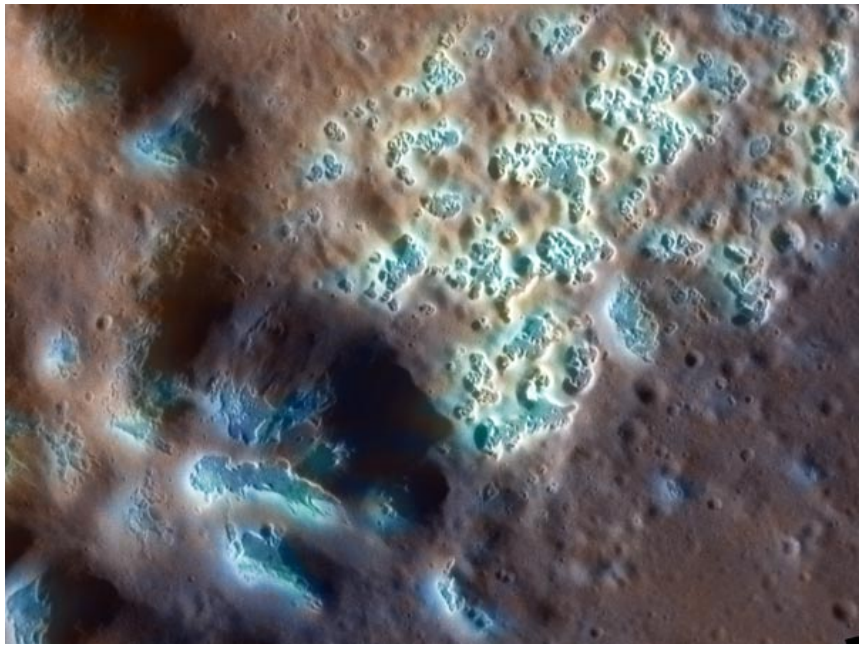
Recent Surface Changes on Mercury?

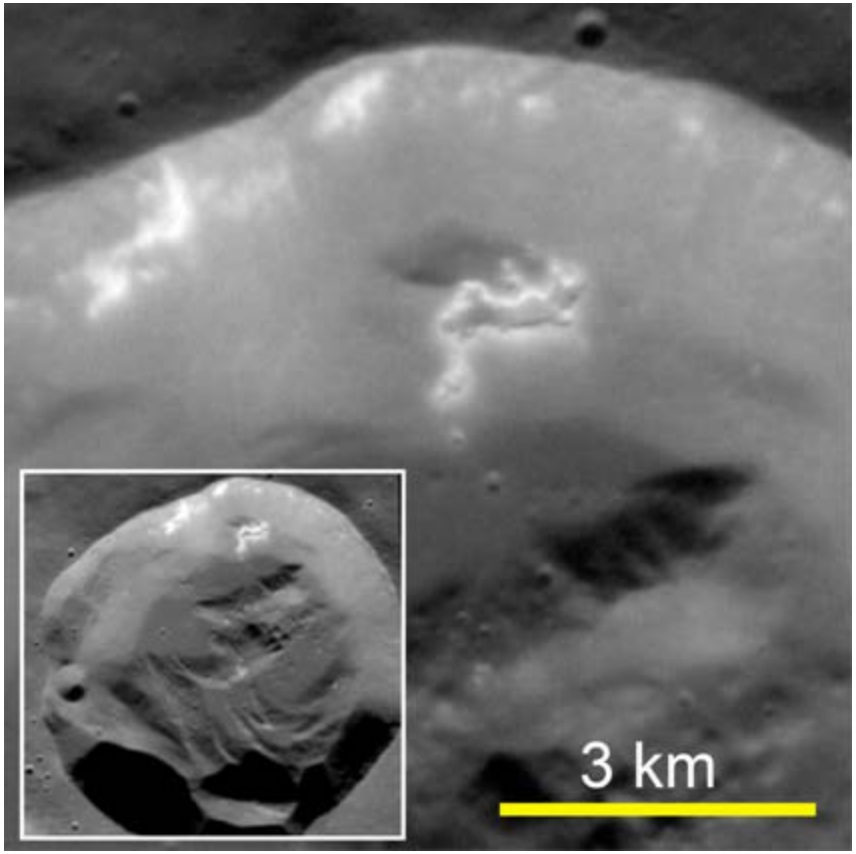
- Due to its small size, Mercury was thought to be geologically ‘dead’ today, except for ongoing impact cratering
- Close-up images from NASA’s *MESSENGER* spacecraft show that some impact craters contain bright shallow depressions, which scientists have named ‘hollows’
- The hollows must have formed recently, since they have accumulated few impacts
- Such features have never been seen elsewhere, and the process responsible for their formation remains a mystery



MESSENGER *enhanced-color image of a portion of the Raditladi impact basinon Mercury. The bright, bluish areas are composed of irregular pit-like depressions (hollows). The pits may be actively forming today.*

A More “Volatile” World Than Expected

- The hollows are found mostly within impact craters, in rocks likely brought up to the surface by an impact event
- Scientists think that these rocks contain abundant *volatile* elements (material that vaporizes easily). *MESSENGER* has measured more volatile elements on Mercury than the Moon.
- High surface temperatures and intense bombardment by the solar wind and micrometeoroids may slowly allow the volatiles to escape the rocks as gas, leading to collapse of the remaining rock



Small hollows on the Sun-facing wall of a 15-km diameter crater. Exposure to the harsh space environment at Mercury is probably responsible for formation of the hollows.

The Big Picture

- Mercury was expected to form with few volatile elements because the high temperatures close to the Sun should have kept them gaseous, preventing them from being incorporated in the solid material that formed the planet

- But this and other *MESSENGER* results indicate that Mercury has a surprisingly large abundance of volatiles. How did they get there?

- These findings suggest that our ideas about the formation of the planets and the early Solar System need to be revised

Painting by William K. Hartmann depicting the early Sun and formation of the planets.

MESSENGER *results imply that materials originating at different distances from the Sun were mixed extensively to form the planets.*

For more information…

Press

- *New Scientist* – Sept. 29, 2011 - “Bright 'hollows' on Mercury are unique in solar system”
  http://www.newscientist.com/article/dn20985-bright-hollows-on-mercury-are-unique-to-solar-system.html
- *BBC News* – Sept. 30, 2011 – “’Hollows’ mark Mercury’s surface”
  http://www.bbc.co.uk/news/science-environment-15113388

Images

- Slide 1 image courtesy NASA / APL / Carnegie Institute
  http://photojournal.jpl.nasa.gov/catalog/PIA14856
- Slide 2 image from the source article
- Slide 3 image courtesy William K. Hartmann
  http://www.psi.edu/~hartmann/catalog/catalog1.html

Source Articles (on-campus login may be required to access journals)

- D.T. Blewett et al., 'Hollows on Mercury: MESSENGER Evidence for Geologically Recent Volatile-Related Activity', *Science*, **333** (no. 6051), p. 1856-1859, DOI: 10.1126/science.1211681, 2011.
  http://www.sciencemag.org/content/333/6051/1856.full?sid=283c8d6d-fb4e-4ae5-8004-39ec247764e9

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