lies the Beethoven basin, which was mapped previously by [2].

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