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Tips and tricks to perform reliable stable isotope analysis with a Picarro CRDS

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In the last decade new gas analyzers based on optical spectrometry such as cavity ring down spectrometry (CRDS) and Off-Axis Integrated Cavity Output Spectroscopy (OA-ICOS) have become available and represent a good alternative for the stable isotopic analyses of water and gas samples to traditional mass spectrometry (IRMS).

This, relatively new technique, provides several benefits compared to IRMS such as lower upfront capital costs, lower maintenance, lower sample preparation time and, in the case of water samples, the analysis of both D/H and $^{18}O/^{16}O$ directly and simultaneously**,** with no conversion of H_2O to H_2 or CO/CO_2. This simplification reduces both the time for sample analysis and the intrinsic errors related to such conversions. However, on the other hand there have been also identified some disadvantages, mainly related to the memory effect, control of injection volume and syringe maintenance, which may result in less reliable results.

To understand these issues appropriately, with the aim of minimizing their effects, we have performed three experiments using a Picarro l-1102i CRDS analyzer coupled to a CTC Analytics autosampler.

The first experiment examining the memory effect is focused on determining the number of injections that should be rejected depending on the isotopic composition difference between the analyzed samples. We have also determined the optimum injection volume for the most accurate results and finally, we have investigated how to increase the syringe lifetime by using n-methylpyrrolidine (NMP) as a lubricant and an additional cleaning method performed at the end of each run consisting in 10 fill strokes of the syringe with NMP and with deionized water.

As a result of exploring these analysis aspects, we provide some tips and tricks that can be useful to perform more reliable isotopic analyses achieving an accuracy of better than 0.5 ‰ for δD and better than 0.1 ‰ for δ^{18}O which is even better than that obtained using conventional IRMS techniques.