

Periodic Comet Showers, Mass Extinctions, and the Galaxy

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Geological and astronomical studies can be synthesized to provide a hypothesis connecting the history of life on Earth with the dynamics of the Galaxy. Impacts of comets and asteroids on the Earth are believed to be capable of causing severe environmental effects and mass extinction of life. The size-frequency distribution of earth-crossing objects is in general agreement with the hypothesis that collisions with large bodies (mostly comets) ≥ 5 km in diameter could explain the record of ~ 25 extinction episodes in the last 545 m. y. The five major mass extinctions could be related to impacts of the largest comets (≥ 10 km in diameter). Several of these extinction events have thus far been correlated or tentatively correlated with concurrent impact ejecta layers and/or large impact craters, suggesting times of increased flux of impactors. Smaller comet and asteroid impacts might be responsible for lesser global and sub-global faunal and floral turnover events.

Periods of ~ 30 m.y. to ~ 36 m. y. have been found in sets of large, well-dated impact craters, and extinction shows a periodic component of ~ 30 m. y. These results could be explained by periodic or quasi-periodic showers of Oort Cloud comets. The pacemaker for such comet showers may involve the Sun's vertical oscillation through the plane of the Milky Way Galaxy, suggesting that evolutionary changes on the Earth are partly related to simple galactic dynamics.