



A Close-up of the Methane Global Budget

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Understanding the global methane (CH_4) budget, and its role in the carbon cycle, is one important step to better understand climate change, its feedbacks and impacts on a global scale, so as to contribute to mitigation practices and other efforts to control our changing climate. Methane is a potent greenhouse gas and contributes 0.5 W m^{-2} to total direct radiative forcing. Its short life time compared to CO_2 makes it an interesting target for emission reductions that could benefit our climate on relatively short time scales.

Relative to our knowledge of CO_2 , our understanding of the global CH_4 budget is limited, and our ability to quantify its underlying drivers and its evolution is poor. The atmospheric concentration of CH_4 has increased nearly continuously and by a factor of 2.7 since pre-industrial times mostly due to human activities. Since the beginning of atmospheric measurements of CH_4 , its rate of growth has varied significantly. Large growth rates have been observed during the late 1970s and early 1980s. Average growth rate slowed down to ca. 11 ppbv y^{-1} from 1983-1991, with a sharp decrease in 1992. The mid-1990s were generally characterized by small growth rates, albeit a large increase was observed in 1998. The atmospheric CH_4 abundance was constant from 1999 through 2006, implying a steady state in the global atmospheric CH_4 budget. Near-zero growth characterized the early 2000s, whereas from 2007-2010 growth rates increased again. Within the Global Carbon Project (GCP), a new initiative to establish a routine update of the CH_4 global budget has been introduced. Core to the success of this initiative are close interactions among the CH_4 observational, emission inventory and modeling communities.

Sources of CH_4 – e.g. agricultural, fossil fuel use, fire, waste treatment and natural wetland emissions – and CH_4 sinks – tropospheric OH, stratospheric loss and the soil sink – show large uncertainties and interact with the changing climate. A synthesis of the processes controlling the CH_4 budget since 1850, and a close look at the recent decades and the variations in growth rate and CH_4 source distribution and spatial gradients, will likely provide a more detailed understanding of the CH_4 global budget. Such a synthesis product will improve our understanding of the sensitivity of natural CH_4 sources to climate variability, the largest uncertainties, the expected trends in regional fossil fuel and agricultural sources, and provide a sound basis for understanding the behavior of CH_4 in the global climate system.

We will present the collaborative initiative, progress to date and initial results on the CH_4 global budget for the last century.