Geophysical Research Abstracts
Vol. 20, EGU2018-15, 2018
EGU General Assembly 2018

Modelling trophic networks across the early Toarcian Ocean Anoxic Event (Lower Jurassic)

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Trophic guild diversity, connectivity, and robustness decreases across the early Toarcian Ocean Anoxic Event. We focus on the modelling of trophic network dynamics across the early Toarcian extinction; which is thought to have been driven by an Ocean Anoxic Event. The analysis is based on a field database collected from the Pliensbachian-Toarcian of the Yorkshire Coast, UK, with 162 macrofossil species assigned to trophic guilds using the Bambach ecospace model. Although there is limited evidence for the decoupling of pelagic and benthic ecosystems, there is a major loss of motile, metabolically demanding benthic fauna. Network connectivity is greater in the latest post-extinction recovery than in pre-extinction times, although the number of guilds remain equal. This is likely due to the appearance of new predatory guilds that display a high degree of centrality, i.e. well connected to other nodes, in the networks. The results suggest that the early Toarcian extinction event was a top-down extinction with metabolically demanding benthic guilds, such as motile predators, disappearing during the Ocean Anoxic Event, as they were more sensitive to dysoxic and anoxic conditions than stationary benthic faunas with lower metabolic demands.