

## **Why not? Exploring the variable effects of environmental disturbance on the survival of species**

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Ocean anoxia, ocean acidification, rapid climate change, and asteroid impact have all been identified as primary culprits in one or more of the major mass extinction events in the history of life. However, the effects of these environmental disturbances are far from universal. For each driver, there are examples in which relatively large environmental changes are unaccompanied by mass extinction.

Here I will argue that the difference between an environmental change that drives a mass extinction and one that does not, may have more to do with the rapidity and geographic extent of that change, than the type of disturbance. For multiple species to disappear en masse from the fossil record, environmental change has to affect species and populations on ecologically relevant timescales across much of the global ocean.

Recent advances in the geochronology of geologically rapid (and geologically instantaneous) events combined with new geochemical proxies and earth system models provide an unprecedented perspective on past periods of abrupt change. Such perspectives now approach biologically relevant spatial and temporal scales. This combination of factors has shed new light on the changes and consequences of the Cretaceous-Paleogene Mass Extinction and the Paleocene-Eocene Thermal Maximum –two events that I will focus on during my talk. The PETM will be considered further alongside extinction driving analogs in deeper time, in which ocean redox is thought to have played a decisive role.