THE ORBITAL EVOLUTION OF METEOR STREAMS AT THE 2/1 RESONANCE WITH JUPITER.

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We investigated the orbital evolution of Quadrantid-like meteor streams situated in the vicinity of the 2/1 resonance with Jupiter. For the starting orbital elements we took the values of the orbital elements of the Quadrantid meteor stream except for the semi-major axis which was varied between a = 3.22 and a = 3.34 AU. We considered these meteor streams as a ring and we investigated the resonant effect on the dispersion of this ring over a period of 13 000 years. Only gravitational forces due to the Sun and due to Jupiter were taken into account.

The main results are the following : Different parts of this ring evolved in a different way according to their starting values for the resonant argument σ. For the 2/1 resonance, σ is defined by $\sigma = -(\tilde{\omega} + \ell - 2\ell_J)$, where $\tilde{\omega}$ and ℓ are the longitude of perihelion and the mean longitude respectively of a ring particle and where ℓ_J denotes Jupiter's mean longitude.

For $\sigma = 0°$, a ring particle is situated at its perihelion, and for $\sigma = 180°$,a ring particle is situated at its aphelion during a conjunction with Jupiter.

The dispersion is not uniform with respect to σ. We can say that the dispersion rate is fastest for ring pieces starting with σ

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close to 180° while the dispersion rate is slowest for σ close to 0°. Therefore, the following effect occurs : After a few thousand years, only a piece of the ring persists while the rest of the ring has already dispersed.

After 13 000 years, the perihelion distances range from almost 0 to about 3 AU.

In addition, it also happens that a ring piece starts to precess rapidly in such a way that finally the particles of this ring piece encounter the particles of the remainder of the ring in almost opposite directions with relative velocities exceeding 50 km/s. These high velocity encounters between particles of the same original ring occur in the range between 0.3 and 1 AU from the Sun. Further investigations have to be made in order to find out wether or not this peculiar behaviour might be an important mechanism for the destruction of meteor stream particles.

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