An integrated stratigraphy of the Early Cretaceous (Valanginian - Albian) - implications for Boreal–Tethys correlation

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The interpretation of past oceanographic events on a supra-regional scale requires precisely dated and well correlated biostratigraphic schemes. Only synchronous events can be interpreted in a global context. Events of local or regional character have therefore to be accurately correlated with time-equivalent shifts in other areas in order to be interpreted in a wider context. One of the problems of inter-basin correlation based on biostratigraphy lies in floral and faunal provincialism of the relevant index fossils. In order to overcome such limitations, chemostratigraphy can be used as a stratigraphic tool independent of biostratigraphy.

We present stable isotope data ($\delta^{13}C$, $^{87}Sr/^{86}Sr$) for the Lower Cretaceous (Valanginian - Albian) partly based on previously published data (Speeton, northeast England; Vocontian Basin, southeast France) in addition to new findings from Northeast Greenland and northern Germany. The belemnite and bulk rock based isotope data allow a correlation of the Lower Cretaceous sequences of the Boreal Realm and the Tethys independent of biostratigraphy. This chemostratigraphic approach may help to overcome the biostratigraphic problems which have been discussed for more than 40 years. Various offsets of the biostratigraphic scheme, which are asking for adjustment, are being discussed.

Our findings allow for a correlation of different paleoclimatic, paleoenvironmental and paleobiological shifts which occurred in the Valanginian – Albian. These include the Valanginian Weissert Event and the Nannoconid crises as well as a warming peak during the Barremian. This mid Barremian warming event is mirrored by the highest Sr-isotope values observed throughout the entire Early Cretaceous. We link the high Sr-isotope values to continental weathering and increased run-off. In more restricted basins of the Boreal Realm these conditions are reflected by the deposition of black shales (Hauptblätterton, Munk marl bed). High resolution data are presented for the early Aptian oceanic anoxic event (OAE 1a).