ON THE STABILITY OF SATURNIAN TROJANS AT HIGH INCLINATIONS

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Several papers have been written recently investigating the stability of Saturn's Trojans. Most of these papers treated low inclination orbits, only Zhang and Innanen (1989c) considered orbits with high inclination. However, their integration time was smaller than 100000 year, though we know from Innanen and Mikkola (1989) that the triangular Lagrangian points of Saturn become unstable after 100000 year. Thus the question is, how the orbits will evolve at high inclinations if we integrate these orbits for more than 100000 year.

I have studied the evolution of about 20000 test particles distributed near the Lagrangian points of Saturn for intervals up to 10 million year in the model of the Sun-Jupiter-Saturn-Asteroid system using a 4th order symplectic mapping method described by Wisdom and Holman (1991). The initial semimajor axis (a) of the test particle was varied from 9.08 to 9.96[AU] with a step of 0.04. I also varied the mutual inclination (i_M) between Saturn and the test particle from 0^o to 50^o with a step of 5^o and the argument of the pericenter of the test particle between 0^o and 360^o.

The unstable hole at L_4 and L_5, found by Innanen and Mikkola (1989) in the planar problem, are evident also in the spatial case. Stable orbits can exist farther from the Lagrangian points, below $i_M \leq 15^o$. For higher inclinations the orbits become unstable in 10 million year. The time for which the test particle is locked in the 1:1 orbital resonance rapidly decreases when we increase the inclination of the test particle, namely over 35^o the stability time is less than 300000 year.