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MPF model ages of the Rembrandt basin and scarp system, Mercury.

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The 715-km-diameter Rembrandt basin is the largest well-preserved impact feature of the southern hemisphere of Mercury [1] (Fig. 1), and was imaged for the first time during the second flyby of the MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) mission [2]. Much of the basin interior is covered by smooth, high-reflectance plains interpreted to be of volcanic origin [1-3] that host sets of contractional and extensional tectonic structures. Notably, Rembrandt basin and its smooth plains are cross-cut by a 1,000-km-long reverse fault system [1-5] that trends ∼E–W, bending toward the north within the basin. The individual faults of this system accommodated crustal shortening that resulted from global contraction as Mercury's interior cooled [1]. The current shape of the reverse fault system may have been influenced by the formation of the Rembrandt basin [5].
The emplacement of the interior smooth plains predates both the basin-related tectonism and the final development of the giant scarp, which is suggestive of either short-lived volcanic activity immediately after basin formation or a later volcanic phase set against prolonged tectonic activity.
In order to quantify the duration of volcanic and tectonic activity in and around Rembrandt basin, we determined the crater count-derived ages of the involved terrains by means of the Model Production Function (MPF) chronology of Mercury [6-8], which is rely on the knowledge of the impactors flux on the planet. Crater chronology allowed us to constrain the Rembrandt basin formation to the early Calorian period and a widespread resurfacing up to 3.5 Ga ago. The volcanic activity affected both the basin and its surroundings, but ended prior to some basin-related and regional faulting. Hence, if the giant scarp begun to develop even before the basin formation (as suggested by its length-displacement profile across the basin itself, [5]) the regional tectonic activity along this structure might have started even before the Late Heavy Bombardment period and lasted for more than 300 Ma, when the volcanic activity in this part of hermean surface was already accomplished.

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