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Calibration and application of clumped isotopes of G. ruber for high-resolution climate reconstructions of the last 2500 years from the Gulf of Taranto, Mediterranean Sea

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The aim of this project is to reconstruct climate evolution during the last 2500 years in the eastern Mediterranean Sea at sub-decadal resolution based on isotope analysis of planktonic foraminifera. We utilize a newly developed technique for clumped isotope measurements of small samples (Schmid and Bernasconi, 2010), which allows for the first time to produce combined high-resolution δ^{18}O and clumped isotope records from sediment cores. The clumped isotope method provides the opportunity to determine the temperature of the precipitation of calcite via the abundance of ^{13}C- ^{18}O bonds in carbonate and at the same time to calculate the δ^{18}O of sea water in which the organism lived via the δ^{18}O of the same sample.

Here we present δ^{18}O and clumped isotope measurements of *G. ruber (white)* from a short sediment core covering the last 500 years and a long sediment core covering the last 2500 years, at 3.5 years resolution. We find that in the last 50 years the obtained clumped isotope temperatures are in good agreement with measured sea surface temperatures (SST's) with an accuracy of $\pm$ 2°C or better. Thus we show that this new method is a robust new tool for reconstructing changes in temperature and δ^{18}O of seawater, and therefore of salinity, on exactly the same sample. We observed that SST's did not change significantly over the last 2500 years, but that changes in salinity in the order of 1-2 PSU are not uncommon, suggesting changes in circulation and freshwater runoff. Additional analyses on core top samples and water samples support our calibration of the clumped isotope signatures of *G. ruber (white)*.

In terms of the climatic evolution our isotopic data and a compilation of regional historical, geographical and archeological data indicate that during the Roman Classical Period the conditions were more humid in the Mediterranean and drifted towards drier conditions during the Medieval Warm Period (MWP). Additional counts of *G. ruber (pink)* support the assumption of much drier conditions during the MWP, which concords with higher δ^{18}O values of *G. ruber (white)* due to higher salinity. The results of the short core, covering the LIA, correlate well with global temperature reconstructions.

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