The Yarkovsky Effect on Bodies with Real Shapes: 6489 Golevka

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The Yarkovsky effect is a recoil felt by a body in response to the momentum carried away by the thermal photons that it emits. Its effect on the orbital elements of asteroids has been investigated by many authors for ideal bodies, that is, spherical or ellipsoidal bodies with uniform albedo and thermal properties. The results of those studies show that the Yarkovsky effect is probably important in the transport of asteroids from the main belt to the inner solar system.

More realistic calculations can yield Yarkovsky perturbations for specific solar system bodies. Such results could lead to more precise NEA ephemerides, which would be important for radar observations, direct observations of Yarkovsky displacements, and NEA hazard detection (and perhaps mitigation). To develop such a tool, we use the finite-difference approach (Spitale and Greenberg; Icarus 149:222), suitably modified to study bodies with arbitrary shapes and nonuniform albedo. The effects of shadowing and thermal ``reillumination", which are not relevant for bodies with convex shapes, are included.

Using this new calculation, we evaluate the importance of shape for the precise Yarkovsky perturbations on the orbit of asteroid 6489 Golevka.