**DISSIPATIVE COLLISIONS OF ASTEROID-SIZED BODIES.** M.P. Lazarev, A.V. Vityazev, Institute for Dynamics of Geospheres RAS, 38 Leninsky prosp. (bldg. 1), 119334 Moscow, Russia, avit@idg.chph.ras.ru

**Formulation of the problem.** Inelastic collisions of bodies which change parameters of orbital motion and internal conditions have been investigated during a long time in dynamic and evolution models of planetary system [1-3]. Recently a considerable attention has been focussed on numerical calculations of collisions of small bodies (impactors) with large one (target) for purposes of investigation of cratering processes: fragmentation, heating, melting and so on [4]. It is common to assume in these calculations that all kinetic energy of collision dissipated . In contrast in some papers in planetary cosmogony (see, for example, [5] ) it was assumed that all impact energy goes to the change of the energy of orbital motion. The numerous results of well known calculations of the Moon origin model in consequence of the impact of Mars-size bodies to protoEarth are unsuitable for rapid estimation of the importance of an dissipative factor in other collisions. Here simple method and analytic formulae for estimation of influence of dissipative factor in collisions of bodies are present.

**Methodology**. Let us consider the case when mass of impactor M*, moved with velocity V*, is many fever than target mass M. For simplicity assume that larger body before the central impact move in a circular orbit with keplerian velocity $V= (GM_* /R )^{1/2}$, where $M_*$ – mass (third ) central body (Sun or some planet) around which M и M* in the same plane are circulated . Recall that for the Earth $V_\oplus \cong$ 30 км /s. In noninertial system of the coordinates with origin in centre of M from equations of the momentum conservation we can obtain $\Delta V = V^*\alpha (1 - \alpha)$, $\alpha = M^*/M << 1$. After the collision the quantities characterized the energy of body M, their orbital momentum L, radial $v_r$ and tangent $v_\varphi$ velocities are obtained the small increments. For orbital energy we have $E =E_0 + \mu\ \Delta E$, where $\mu \Rightarrow 1$for the case when we can ignored the dissipative lost and $\mu \Rightarrow 0$, when the part of impact energy, going to the change of parameters orbital motion ( eccentricity «e») a negligibly small.. For the orbital momentum $L = L_0 + \gamma\ \Delta L$, where $\gamma$, smaller than 1, implies that a part of orbital momentum in a system of collided bodies going to spinning of M. Let assume, that V vastly more than escape velocity from M (actual $V^*/V \sim 0.1$). Then we make use the solution of two-body problem (see, for example, [6]).

**Results and Discussion** From the integrals of the two-body problem we can obtain for example the expression for eccentricity of new orbit of body M after collision in radial direction :

$e = \Delta e = \sqrt{\mu}\ V^*\alpha/V$. (#)

Firstly we emphasize that increment of eccentricity $\Delta e \propto \mu^{1/2}$. If on the crater formation goes the sizable part ($\mu =0.1 \div 0.01$) of kinetic energy we must taken it into account for estimations of $\Delta e$. In [5] where the (#) without $\mu$ was obtained the result for the consequences of impact of Mars-size body with protoEarth can been wrong. From (#) one can see that the some anxiety about a dramatic dynamic consequences «deep impact» mission to Tempel 1(here $\alpha < 10^{-12}$) were also wrong . Some details of calculations and other formulae would be presented on the conference.

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