Preliminary findings from geological mapping of the Hokusai (H5) quadrangle of Mercury

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Preliminary Findings from Geological Mapping of the Hokusai (H5) Quadrangle of Mercury.

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Introduction: Quadrangle geological maps from Mariner 10 flybys only cover 45% of the surface of Mercury at 1:5M scale, e.g. [1]. This study will use orbital data from NASA’s MES’ercury Surface, Space EVironment, GEochemistry, and Ranging (MESSENGER) satellite, to produce a map at 1:2M scale of the Hokusai quadrangle (0–90° E; 22.5–66° N) (Fig. 1), which is in the hemisphere unmapped by Mariner 10. This geological map will aim to be compatible with other new quadrangle maps [2] and to complement a global map now in progress [3].

Features: Hokusai contains prominent features already being studied, such as Rachmaninoff basin [4] and volcanic vents [5]. Our fine-detail study of the region has identified additional important geological features.

Rustaveli, 83°E, 52°N. Rustaveli is a 200.5 km diameter peak-ring basin. It is an important, but so far understudied, feature in Hokusai quadrangle. Its widespread, un-degraded ejecta deposit, clear crater rim and well preserved terraces show it to be one of the youngest impact basins on Mercury of its size. Its peak-ring is deeply flooded, or buried entirely in places, by a smooth infill we believe to be due to post-impact volcanism. Rustaveli’s peak-ring is elongated approximately E-W. One possible explanation is that the impact was oblique. The western portion of Rustaveli’s crater rim is polygonal [6]. This could be due to slumping of the terraces along joints in the target material (most likely smooth volcanic plains) during crater modification [7].

‘Unity’ Rupes, 85°E, 27°N. This feature, informally referred to as ‘Unity’ Rupes, is a ~320 km scarp consistent with a SE dipping thrust fault. The main scarp has associated, smaller scarps to the SW and NE. Cross-cutting of scarps by scarp segments may allow for estimates of the amount of shortening [8].

Valleys: Valleys similar to those reported elsewhere on Mercury by Byrne et al. [9] appear at the southernmost extent of the Northern Plains in Hokusai. We suggest they are partially flooded catenae consistent with an ancient basin hypothesised in Prockter et al. [3].