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# Atmospheric monitoring of methane emissions at the European scale

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Methane (CH4) is the second most important greenhouse gas and due to its lifetime of 8-10 years, it is an important target for climate change mitigation. Even though CH4 emissions are a major contributor to Europe's global warming impact, there are still significant discrepancies between bottom-up inventories of emissions and estimates derived from atmospheric measurements of concentrations. Sources quantified with adequate uncertainties are needed in order to verify mitigation efforts and achieve effective emission reductions, as agreed in the COP21. To do so, as methane is emitted by a variety of sources, it is necessary to combine an ensemble of observational constraints in a modeling framework. In this context, the use of methane isotopes (e.g. 13C) can help bringing additional constraints on the top of 12C data. In the European $MEMO_2$ project, local scale measurement campaigns are used to improve the reference European CH4 inventory and to characterize the 13C signature of the main sources of CH4 in Europe. The objective of the $MEMO_2$ project is to evaluate and improve the CH4 and 13CH4 inventories using atmospheric measurements from ICOS and INGOS, and transport modeling within an atmospheric inversion framework. Forward simulations of CH4 are performed with the CHIMERE transport model using the EDGAR and TNO-MACC III emission inventories. The results are compared to measurements and the transport model skills are evaluated against simulations from other transport models and higher resolution configurations of CHIMERE.