

An analytical theory of motion of Nereid

Abdel-naby Saad¹, Hiroshi Kinoshita²

¹*The Graduate University for Advanced Studies,
2-21-1, Osawa, Mitaka, Tokyo 181-8588, Japan. E-mail: saad@pluto.mtk.nao.ac.jp*

²*National Astronomical Observatory,
2-21-1, Osawa, Mitaka, Tokyo 181-8588, Japan. E-mail: Hiroshi.Kinoshita@nao.ac.jp*

In this paper, an analytical theory of motion of the second Neptunian satellite Nereid is constructed using Lie transformation approach. The main perturbing forces which come from the solar influence are only taken into account. The disturbing function is developed in powers of the ratio of the semimajor axes of the satellite and the Sun and put in a closed form with respect to the eccentricity. The theory includes secular perturbations up to the fourth order, short, intermediate and long period perturbations up to the third order. The osculating orbital elements which describe the orbital motion of Nereid are evaluated analytically. The comparison with the numerical integration of the equations of motion gives an accuracy on the level of 0.3 km for the semimajor axis and 10^{-8} for the eccentricity over a period of several hundred years.