



## **Cavity Enhanced Spectrometer performance assessment for greenhouse gas dry mole fraction measurement in humid air.**

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Due to the high variability of the water vapor content in the atmosphere, the mole fraction of trace gas such as greenhouse gas (GHG) in the atmosphere is usually presented as mole fraction in dry air. In consequence, the first technology used for GHG measurement, gas chromatography or non-dispersive infra-red spectroscopy, required to dry the air sample prior to analysis at a dew point lower than  $-50^{\circ}\text{C}$ . The emergence of new GHG analyzers using infrared Enhanced Cavity Spectroscopy which measure the water vapor content in the air sample, allows providing the dry mole fraction of GHG without any drying system upstream by applying appropriate correction of the water vapor effects (dilution, pressure broadening...).

In the framework of ICOS, a European research infrastructure aiming to provide harmonized high precision data for advanced research on carbon cycle and GHG budgets over Europe, the Metrology Lab of the Atmosphere Thematic Centre (ATC), located at LSCE in France, is mainly dedicated to elaborating measurement protocols and evaluating performance of GHG analyzers. Among the different tests conducted to characterize the metrological performance, the Metrology Lab focuses on the water vapor correction to apply on the GHG measurement. Most of the analyzers tested at the Metrology Lab are based on Cavity Enhanced Spectroscopy measuring the ICOS mandatory species,  $\text{CO}_2$ ,  $\text{CH}_4$  and  $\text{CO}$ . This presentation presents the results of the performance assessment of the manufacturer built-in water vapor correction and the possible improvement. Thanks to the large number of instrument tested, the presentation provides a performance overview of the GHG analyzers deployed in the ICOS atmospheric station network. Finally the performance of the water vapor correction will be discussed in regard of the performance obtained by using a drying system.