Mercury studies reveal an intriguing target for BepiColombo

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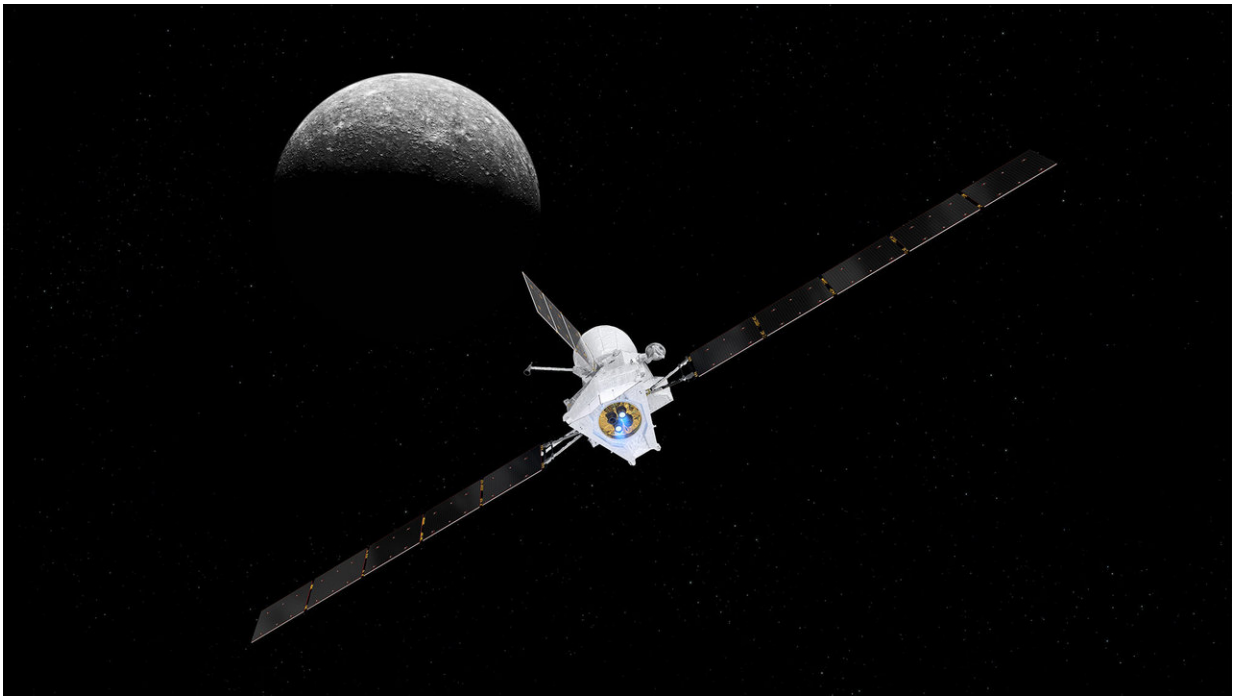


