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Top-down estimates of European CH4 and N2O emissions based on 5 different inverse models

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European CH_4 and N_2O emissions are estimated for the years 2006 and 2007 using 5 independent inverse modeling systems, based on different global and regional Eulerian and Lagrangian transport models. The major objective of this ensemble approach is to provide more realistic estimates of the overall uncertainties of the derived emissions. This is particularly important for the application of inverse modeling to verify bottom-up inventories.

We use continuous observations from 10 European stations (including several tall towers) for CH_4 (8 stations for N_2O), complemented by further European and global flask sampling sites. While the CH_4 measurements from the different monitoring groups used in this study are relatively well inter-calibrated, we apply a recently developed bias correction scheme for the N_2O measurements to correct for significant calibration offsets, which are apparent for measurements from different laboratories.

The available observations mainly constrain CH_4 and N_2O emissions from Northwest and Eastern Europe. The different inverse models show reasonable consistency regarding the derived emissions from larger regions and country totals, but show significant differences on smaller scales. While the modeling protocol for the reference inversion includes the use of a priori information from detailed bottom-up inventories, additional sensitivity studies without this a priori information demonstrate the significant constraints of the observations on the emissions from larger regions within the footprint area of the measurement network.