

Migration mechanism of Neptune by interaction with planetesimals

Keisuke Takahashi[1]; Sei-ichiro Watanabe[2]

[1] Earth and Planetary Sci., Nagoya Univ; [2] Earth and Planetary Sci., Nagoya Univ.

<http://epp.eps.nagoya-u.ac.jp>

An outward orbital migration of Neptune in early solar system history provides an efficient mechanism for shortening the planet growth time as well as sweeping up large numbers of Trans-Neptunian objects into Neptune's mean-motion resonances. Though several works about migration of Neptune have been done, it is still uncertain the rigid mechanism and quantitative time scale of migration.

We investigate the basic mechanism of orbital migration in an ideal situation that two giant planets (say Jupiter and Neptune) revolves around the Sun within a swarm of planetesimals.

We numerically integrated the orbital evolution of planetesimals with various orbital elements and find net angular momentum exchange.

Planetesimals around Neptune are scattered and stochastically increase their eccentricities. Some of them are finally scattered by Jupiter and remove from feeding zone of Neptune. Then the net angular momentum was transferred from the removed planetesimals to Neptune. This is the basic mechanism of outer migration of Neptune.

Now, we are investigating about migration velocity dependence to mass and planet interval quantitatively. After investigate the physical construction, we'll discuss about applicability to the problem of the migration of Neptune.