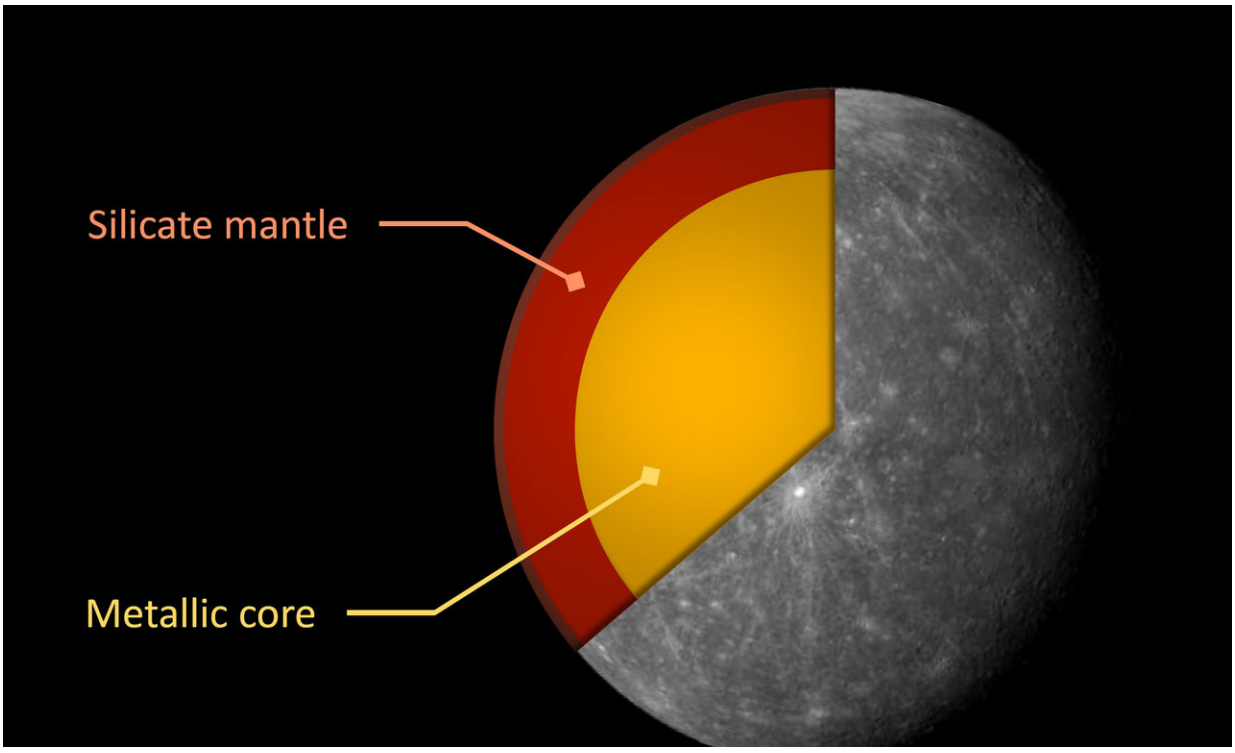
BepiColombo approaching Mercury. Credit: ESA/ATG medialab, NASA/JPL

A month before the planned launch of the joint ESA-JAXA BepiColombo mission to Mercury, two new studies shed light on when the innermost planet formed and the puzzle of its chemical composition. The findings will be presented by Bastien Brugger and Thomas Ronnet at the European Planetary Science Congress (EPSC) 2018 in Berlin.

Mercury is the least-studied of the terrestrial planets and is something of an anomaly compared to Venus, Earth and Mars. It is very small, very dense, has an oversized molten core, and formed under chemical conditions that mean it contains much less oxidized material than its neighbouring planets.

Research by a team at the University of Aix Marseille suggests that two factors may help explain why Mercury is so strange. Firstly, the planet may have formed very early in the Solar System's history from condensed vapour from planetesimals. Secondly, that there may be more iron within Mercury's mantle than might be suggested by measurements of the surface.

"We think that very early in the Solar System, planetesimals in the innermost region of the Solar System could have formed from reprocessed material that was vaporized due to the extreme temperature there and subsequently recondensed," said Ronnet. "In addition, we are able to rule out a scenario where Mercury formed from a pile-up of planetesimals coming from further out in the Solar System since, in this case, Mercury would contain more oxidized material than we actually find."



