

Regional-scale atmospheric inversion estimates of European CH₄ and N₂O emissions

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The regional-scale atmospheric inversion system TM3-STILT is applied to estimate European CH₄ and N₂O emissions for 2007-2012 with a nominal spatial resolution of 0.25° x 0.25°. In this inversion system, the high-resolution regional Stochastic Time-Inverted Lagrangian Transport model STILT is coupled with the global 3-dimensional transport model TM3 in order to account for small-scale variability as well as large-scale patterns in fluxes and transport. The inversions are based on hourly atmospheric concentration measurements from 10-12 European InGOS stations, which also provide estimates of measurement accuracy and precision, and additional flask/hourly measurements at global sites in combination with a-priori flux information obtained from global emission inventories. A series of sensitivity studies covering a range of inversion set-up parameters is performed to investigate the robustness of the emission estimates and to assess their uncertainties. They confirm that the measurement data from the presently available network mainly constrain the emission estimates for the western and central part of Europe. The overall patterns of the emission estimates for this region are relatively robust, even without the use of detailed a-priori emission information.