MESSENGER discovers an unusual impact basin on Mercury

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A previously unknown, large impact basin has been discovered by the MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) spacecraft during its second flyby of Mercury in October 2008. The impact basin, now named Rembrandt, more than 700 kilometers (430 miles) in diameter. If the Rembrandt basin had formed on the east coast of the United States, it would span the distance between Washington, D.C., and Boston.

Large impact basins are important landforms created by the collision of asteroid-scale objects early in planetary history. The Rembrandt basin formed about 3.9 billion years ago, near the end of the period of heavy bombardment of the inner Solar System. Although ancient, the Rembrandt basin is younger than most other known impact basins on Mercury.

"This is the first time we have seen terrain exposed on the floor of an impact basin on Mercury that is preserved from when it formed," said Thomas Watters of the Center for Earth and Planetary Studies at the Smithsonian's National Air and Space Museum, lead author of a new report on the findings in the journal *Science*. "Terrain like this is usually completely buried by volcanic flows."

Ancient impact basins are typically flooded and nearly or completely filled by volcanic flows. The Rembrandt basin is the only known impact basin on Mercury that has not been largely filled in. Another remarkable aspect of the Rembrandt basin is the pattern of tectonic landforms that

deformed the volcanic flows filling the central area of the basin—landforms created by tectonic forces. Thick sequences of volcanic flows on the basin floor led to subsidence and contraction that formed ridges. The floor was also uplifted, leading to extension and the formation of troughs. Ridges and troughs form a "wheel-and-spoke-like" pattern.

"The pattern of tectonic landforms in the Rembrandt basin is truly extraordinary," said Watters. "It is unlike anything we have seen before in other impact basins on Mercury, the Moon or Mars, or in basins formed on the icy moons of the outer planets."

This pattern of tectonic landforms and the superposition relations they have with one another suggest multiple stages of volcanic and tectonic activity in the Rembrandt basin. The most recent tectonic event in Rembrandt was the formation of a large thrust-fault scarp more than 1,000 kilometers (620 miles) long.

"This amazing thrust fault is on the scale of the San Andreas fault in California, and it cuts across the rim and floor of the Rembrandt basin," said Watters. "It is the longest thrust-fault scarp yet discovered on Mercury. Such thrust faults formed as a consequence of interior cooling and global contraction of the planet."

Source: Smithsonian (news : web)