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Simultaneous measurement of NO and NO_2 emissions on road by dual-channel cavity ring down spectroscopy technique

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NO_x (=NO+NO_2) are relevant to air quality due to their role in tropospheric ozone (O_3) production. In China, NO_x emissions are relatively high and exhausted from on-road vehicles makes up 20% of total NO_x emissions. Too much NO_x are harmful to the human body and animals. In order to detect the NO and NO_2 emissions on road, a dual-channel CRDS system for NO_2 and NO detection is reported. The detection limits of the developed CRDS system for NO_2 and NO_x measurements are estimated to be about 0.035 ppb (1σ, 1 s) and 0.039 ppb (1σ, 1 s), respectively. Considering the error sources of NO_2 absorption cross section and RL determination, the total uncertainty of NO_2 measurements is about 5%. The performance of the system was validated against other instruments. The good agreement between these experiments show the CRDS method is capable of measuring species with high sensitivity and accuracy. The measurements of on-road vehicle emission plumes by this mobile CRDS instrument show the different emission characteristics in the urban and suburban areas of Hefei. The instrument provides a new method for retrieving fast variations of NO and NO_2 plumes.