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By: Gabriel Gache, Science News Editor

Mercury's surface appears to have been influenced by volcanic activity, shows a low iron content
NASA

Mystery behind Mercury Halfway Solved

Surface influenced by volcanic activity, but low in iron content

Multispectral imaging data collected by NASA's MESSENGER spacecraft during its first fly-by in January this year reveals that volcanism was one of the essential factors that contributed to the shaping of the surface of Mercury. The spacecraft was able to distinguish surface rock units that have been linked to lava flows, volcanoes and other geological features, as well as to confirm that many of the rocks on the surface are low in iron concentrations.The Mercury Surface, Space Environment, Geochemistry and Ranging spacecraft is the second mission in history to visit the closest planet to the Sun - following the Mariner 10, which executed three fly-bys through the vicinity of Mercury between 1974 and 1975 - and will enter orbit around the planet in 2011 after two more fly-bys, one in October this year and the next in September 2009."We have now imaged half of the part of Mercury that was never seen by Mariner 10. The picture is still incomplete, but we'll get the other half on October 6th," said Mark S. Robinson of the Arizona State University, the author of the paper detailing the new findings.Due to the fact that Mariner 10 was able to make only three fly-bys around Mercury, it photographed just under half of the surface of the planet, which means that until January when the MESSENGER spacecraft executed its first fly-by, more than half of the surface of Mercury was unknown, making it the least studied planet in the solar system.According to Robinson, the surface of Mercury appears to be rather similar to that of the Moon due to craters left behind by multiple impacts, but in fact most of it was reshaped by volcanic activity. "For example, according to our color data the Caloris impact basin is completely filled with smooth plains material that appears volcanic in origin. In shape and form these deposits are very similar to the mare basalt flows on the Moon. But unlike the Moon, Mercury's smooth plains are low in iron, and thus represent a relatively unusual rock type," Robinson said.Additionally, the Caloris seems to contain so-called 'red spots' with diffuse boundaries or found in rimless depressions, which appear to be the result of explosive pyroclastic eruptions."We mapped the new hemisphere using moderate resolution images of 5 kilometers per pixel. As on the Mariner hemisphere, we saw three major units defined by their colors. These units are relatively high-reflectance smooth plains, average cratered terrain, and low-reflectance material. It's an important and widespread rock that occurs deep in the crust as well as at the surface, yet it has very little ferrous iron in its silicate minerals," Robinson explained.What is strange is that usually low-reflectance volcanic material has high contents of iron-bearing silicate minerals, which does not appear to be true in the case of Mercury. One explanation for the apparent low concentration of iron in surface rocks is that it may be shadowed by other chemical compounds like ilmenite, for example. Learning about the history of a planet is actually a quest to find out more about the minerals trapped in its crust and mantle, says Robinson, but since the possibility of returning samples from the surface is currently out of the question, the best we can do for now is to make use of the available tools."Right now, it looks as if Mercury formed with a deficiency in ferrous iron. But we'll know more about its bulk composition, and thus its history, once MESSENGER gets into orbit in 2011. That's when the surface rocks can be studied much more closely, using the full set of instruments," he added.

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