Geophysical Research Abstracts
Vol. 15, EGU2013-12714, 2013
EGU General Assembly 2013

Comparison of two chamber methods and eddy covariance measurements for N2O for low flux conditions

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Chamber measurements of N2O based on flask sampling and subsequent GC analysis in the laboratory reveal high uncertainties in particular at low flux rates. We compared automated measurements with this method to chamber measurements with a Quantum Cascade Laser (QCL, type: CW-QC-TILDAS-76-CS, Aerodyne Research Inc., Billerica, MA, USA) installed in the field and to eddy covariance (EC) measurements with a similar QCL. The comparison was conducted over a grassland located at the research farm of the Thünen Institute, Braunschweig, Germany. The QCL increased the accuracy of the chamber measurements by about factor 10. Furthermore it was possible to reduce the time of chamber closure to less than 10 minutes, allowing a relatively high number of parallel chambers with hourly repetitions. At low emissions, EC measurements were highly uncertain due to relatively high noise. Implications for long-term measurements (e. g. in the framework of research infrastructures) are discussed.