Scientific Report
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Purpose of the visit

The visit was divided into two parts – one week in Nice at Observatoire de la Cote d'Azur and one week in Paris at the Paris Observatory, IMCCE. The aim of the visit was to start developing the algorithms for including thermal infrared data into modelling of asteroids (Nice) and to implement these models into the DAMIT (Database of Asteroid Models from Inversion Techniques) and the Miriade ephemeris service (Paris).

Description of the work carried out during the visit

Nice: With Marco Delbo, we started to implement the thermophysical models of asteroids (1D heat diffusion) into the convex inversion algorithm for asteroid shape and spin determination. The results obtained from the inversion of visible and thermal data were promising – we tested the first version of the code and its convergence on synthetic data.

Paris: We continued with the TPM code developing (with Benoit Carry, ESA). The same code used with convex models can be used in nonconvex models that can also include other disk-resolved data such as adaptive optics profiles or occultation silhouettes. We also discussed the possibility to include the HST Fine Guidance Sensor (FGS) interferometry into the code and looked at the archived FGS data (with Daniel Hestroffer and Paolo Tanga).

We discussed the way how to enable an efficient communication between the SSODNet (Solar System Object Database Network) at IMCCE in Paris and the DAMIT on Prague (with Jerome Berthier). The Miriade ephemeris generator will use the shape models from DAMIT and it will provide physical ephemeris including temperature maps.

Description of the main results obtained

We included the TPM modelling into the convex inversion code. The code was tested on synthetic data and the results were promising. It is necessary to carry on other tests of convergence and the uniqueness and stability of the solution on real data.

Future collaboration with the host institution

We will continue in the development of the thermophysical modelling. The next collaboration will be during M. Delbo's visit in Prague, Charles University, in October/November 2011. As the next step, we plan to develop the multi-data inversion code the way it will be able to include the interferometry from HST FGS into modelling.

Projected publications

We plan to process the asteroids with shape models stored in DAMIT along with the thermal data from IRAS and WISE satellites to derive the size, the albedo, and thermophysical parameters of asteroids. The results will be published in a scientific paper. On a larger time-scale, the code will be released under the GNU General Public License.