DATA BULLETIN

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EXCELLENCE IN ELEMENTS

Unattended high precision $\delta^{18}O$ analysis of 180 water samples with the iso ***FLOW***

Since Epstein and Mayeda first established $\delta^{18}O$ analyses in water samples based on equilibration in 1953, there has been an increased need for high throughput analytical systems providing high quality isotope analyses. Nowadays, other techniques can be used to measure isotopic ratios in water samples, but equilibration is still a favored method $\delta^{18}O$ isotope ratio analysis because of the specificity of the equilibration reaction between H_2O and CO_2.

For years equilibration performances were best achieved in Dual Inlet (DI) mode. But the recently developed iso **FLOW** has proven to generate performances equivalent to DI but with a much higher throughput, thanks to the specially designed 180 positions temperature regulated autosampler. This data bulletin demonstrates stable and precise $\delta^{18}O$ analyses of a full 180 batch of water samples by H_2O-CO_2 equilibration. The batch was run unattendently using the iso **FLOW** coupled to the **isoprime precisION** isotope ratio mass spectrometer.

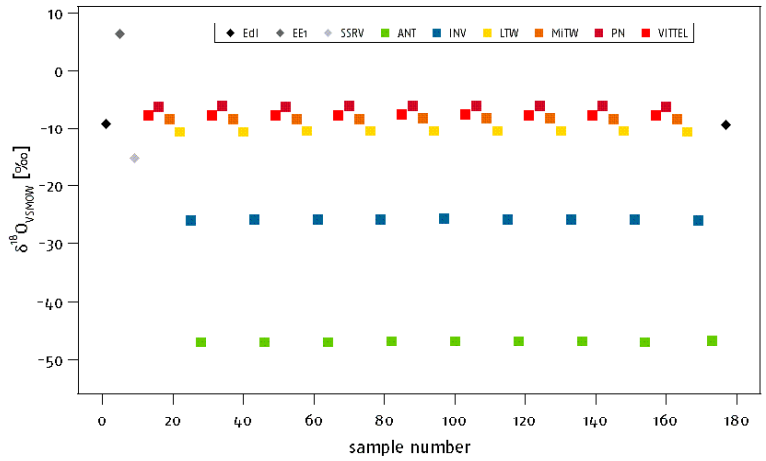


Figure 1. $\delta^{18}O$ analyses of a 180 water samples batch.

Figure 1 shows a full 180 water sample equilibration batch with calibrated working standards at the beginning and at the end of the analysis run. In between the calibrated water standards 6 waters with different isotopic signatures have been repeatedly analyzed.

INSTRUMENT:
iso **FLOW**

DETAILS:
mode: equilibrium
sample: water



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SAMPLE	$\delta^{18}O$ [‰]	SD [‰]	$\delta^{18}O_{ALL}$	SD_{ALL}
EdL III start EdL III end	-9.212 -9.287	0.045 0.090	-9.249	0.053
EE1	6.405	0.072		
SSRW	-15.264	0.057		
VITTEL	-7.758 -7.740 -7.722 -7.652 -7.574 -7.617 -7.650 -7.650 -7.734	0.074 0.056 0.102 0.060 0.065 0.138 0.019 0.040 0.084	-7.677	0.063
PRINCE NOIR	-6.276 -6.211 -6.221 -6.152 -6.145 -6.098 -6.089 -6.269 -6.291	0.063 0.022 0.035 0.084 0.045 0.040 0.049 0.095 0.075	-6.184	0.072
MiTW	-8.405 -8.347 -8.327 -8.324 -8.272 -8.209 -8.275 -8.341 -8.373	0.056 0.107 0.066 0.112 0.021 0.067 0.016 0.057 0.120	-8.319	0.059
LTW	-10.559 -10.547 -10.473 -10.417 -10.420 -10.394 -10.398 -10.487 -10.649	0.120 0.115 0.120 0.039 0.016 0.076 0.106 0.053 0.177	-10.483	0.087
INV	-26.046 -25.956 -25.983 -25.933 -25.834 -25.860 -25.929 -25.902 -26.020	0.021 0.094 0.072 0.022 0.043 0.094 0.022 0.046 0.146	-25.940	0.070
ANT	-47.005 -47.000 -46.940 -46.920 -46.838 -46.878 -46.903 -47.031 -47.749	0.040 0.059 0.017 0.048 0.033 0.033 0.025 0.053 0.017	-46.918	0.090

High throughput

The instrument was left unattended for the whole process of autofilling with the equilibration gas and the analyses of the 180 vials. The batch started at 1:00 pm on day 1 and finished at 8:30 am on day 2 with the 180 isotopic ratios ready to be interpreted. Unlike classical dual inlet automated systems, at the end of the batch the system was ready for another batch without having to condition any trap.

Each sample was analyzed in triplicate which means each line in Table 1 is the average of 3 analyses from 3 different aliquots from the same water. The order of analyses is shown in Figure 1.

High precision

The individual standard deviation (SD) for each set of triplicate analyses is equivalent to DI performance of about 0.05 ‰. No data points have been discarded.

No drift

When analyzing long batches of samples, instrumental drift is a concern. The data presented in this data bulletin show no significant drift between the $\delta^{18}O$ isotope ratio of the working standard EdL III measured at the beginning and at the end of the batch. Although it is an option in the ion**OS**® software, no peak centre was enabled throughout the whole batch. This illustrates the stability of the **isoprime precisION** mass spectrometer.

Conclusion

The iso **FLOW** – **isoprime precisION** system in equilibration mode combines high quality isotopic analysis comparable to dual inlet performances with extremely high throughput analytical capacities using its 180 positions autosampler.

The iso **FLOW** – **isoprime precisION** system is proving to be a state of the art combination for users requiring high precision isotopic analyses (e.g. climate reconstruction) as well as large batches of water samples (e.g. food control).

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Elementar Analysensysteme GmbH
Elementar-Straße 1 · 63505 Langenselbold (Germany)
Phone: +49 (0) 6184 9393-0 | info@elementar.com | www.elementar.com

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