**A PORTRAIT OF ASTEROID 21 LUTETIA FROM VISIBLE AND INFRARED OBSERVATIONS WITH GROUND- AND SPACE-BASED TELESCOPES.** P. L. Lamy[1], A. Barucci[2], S. Fornassier[2], G. Faury[1], O. Groussin[1], M. Kaasalainen[3], L. Jorda[1], S. Mottola[4], and I. Toth[5], [1]Laboratoire d'Astrophysique de Marseille, BP8-13376 Marseille Cedex 12, France, [2]LESIA, Observatoire de Paris, 92195 Meudon Principal Cedex, France, [3]Department of Mathematics and Statistics, University of Helsinki, P.O. Box 68, FI-00014 Finland, [4]DLR, Rutherfordstr. 2, D-12489 Berlin, Germany, [5]Konkoly Observatory, Budapest, Hungary.

Asteroid 21 Lutetia is the second target of the Rosetta space mission with a flyby scheduled in June 2010. An early physical characterization, proeminently its shape and rotational state, is needed to optimize the flyby parameters and the science operations, and to maximize the scientific return.

We observed Lutetia with the OSIRIS-NAC camera aboard Rosetta during the cruise phase, and continuously monitored it over ~14 hr on 2-3 January 2007, thus covering 1.7 rotational periods, at a temporal cadence of 34 min. An accurate photometric calibration was obtained from the observations of a solar analog star, 16 Cyg B. At the time of observation, Lutetia was at 2.6 AU from the Sun, 1.6 AU from Rosetta, for a phase angle of 22.4°. The light curve in the R photometric band of the Johnson-Kron-Cousins system has a mean value $R(1,1,\alpha = 22.4°) = 7.99\pm0.01$ and an amplitude of $0.11\pm0.01$ mag.

We performed the simultaneous inversion of several visible light curves relying on convex modeling [1]. The full three-dimensional solution for asteroid 21 Lutetia is illustrated on Fig. 1. Inversion is basically scale-free, and absolute scaling comes from a measurement of its thermal emission with the Spitzer space telescope [2]. We used the infrared spectrograph (IRS) to obtain 14 spectra ranging from 5.2 to 38.0 µm, and sampling the rotational period of the asteroid. The observations were performed on 10-11 December 2005, when the asteroid was 2.81 AU from the Sun, 2.66 AU from the SST, and at a phase angle of 21.1°. They were interpreted using a standard thermal model incorporating the thermal inertia. The solution for a spherical shape leads to an effective radius r=47.5±0.8km and a thermal inertia I<50 MKS, for a beaming factor between 0.8 and 1.0.

By combining ground- and space-based observations obtained at different phase angles, we are able to contruct the phase function using the linear correction and the H-G formalism. The geometric albedo is constrained by visible photometry using a linear phase function. The H-G phase law which includes an opposition effect, leads to larger values of the albedo. Results will be presented.

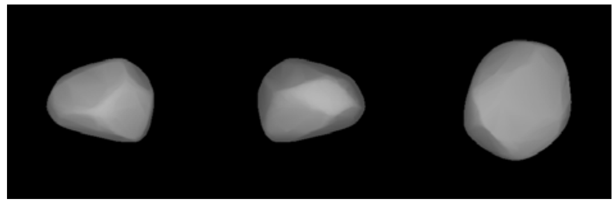

Fig. 1: The shape of asteroid 21 Lutetia reconstructed from the inversion of light curves.

**References:** [1] Torpa et al. , 2003, Icarus 164, 364-383, [2] Lamy, P. L. et al., submitted t to A&A.