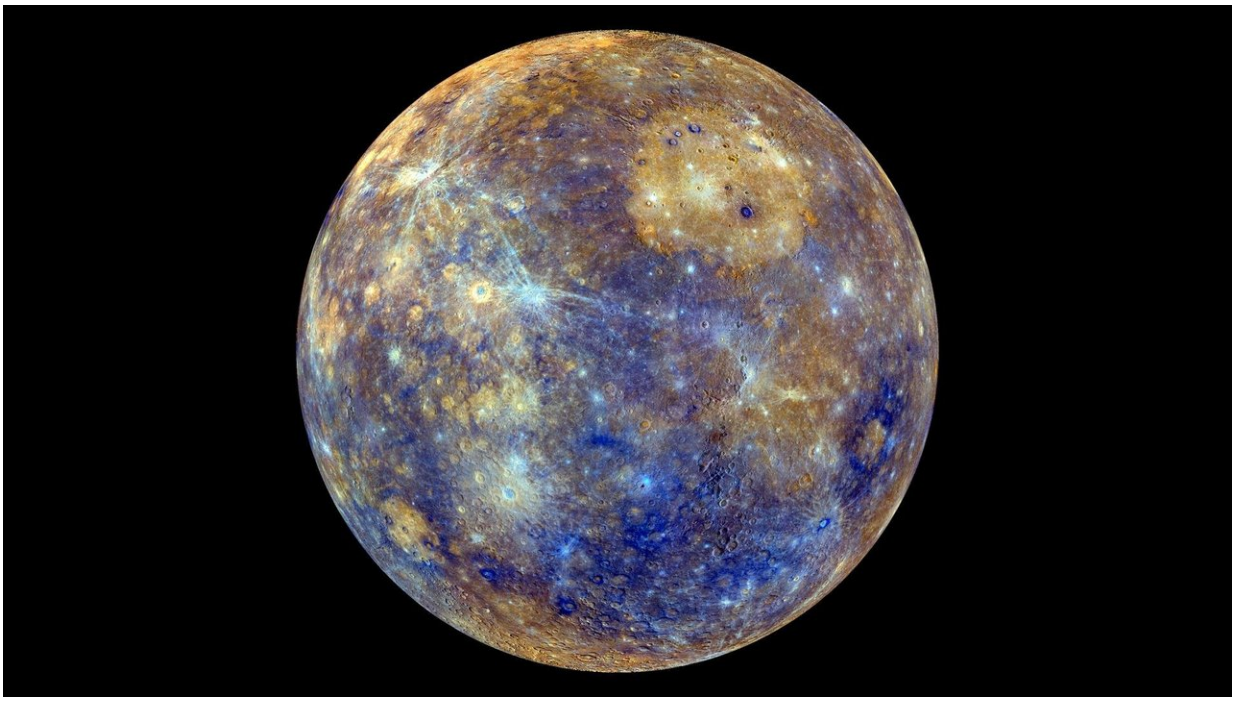
Interior of Mercury. Credit: Brugger/ University of Aix Marseille/NASA/JPL/JHU-APL

Early studies have suggested that Mercury is very rich in iron, and contains more sulphur than should be available in the material from which the bulk of the Solar System formed. Since then, the MESSENGER mission has greatly improved our view of the bulk composition of Mercury.

Brugger ran computer simulations of Mercury's interior investigating core and mantle compositions and compared the results with gravity data gathered by the MESSENGER mission. The results suggest that Mercury has a dense mantle that may contain substantial amounts of iron.

"MESSENGER revealed very low abundances of silicate iron on the

surface of Mercury, and this element would instead be present in metallic or sulphide phases. Our study suggests that iron abundances in the mantle could be higher than values measured on the surface," said Brugger. "With the launch of BepiColombo, we will have a whole new suite of instruments to continue the investigation of Mercury's unique properties, and try to better understand the structure and origin of the planet."



False colour image of Mercury to enhance the chemical, mineralogical, and physical differences between the rocks that make up Mercury's surface. Credit: NASA/JHU-APL/Carnegie Institution of Washington

BepiColombo is Europe's first mission to Mercury. It is a joint endeavour between ESA and the Japan Aerospace Exploration Agency, JAXA, and consists of two scientific orbiters: ESA's Mercury Planetary

Orbiter and JAXA's Mercury Magnetospheric Orbiter. They will be carried on a seven year journey to the innermost planet by the Mercury Transfer Module, using a combination of ion propulsion and gravity assist flybys at Earth, Venus and Mercury. The mission will study all aspects of Mercury, building on the achievements of MESSENGER to provide the best understanding of the Solar System's innermost planet to date.

Provided by Europlanet