Carbon and oxygen isotope analyses by mid infrared laser spectroscopy as a tool for stratigraphic classification of Upper Jurassic carbonate rocks

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Carbonates represent one of the most important reservoir rocks for groundwater, geothermal energy and hydrocarbons. Since carbonates are mainly biological sediments, their depositional environment is often complex and frequently changing. Furthermore, they are often subjected to numerous diagenetic processes like dolomitization and karstification due to their high reactivity with acidic water. This heterogeneity is the main reason for their suitability as a reservoir rock, but also complicates their stratigraphic classification.

Stable carbon and oxygen isotopes of carbonates might be a suitable tool to classify these rocks, because processes like dolomitization or shifts from inorganic to biologically driven deposition as well as global sea level changes due to climate change leave a unique isotope signal within their ^{13}C and ^{18}O isotope signature. The aim of our study is to calibrate a chemo-stratigraphic curve on a drill core representing a complete succession of Upper Jurassic carbonate rocks from Southern Germany. For our study we used Thermo Scientific™ Delta Ray™ Isotope Ratio Infrared Spectrometer (IRIS) with the Universal Reference Interface (URI) Connect, which allows fast and cost effective isotope analysis, even under field conditions. The Delta Ray Connect is based on direct absorption spectroscopy and is used for simultaneous determination of $\delta^{13}C$ and $\delta^{18}O$.

The results will help to validate, if stable isotopes of carbonate rocks are useful tools for stratigraphic analysis within the Upper Jurassic in Southern Germany and might allow classification of disintegrated drilling samples like cuttings. This will help to gain more information about the structure of the Upper Jurassic in the subsurface and might add important information e.g. for sequence stratigraphic purposes.