



A novel and sensitive in situ instrument using incoherent broadband cavity-enhanced absorption spectroscopy for trace gas measurements

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Incoherent broadband cavity-enhanced absorption spectroscopy (IBBCEAS) is a technique with high sensitivity to quantify trace gas concentrations based on their absorption features. The design and calibration of an incoherent broadband cavity-enhanced absorption spectroscopy (IBBCEAS) setup employing a 20 m long optical cavity is described for sensitive in situ measurements of light extinction between 630 nm and 690 nm. The setup was installed at the SAPHIR atmospheric simulation chamber during an intercomparison of instruments for nitrate (NO₃) radical detection. The long cavity was stable for the entire duration of the two week campaign. A detection limit of ca. 2 pptv for NO₃ with a stable acquisition time of 5 s was achieved. In addition to monitoring NO₃, nitrogen dioxide (NO₂) concentrations were simultaneously retrieved and compared against concurrent measurements by a chemiluminescence detector. The spectral analysis of NO₃⁻ and NO₂ from the SAPHIR chamber studies and comparison with a long path DOAS instrument are presented. Moreover, results from a field campaign at Roches Point, Ireland, will be discussed.