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Integration between morphological and spectral characteristics for the geological map of Kuiper quadrangle (H06)

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Kuiper quadrangle (H06) is located at the equatorial zone of Mercury and encompasses the area between longitudes 288°E – 360°E and latitudes 22.5°N – 22.5°S. A detailed geological map (1:3M scale) of the Kuiper quadrangle based on the MESSENGER Mercury Dual Imaging System – Narrow Angle Camera (MDIS-NAC) high spatial resolution data, was performed by Giacomini et al., 2018.

The main basemap used for H06 mapping was the MDIS (Mercury Dual Imaging System) 166 m/pixel BDR (map-projected Basemap reduced Data Record) mosaic. The geological map showed that the quadrangle is characterized by a prevalence of crater materials which were distinguished into three classes based on their degradation degree (Galluzzi et al., 2016). Different plain units were also identified and classified on the basis of their density of craterisation: (i) intercrater plains, densely cratered, (ii) intermediate plains, moderately cratered and (iii) smooth plains, poorly cratered.

To integrate morphological and spectral characteristics of Kuiper quadrangle, this map has been integrated with the spectral map of H06 achieved by MDIS WAC data. In particular, we produced an homogeneous 8 color global mosaic at 1600 m/pixel scale and a partial mosaic at 665 m/pixel, similar to the one released by MESSENGER team (Becker et al., 2009). Finally, for a more detailed analysis, also mosaics at 385 m/pixel and 246 m/pixel were created (Carli et al., 2020). However, they cover only a few areas, due to the lack of high spatial resolution coverage for the equatorial and southern regions of Mercury. Using these products, the spectral variations, highlighted by specific indices and color combinations, are discussed in order to define spectral units to be integrated with the morpho-stratigraphic ones. This analysis allows us to infer some indications on material composition as well as to produce a more detailed geological map of H06, where morpho-stratigraphic and spectral units are integrated to each other. In this work we will specifically show some example, on key areas, of such integrated map.

This preliminary analysis highlights that a higher spectral and spatial resolution are needed in order to obtain new information about the origin of the landforms and deposits. In light of these

evidences, it appears that the high resolution of the instruments of BepiColombo mission, like STC and HRIC cameras and VIHI spectrometer of SIMBIO-SYS, can significantly contribute to answer several questions raised during the geological mapping and analysis of the Kuiper quadrangle.

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