

A TIME ESTIMATE FOR CONSOLIDATION AND DISINTEGRATION OF AN ASTEROID – RUBBLE PILE. THE SIMPLEST MODEL. A PRELIMINARY ANALYSIS. G.A. Leikin, A.N. and Sanovich, Sternberg, State Astronomical Institute Universitetsky Prosp. 13, Moscow 119992, Russia E-mail: san@sai.msu.ru

Abstract: The analysis of the simplest model shows that an asteroid – rubble pile evolves, depending on the parameter V^2d (where V is the average velocity of fragments and d is the average distance between fragments), either as a conglomerate of "independent mutually gravitating clusters" (when $V^2d < fm$, where f is the gravitational constant and m is the average mass of a fragment) or as a "receding cluster" (when $V^2d > fm$). In the latter case the recession energy is drawn from the gravitational energy of the cluster. Within the framework of the model considered, the characteristic consolidation time in the first ("elliptical") case is estimated to be within ~ ten million years; in the second ("hyperbolic") case, the doubling time for the average distance between the

asteroid fragments lies within the limits of several hundred thousand to several million years. It should be noted that the actual consolidation time in the first case may be considerably smaller due to the presence of diffuse matter increasing kinetic energy loss. In the second case, the presence of diffuse matter will result in accelerated exchange of gravitational and kinetic energies and consequently in accelerated "recession" of the cluster of fragments. Thus the mechanism considered enables an asteroid – rubble pile to survive for a long time, and on the other hand, even without tidal effects, it prevents the transformation of the whole Asteroid belt into a structureless "cloud".