Near Earth Objects dynamical model and ephemerides

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Near Earth Asteroids are a population of asteroids that regularly approach the orbit of the Earth so that some of them may represent a risk of impact with Earth. In that context, the knowledge of their orbit and the estimation of their orbital uncertainty are key points for risk assessment and impact probability. The orbit determination consists in the determination of six orbital elements that fit to the observations. Due to errors on the observations, the orbital elements have an uncertainty leading to errors on their ephemeris in particular in the future. Moreover, as NEAs have regular close approaches with the Earth or planets, their orbits are perturbated and even small perturbations have to be taken into account.

In this presentation, I will detail the dynamical model used for NEA, the orbit determination process and the methods to estimate the precision of their orbit. I will also present the current limitations in the estimation of uncertainty and the expected improvements brought by several scientific missions such as Gaia in the NEA risk assessment.