Thermophysical modeling of main-belt asteroids from WISE data

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We determine asteroid physical parameters such as size, surface roughness, albedo, and thermal inertia by applying the implementation of the thermophysical model (TPM) of Lagerros (1996; 1997; 1998) to the thermal data obtained by the NASA WISE satellite.

We present thermophysical parameters for ∼150 asteroids, which gives us so far the largest sample of asteroids with determined values of thermal inertia. On several individual cases, we discuss the reliability of our determinations and limitations of the TPM method we use.

As initial shapes, we adopt convex shape models from the DAMIT database (Ďurech et al., 2010) and present new determinations based on combined dense and sparse-in-time disk-integrated photometry and the lightcurve inversion method (Kaasalainen & Torppa 2001; Kaasalainen et al., 2001). We use thermal data from the WISE filters W3 and W4, as well as the data observed by the IRAS satellite. However, due to the intriguing accuracy of the fluxes and larger amount of measurements, the WISE data are significantly more important and dominate the modeling. The WISE data are processed the same way as in Alí-Lagoa et al. (2014) for asteroid (341 843) 2008 EV_5.

We show the main results of the study of derived thermophysical parameters within the whole population of MBAs and within several asteroid families with the main focus on the thermal inertia. The thermal inertia increases with decreasing size (as previously shown by Delbó et al., 2007), but a large range of thermal inertia values is observed within the similar size ranges between D∼10–100 km. Surprisingly, we derived very low ($<10\ \mathrm{J\,m^{-2}\,s^{-1/2}\,K^{-1}}$) thermal inertias for many asteroids (∼20) with various sizes. The range of thermal inertia values is large even within a few asteroid families.

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