

Sub-Milankovitch cycles in Upper Cretaceous pelagic successions along the active and passive continental margins of the NW Tethys

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Two Upper Cretaceous sections in the Eastern Alps of Austria were investigated in detail to decipher Milankovitch and sub-Milankovitch cycles. The two sections were situated palaeogeographically at the passive (northern Penninic-Helvetic) margin of the European Foreland and at the active (southern) margin of the northwestern Tethys ocean branch (Penninic Ocean or Alpine Tethys). Sample material was collected from three short profiles of visible and known cyclic succession yielding limestone-marlstone cycles (Northern Calcareous Alps: Postalm section; Ultrahelvetic Unit: Rehkogelgraben section). Samples cover a time range of 240 ka in total based on published Milankovitch-type cyclostratigraphy (NEUHUBER et al., 2009, 2016; WAGREICH et al., 2012). High-resolution geochemical analyses of whole rock analyses using ICP-MS, EDXRF/ EDXRF-handheld device, WDXRF, stable C and O isotopes measurements and continuous thin-sections profiles were performed to characterize the various beds.

Elemental abundance ratios show cyclic arrangements and thus allow an interpretation as being climatic in origin, controlled by orbital parameters. Using spectral analyses and bandpass filtering it was possible to interpret a ~10 ka, ~5 ka and a ~7–8 ka signal based on fluctuations in CaCO₃, stable carbon and oxygen isotopes. The 5 ka signal is most likely an artefact reflecting the first harmonic of the precession signal. The 7–8 ka signal is interpreted most likely as an artificial product of the statistical methods used. The 10 ka or semi-precession period is possibly, in accordance with previous studies, an original climate cyclic signal that may be linked to cyclic climatic variations especially in the tropics, which themselves are controlled by orbital forcing (BERGER et al., 2006).

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