Investigating asteroid surface thermal inertias with NEOWISE

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NEOWISE, the asteroid-hunting mission that employs the Wide-field Infrared Survey Explorer (WISE) spacecraft, has observed over 150,000 minor planets over four infrared wavelength bands (Mainzer et al. 2011). Several of these asteroids have also been observed by radar, and have associated shapes and spin states (e.g., Busch et al. 2011, see current list maintained by L. Benner at http://echo.jpl.nasa.gov/~lance/shapes/asteroid_shapes.html). We combine these datasets via thermophysical modeling, a technique that combines 3-D asteroid shapes, a model of heat transport, and infrared observations to determine the thermal inertia of an asteroid (e.g., Leyrat et al. 2011).

Thermal inertia measurements can constrain regolith composition and density, which can be linked to collisional history and dynamical evolution. Measurements of thermal conductivity and heat capacity (components of thermal inertia), can refine predictions of the Yarkovsky drift, a non-gravitational force that can change asteroid orbits (Bottke et al. 2006). We present thermal inertia measurements derived from the NEOWISE dataset, such as surface thermal inertia measurements of 2008 EV5 (see figure).

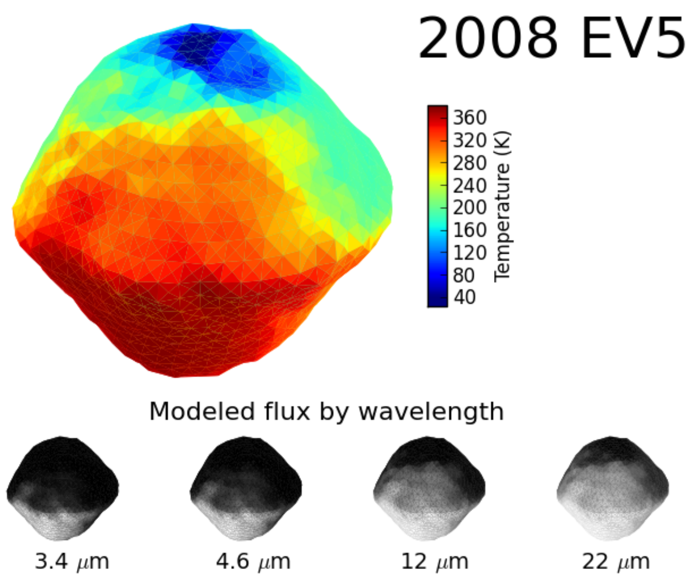

Figure: Top: Temperature map for EV5, for a model with low surface thermal inertia. Bottom: Emitted thermal fluxes corresponding to top temperature map, over the four wavelength channels used by WISE. Radar-derived shape from Busch et al. (2011).

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References: Bottke et al., (2006) *Annual Review of Earth and Planetary Sciences*, **34**, 157; Busch et al., (2011) *Icarus*, **212**, 649; Leyrat et al., (2011), *Astronomy and Astrophysics*, **531**, A168; Mainzer et al., (2011), *The Astrophysical Journal*, **731**, 53.