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Mobile and tall tower measurements of Methane and Ethane in the Netherlands

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In the Benelux there is a discrepancy between the methane emission levels reported from the emission inventory and those obtained from inverse models and measurements (Bergamaschi et al., 2017). The origin of this discrepancy, with higher emission estimated by the inverse models, is still unknown. In this study both mobile and tall tower measurements are used to find the reason for the different emission estimate.
Results are presented from experiments carried out with a new dual quantum cascade laser system (QCL) of Aerodyne which makes it possible to measure methane and ethane simultaneously (together with nitrous oxide, carbon dioxide, carbon monoxide, and methanol). The combination of methane and ethane makes it possible to distinguish natural gas methane from other methane sources (likes cows). The QCL can measure with a frequency up to 10 Hz, which makes it suitable for mobile measurements as well as eddy covariance measurements. Mobile measurement campaigns show the spatial pattern of methane emission and the split between natural gas sources and other sources.
The QCL also measured stationary on the tall tower Cabauw (located in the centre of the Netherlands) during an inter-comparison campaign. This campaign was undertaken to compare two FTIR Spectronus systems against two CRDS Picarro systems. The QCL data is used to see how high frequency “spikes” influence the average data obtained by the other systems. The combination of methane and ethane, measured by the QCL, is even more important to distinguish sources in tall tower measurements, since the sources are located further away. At Cabauw four different heights are measured (20, 60, 120 and 200 m). Do we see higher up, where sources are more mixed, less correlation between methane and ethane? Are we even on 200 m still able to distinguish natural gas sources from other sources? All questions we will answer in this study with a unique dataset.

Literature
Bergamaschi, P., Karstens, U., Manning, A. J., Saunois, M., Tsuruta, A., Berchet, A., ... & Levin, I. (2017). Inverse modelling of European CH4 emissions during 2006–2012 using different inverse models and reassessed atmospheric observations. Atmospheric Chemistry and Physics Discussions.