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Institut des Sciences de la Terre

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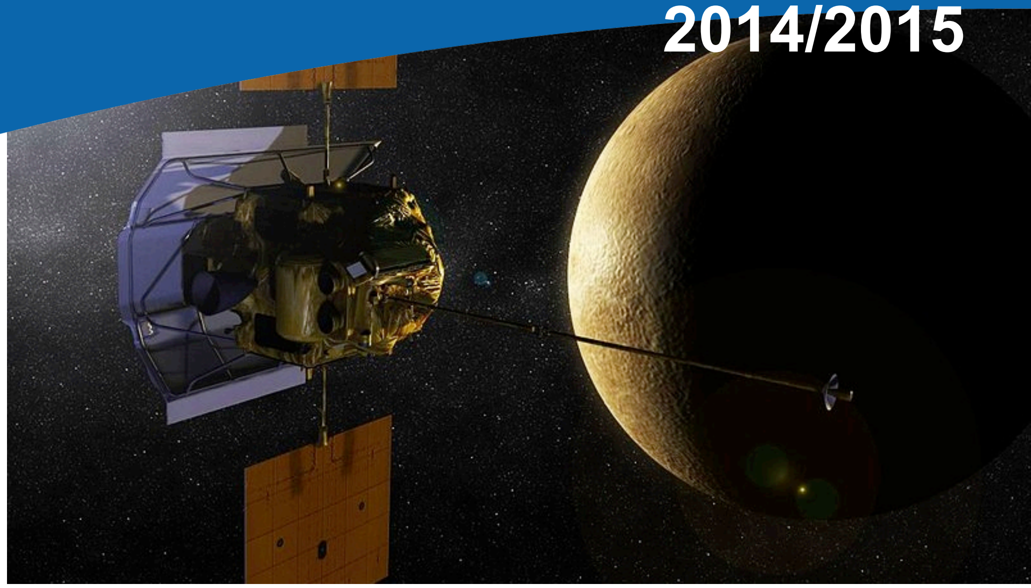

The interior structure of Mercury and the convection regime in its fluid core: constraints from gravity and rotation observations

Mathieu DUMBERRY

University of Alberta, Edmonton, Canada

Mercury, the closest planet to the Sun, remains enigmatic. First, its large mean density suggests that the radius of its metallic core is approximately 4/5th of the planetary radius, a ratio much larger than for other Terrestrial planets. Second, one may expect Mercury's core to have fully solidified by now from heat loss through its thin silicate (mantle) shell; yet, we now know that the outermost part of the core is fluid. Third, Mercury has a global, dipole-dominated magnetic field (most likely powered by convection in the fluid core), although its strength is approximately 100 times smaller than that of Earth. The dynamo mechanism that can generate such a field has not yet been fully elucidated. Mercury's dynamo is intimately connected to its convection regime, which may contain exotic features such as precipitating Iron snow in parts or in all of the fluid core. In this talk, I will review our current understanding on these topics and how observations from the MESSENGER spacecraft -- currently in orbit around Mercury -- can help us unravel some of these mysteries. I will also show how information on Mercury's gravity field and rotation can be combined to yield constraints on its interior structure, including the size of its solid inner core. The latter is tied to the temperature gradient inside the planet and can inform us on the convection regime. At that best fit of gravity and rotation observations, convection tend to feature Iron snow forming in parts of, if not everywhere within, the fluid core. How the convective dynamics associated with snow formation can maintain a dipole dominated field (at least at Mercury's surface) remains an open question.

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Salle de conférences d'ISTerre

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