INFINITESIMAL VARIATIONS IN THE REFERENCE AND THEIR IMPLICATIONS ON THE MINOR PLANETS ELEMENTS AND MASSES

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ABSTRACT. It is well known that the elliptic motion of a body is determined by metrical elements, connected with the size and the shape of the orbit, and the angular elements, connected with the orientation of the orbit. On the other hand, the change of the Reference System could vary the orientation of the orbit including the inclination which, being a metrical element, contributes to determine the orientation of the orbit too. So, a temporal variation of the inclination may indicate a geometrical initial variation or a bad initial determination of any physical parameter, or both things. This is a question that we shall study in our paper, in a first approach.

1. EXPLAINING THE PROBLEM

A variation on the Reference induces also variations on the initial elements $\Delta i_0, \Delta\Omega_0, \Delta\omega_0$ and these initial variations imply variations in all the elements with time. We know that the inclination is related not only with the orbit orientation, but also is a metric element that is related with the size of the orbit. So, the observation of a metric element at a given time, comes from a bad determination of the initial elements, the initial Reference or its mass (or maybe all of them)?

2. EXPERIMENTAL CONFIRMATION OF THE PROBLEM

We take Pallas and we integrate taking null mass for it and with the initial elements varied by means of the infinitesimal rotations between FK5 and Hipparcos from Mignard & Froeschle (2000). We note that at initial time only changes the angles $\Delta i_0, \Delta\Omega_0, \Delta\omega_0$. On the other hand, we take the mass value given by Krasinsky et al. (2001), and the initial elements without the previous mentioned variations. Finally, we compare different shapes of temporal elements variations (35000 days) in order to observe possible relations. It's clear the "a priori" independence of the results. Nevertheless, we have observed many non expected and surprising relations:

a) there is a relationship between the temporal variation in the inclination of Pallas induced by change of its mass and the temporal variation in the semiaxis due to variations in the initial elements (and mass null); b) between the eccentricity and the perihelion argument; c) between the perihelion argument and the eccentricity. Another fewer relations appear between: d) the ascending node and the inclination; e) with semiaxis and the partial derivative of the semiaxis with respect to its initial value; and finally f) with the argument of the ascending node and the partial derivative with respect itself at initial epoch. Summing up, it appears as necessary a correct and global approach to the correction of Systems (with the geometrical and physical aspects and their mutual compatibility relationships). See also Marco et al. (2004) and Mignard & Froeschlé (2000).

Acknowledgments. This work was partially supported by the grant P1 1B2003-12 from the FUNDACIO CAIXA CASTELLO-BANCAIXA

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