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Dating tectonic structures on Mercury: new clues to understand the planet's thermal evolution

Lorenza Giacomini (1), Matteo Massironi (2), Simone Marchi (3), Caleb I. Fassett (4), Gaetano Di Achille (5), and Gabriele Cremonese (6)

(1) Università degli Studi di Padova, C.I.S.A.S., Padova, Italy (lorenza.giacomini@unipd.it), (2) Università degli Studi di Padova, Dipartimento di Geoscienze, Padova, Italy, (3) NASA Lunar Science Institute Center for Lunar Origin and Evolution, Boulder, USA, (4) Mount Holyoke College, Department of Astronomy, South Hadley, USA, (5) Istituto Nazionale di Astrofisica, Osservatorio Astronomico di Capodimonte, Napoli, Italy, (6) Istituto Nazionale di Astrofisica, Osservatorio Astronomico di Padova, Padova, Italy

The global tectonic scenario of Mercury is dominated by contractional features mainly represented by lobate scarps and related to planetary cooling (Watters et al., 1998, Geology, 26, 991–994). Topography of lobate scarps on Mercury: New constraints on the planet's contraction. These structures are the expression of surface-breaking thrust faults and are linear or arcuate features widely distributed on Mercury. Since they display a broad distribution of orientations, lobate scarps are thought to be related to a global contractional strain. The MESSENGER MDIS camera (with a wide-angle and a narrow-angle channels), acquired images of new regions of the Mercury surface that allowed us to detect several new lobate scarps especially where the illumination geometry is more favorable for structural analysis. Among them a 2000-km long thrust system, located between 80° and 100°E of longitude, has been detected. This system consists of several lobate scarps all exhibiting a N-S orientation and a westward vergence. Due to its considerable extension, this feature can give clues to the stress field affecting the surface in a wide sector of the planet. Dating these features and comparing the results with independent age determinations, and structural and stratigraphic evidences might concur to further constrain the age of tectonic deformation on Mercury and possibly increase our knowledge on the thermal evolution of the planet. The dating of the system was performed with different methods. Indeed, traditional stratigraphic study was accompanied by crater counts of geological units overlapping the thrust and the buffered crater counting technique, allowing us to determine an absolute model age determination for the tectonic feature. The employment of these different methods gave consistent results suggesting that thrust activity ended between 3.7-3.8 Ga, with Neukum Production Function (NPF), and 3.5-3.7 Ga, with Model Production Function (MPF), respectively.