PRELIMINARY FINDINGS FROM GEOLOGICAL MAPPING OF THE HOKUSAI (H5) QUADRANGLE OF MERCURY.
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Introduction: Quadrangle geological maps from Mariner 10 data cover 45% [1] of the surface of Mercury at 1:5M scale, e.g. [2],[3]. Orbital MESSENGER data, which cover the entire planetary surface, can now be used to produce finer scale geological maps, including regions unseen by Mariner 10.

Hokusai quadrangle (0–90° E; 22.5–66° N) is in the hemisphere unmapped by Mariner 10. It contains prominent features which are already being studied, including: Rachmaninoff basin [4], volcanic vents within and around Rachmaninoff [5], much of the Northern Plains [6,7] and abundant wrinkle ridges [8]. Its northern latitude makes it a prime candidate for regional geological mapping since compositional [9,10] and topographical data [11], as well as Mercury Dual Imaging System (MDIS) data [12], are available for geological interpretation. This work aims to produce a map at 1:2M scale, compatible with other new quadrangle maps [e.g. 13] and to complement a global map now in progress [14].

Methods: A basemap of Hokusai (Fig. 4) was constructed (at an average ground resolution of 166 mpp) from the MESSENGER MDIS basemap tiles, including a 5° overlap with the surrounding quadrangles. Using ArcGIS, the basemap was projected into a Lambert Conformable Conic projection for mapping. We are currently mapping geological features at 1:400k scale. Once mapping from this basemap is complete, complex features will be re-examined using local mosaics of high-resolution images and local-scale maps produced.

Features: Preliminary mapping suggests several features that warrant in-depth study, making Hokusai quadrangle a particularly interesting area.

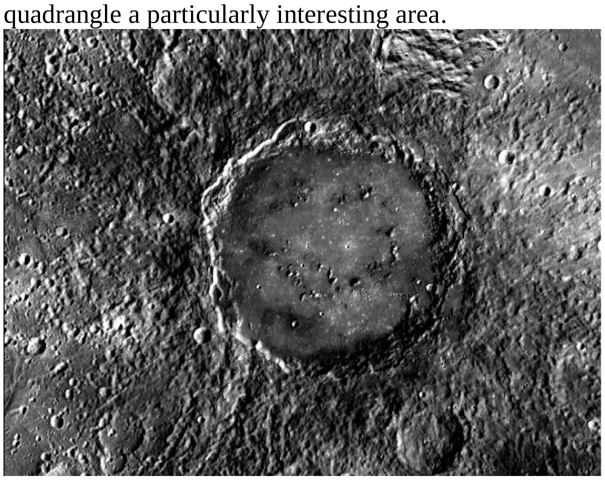

Fig. 1. Rustaveli. 200.5 km diameter.

Rustaveli, 83° E, 52° N. Rustaveli (Fig. 1) is described in another abstract by us [15].

'Unity' Rupes, 85° E, 27° N. This structure (Fig. 2), informally referred to as Unity Rupes, is in the SE corner of the quadrangle and trends NE-SW. It is consistent with a thrust fault in which the hangingwall is overthrusted from the SE to the NW. In the SW, the main scarp turns until it trends SSW. Here, it appears to overprint an older, smaller scarp that trends approximately NW-SE. This smaller scarp cross-cuts a crater which may allow an estimation of the amount of shortening [16].

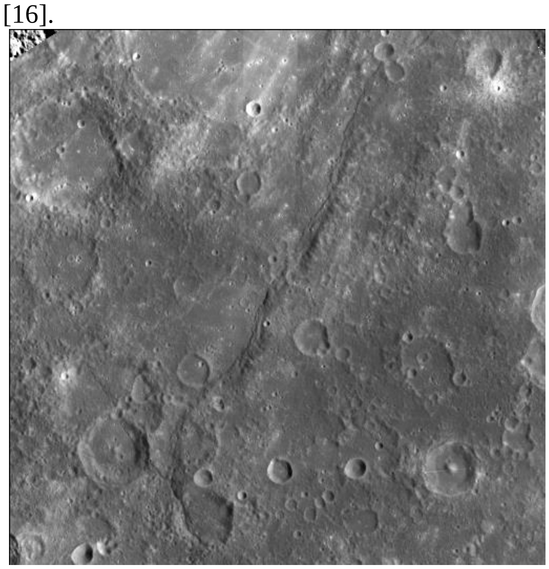

Fig. 2. 'Unity' Rupes (informal name). Image 280 km across.

