Shape and Physical Properties of Asteroid (21) Lutetia from OSIRIS Images

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Abstract

The Rosetta spacecraft of the European Space Agency flew by asteroid (21) Lutetia on July, 10, 2010 on its way to its final target, comet 67P/Churyumov-Gerasimenko. A total of 460 images has been acquired during the flyby with the narrow (NAC) and wide (WAC) angle cameras of the OSIRIS instrument, the NAC pixel scale reaching a minimum value of 60 m at closest approach. Several filters have been used, covering a wavelength range from the far UV ($0.25 \ \mu$m) to the end of the visible spectrum ($1.0 \ \mu$m). The phase angle went through the range $11°$–$0°$–$160°$, the spacecraft reaching opposition 18 min before closest approach.

We will report on the calculation of the three-dimensional high-resolution global shape model of (21) Lutetia using two techniques: stereo-photoclinometry for the regions observed by OSIRIS, complemented by inversion of photometric light curves and adaptive optics profiles for the rest of the surface. This allows us to retrieve the physical properties of this object: volume, moments of inertia, gravity field, local gravitational slopes and rotational parameters. The density is calculated using the mass measured by the radio science experiment (RSI) on board Rosetta. We will further discuss quantitatively the properties of the main geo-morphological features observed at the surface.