MERGING OF NEW 1:3M MERCURY GEOLOGIC MAPS AT NORTHERN MID-LATITUDES: STATUS REPORT. V. Galluzzi[1], L. Guzzetta[1], P. Mancinelli[2], L. Giacomini[3], L. Ferranti[4], M. Massironi[3], P. Palumbo[1,5], C. Pauselli[2] and D. A. Rothery[6], [1]INAF, Istituto di Astrofisica e Planetologia Spaziali, Rome IT (valentina.galluzzi@iaps.inaf.it), [2]Dipartimento di Fisica e Geologia, Università degli Studi di Perugia, Perugia IT, [3]Dipartimento di Geoscienze, Università degli Studi di Padova, Padua IT, [4]DiSTAR, Università degli Studi di Napoli "Federico II", Naples IT, [5]Dipartimento di Scienze e Teconologie, Università degli Studi di Napoli "Parthenope", Naples IT, [6]Department of Physical Sciences, The Open University, Milton Keynes UK.

Introduction: Planetary geological mapping is key to understanding planetary surface processes, dynamics and age correlations. After the end of Mariner 10 mission a 1:5M geologic map of seven of the fifteen quadrangles of Mercury [1], [2] (and references therein) was produced. MESSENGER (MErcury Surface, Space ENvironment, GEochemistry and Ranging) mission filled the gap by imaging 100% of the planet with a frame resolution up to 8 mpp (meters per pixel) at the north pole, and a global average resolution of 200 mpp. At a global scale, maps showing smooth plains [3], faults [4], volcanic features [5] were published, and a global 1:15M geologic map is going to be published by [6]. However, MESSENGER MDIS (Mercury Dual Imaging System) images would permit mapping at an average scale of ~1:400k, see [7], thus allowing a final output of at least 1:3M (according to USGS mapping standards). Despite the quality gap between Mariner 10 images and MESSENGER images, no global geological mapping project with a scale larger than 1:5M has been proposed so far. Here we present the status of an ongoing project for the geologic mapping of Mercury at an average output scale of 1:3M based on the available MESSENGER data, in preparation for the ESA/JAXA (European Space Agency, Japan Aerospace Agency) BepiColombo mission.

Produced geologic maps: The area between longitudes 90°E and 360°E and latitudes -22.5°N and 70°N encompasses the Victoria (H02), Shakespeare (H03), Raditladi (H04) and Kuiper (H06) quadrangles that were mapped or are still being mapped at an average mapping scale of ~1:400k with the aim of a final output at ~1:3M (e.g. [8], [9]) and are thus compatible for merging. The merged geologic map presented here in figure 1 is the result of the following works.

H02 - Victoria quadrangle. This quadrangle (270°E – 360°E; 22.5°N – 65°N) mapped by [8] is characterized by the presence of the Northern Smooth Plains unit in its north-eastern area and a large extent of Intercrater Plains interrupted by patches of Intermediate Plains. In addition to these, H02 is characterized by two main non-parallel fault systems [10], one of which is the Victoria Rupes – Endeavour Rupes – Antoniadi Dorsum array described in [4] and [8]. Mapping based on Mariner 10 images at 1:5M scale [11], covered only ~40% of the area.

H03 - Shakespeare quadrangle. This quadrangle (180°E – 270°E; 22.5°N – 65°N) is almost totally covered by the previous 1:5M geologic map by [12]. Currently, it is being mapped [13] on the same basis as the work done for H02. It encompasses the eastern part of the Caloris Basin and so includes all the units related to the Caloris impact event and subsequent volcanism. In its eastern part, a NE-SW striking fault system is probably the continuation of one of the H02 fault systems.

H04 - Raditladi quadrangle. This quadrangle (90°E – 180°E; 22.5°N – 65°N) was only partially covered to the east by a prosecution of the Mariner 10 H03 map [12]. Later, it was partially mapped by [14] in a detailed investigation of the Raditladi basin. The H04 map merged in figure 1 was done by [9]. It encompasses a large portion of the Caloris Basin, volcanic deposits with flow features in the north-western region, wide Smooth Plains deposits surround-ing and filling the Caloris basin and older intercrater plains and it is thus important to match the units mapped in H03.

H06 - Kuiper quadrangle. This quadrangle (288°E – 360°E; -22.5°N – 22.5°N) was previously mapped by [15] for its most part, and it is now being mapped in more detail starting from its western area [16]. The mapped region is characterized by a predominance of smooth plains emplaced on the larger crater floor, and thrusts, showing a preferential NNW-SSE orientation in the eastern part of the quadrangle.

Methods: The produced geologic maps were merged using the ESRI ArcGIS software and use a Mercury datum of 2440 km radius. Originally, the maps were produced in Lambert Conformal Conic projection (H02, H03 and H04) or equirectangular projection (H06). To allow these to be merged, we reprojected the feature datasets to a common equirectangular projection so we could work on quadrangle boundaries to adjust discontinuous contacts. Contact discrepancies were reviewed and discussed among the mappers of adjoining quadrangles in order to match the geological interpretation and provide a unique consitent stratigraphy.

Future work: All the merged quadrangles show craters larger than 20 km classified into three morpho-

stratigraphic classes [8], based on local observations and on the fact that at this mapping scale, several issues arose when using a higher number of classes, e.g. [17]. This preliminary classification is based on both crater degradation morphology and crater superposition relationships in order to assess the relative age of impact events.

Conclusions: At this stage, ~20% of Mercury is now covered by 1:3M geologic mapping. Our completion of the H06 quadrangle and current work on H05 by [18] will extend the coverage to ~34%. This project will lead to a fuller grasp of the planet's stratigraphy and surface history. Completing such a product for Mercury is an important goal in preparation for the forthcoming ESA/JAXA BepiColombo mission to aid selection of scientific targets and to provide context for interpretation of new data.

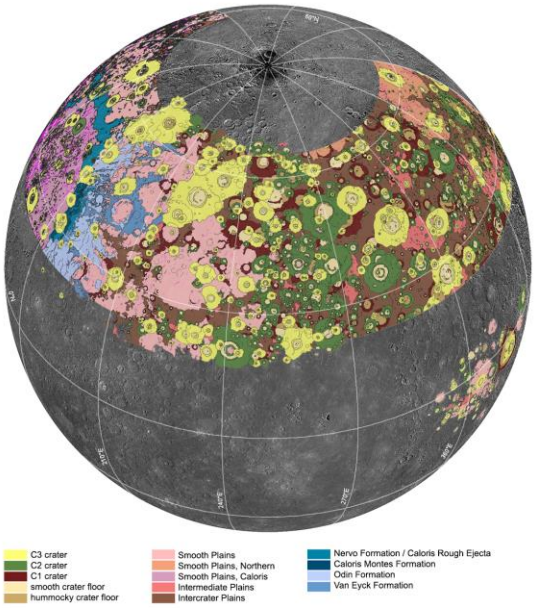

Figure 1: Geologic maps of the H02, H03, H04 and H06 quadrangles merged together and displayed in orthographic projection centered at lon. 250°E and lat. 40°N.

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