U isotope variations in a dolomitized Jurassic carbonate platform (Tithonian, Southern Germany)

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In recent years, several studies have been published that aimed at calibrating the U isotope system in modern settings as a paleoredox proxy. Such studies may improve the framework for interpreting U isotope records by unraveling the fundamental controls on the sequestration of uranium into sediments. However, not all processes can be examined in a modern context. Many geological processes operate on either timescales too long to observe in modern environments, or do not occur in surface environments. Dolomite is a common mineral in many sedimentary rocks. However, while dolomite occurs in considerable amounts in the geological record, it is not very common in modern depositional settings and generally forms during diagenesis. It is therefore important to understand whether dolomitization had a significant impact on the U isotopic composition of dolomitized rocks.

The U isotopic composition ($\delta^{238}U$) of a dolomitized Jurassic carbonate platform was studied to assess whether dolomitization can have an impact on the uranium isotopic composition of carbonates rocks. A positive correlation between redox sensitive elements (U, Re, Mo, and V) and $\delta^{238}U$ confirms that the authigenic uptake of uranium under reducing conditions preferentially incorporates uranium enriched in ^{238}U. This shifts the $\delta^{238}U$ of bulk carbonate sediments to values that are heavier than the contemporaneous seawater. The magnitude of this offset appears to correlate with the level of authigenic enrichment of redox sensitive elements as amples with high Re and V concentrations and high Re/Mo ratios have the most enriched $\delta^{238}U$ values. This positive correlation between redox sensitive elements and $\delta^{238}U$ does not change within the dolomitized interval. This suggests that during dolomitization the uranium isotopic composition of the limestones was not altered. Therefore, our results indicate that the dolomitization process does not result in sediments depleted in ^{238}U.