Geophysical Research Abstracts
Vol. 12, EGU2010-7930, 2010
EGU General Assembly 2010

GAP on EJSM: an accelerometer for accurate gravity and atmospheric measurements of Ganymede

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The Gravity Advanced Package (GAP) is an electrostatic accelerometer with a bias calibration system proposed on EJSM Jupiter Ganymede Orbiter (JGO) for fundamental physics objectives – more precisely for testing the law of gravity at the scale of the solar system – and for planetary objectives.

GAP can provide decisive information during the planetary phase of the mission. During the orbit of JGO around Ganymede or the flyby of Callisto, such an instrument will measure the non-gravitational forces acting on the spacecraft, mainly due to the atmosphere. By combining these measurements with the ones provided by the radio-science instrument, which measures the total acceleration of the spacecraft, the gravitational forces acting on the spacecraft can be derived without using any model of the atmosphere. This is a major contribution of GAP to the mission considering the low altitude and the size of the solar panel, which would otherwise require precise models. Indeed, the presence of the instrument on board would provide data to better understand the atmosphere and the gravity field of Ganymede and Callisto.

This combination of measurements from the accelerometer and from radio-science is similar to what is currently done for determining precise model of the Earth gravity potential with CHAMP, GRACE and GOCE missions. The GAP instrument is proposed by the ONERA team which has already built the 9 accelerometers in orbit for these geodetic missions.

The presentation will describe the scientific objectives of the instrument with a review of the impact of the non-gravitational forces on the gravity measurement of Jupiter's moons. Then, a description of the instrument with its performance will be given, as well as the requirements for its implementation in the spacecraft.