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Two new optical spectrometric (CRDS technique) devices for stable isotope measurement on carbon dioxide, methane and water

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Two new devices, based on Cavity Ringdown Spectrometry (CRDS) methods, are under development. A first device, for measuring H, C, and O isotopes on carbon dioxide and methane, and a second device, for measuring water (on vapour) for H and O isotopes, are expected to be available Spring 2005 and Fall 2005, respectively.

Basics of the technical working of the devices will be explained. Sample gases (or water vapour), loaded in a sample optic cell, are measured in relative way against a 'standard' gas in the reference optic cell. The devices have the advantage that gas or water samples can be measured: without or hardly any preparation of the sample, on gas mixtures without need to separate fractions, and can be used for 'in place' measurements in the field (the devices are "portable": they are relatively light [approx. 30 kg], reasonably small [about 90 x 32 x 12 inch] and power can be supplied by e.g. batteries). The devices are comparatively cheap, both in buying costs as well as in running costs (no sample preparation, low energy costs, no climatized room needed [exception of extreme climate conditions], low specialization level of operator possible, short measuring time and high throughput of samples). All isotopes of interest (H, D, ^{12}C, ^{13}C, ^{16}O, ^{17}O, ^{18}O, where applicable) can be measured without changing of sample gas. Major disadvantage of the CRDS technique is a lower precision compared with standard IRMS techniques, about an order lower if compared with commonly reported levels of precision by IRMS.

Measuring stable isotopes on carbon dioxide, methane and water 'in place' in the field in a relatively simple way is made possible with these new devices. Applications in biogeochemistry, e.g. for direct measuring of stable isotopes on biologically produced gases, in atmospheric studies measuring stable isotopes on trace gases and gases produced by environmental pollution (e.g. source tracking) are some examples which can be named. Very attractive is the option to include ^{17}O isotopic measurements, eventually as tracer for atmospheric involvement (e.g. heritage of ^{17}O vs. ^{18}O non-mass dependent fractionation in atmospheric processes) in processes at the Earth's surface.

The devices also can be used as a cheaper alternative compared with IRMS for those studies where a somewhat lower precision is sufficient for interpretation of the results.