



The global methane budget 2000-2012 : main points and next steps

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With a lifetime around 9 years in the atmosphere and a diversity of emission types, atmospheric methane, the second anthropogenic greenhouse gas after carbon dioxide, is a major target for climate change mitigation. Atmospheric observations include a large variety of in-situ and remote-sensed observations from the surface or from space. These data are assimilated in atmospheric inversion to infer methane emissions and sinks (top-down approaches). In parallel, a large international effort is conducted to model processes emitting methane at the surface (e.g. wetland emissions) or destroying methane in the atmosphere (e.g. OH radicals), but also to compile inventories of anthropogenic emissions (bottom-up approaches).

Large uncertainties remain in the spatio-temporal quantification of methane sources and sinks. Here, we present a synthesis of global and regional methane emissions and sinks for the period 2000-2012, using an integrated approach to combine: atmospheric measurements, chemistry-transport models, ecosystem models, emission inventories, and climate-chemistry models. Robust and not robust emission estimates are extracted for global to regional scales and presented from an ensemble of atmospheric inversions and of process-based models. We discuss scenarios of methane emissions and sinks (process-based and region-based) possibly explaining the sustained atmospheric increase since 2007.

We show in particular that US methane emissions are not likely to contribute significantly to the positive atmospheric trend, that none of the IPCC atmospheric scenarios represents the recent trajectory of concentrations, and that biogenic sources are probably the largest contributors to the positive anomaly in emissions, with a likely dominance of tropical and anthropogenic sources. We also show that Chinese emissions and trends have most likely be over estimated in some inventories. We finally propose possible future activities for the methane component of the Global Carbon Project.