Using Simple Shapes to Constrain Asteroid Thermal Inertia

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With the use of remote thermal infrared observations and a thermophysical model (TPM), the thermal inertia of an asteroid surface can be determined. The thermal inertia, in turn, can be used to infer physical properties of the surface, specifically to estimate the average regolith grain size. Since asteroids are often non-spherical techniques for incorporating modeled (non-spherical) shapes into calculating thermal inertia have been established. However, using a sphere as input for TPM is beneficial in reducing running time and shape models are not generally available for all (or most) objects that are observed in the thermal-IR. This is particularly true, as the pace of infrared observations has recently dramatically increased, notably due to the WISE mission, while the time to acquire sufficient light curves for accurate shape inversion remains relatively long. Here, we investigate the accuracy of using both a spherical and ellipsoidal TPM, with infrared observations obtained at pre- and post-opposition (hereafter multi-epoch) geometries to constrain the thermal inertias of a large number of asteroids.

We test whether using multi-epoch observations combined with a spherical and ellipsoidal shape TPM can constrain the thermal inertia of an object without *a priori* knowledge of its shape or spin state. The effectiveness of this technique is tested for 16 objects with shape models from DAMIT and WISE multi-epoch observations. For each object, the shape model is used as input for the TPM to generate synthetic fluxes for different values of thermal inertia. The input spherical and ellipsoidal shapes are then stepped through different spin vectors as the TPM is used to generate best-fit thermal inertia and diameter to the synthetically generated fluxes, allowing for a direct test of the approach's effectiveness. We will discuss whether the precision of the thermal inertia constraints from the spherical TPM analysis of multi- epoch observations is comparable to works that use non-spherical shapes. The findings presented at the conference will be discussed in relation to works that also use different shape models (i.e. sphere, lightcurve and radar-derived shapes) to perform TPM analyses on asteroid thermal data.