Characterizing the surface composition of Mercury

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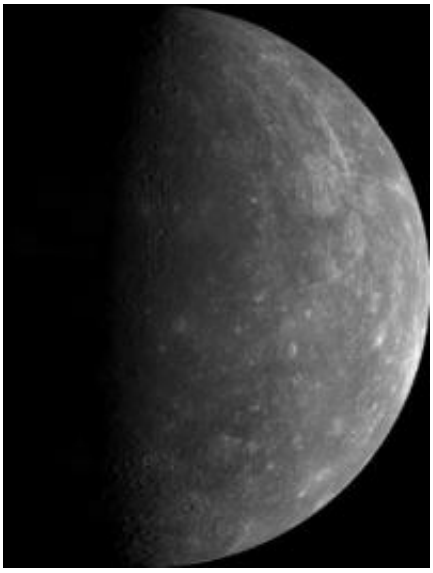

Mercury. Credit: NASA

The MESSENGER spacecraft, which has been orbiting Mercury since March 2011, has been revealing new information about the surface chemistry and geological history of the innermost planet in the solar system.

Weider et al. recently analyzed 205 measurements of the surface composition from MESSENGER's X-ray spectrometer, focusing on the large expanse of smooth volcanic plains at high northern latitudes and surrounding areas that are higher in crater density and therefore older

than the northern plains.

In general, the measurements show that Mercury's surface composition is very different from that of other planets in the solar system. It is dominated by minerals high in magnesium and enriched in sulfur. This composition is similar to that expected from partial melts of enstatite chondrites, a rare type of meteorite that formed at high temperatures in highly reducing (low oxygen) conditions in the inner solar system.

In addition, the researchers find that the composition of Mercury's northern plains deposits differs from that of the surrounding older terrain. In particular, the older terrain has higher ratios of magnesium to silicon, sulfur to silicon, and calcium to silicon, but lower ratios of aluminum to silicon. These differences suggest that the smooth plains material erupted from a magma source that was chemically different from the source of the material in the older regions. Future studies will help constrain further the formation and geological history of Mercury.

More information: Chemical heterogeneity on Mercury's surface revealed by the MESSENGER X-Ray Spectrometer *Journal of Geophysical Research-Planets*, doi:10.1029/2012JE004153

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