Weak photic-zone euxinia at the end of the Permian in central pelagic Panthalassa as recorded in marine organic carbon isotopes

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The mass extinction at the end-Permian is associated with a negative shift of carbon isotope compositions ($\delta^{13}C$). The $\delta^{13}C$ values of carbonate ($\delta^{13}C_{carb}$) varies by 3–6‰. On the other hand, the carbon isotope excursions of marine organic matter are not apparently corresponded to $\delta^{13}C_{carb}$ excursion. One of the reasons is less data set for pelagic sediments because of few complete deep-water Permian/Triassic boundary (PTB) sections. Here we report the $\delta^{13}C_{org}$ excursion in the pelagic deep-water PTB section: Akkamori section-2 (Am-2; [1]) in accretionary complex of Japan. Our results identified a 2.0‰ negative shift of $\delta^{13}C_{org}$ in the low-latitude pelagic Panthalassa at the end of the Permian. The $\Delta\delta^{13}C_{carb}$-$\Delta\delta^{13}C_{org}$ for Am-2 is 1–3‰. This estimated range is contrasting to the range reported from other areas: smaller for the east Tethys (Meishan) and the central Tethys (Abdeh), larger for the Boreal sea (Spitsbergen) and the east pelagic Panthalassa (Ursula Creek), slightly smaller for the west Tethys (Masole and Gartnerkofel-1), compared to this study value. Possible cause of these regional differences is contribution of isotopically heavier biomass from primary producers of phototrophic bacteria including cyanobacteria and green sulphur bacteria (GSB). Cyanobacterial blooming just after the mass extinction is revealed by biomarker evidence in the Meishan section [2] where high $\Delta\delta^{13}C_{carb}$-$\Delta\delta^{13}C_{org}$ values are reported. As cyanobacterial productivity is generally higher than GSB, main primary producer might be cyanobacteria in the sea area with high $\Delta\delta^{13}C_{carb}$-$\Delta\delta^{13}C_{org}$. Increases of anaerobic phototrophic GSB are also supported by biomarker evidence in the Meishan section [3]. Therefore, $\Delta\delta^{13}C_{carb}$-$\Delta\delta^{13}C_{org}$ values of PTB could be affected by development of photic zone euxinia. This further implies that the pelagic Panthalassa is less influenced by photic zone euxinia compared to the east shallow Tethys, but more influenced compared to the east pelagic Panthalassa and the Boreal sea.

[1] Takahashi *et al*. (2009) *Palaeogeogr. Palaeoclimatol. Palaeoecol.* **271**, 1-12. [2] Xie *et al*. (2005) *Nature* **434**, 497-494. [3] Grice *et al.* (2005) *Science* **307**, 706-709.

Exploration of the most alkaline extreme in a deep-sea serpentine seamount, the South Chamorro Seamount

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In 2001, Ocean Drilling Program (ODP) expedition Leg#195 was conducted in the South Chamorro Seamount located in the Mariana Forearc. The geochemistry characterization of the subseafloor serpentine mud pore-water demonstrated that the subseafloor environment is the most alkaline-extreme environment of which pH reaches to pH12.5. Based on the culture-independent molecular analysis of the subseafloor microbial communities, there were detected hot spots of archaeal populations at several depths. The subseafloor environment under pH12.5 is almost marginal for the microbial habitability (the highest pH limit for microbial growth is known as pH12.4). If the active microbial communities are truly present, what kinds of energy and carbon sources sustain the communities? Is it like 'the Lost City type'?

To clarify these questions, we have explored the biogeochemical interaction in the highly alkaline crustal fluid entrained through the CORK. The CORK entrains the endmember of the serpentinization-derived deep crustal fluid from ~150 m below seafloor. Using a ROV, the pristine subseafloor fluids have been sampled and the detail geochemical characterization, SIP-NanoSIMS analysis, RI-tracer experiments, culture-dependent and –independent analyses are now going on. In addition, in situ colonization devices for active microbial populations and mineral-microbe interaction are also deployed in the borehole for 5 months under 4°C and pH12.3. These investigations could clarify the question whether the functionally active subseafloor microbial ecosystem is truly present there, the most alkaline extreme with the geologically-derived dark energy sources.