

Interaction of the Gould Belt and the Earth

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Introduction: Now one of the problems in astronomy is asteroid and comet hazard. The great and small catastrophes after falling celestial bodies on the Earth occurred in the history many times. Asteroids and comets within Solar systems are main sources of danger [1]. But meteors of the galactic origin also possible fall on the Earth. The chances of such falling are less than the possibility of falling of Solar system's minor planets on the Earth. The Gould belt is possible source of galactic meteors [2].

OB- association of Sco-Cen from the Gould belt is situated from us on distance 130 parsecs now. It may be give 20 explosions supernova stars on the distance before 40 pc for 11 million years [2]. Postponing on geological scale of time episodes mass extinction of species (x-axis is million years calculated from our epoch, vertical scale is a per cent survived of species) paleontologists have found between them regular intervals in 26 million years [4] (Fig. 1). We shall determine of epochs of extreme cometary's hazard, considering motion of the belt and Sun in gravitation field of the Galaxy. Initial data are initial positions of bodies and vectors of theirs velocities.

A model of Gould Belt motion in the Galaxy: For the determination of the epochs we may use already known orbit elements (v is true anomaly, w – is argument of epicenters, a is semimajor axes, e is eccentricity, i is inclination, λ – longitude of ascending node) of approaching bodies. In order to solve this problem we shall

minimize a square of distance r_{12}^2 between bodies, supposing this distance is depended on regularizing times s_2 and s_1 . Hence, the problem is solvable by means of an equation [3]

$$\frac{dr_{12}^2}{ds_1} = 0 \quad (1)$$

The equation (1) may be use for all types of orbits and trajectories of unperturbed motion. Intervals of times of approaching the Sun and the belt Gould after 2003 year are in the Fig. 2 These intervals may be considered as epochs of extreme cometary's hazard for the human civilization.

Conclusion: In this work the interval of time from 0 to 700 mln. years is considered. Analysis of the model solutions of the equation (1) shows the Gould belt approaches with the Solar system about every 100 – 120 mln. years. In these epochs distance between the Solar system and the belt is about or more then 150 pc, and the Sun is within the belt.

The belt is young formation in our Galaxy. This is the region of active formation of stars. As it is known, clouds of minor bodies surround stars, and gravitational fields of the others stars passing by may capture these clouds. Therefore possible fluxes of interstellar comets and meteors may appear in the corresponding epochs. These interstellar bodies may collide with the Earth.

References:

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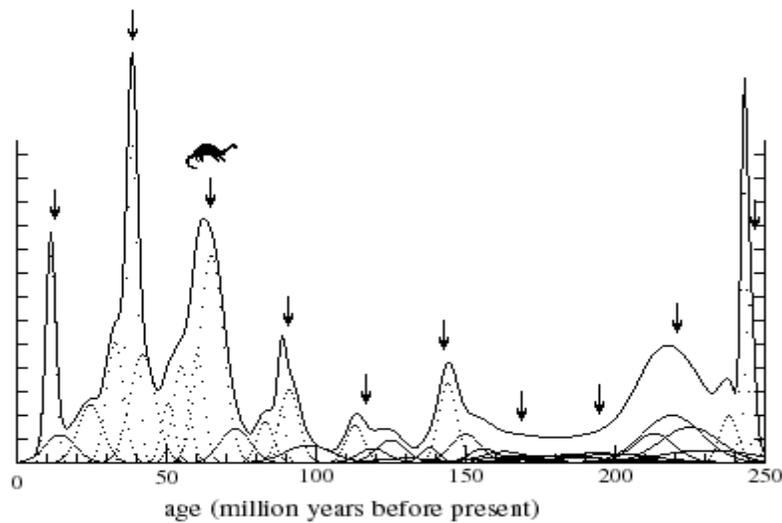


Fig 1 [2]

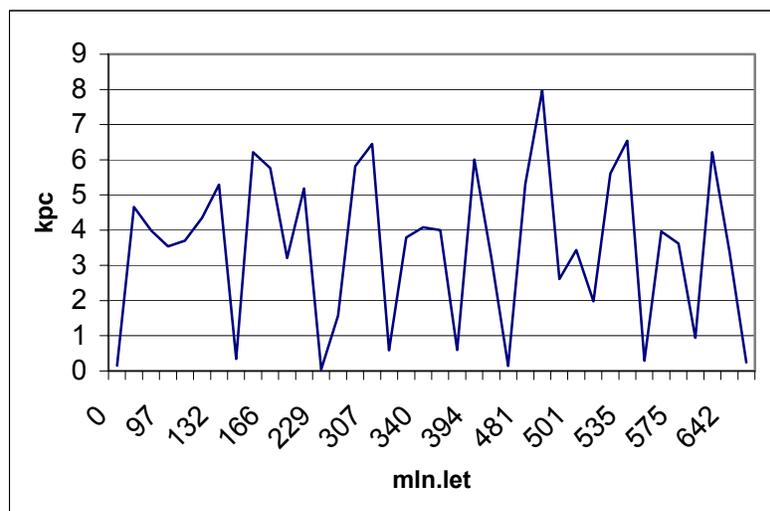


Fig. 2