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Inverse modeling of European CH_4 emissions 2001-2006

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European CH_4 emissions are estimated for the period 2001-2006 using a four-dimensional variational (4DVAR) inverse modeling system, based on the atmospheric zoom model TM5. Continuous observations are used from various European monitoring stations, complemented by European and global flask samples from the NOAA / ESRL network. The available observations provide mainly information on the emissions from Northwest Europe (NWE), including the UK, Ireland, the BENELUX countries, France and Germany. The inverse modeling estimates for the total anthropogenic emissions from NWE are 21% higher compared to the EDGAR emission inventory and 40% higher compared to values reported to UNFCCC. Assuming overall uncertainties on the order of 30% both for the bottom-up and top-down estimates, however, these estimates are considered to be still consistent with each other.

Sensitivity studies showed some dependence of the derived spatial emission patterns on the set of atmospheric monitoring stations used, but the total emissions for the NWE countries appear to be relatively robust. While the standard inversions include a priori information on the spatial and temporal emission patterns from bottom-up inventories, a further sensitivity inversion without this a priori information results in very similar country totals, demonstrating that the available observations provide significant information on the emissions from the NWE countries largely independent from bottom-up inventories.