



## **Anoxia, toxic metals and acidification: volcanically-driven causes of the Middle Permian (Capitanian) mass extinction in NW Pangaea?**

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The controversial Capitanian (Middle Permian, 262 Ma) mass extinction, mostly known from equatorial latitudes, has recently been identified in a Boreal setting in Spitsbergen. We now document this extinction in the record of brachiopods from the Sverdrup Basin in NW Pangaea (Ellesmere Island, Canada), confirming Middle Permian losses as a global crisis on par with the “Big Five”. Redox proxies (pyrite framboids and trace metals) show that the high latitude crisis coincided with an intensification of oxygen-poor conditions - a potent killer that is not clearly developed in lower latitude sections. Mercury becomes briefly enriched in strata at the level of the Middle Permian extinction level in Spitsbergen and Ellesmere Island, indicating voluminous but short-lived volcanism that is likely to have been the emplacement of the Emeishan large igneous province (LIP) in SW China. A potent cocktail of poisons appears to have impacted across the Boreal Realm, whilst the near-total loss of carbonates near the extinction level is also consistent with reduced pH across the region. Multiple stresses, possibly with origins in low-latitude LIP volcanism, are therefore implicated in the Middle Permian extinction and there was no respite even in the far-distant Boreal Realm.