Biostratigraphy, isotope stratigraphy (δ18O, δ13C) and geochemical characteristics (XRF) of Upper Tithonian to Lower Cretaceous deeper-water sedimentary rocks (Northern Calcareous Alps, Salzburg) as a tool to prospect raw material for the cement industry

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We investigated the Uppermost Jurassic to Lower Cretaceous deeper-water calcareous to siliciclastic and siliceous sedimentary rocks (Oberalm, Schrambach and Rossfeld formations) of the Leube quarry in the central Northern Calcareous Alps of Salzburg. Based on an already existing detailed biostratigraphy supported by Calpionellids and Ammonoids, we measured the geochemical characteristics (XRF) and the isotope stratigraphy (δ18O, δ13C) of the more than 450m thick sedimentary succession. Aim is to establish besides the existing classical prospecting methods a new method based on geochemical data to recognise similar successions in the partly deeply weathered and highly deformed Late Jurassic to Early Cretaceous successions of the Northern Calcareous Alps. Beside the limestones of the Oberalm Formation, characteristic sedimentary rocks in the Upper Tithonian to Lowermost Cretaceous are reef slope breccias of the Barmstein Limestone and the oligomictic breccias of the late Upper Tithonian so called “Tonflatschenbreccia”. This succession is characterized by a general deepening- and fining-upward trend getting upsection more and more homogeneous. Generally the content of clay increases and the amount of carbonate decreases. Reason is the back-stepping of the Plassen Carbonate Platform in the Late Tithonian to Middle Berriasian. This trend also becomes apparent in the analysis of major elements with XRF showing a more and more homogeneous chemical composition of the samples. The δ18O and δ13C curves constitute more or less a similar trend.

The drowning of the Plassen Carbonate Platform around the Middle/Late Berriasian boundary resulted in the deposition of a condensed section with red and green limestones and marls of the Gutratberg beds in the uppermost part of the Oberalm Formation. This event can also be seen in the geochemical data and the isotope curves and represents the upper boundary of the Oberalm Formation. The Late Berriasian to Valanginian Schrambach Formation is characterized by the deposition of a relatively homogenous marly and well-bedded limestone marl sequence followed by the Rossfeld Formation (Late Valanginian to Early Aptian). The deposited rocks change to coarse grained siliciclastic breccias and conglomerates followed by a fining upward trend with finegrained arenites, siliceous limestones and marls. The abrupt change at the Schrambach/Rossfeld boundary is also clearly visible in the geochemical data.

We present the first correlation of isotope and geochemical data in connection with high resolution biostratigraphy. Using a standard profile of a more or less complete sedimentary succession of the considered period in the deeper part of the basin, these resulting data can provide the basis to correlate sections from different outcrops. It will be also able to distinguish different depositional areas within the basin. This combination of different methods should help to recognise the completeness of successions occurring usually in weathered outcrop conditions. Besides classical prospecting methods this approach can act as a new tool in the prospection of raw materials for the cement industry.