PRELIMINARY GEOLOGIC MAP OF THE BEETHOVEN BASIN, MERCURY A. M. Lewang[1], H. Hiesinger[1], H. Bernhardt[1,] V. Galluzzi[2], L. Guzzetta[2] , M. Massironi[3]
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Motivation: The Beethoven Basin (20°S, 124°W; 630 km) is one of the largest confirmed basins on Mercury and thus plays an important role for understanding the formation and evolution of basins on this planet. MESSENGER´s higher resolution images allow deeper insights and a more detailed map of the basin and its surrounding. Our new map is part is part of the ongoing work of creating a global 1:3M map of Mercury [2]. This map improves our knowledge of the planet´s stratigraphy and surface history, and will provide the scientific context for the upcoming BepiColombo mission [1].

Data and methods: Geomorphologic mapping at the 1:3 M scale is conducted primarly using the Mercury Dual Imaging System (MDIS) data with a mean spatial resolution of ~200 m/pixel [3]. Additionally, the Digital Elevation Model (DEM), and the MDR (MDIS 8-color) basemap, as well as other available datasets for the southern hemisphere were used [3].

Map description and discussion: The Beethoven basin is located east of the Tolstoj basin and SW of Mercury´s high magnesium region. The basin floor is largely covered by smooth plains material of volcanic origin [e.g., 4, 5], superposed by two large craters, Sayat-Nova at the southern rim and Bello, located in the center of the basin. On the basis of their morphology and spectral characteristics, plains on Mercury are divided into three different types (*Sp, Imp, Icp*) [2]. The intercrater plains *(Icp)* are defined as 'level to gently rolling ground between and around large craters and basins' [6]. The intermediate plains *(Imp)* are defined as forming 'planar to undulating surfaces that have higher crater density than *Sp* material but are less heavily cratered than intercrater plains material' [7]. The smooth plains *(Sp)* are classified as 'relatively flat, sparsely cratered material' [e.g., 6]. The western part of the basin is characterized by the Duyfken Rupes, an up to 1 km high thrust fault next to an arcuate trough and remnants of the Beethoven rim material *(Brm*). *Brm* is defined as the hilly and radially lineated material, extending beyond the rim of the Beethoven basin. We observed a lower crater size frequency distribution (CSFD) within the interior *sp* compared to the *Brm*, as described by other authors [e.g., 8]. Both CSFDs suggest that the basin formed in the late Tolstoian period. Beyond the western rim, *Brm* is mostly covered by smoother plains. In the south, *Brm* is covered by younger impact craters, while *Brm* in the north and east is less disturbed. Secondary crater chains extend several hundreds of kilometers across the surface, especially in the NE. In the east, only a few secondary crater chains are observable and the transition from *Brm* to *Imp* and ejecta from other craters is highly gradual. This is due to Beethoven´s thinning ejecta blanket in this area. However, it is highly likely that *Brm* is not exposed farther east than Palmer Rupes, an up to 1 km high thrust fault. Craters are divided into a three-class morpho-stratigraphic system, i.e.: heavily degraded, degraded, and well preserved [2]. Possible *hollows* are labeled as *bright deposits*. Within three of the biggest craters in the basin clusters of hollows are exposed, with an extent of tens of meters to a few kilometers [9]. In the northeast of the map, there are several elongated and circular depressions within craters. These were interpreted by their spectral reflectance as pyroclastic vents [e.g., 10, 11]. Areas characterized by a relative low albedo are labeled as low reflectance material *(Lrm)*. *Lrm* can be subdivided into three groups by their spectral reflectance values in the MDR basemap, i.e., `color´, morphology and location: (1) Areas on the floor and on the rims of craters, which show deep-blue colors in the MDR basemap and represent ejecta material. (2) Smooth areas with relatively lower albedo compared to the average *sp*, observable close to craters and basin rims, e.g., W of the Beethoven basin. These are interpreted as impact melt deposits [12] and appear dark-brown in the MDR basemap. (3) A roughly 3,000 km^2 large area, around the highest point of the Duyfken Rupes. Here, impact melt or ejecta is unlikely, since there is no crater nearby and the outcrop is located in a hilly region. The origin is unclear but due to its location on top of a possibly deep thrust fault, it may represent volcanic material of distinct surface morphology, age, or composition compared to other *sp*.

