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Testing of a continuous technique for triple water isotope determination

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Various results indicate that there is a mass independent fractionation (MIF) signal in stratospheric water vapor, but its magnitude is still under discussion (1,2). As in the case of CO_2, MIF in tropospheric H_2O is expected to be significantly smaller than in stratospheric O_3. It has been shown that $\Delta^{17}O$ during evaporation depends on h_n (ratio of vapor concentration in the free air to the saturated concentration at the temperature and salinity of the sea surface) and therefore can be used to estimate past changes in humidity from acquifers containing fossil waters as well as from ice cores (3). Recently it has been observed that $\Delta^{17}O$ in Antarctic ice remained small over long time periods. This finding contrasts with measurements of $\Delta^{17}O$ on monthly-integrated precipitation samples collected from the Swiss precipitation network run by UBern, which showed occasionally large deviations in $\Delta^{17}O$ O of up to several per mil. The latter measurements were undertaken with the conventional CO_2-H_2O equilibration system for isotope ratio investigations on water samples that exhibits a limited precision of about 80 permeg (4). Based on the method develop by Baker et. al. (5), we investigated an continuous flow technique for its quantitative conversion and precision regarding water oxygen. To check the complete conversion of H_2O by CoF_3, an equivalent amount of oxygen in an atmospheric air aliquot was injected. Precision of single runs is significantly above the targeted numbers, therefore multiple injections are requested to approach the 5 to 10 permeg level..

References

1. C.R. Webster et. al., Water isotope ratio D/H, $^{18}O/^{16}O$, $^{17}O/^{16}O$ in and out of cloud map dehydration pathway. *Science* **302** 1742(2003),10.1126/Science.1089496

2. P. Franz et al., High-precision isotope measurement of $H_2{}^{16}O$, $H_2{}^{17}O$, $H_2{}^{18}O$ and the $\Delta^{17}O$-anomaly of water vapor in southern lowermost stratosphere. *Atmospheric Chemistry and Physics* **5**, 2949(2005),1680-7324/Atmos. Chem. Phys.2005-5-2949

3. E. Barkan et.al., Diffusivity fractionations of $H_2{}^{16}O/H_2{}^{17}O$ and H_216O/H_218O in air and heir implications for isotope hydrology. *Rapid Communication In mass Spectrometry* **21** 2999(2007), 10.1002/rcm.3180

4. J. Elsig et.al.,Measurements of the ^{17}O Excess in water with the equilibration method. *Analytical Chemistry*, **80/9** 3244(2008),10.1021/ac702436t

5. L. Baker et al., A technique for the determination of $^{18}O/^{16}O$ and $^{17}O/^{16}O$ isotopic ratio in water from small liquid and solid samples. *Analytical Chemistry*, **74/7**(2002), 10.1021/ac010509s