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Do Lower Cretaceous CORBs indicate icehouse interludes?

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Cretaceous Oceanic Red Beds (CORBs) are typical deep-marine sediments of the Late Cretaceous (Hu et al., 2005a). Lower Cretaceous CORBs are comparable sarce, and only a few examples have been investigated so far (Hu et al., 2005b). Lower Cretaceous red pelagic carbonates are present in the Northern Calcareous Alps (NCA) within a pelagic to hemipelagic succession and can be correlated to other CORBs, e.g., in Italy and Spain.

Red pelagic intervals of Early Cretaceous age are known from the Schrambach Formation and the Tannheim Formation. The Schrambach Formation comprises grey, sometimes spotty pelagic micritic limestones and marlstones. Red intervals of a few meters within the dominantly grey succession (Anzenbach Member) form a distinct stratigraphic level of red marls southeast of Salzburg, where a Late Berriasian to early Valanginian age has been proven.

Aptian/Albian *Hedbergella*-limestones mark the base of the Tannheim Formation at the boundary between pelagic micrites and overlying marls. These dark red limestones (foraminiferal packstones) constitute a condensed facies extremely rich in planktonic foraminifera of the genus *Hedbergella* and grade into red marlstones. A late Aptian to early Albian age can be confirmed by planktonic foraminifera and strontium isotope stratigraphy.

Remarkably, these two red intervals coincide with the times of cool climate and suspected icehouse conditions for the Lower Cretaceous. Both the (late Berriasian to) Early Valanginian and the Late Aptian are times of maximum glendonite and dropstone occurrences and times of relatively low ocean temperatures as inferred from several d13O records. This points to a possible causal link of cool climate interludes

with preferred oxic bottom conditions at least in the Tethys region. Brief cooling periods may have resulted in increased production of oxygen-rich bottom waters and led to oxidation of bottom sediments. Longer term sea-level lowstands as recognized in the Valanginian and Late Aptian may also support this hypothesis.

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