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Geology and Stratigraphy of Four Candidate Pyroclastic Deposits on Mercury

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The MESSENGER (Mercury Surface, Space Environment, Geochemistry, and Ranging) spacecraft [1] to Mercury revealed numerous new findings, including the discovery of potential pyroclastic deposits [2-9]. Besides impact cratering, volcanic processes, including the deposition of pyroclastic materials are among the most important processes to shape the surface of a planet. Volcanic processes allow us to study the thermal evolution of the planet, and impacts provide insights into the composition of the crust, and possible the mantle.

In this study we focus on four specific examples of potential pyroclastic deposits: Lermontov NE (-48.15°E, 15.80°), Lermontov SE (-49.08°E, 15.04°), Glinka (-112.42°E, 15.01°), and Unnamed crater 7 (88.20°E, 32.40°). For our investigation we used data of the Mercury Dual Imaging System (MDIS) [10]. In particular we studied narrow-angle Camera (NAC) images with a resolution of 25-100 m/pixel and wide-angle camera (WAC) images with a resolution of about 170-250 m/pixel. Our data set is complemented by Digital Terrain Models (DTM) based on photogrammetric analyses of stereo images [11].

The objectives of this study are to investigate the geologic context of the pyroclastic deposits, to map their morphological/compositional sub-units in detail, to derive volume estimates for these deposits, to study their eruption conditions, and to derive information on the timing of the emplacement of these units. In addition, absolute model ages are determined to develop a stratigraphy of the mapped units

Several morphologic features were observed in association with the pyroclastic deposits, including lobate scarps, melt pools, and large irregular depressions, as well as small-scale irregularly shaped, shallow, rimless depressions, i.e. hollows [2]. In Lermontov, the large irregular depressions that can be plausibly interpreted as vent structures [6,7] occur within a roughly circular depression of about 50 km in diameter, located in the center of the floor of Lermontov. Because of the hilly terrain, multiple volcanic processes might have led to the formation of these structures. Crater counts for Lermontov yielded absolute model ages between 3.79 (+0.03/-0.03) Ga and 4.01 (+0.02/-0.03) Ga and for Glinka between 3.20 (+0.15/-0.39) Ga and 4.00 (+0.04/-0.07) Ga.

[1] Solomon, S.C. et al. (2008) Science 321, 59–62. [2] Blewett, D.T. et al. (2009a) Earth Planet. Sci. Lett. 285, 263–271. [3] Blewett, D.T. et al. (2009b) Lunar Planet. Sci. Conf. 40 (abstract 1793). [4] Head, J.W. et al. (2008) Science 321, 69–72. [5] Head, J.W. et al. (2009) Earth Planet. Sci. Lett. 285, 227–242. [6] Kerber, L. et al. (2009) Earth Planet. Sci. Lett. 285, 263–271. [7] Kerber, L. et al. (2011) Planet. Space Sci., 59, 1895-1909. [8] Murchie, S.L. et al. (2008) Science 321, 73–76. [9] Robinson, M.S. et al. (2008) Science 321, 66–69. [10] Head, J.W. et al. (2011) Science 333, 1853-1856. [11] Preusker, F. et al. (2011) Planet. Space Sci. 59, 1910-1917.