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The thermal forces and torques changing the orbits and spins of small asteroids

M. Broz (1), D. Voukrouhlicky (1), D. Capek (1), W.F. Bottke (2), D. Nesvorny (2), A. Morbidelli (3)

(1) Charles University, Prague (2) Southwest Research Institute, Boulder, (3) Nice Observatory

We review the state-of-the-art calculations of thermal emission from the surface of small asteroids and the corresponding effects on orbital and rotational dynamics (namely the Yarkovsky/YORP effect).

Many observations of small Solar System bodies are hard to interpret without the thermal effects: cosmic ray-exposure ages of meteorites, size-distribution of near-Earth asteroids, non-gravitational accelerations detected on several asteroids, too short dynamical life-times of some asteroids inside mean motion resonances, bimodal obliquity distribution among the Koronis family members, excess of slow- and fast- rotating asteroids, uneven shapes of many asteroid families (like Eos or Astrid), convergence of orbits of small clusters (like Veritas or Datura), etc. All of these observations confirm the important role of thermal effects.

Nevertheless, further improvements are necessary: we have to extend the Yarkovsky/YORP modelling toward small irregularly shaped bodies. In order to assess more precise values of thermal properties of asteroids, one needs to continue the measurements of their IR fluxes, to conduct additional estimates of non-gravitational accelerations, and to detect the YORP-driven spinup or spindown.