Geophysical Research Abstracts
Vol. 13, EGU2011-1945, 2011
EGU General Assembly 2011

Virtis / Rosetta: temperatures analysis during Lutetia Dynamic Rehearsal as an input in Lutetia Fly-By planning

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The International Rosetta Mission is one of ESA's Planetary Cornerstone Missions. On cruise to the main target (comet 67P/Churyumov-Gerasimenko) the spacecraft has been scheduled for close fly-bys at two main belt asteroids (Steins and Lutetia). Since the Lutetia fly-by geometry would have required a flip in the spacecraft attitude before closest approach which would have implied the illumination of the –X and $\pm$Y panels of the spacecraft including the radiators of some instruments, four months before the actual Lutetia fly-by it has been scheduled a Lutetia Dynamic Rehearsal with the purpose of testing the flight dynamics aspects of the Lutetia fly-by. In addiction payload operations have been allowed to monitor the background (temperatures, pressure, etc.) as a calibration for the asteroid flyby. The attitude of Rosetta during the Lutetia Dynamic Rehearsal was chosen so that the position of the sun as seen from Rosetta was the same as during the Lutetia flyby, the only parameter different being the spacecraft/sun distance. VIRTIS (Visible Infrared Thermal Imaging Spectrometer) carried by the ESA's Rosetta spacecraft is a spectrometer which uses two optical heads (-M,-H), respectively dedicated to the VIS-NIR imaging spectroscopy (250-5000 nm) and infrared spectroscopy (2500-5000 nm) with high spectral resolution. Virtis uses a radiator to keep the spectrometers temperature within the operating range. Usually Virtis radiator has an operative temperature of 135K when facing the deep space. Due to the flip in the spacecraft attitude, the radiator would have been illuminated by the sun (with an angle of about 5 degrees from the normal to the radiator) for about four hours during Lutetia fly-by and would not been able to maintain the nominal temperature. Under these conditions it was expected an increase in the background signal in the thermal IR range (4000-5000 nm). In order to avoid a signal saturation, it was necessary to evaluate with sufficient precision the temperature increases and their effects on the background signal. In this poster we show how, taking into account the different spacecraft/sun distances during Lutetia Dynamic Rehearsal (1.74 AU) and Lutetia fly-by (2.71 AU), it was possible, after an analysis of the temperature diagrams of the Lutetia Dynamic Rehearsal, to predict within one degree the temperature trend during the Lutetia fly-by. Therefore it was possible to properly evaluate the optimum integration time to achieve a good signal without reaching saturation level in the thermal IR range.