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Performances of express mode vs standard mode for d^{18}O, dD and ^{17}O-excess with a Picarro analyzer

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The recent development of optical spectroscopy enabled the development of the use of water isotopes in climate, environment and hydrological studies. An increasing number of studies also includes the most recent parameter ^{17}O-excess as an indicator for kinetic fractionation effects in the water cycle. However, for some applications such as ice core science, the ^{17}O-excess signal to be measured is very small, of the order of 10 – 20 ppm and it is a big analytical challenge to obtain the requested precision.

Here, we present results of performance of the new express mode and the standard mode developed for d^{18}O, dD and now also ^{17}O-excess for a Picarro analyzer. In the standard mode, there is a new injection of water vapor lasting 4.5 minutes every 10 minutes. To get rid of memory effect, the first injections are discarded or a correction is applied which depends on the difference in water isotopic composition between the measured sample and the previous one. For each new sample measured with the express mode, the sequence begins with 6 injections of water vapor in the cavity of 40 secondes each to get rid of the memory effect. It is followed by injections of water vapor lasting 2 minutes every 4 minutes. The advantage of the express mode is to avoid the memory correction and to decrease the measurement time. It thus permits to run more replicates which is important to improve the accuracy of the measurements, especially ^{17}O-excess. We present here results of several series of samples and standards of different water isotopic composition (d^{18}O ranging from -54 to 0 ‰) ran three times with both the standard and the express modes and compare the performances of the two modes.