

Oxygen and carbon isotope signatures of high-latitude Permian to Jurassic calcitic fossils from southern hemisphere

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Oxygen and carbon isotope values of calcitic fossils have been frequently used for characterization of palaeo-environments and for attempts to estimate temperature of past seawater. Fossil shell and skeletal remains of low-Mg-calcite are most suitable for this purpose because of their resistance to diagenesis and to resetting of their primary geochemical signals. Studies of samples from high palaeolatitudes are of particular interest of their potential to quantify past palaeotemperature gradients.

In the present study, brachiopods, bivalves and belemnites were sampled from Permian to Jurassic successions in New Zealand and New Caledonia that were deposited at palaeolatitudes higher than 60°S in marine forearc environments with sedimentation dominated by volcanogenic siliciclastics. The good temporal resolution, based on New Zealand stages, minimizes errors in stratigraphic correlation to low latitudes. The quality of samples was checked by scanning electron microscopy (SEM) with complementary trace element evaluation (ICP-OES) currently in progress. These screening techniques are used for evaluation of postdepositional alteration of samples as well as for detection of potential vital effects and ecological impacts.

A preliminary evaluation of about 1200 $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ values shows distinct temporal fluctuations based on the upper envelopes of the trends [cf. 1]. The overall carbon isotope trend is in good agreement with the low-latitude datasets, including its rapid increase of $\sim 4\text{‰}$ during the early Late Triassic [2] that is therefore likely of global nature. The early and middle Permian and the late Jurassic high-latitude $\delta^{18}\text{O}$ values are heavier if compared to their low-latitudes counterpart. The Triassic values, on the other hand, do not show any clear difference between high- and low-latitudes, indicating a diminished pole-to-equator sea surface temperature gradient at these times.

[1] Korte *et al.* (2008) *Palaeogeogr. Palaeocl.* **269**, 1–16.

[2] Korte *et al.* (2005) *Palaeogeogr. Palaeocl.* **226**, 287–306.

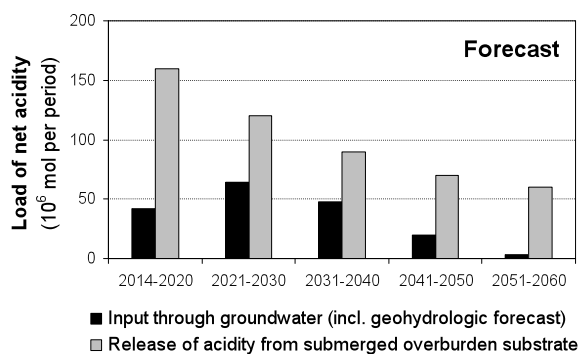
Long-term forecast of acidity load from overburden substrate into a mining pit lake: An integrated approach

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Open-cast lignite mining in Germany left behind hundreds of lakes most of which are strongly acidic and do not meet water quality standards set for recreational use and water management purposes. To estimate future expenses and develop appropriate reclamation technologies, the authority in charge (LMBV) needs a reliable prediction of the lake water chemistry including the loads of acidity and alkalinity. By combining field and bench experiments with appropriate models, the most relevant physicochemical processes were identified and reliable data collected to determine crucial model parameters that enable a long-term forecast of net acidity load from the lake bed into the water of Lake Zwenkau, a pit lake of $176 \cdot 10^6 \text{ m}^3$ currently being filled. The results demonstrate that the release of acidity is mainly by molecular diffusion of protons following ion exchange within the submerged overburden substrate ($\sim 5 \text{ km}^2$). Similar release rates were found in both a 10-month field test and bench experiments under controlled conditions. While during the five-year period of lake filling the overburden substrate contributes by only ten percent to the overall load of net acidity, this source of acidity will dominate over other sources like groundwater recharge beyond the filling period.



Without technical treatments, the discharge of net alkalinity from natural groundwater may not balance the net acidity of the pit lake before the 2051-60 decade.