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From anoxic to oxic conditions in the northern Helvetic Seewen Formation (Cenomanian – Turonian)

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Several Cenomanian – Turonian pelagic limestone sections of Northern Tethyan origin were studied to gain a better understanding of shelf sedimentation and oceanography during a time of major carbon cycle perturbation. Three expanded sections (Chäserrugg, 32 m; Strichboden, 8 m and Kamor, 29 m) were sampled in 10 cm spacing. All sections belong to the northern Helvetic Seewen Formation (Churfirsten-Säntis nappe). Samples were analysed for stable carbon- and oxygen-isotopes. The new C-isotope stratigraphy established in eastern Switzerland shows that isotopically defined OAE2 has a thickness of 2-3 meters in the Seewen Limestone successions of Eastern Switzerland. A chemostratigraphic correlation with other reference curves of the Latest Cenomanian and Earliest Turonian intervals is possible.
The onset of the δ13C positive excursion of the Ocean Anoxic Event 2 (OAE2) is characterised by condensed beds with some dissolution features which are filled by glauconite grains. This characteristic layer can be found at several places in the Eastern Switzerland. The condensed beds comprise the first δ13C excursion of OAE2 (4.1‰). Sedimentary facies on top of the condensed bed varies between more distal and more proximal shelf successions. At the locality Strichboden, darker and more marly limestones were formed in a more distal shelf setting near or within an expanded oxygen minimum zone. More proximal shelf successions are preserved in the Alpstein (Kamor) and in the Vorarlberg (A) region. In the Kamor section, the condensed interval preserves the signature of OAE2 with a δ13C value of 4.8‰ . An 80cm thick glauconite sand layer, the so called “lower” Götzis bed (Föllmi and Ouwehand, 1987), forms the top of this condensed interval. The sand facies reflects stronger current activity affecting sediments deposited along the more proximal shelf.
10 m above the Cenomanian-Turonian δ13C excursion several red pelagic limestone beds are intercalated with the otherwise white Seewen limestone. These red limestones can be correlated with “Oceanic Red Beds” identified in numerous deep pelagic successions on a global scale. In the sections studied, the first and most distinct Oceanic Red Bed (CORB9) occurs always in the H. Helvetica total range zone (Bolli, 1944). The CORB’s coincide with a negative shift of the δ13C record of the Middle and Late Turonian. Red limestones formed along the northern Tethys shelf were already described by Neuhuber et al. (2007) in the Ultrahelvetic units of the Eastern Alps of Austria and Bavaria. They all record a major oxygenation event in the Turonian related to a changing ocean circulation pattern.

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Neuhuber, S., Wagreich, M., Wendler, I. & Spötl, C. 2007: Turonian oceanic red beds in the Eastern Alps: concepts for paleoceanograpic changes in the Mediterranean Tethys. Palaeogeography, Palaeoclimatology, Palaeoecology 251, 222–238.