Middle to Late Jurassic climate changes in the Germanic Basin – $\delta^{18}O$ and $\delta^{13}C$ of calcite fossils

HOUGAARD I.W.[1], VICKERS M. L.[1], ULLMANN C.V.[2], SCHWEIGERT G.[3], HOSTETTLER B.[4], FRANZ M.[5], KUTZ M.[6], FREDERIKSEN J.A.[1], KORTE, C.[1]

[1] IGN, KU, Øster Voldgade 10, Copenhagen, DK (iwh@ign.ku.dk, mlv@ign.ku.dk, jaf@ign.ku.dk, korte@ign.ku.dk)

[2] CSM, Univ. of Exeter, Penryn, Cornwall TR10 9FE, UK (c.ullmann@exeter.ac.uk)

[3] Palaeontology Department, SMNS, Rosenstein 1, 70191 Stuttgart, DE (guenter.schweigert@smns-bw.de)

[4] NM Bern, Bernastrasse 15, Bern, CH (bern61@bluewin.ch)

[5] Regierungspräsidium Freiburg, 79083 Freiburg i. Br. DE (matthias.franz@rpf.bwl.de)

[6] 67390 Mackenheim, FR (michael.kutz@orange.fr)

The Jurassic was generally a greenhouse period, characterised by several periods of excessive organic matter burial and carbonate accumulation in marine, epicontinental basins resulting from the break-up of Pangea. A number of cool interludes, however, have been recently postulated.

For the present study, macrofossils (belemnites, brachiopods, and bivalves) from several SW German and Swiss Jura sections have been analysed for C and O isotope ratios, enabling a high-resolution reconstruction of temperature, bioproductivity, and environmental changes during the Middle and Late Jurassic of the Germanic Basin. The sample set additionally fills a current data-gap in the late Bajocian to Tithonian stages. Geochemical data are utilised to interpret the drivers of environmental change in the Germanic Basin, and are compared to other European basins to establish the regional/global extent of the trends.

The $\delta^{18}O$ values display a positive shift of ~1.5 ‰ between the early Aalenian and the early Bajocian, much smaller than that observed in fossils from the more northerly palaeolatitudes of the Scottish Hebrides Basin. Relatively heavy $\delta^{18}O$ values persist into the early Kimmeridgian, suggesting a prolonged phase of cool seawater temperatures.

Several positive carbon isotope excursions (CIEs) within the investigated period are imaged by the macrofossil dataset. With the initiation of the middle Oxfordian positive CIE, the $\delta^{13}C_{carb}$ signals of brachiopods and bivalves become consistently 2 – 3 ‰ heavier compared those of belemnites from the same sections. The $\delta^{18}O_{carb}$ values of these fossils do not show this offest which therefore cannot be explained by differences in habitat.