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STATISTICAL ESTIMATION OF THERMAL INERTIA BASED ON THE YARKOVSKY DRIFT DETECTION FOR A CANDIDATE DEFLECTION ASTEROID 2015 XF261

Abstract

2015 XF261 is a candidate target object for a near-Earth asteroid deflection test mission proposed by China around 2029. Utilizing optical astrometry observations publicly available in the MPC database as of February 15, 2024, we performed an orbit-fitting procedure incorporating the Yarkovsky effect. Our analysis revealed the possibility of obtaining a valid Yarkovsky detection through the fitting process, yielding $A_2 = (-4.107 \pm 0.430) \times 10^{-13}$ au/day^2, or da/dt $= (-2.929 \pm 0.306)$ km/yr. By considering statistical distributions of several physical parameters, including density, diameter, albedo, spin axis obliquity, etc., and assuming different spin periods, Monte Carlo simulations were performed and statistical distributions of the thermal inertia (TI) can be obtained. The results show that the determination of the spin period is very important to constrain the TI, and a faster spin generally leads to a smaller distribution of the TI. For example, if the spin period is less than 10 minutes, the probability that the TI is less than 250 J m^{-2}K^{-1}s$^{-1/2}$ is at least 90%.