

A new high-resolution C-isotope chemostratigraphy through the Aalenian Opalinus Clay and its neighbouring units in Northern Switzerland

Stephan Wohlwend (1), Nathan Looser (1), Stefano M. Bernasconi (1), Timothy Eglinton (1), and Gaudenz Deplazes (2)

(1) ETH Zurich, Geological Institute, Sonneggstrasse 5, 8092 Zürich, Switzerland (stephan.wohlwend@erdw.ethz.ch), (2) Nagra, Postfach 280, Hardstrasse 73, 5430 Wettingen, Switzerland

The formation Opalinus Clay, mainly deposited during the Early Aalenian (Opalinum Zone), consists of dark grey to black calcareous and sandy claystone and, compared to other Mesozoic formations, has a relatively homogeneous composition. Based on the mineralogy and grain-size, the Opalinus Clay, however can be further divided into sub-units. Currently different additional geophysical and geochemical methodologies for defining these sub-units are tested. The extent of these sub-seismic-scale sub-units can be investigated by comparing the records of different outcrops and drill cores. Because different sub-units are difficult to correlate, the question arises, if one facies is missing in some profiles or if different facies have been deposited at the same time within the investigated area. To predict potential lateral facies changes within the Opalinus Clay, the depositional environment must be investigated and for that not only a compositional but also a chronological differentiation is needed.

Biostratigraphy based on ammonites and palynomorphs is a frequently applied method to establish a chronology in these clay rich Mesozoic sediments. Previous studies indicate that the onset and end of the deposition of the Opalinus Clay facies is diachronous (e.g. Reisdorf et al., 2014; Feist-Burkhardt & Pross 2010). However, the resolution of these biostratigraphic tools is mostly not high enough to differentiate the sub-units of different drill cores within the Opalinus Clay. Therefore, in this study we evaluated if high-resolution carbon isotope stratigraphy measured on carbonates as well as on organic matter can be used as an additional independent method for correlation. The C-isotope chemostratigraphy for the Opalinus Clay provides sufficient variability to establish a very high-resolution correlation for the whole Early Aalenian (Opalinum Zone). Together with the under- and overlying formations a temporal period from the Toarcian oceanic anoxic event to earliest Bajocian can be covered. The newly established C-isotope chemostratigraphy shows several distinct negative and positive excursions which can be followed throughout the drill cores from Riniken, Weiach, Benken to Schlattigen-1 over about 50 km. A stepwise negative excursion can be seen in all four cores in the lowermost Opalinus Clay in the Opalinum Subzone of the Opalinum Zone. A second excursion with an increase of values can be seen in the uppermost part of the Opalinus Clay succession in the Comptum Subzone of the Opalinum Zone. These two excursions may reflect the global variation in the C-isotope record in the earliest Aalenian.

Feist-Burkhardt, S. and Pross, J. (2010): Dinoflagellate cyst biostratigraphy of the Opalinuston Formation (Middle Jurassic) in the Aalenian type area in southwest Germany and north Switzerland. *Lethaia* 43, 10-31.

Reisdorf, A.G., Wetzel, A., Schlatter, R. and Jordan, P. (2011): The Staffelegg Formation: a new stratigraphic scheme for the Early Jurassic of northern Switzerland. *Swiss Journal of Geosciences* 104/1, 97-146.