Anoxia during the OAE 2: Paleoenvironmental insights from Tibet and Mexico

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Several studies show that the onset of the OAE 2 was triggered by a short-lived but significant increase in phosphorus burial. The bottom waters became anoxic and switched from being a P sink to a P source, sustaining the productivity in a positive feedback loop. The behaviour of Total Phosphorus (Ptot) and trace metals at larger scale is still poorly known, away from the main black shales source (Western Tethys and Central Atlantic) .

The Gongzha section (Tibet, China), located at the north margin of the Indian plate (SE Tethys), is characterized by monotonous hemipelagic marly limestones. $\delta^{13}C$ data exhibit the classical C-T positive shift. Significant peaks in Ptot are observed at the onset of the shift, followed by a depletion at the end of *R. cushmani* zone, persisting up to the end of *W. archaeocretacea* zone. A similar P maximum is observed in W. Tethys & Central Atlantic sections, and appears therefore to be global, coinciding partly with increased detrital inputs. At Gongzha, trace-metals contents are under background level compared with sections characterized by strong anoxic conditions. Redox sensitive elements such as Va, Ni, Co, U, generally indicative of anoxic conditions, do not show any increase during the $\delta^{13}C$ shift, suggesting that dysoxic rather than anoxic conditions prevailed in Tibet area during OAE 2.

Southern Mexico sections, located at the western edge of Central Atlantic, exhibit a perfectly correlateable $\delta^{13}C$ curve. But the main part of the $\delta^{13}C$ excursion surprisingly coincides with oligotrophic carbonate platform environments, characterized by abundant rudists and intensive bioturbation. The uppermost part of the $\delta^{13}C$ shift corresponds to the appearance of a thick accumulation of unbioturbated microbialites, thus reflecting a change towards mesotrophic conditions. The definitive drowning of the carbonate platform, marked by the deposition of black shales and turbidites, occurs only in the lower Turonian (*P. flexuosum)*, when $\delta^{13}C$ return to background values.

Water contents in pyroxenes of intraplate lithospheric mantle

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Water contents of clinopyroxene and orthopyroxene in mantle peridotites from various xenolith occurrences in intraplate settings were determined by FTIR. The localities are as follow: CapeVerde, Northern Victoria Land, Antarctica and Subei Basin, Eastern China. They represent well-known localities where detailed petrographical and geochemical studies have already been carried out or areas which are currently under investigation. The water incorporated in these pyroxenes is low (cpx, 37-399ppm; opx, 9-166ppm) or very low as in Antarctica (cpx, 5-16ppm; opx, 9-16ppm) and, among each population, no clear correlation with melting parameters in single mineral is evident. Results are compared with the available literature data on water contents in mantle pyroxene which includes peridotites from on-craton (hosted by kimberlitic-type magmas) and off-craton (hosted by alkaline basic magmas), as well as subarc mantle settings. The "relatively dry" (cpx, 140-528 ppm; opx, 38-280 ppm) sub-arc mantle xenoliths are shown to be wetter than the intraplate (off-craton) xenoliths. Cratonic mantle pyroxenes are only represented by a few determinations on garnet peridotites and eclogite from Kaapvaal and Colorado Plateau. They record the highest water contents (cpx, 342-1012 ppm; opx, 180-491 ppm) so far measured in mantle pyroxenes from various tectonic settings. Despite the limited data set, the indication that the cratonic mantle is strongly hydrated is compelling. Rehydration for the Colorado Plateau craton may be due to the Farallon plate subduction while for Kaapvaal Craton it might be related to young (<100Ma) metasomatic enrichments. If this is the case then the pristine Archean mantle water content needs to be determined; this may be solved by analysing highly depleted unmetasomatized lithologies. However, assuming that the water content was initially very low, it is hard to believe that metasomatic events, similar to those observed in the intra-plate settings studied in this work, would be able to produce a significant increase in the water content. According to literature and our own data it appears that water rehydration may substantially occur at convergent margins.