Mercury’s Caloris basin rim

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Part of the southern rim of the Caloris basin (field of view 1080 km across)

Project highlights:
- Is the rim of Mercury’s largest impact basin as unusual as it seems?
- What controls its form?
- Most suitable for a geoscience graduate with GIS skills
- Working with science team members of an active planetary orbital mission

Project description:

The 1550 km diameter Caloris basin is Mercury’s largest well-preserved impact basin and is an exemplar for the study of basin formation. The Caloris floor is hidden, having been completely flooded by plains lavas soon after formation, but the basin rim is well seen around most of the circumference. This rim is remarkable for its locally stepwise form including re-entrants on a scale of about 20 km to 200 km. We want to establish how much of this has been inherited from the excavation stage of basin formation versus how much of it results from collapse of portions of the original rim (the modification stage of crater formation) or from even later volcano-tectonic events.

Stepwise forms are lacking in the rims of smaller basins on Mercury. The Moon’s multiringed Orientale basin has been suggested as a possible analogue, but the comparison does not bear close scrutiny. A student with modelling skills could make much if this, but the project does not have to go in that direction.
In this project, the student will be tasked with mapping most informative parts of the Caloris rim using ArcPro GIS software and making comparisons with the rims of other basins. Initial work will be with imagery from NASA’s 2011-2015 MESSENGER mission, but 18 months into the project we anticipate new and better data from ESA’s BepiColombo planetary orbiter. Supervisors have close links with the BepiColombo team, and the lead supervisor heads ESA’s Mercury Surface & Composition Working Group.

Candidates with experience in GIS and geological mapping in the field on Earth are especially encouraged to apply. Additional background in planetary science would be an advantage but is not essential.

References:


