time between consecutive encounters is observed, giving further support to the hypothesis that the chaoticity is due to frequent close encounters.

We introduce a simple model based on an impulsive approach to describe the basic characteristics of the evolution. The particles evolve linearly between encounters and suffer "kicks" in semimajor axis at the encounters. The model successfully reproduces the short Lyapunov times observed in the numerical integrations, confirming the previous hypotheses.

The LCE were found by adding short time contributions, the so-called "stretching numbers" (Voglis & Contopoulos 1994, J. Phys., A 26, 4899). The spectrum of stretching numbers was demonstrated to be invariant and gives us a more complete information about the chaotic behavior. By comparing spectra we discuss the dynamical similarities between the objects and analyse the possible different routes to the chaos. We apply different hierarchical clustering methods to identify "families" of spectra (group of similar spectra).

WAS SL-9 A JUPITER FAMILY COMET OR AN ESCAPED ASTEROID?

Gonzalo Tancredi[1] and Andrea Sosa[1]

SL-9 was an unusual object in many senses. It experienced a long-lasting temporary satellite capture by Jupiter. This kind of capture is a rare phenomena among the observed Jupiter family comets, because there is a very narrow window in the orbital elements phase-space for which it can occur.

We consider three possible sources for the origin of these unusual objects: the Jupiter family of comets, the Hildas and the Trojans asteroids. Although the mean motion resonances with Jupiter act as a protection mechanism that prevents close encounters, due to mutual perturbations or collisions, an asteroid can escape from the resonance and become a Jupiter approacher.

We estimate the frequency of collision with Jupiter for members of these populations. The frequency of collision (f_{col}) is determined by the frequency with which an object approaches Jupiter (f_{app}), the probability to collide after it has approached ($p_{col/app}$) and the number of objects in the population (N).

We found two clusters of possible initial conditions for colliding objects with long captures (LC objects): one inside and the other outside Jupiter's orbit. The center of the inner cluster is at the 3:2 resonance with Jupiter. We obtained $p_{col/app} = 6.4 \times 10^{-4}$. Performing numerical integrations of LC objects we calculated $f_{app} = 9.6 \times 10^{-4}$ yr^{-1}.

For an empirical correlation between the Lyapunov time (T_L) and the time of events (T_e) is possible to estimate the escape rate for Hildas and Trojans. For Trojans we also include the effect of mutual collisions. The escape rate times the actual number of objects times the resident time in Jupiter approaching orbits gives the present number N of LC candidates. We found that the frequency of collision for Hildas and Trojans are much lower than for Jupiter family comets. The obtained frequency implies a SL9-type event every 12500 yr.

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ASTROMETRIC OBSERVATIONS OF AMALTHEA AND THEBE

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Amalthea and Thebe are two of the four known inner satellites of Jupiter. Amalthea was discovered in 1892 by Barnard and Thebe in 1979 by the Voyager spacecraft. Their visual magnitudes are about 14 and 16 respectively and their maximum elongations are smaller than 60" and 75". These two satellites are very difficult to observe due to their small distance from Jupiter and the magnitude of the planet (about −2).

To observe these satellites we used the Cassegrain focus of the 1.60-m Ritchey-Chretien reflector of the Laboratório Nacional de Astrofísica, Brazil. This telescope has the focal distance for the Cassegrain combination equal to 15.8-m, which gives a scale of 13.″0/mm at the plane. All observations (73 frames with Amalthea and 50 with Amalthea and Thebe) were made in three nights (1995 May 23, 1995 June 13 and 1995 September 9) using the EEV P88231 CCD of 770 x 1152 square pixels with 22.5 μm. The exposure was of 5 seconds and no filter was used. As the image of the planet is always saturated, the diffraction spikes were avoided by placing a mask with 8 circular apertures between the secondary mirror support vanes. To saturating the whole CCD, a circular mask with appropriate diameter is placed in front of the CCD window to obstruct the light of the planet.

For the astrometric calibration of the CCD, we used the known positions of some Galilean satellites found in the frames. The centers of all satellites were obtained using the ASTROL software (Colas and Serrau, Bureau des Longitudes, 1993) and the errors in the centers were: 0.″2 for the reference satellites, 0.″03 for Amalthea and 0.″07 for Thebe.

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