

Evaluation of an OA-ICOS (Off-axis Integrated Cavity Output Spectrometer) for N₂O measurements at Schauinsland station

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High precision atmospheric N₂O measurements in different networks and at in-situ stations were measured in the last decades by gas chromatography (GC) but since a few years, new analysers have been developed based on spectroscopic technologies. The concentration gradients over the continent or between maritime and continental air are small and need to be measured very precisely which is challenging for both GC and optical analyzers.

At the UBA station Schauinsland (German Environmental Agency) an OA-ICOS analyser developed by Los Gatos Research is running since January 2015 in comparison to a GC system. Within this study we characterize the short-term and long-term repeatability, drift, temperature dependence, linearity and cross interferences with water vapour. The analyser shows standard deviation better than 0.1 ppb for the 5 min averages. The water vapour correction algorithms applied by LGR is not sufficient for high-precision atmospheric measurements and even the small differences in water vapour content of calibration gases and ambient air dried with a cryogenic cooler need to be corrected. The calibration procedure was optimized taking the non linearity, the analysers drift and the gas consumption into account. Here we present a calibration strategy using a drift standard which is injected every 6 hours. Comparison with GC measurements yield still a difference between (-0.07 and 0.33) ppb in 2017 which we could not explain with cross analysis of calibration gases and inlet line tests