



Boron isotopes in brachiopods during the end-Permian mass extinction: constraints on pH evolution and seawater chemistry

Hana Jurikova (1), Marcus Gutjahr (1), Volker Liebetrau (1), Uwe Brand (2), Renato Posenato (3), Claudio Garbelli (4), Lucia Angiolini (5), and Anton Eisenhauer (1)

(1) GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel, Wischhofstr. 1–3, 24148 Kiel, Germany (hjurikova@geomar.de), (2) Department of Earth Sciences, Brock University, St. Catharines, Ontario L2S 3A1, Canada, (3) Dipartimento di Scienze della Terra, Università di Ferrara, Polo Scientifico-tecnologico, Via Saragat 1, 44100 Ferrara, Italy, (4) State Key Laboratory of Palaeobiology and Stratigraphy, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, 39 East Beijing Road, Nanjing, Jiangsu 210008, P.R. China, (5) Dipartimento di Scienze della Terra, Via Mangiagalli 34, Università di Milano, 20133 Milan, Italy

The global biogeochemical cycling of carbon is fundamental for life on Earth with the ocean playing a key role as the largest and dynamically evolving CO₂ reservoir. The boron isotope composition (commonly expressed in $\delta^{11}\text{B}$) of marine calcium carbonate is considered to be one of the most reliable paleo-pH proxies, potentially enabling us to reconstruct past ocean pH changes and understand carbon cycle perturbations along Earth's geological record (e.g. Foster et al., 2008; Clarkson et al., 2015). Brachiopods present an advantageous and largely underutilised archive for Phanerozoic carbon cycle reconstructions considering their high abundance in the geological record and its origin dating back to the early Cambrian. Moreover, their shell made of low-magnesium calcite makes these marine calcifiers more resistant to post-depositional diagenetic alteration of primary chemical signals. We have investigated the $\delta^{11}\text{B}$ using MC-ICP-MS (Neptune Plus) and B/Ca and other elemental ratios (Mg/Ca, Sr/Ca, Al/Ca, Li/Ca, Ba/Ca, Na/Ca and Fe/Ca) using ICP-MS-Quadrupole (Agilent 7500cx) from the same specimens in pristine brachiopod shells from two sections from northern Italy during the Late Permian. These sections cover the $\delta^{13}\text{C}$ excursion in excess of ~ 4 ‰ (Brand et al., 2012) and are associated with major climate and environmental perturbations that lead to the mass extinction event at the Permian-Triassic boundary. Particular emphasis will be placed on the implications of our new paleo-pH estimates on the seawater chemistry during the Late Permian.

Brand, U., Posenato, R., Came, R., Affek, H., Angiolini, L., Azmy, K. and Farabegoli, E.: The end-Permian mass extinction: A rapid volcanic CO₂ and CH₄-climatic catastrophe, *Chemical Geology* 323, 121-144, doi:10.1016/j.chemgeo.2012.06.015, 2012.

Clarkson, M.O., Kasemann, S.A., Wood, R.A., Lenton, T.M., Daines, S.J., Richoz, S., Ohnemüller, F., Meixner, A., Poulton, S.W. and Tipper, E.T.: Ocean acidification and the Permo-Triassic mass extinction. *Science* 348, 229-232, doi: 10.1126/science.aaa0193, 2015.

Foster, G.L.: Seawater pH, pCO₂ and [CO₃²⁻] variations in the Caribbean Sea over the last 130 kyr: A boron isotope and B/Ca study of planktic foraminifera. *Earth and Planetary Science Letters* 271, 254-266. doi:10.1016/j.epsl.2008.04.015, 2008.