

The potential role of Large Igneous Provinces in the heat-deaths of Earth- and Venus-like worlds

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Large Igneous Provinces (LIPs) are a key driver of environmental and biotic change including mass extinction events through Earth history. In this work we focus on the timing of LIPs through Earth's history, with the goal to estimate the likelihood of simultaneous large-scale global warming events which could largely extinguish life on terrestrial worlds like Earth or Venus. We speculate that multiple simultaneous LIP events could drive a planet into an extreme runaway greenhouse state such that plate tectonics subduction may shut down. This would effectively end volatile cycling as we understand it today and may have been responsible for the heat-death of Venus. We quantify the frequency of simultaneous events in a random history which is statistically the same as the compiled terrestrial LIP record: pairs of LIPs as close in time as 25 thousand years are likely. We assess the effects of such coincidences based on estimates of the persistence of increased CO₂ anomalies in the atmosphere.