

Trigger and process of the end-Permian mass extinction

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The largest mass extinction of animals and plants in both the ocean and on land occurred at the end of the Permian, largely coinciding with the largest flood basalt volcanism event in Siberia. Our depth-transect data show that euxinia frequently developed below 100-m water depth in the Changhsingian, followed by anoxia or dysoxia at 200- to 40-m water depths during the extinction. These organic and isotopic geochemical results imply that there was an accumulation of hydrogen sulphide in intermediate and deep waters followed by oxidation of hydrogen sulphide that led to dissolved oxygen consumption, surface-water anoxia, and acidification, resulting in the end-Permian mass extinction in the seas. The possibility of atmospheric ozone collapse due to coincident massive release of CH₄ from the Siberian igneous province and H₂S from the euxinic ocean to the atmosphere is not likely. Our calculations indicate that a massive release of CH₄ and H₂S to the atmosphere would cause an approximately 10% decrease in atmospheric O₂ levels but not significantly alter ozone levels. The slight decrease in atmospheric O₂ levels may also have contributed to the extinction event. However, the end-Permian mass extinction of terrestrial animals was most likely significant global warming and an increase in CO₂ levels probably induced by the Siberian volcanism, not an increase in UV radiation levels and a decrease in atmospheric O₂ levels.

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