Reducing sample size on the IBEX automated clumped isotope system: preliminary results

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Carbonate Clumped-isotope thermometer is considered a very promising technique given the advantages and unique information it provides in various fields (i.e. paleoclimatology, diagenetic processes, paleoaltimetry). Despite significant progress mode over the last decade, the major limitation of this method still remains the relatively large sample size needed as well as the long measurement time required to achieve the required precision. The long-integration dual-inlet (LIDI) method represents an important step towards smaller sample size. It consists of measuring firstly the sample gas and then the reference gas (WG) for an integration time of 600s each. The elimination of the alternative measurement between sample and WG gas as well as the pressure balancing allows to notably reduce the time and sample use compared the standard dual-inlet (DI) technique.

To our knowledge, the LIDI tecnique has only been successfully applied to the automated Kiel IV carbonate device. Here we present our work on (a) exploring the optimum beam size for clumped isotope measurement, and (b) applying for the first time the LIDI technique on a MAT 253 mass spectrometer coupled to our in-house Isotope Batch Extraction (IBEX) system. The IBEX is an automated device, developed in collaboration with Protium MS. It is currently used for clumped isotope analyses in the carbonate research lab of Imperial College. The main aim of our research is to determine the internal lower limit of the beam intensity, in order to define the minimum sample size required to obtain high-precision carbonate clumper isotope analyses.

The reference gas (δ^{13}C: -36.97‰ VPDB; δ^{18}O: 8.6‰ VSMOW) in both the sample (left) and reference (right) bellows was firstly used to calibrated and to monitor the long-term stability of the system. Then carbonate standards was used to verify the reproducibility of clumped isotope measurements. The proposed investigation will open new possibilities in clumped isotope research, notably in paleoclimatic and diagenesis where high resolution analyses and/or small samples are required.