
Asteroid orbit uncertainty propagation and Impact monitoring at JPL

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Résumé

Over the past decades, international efforts in detecting moving solar system objects (SSOs) have seen a steady increase in the number of asteroid discoveries. Although we count almost 800 000 known asteroids as of today, the vast majority of sub-kilometer sized Solar System Objects (SSO) still remains undetected. Of the known objects roughly 19 000 regularly approach the Earth to within 4 times the distance to the moon. The Solar System Dynamics group at the NASA Jet Propulsion Laboratory keeps track of such near-Earth objects and assesses whether or not they pose a potential threat to the Earth. Impact probabilities are estimated by studying how uncertainties in the asteroids' orbit evolve with time. The two predominant methods used to this end are linear covariance mapping in the cases that do not have deep encounters with the terrestrial planets on the one hand, and Monte Carlo sampling on the other hand. This lecture provides an introduction to both methodologies and discusses applications to asteroid orbit deflection demonstration missions such as NASA's Double Asteroid Redirection Test (DART).

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