

Frequency of significant cooling and subsequent mass extinctions by asteroid-comet impacts

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For decades, role of asteroid-comet impacts for climate changes and extinctions of biota has been a subject of debate. A consistent impact rate since the end of the late heavy bombardment and vulnerability of comet suggests approximately 70 and 10 significant Cooling Events enough to cause Mass Extinctions (CEME) after the late heavy bombardment 3.8 Ga and in the Phanerozoic after diversification of multicellular animals, respectively. Many scientists have sought evidence of impact for all mass extinctions. However, only one mass extinction likely occurred by asteroid impact in the Phanerozoic. Here I show that approximately 20 and a few CEME caused by asteroid impacts are possible after 3.8 Ga and in the Phanerozoic, respectively. High concentration of hydrocarbon in target rocks is essential to cause CEME, as an impact burned hydrocarbon in the target rocks forming stratospheric soot, which caused extreme global cooling and draught. The high content areas enough for CEME occupy 13–15% and 40% of the Earth surface for 9–15 km and 20–30 km asteroid impacts, resulting in the decrease of possible number of CEME.

Keywords: mass extinctions, asteroid-comet impacts, global cooling