Sub-parallel valleys, 34° E, 32° N. These (Fig.3) have been exploited by flood volcanism, similar to those reported elsewhere on Mercury by *Byrne et al.* [17]. This region appears to be partially flooded intercrater plains. The flow direction is presumably from NE to SW where, at the end of the valleys, the smooth plains material embays higher terrain. We suggest that the valleys are flooded catenae, in which case the primary impact is consistent with an ancient basin hypothesised in [14]. There is no evidence to suggest that the valleys are tectonic features.

Other features. The smooth plains contain many ghost craters [7] which are picked out by wrinkle ridges. Many of these ghost craters have polygonal outlines.

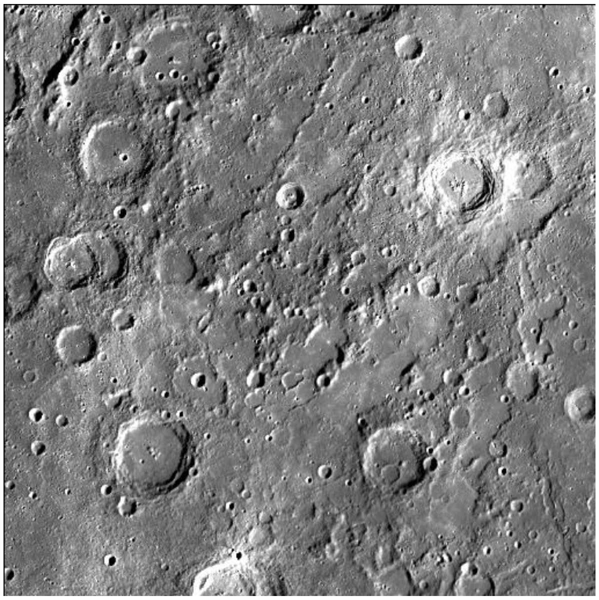

Fig. 3. Valleys. Image 500 km across. Northern Plains can be seen in the top right of the figure. The passage along valleys from NE to SW has since been partially obscured by a bright, young crater.

Future work: Craters >20 km in diameter will be classified according to the modified degradation scheme of [14] to determine the morphostratigraphy of the region. Smooth plains will be distinguished from intercrater plains. Whether the intercrater plains can be consistently divided into more than one unit at this scale [14] will also be assessed.

References: [1] Watters T. A. et al. (2009) E*arth and Planetary Science Letters, 285,* 283–296. [2] Grolier M. J. and Boyce J. M. (1984) *USGS Miscellaneous Investigation Series Map I--1660, 21*. [3] Strom R. G. et al. (1990) *USGS Miscellaneous Investigations series Map I--2015*. [4] Blair D. M. et al. (2013) *JGR: Planets, 118*, 47-58. [5] Thomas R. J. et al. (2014) *Geophys. Res. Lett., 41*, 6084-6092. [6] Head J. W. et al. (2011) *Science, 333*, 1853-1856. [7] Ostrach L. R. (2015) *Icarus, 250,* 602-622. [8] Byrne P. K. (2014) *Nature Geoscience, 7*, 301-307. [9] Nittler L. R. et al. (2011) *Science, 333,* 1847-1850. [10] Rhodes E. A. et al. (2011) *Planetary and Space Science, 59,* 1829-1841. [11] Zuber M. T. et al. (2012) *Science, 336,* 217-220. [12] Hawkins S. E et al. (2007) *Space Science Reviews, 131*, 247-338. [13] Galluzzi V. et al. (2015) *Geophys Tes Abs*, *17,* EGU2015-14857, [14] Prockter L. M. et al., (2016) *LPS XLVII*, Abstract #1245. [15] Wright J. et al. (2016) *LPS XLVII*, Abstract #2063. [16] Galluzzi V. (2015) *Geol. Soc., London, Special Publications*, *401*, 313-325. [17] Byrne, P. K. et al. (2013) *JGR: Planets 118,* 1303-1322.

