Performance test of a CRDS instrument for continuous CO₂/CH₄ measurement and its suitability for the ICOS atmospheric stations network


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Introduction

ICOS (Integrated Carbon Observation System; http://www.icos-infrastructure.eu) is a new European research infrastructure for quantifying and understanding the greenhouse balance of the European continent and adjacent regions. During its preparatory phase, the project will be developed to a fully operational level, with a reduced number of observational sites. Part of the project is the construction of a network for atmospheric sites. A part of the project is the development of a low-maintenance drying system. Further test results can be found in Wastine et al. (2009).

Calibration/drift

A low-maintenance drying system based on natrium dryers and a high pressure dryer (for the purge gas) is being developed at LSCE. The objective is a system that does not need consumables for drying the nafion purge gas (e.g. Mg(ClO₄)₂) and that dries efficiently the sample without modifying its trace gas composition. The preliminary results are encouraging. Such a system would be particularly useful on high-humidity sites (e.g. Lamto station) as high humidity of the sample increases the uncertainty of the measurement (see section “H₂O correction”).

Drying system

The gas is air from an air inlet that passes through a dryer composed of a CRDS. The relative air humidity drops from 50% to 10% due to adsorption. The above example is for sample air that has been dried using the CRDS analyser.

H₂O correction

All our analyzers have the same built-in CO₂ correction (below):

$$CO_{corr} = CO \times 1.0 \times \frac{H₃O}{H₂O}$$

We found indications that the correction parameter (CO₂) may change through time between analyzers, which could (e.g. at high ambient humidity) affect the measurement. The presence of a reliable H₂O correction parameter 0.01244 may change through time between analyzers, which could (e.g. at high ambient humidity) affect the measurement. The presence of a reliable H₂O correction parameter 0.01244 may change through time between analyzers, which could (e.g. at high ambient humidity) affect the measurement.