Early Cretaceous climate and glendonites

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The link between glendonites and cooling events and high-latitude cold-water environments was already understood even before it was recognized, that glendonite is a pseudomorph of ikaite, a metastable cold-water carbonate hexahydrate (KEMPER, SCHMITZ, 1975). Although factors affecting glendonite distribution are still in discussion (QU et al., 2017; LU et al., 2015), the temperature limitation for the origination of ikaite/glendonite just as the spatial and stratigraphic distribution of glendonite linked to cooling events is unquestionable. This is confirmed by other independent palaeoclimatic parameters like occurrence of tillites and/or dropstones, oxygen isotope values, TEX86, changes in climate-sensitive flora and fauna, etc. We provide a brief review of all known Early Cretaceous glendonite records correlated to other independent evidence for climate changes. It should be considered, that high-latitude sections, which are suggested to be more climate-sensitive compared to those of mid latitudes, are still insufficiently studied and, for example, studies of oxygen isotopes in molluscan shells are restricted to few areas and time slices. Latest Jurassic (Tithonian) and earliest Cretaceous (Berriasian to earliest Valanginian) glendonites are rare. They are known from few areas only: Chile and Arctic Canada for the Tithonian, Northern Siberia and Arctic Canada for the Berriasian. These glendonite occurrences may indicate beginning of the Early Cretaceous high-latitude cooling event, which became much stronger later. The maximum glendonite distribution in both, Northern and Southern Hemispheres, is in the Valanginian and Late Aptian, which are known as cold episodes (BODIN et al., 2015), while Late Hauterivian (and Early Albian) glendonite occurrences in the Arctic indicate minor cooling events, clearly coinciding with strong southward migration of boreal faunas. But there is an obvious asymmetry in the spatial distribution of glendonites in the Early Cretaceous: In the Late Aptian glendonites have been known for a long time from the northern and southern Hemisphere, while in the Valanginian glendonites are just recently discovered, but represented by ‘microglendonites’ only. Macroscopic glendonites are still unknown from the southern hemisphere.

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