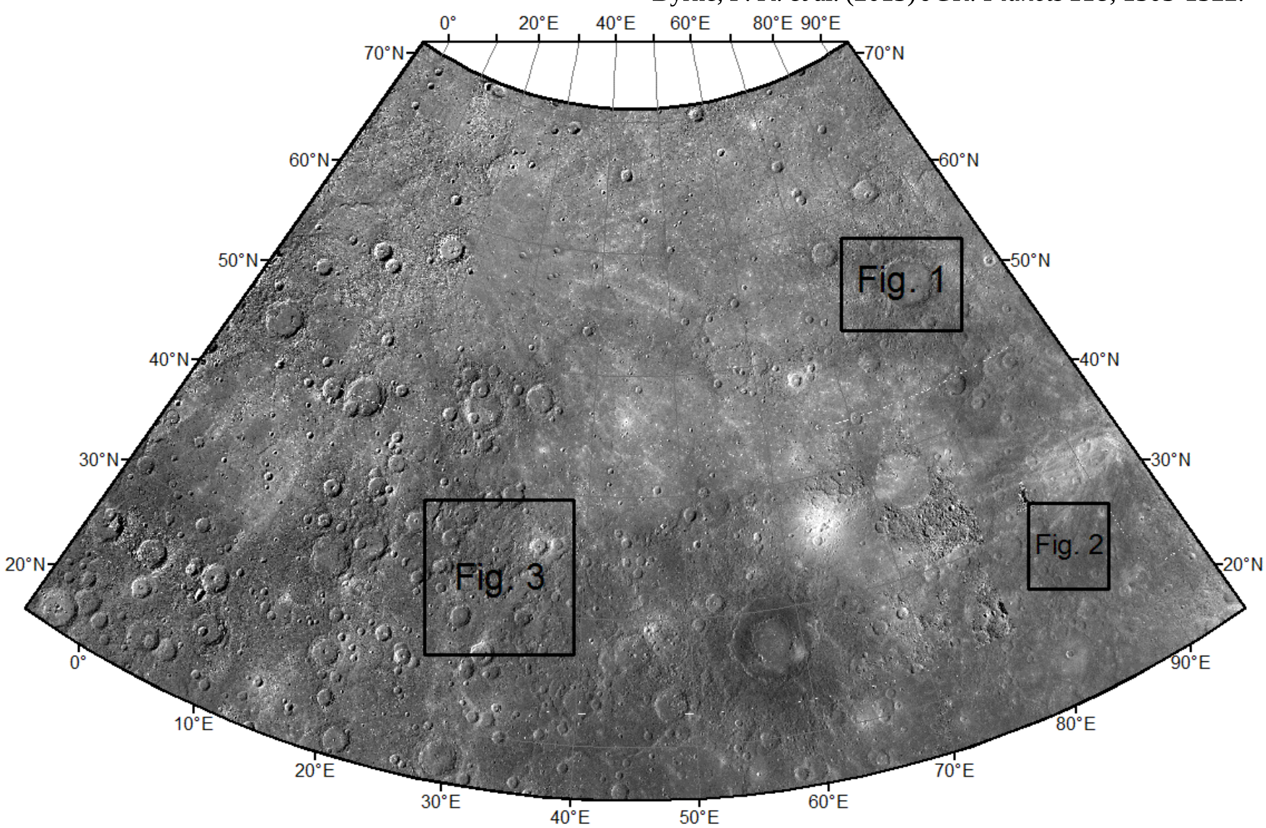

Fig. 4. The basemap of Hokusai with 5° overlap with surrounding quadrangles.