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DTM analysis and displacement estimates of a major mercurian lobate scarp.

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During its second and third flybys, the MErcury Surface Space ENvironment GEochemistry and Ranging (MESSENGER) mission imaged a new large and well-preserved basin called Rembrandt Basin (Watters et al., 2009, Science) in Mercury's southern hemisphere. This basin is a 715-km-diameter impact feature which displays a distinct hummocky rim broken up by the presence of several large impact craters. Its interior is partially filled by volcanic materials, that extend up to the southern, eastern and part of the western rims, and is crossed by the 1000-km long homonymous lobate scarp. In attempt to reveal the basin-scarp complex evolution, we used MESSENGER Mercury Dual Imaging System (MDIS) mosaics to map the basin geological domains - inferring where possible their stratigraphic relationships, and fix the tectonic patterns. In contrast to other well-seen basins, Rembrandt displays evidence of global-scale in addition to basin-localized deformation that in some cases may be controlled by rheological layering within the crust. Extensional features are essentially radial and confined to the inner part, displaying one or more uplifts episodes that follow the impact. The widespread wrinkle ridges form a polygonal pattern of radial and concentric features on the whole floor, probably due to one or more near-surface compressional stages. On the other hand, Rembrandt scarp seems to be clearly unrelated to the basin formation stage and rather belonging to a global process like cooling contraction and/or tidal despinning of the planet. The main compressional phase responsible of the overall scarp build-up was followed by minor compressional structures detected within younger craters in turn cutting the main scarp. This suggests a prolonged slowing down phase of a global tectonic process. The whole feature displays an unusual transpressional nature for a common lobate scarp. Then we performed a structural and kinematic analysis subdividing the main feature into three branches: the southern one with clear evidences of a right-lateral strike slip movement acting together with an inverse kinematics, the northern one with the left-lateral component recorded on a prominent pop-up structure, and the central sector without any evidence of strike slip movements. The Digital Terrain Models of Preusker et al. (2011, PSS) help us to reconstruct the deformation, assessing the displacements along the three branches and considering different fault attitudes in depth.