Future work: We plan to conduct a topographic analysis and complete CFSD measurements to verify the preliminary stratigraphy of the Beethoven basin, as well as extending the map in an eastern direction to Palmer Rupes. The final goal is to integrate this map into a global map of Mercury [2].

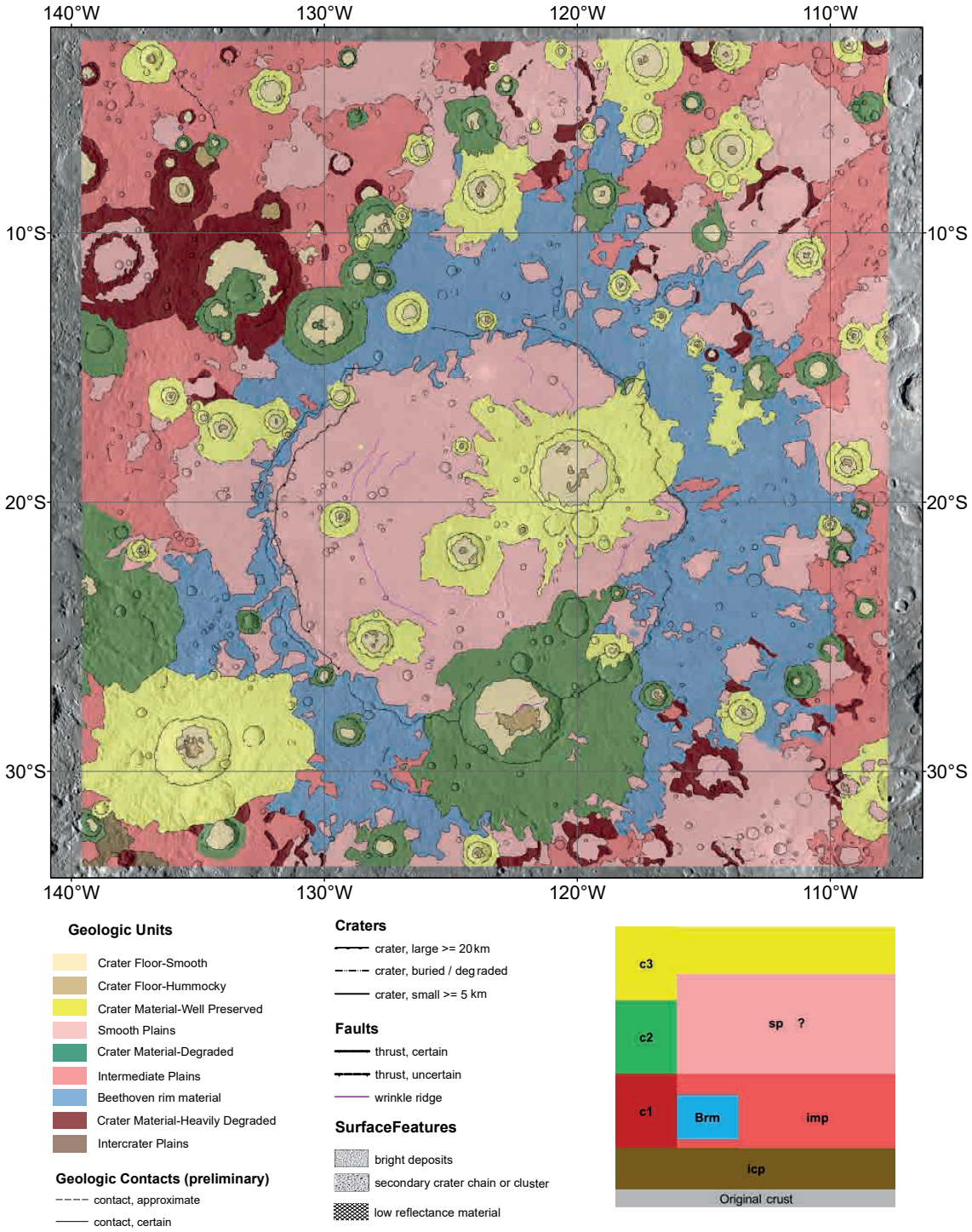

Figure 1: Preliminary map and stratigraphy of the Beethoven basin, Mercury.

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