



## **Did the Siberian traps cause an Early Triassic nutrient crises?**

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The latest Permian mass extinction was followed throughout most of the Early Triassic by a prolonged period of ecologic recovery. What factors delayed biotic recovery are still under debate and partly revolve around impacts of volcanic induced global warming on primary marine productivity. We examined N isotope records from the Festningen section, Spitsbergen, to examine changes in nutrient availability through the Early to Middle Triassic along the northern margin of Pangea. Our results show progressive decline shift from high to low nitrogen isotope values throughout the Griesbachian, that we interpret to reflect progressive reduction in N availability and in response increased atmospheric N<sub>2</sub> fixation. This nutrient limitation occurs throughout the remainder of the Early Triassic and occurs in conjunction with decreased organic matter in the sediments as well as declines in paleoproductivity proxies, suggesting stressed primary productivity along northern Pangea during that time. There was a return to a highly productive continental margin in Middle Triassic time coincident with final cooling of global oceans. These results are consistent with other studies from northern and western Pangea and thus show regional nutrient limitations occurred in what should have been a major zone of marine primary productivity. Such nutrient limitation likely contributed to the prolonged Early Triassic marine recovery. We suggest this was driven by Siberian Traps induced global warming, creating high ocean temperatures that depressed the marine nutricline below the zone of upwelling.