Laboratoire des Sciences du Climat et de l'Environnement
LSCE (UMR 8212)

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WARNING! Embargo date and time: December 12 2016, 1am CET

Atmospheric methane concentrations are rising faster over the last years than the past 20 years.

An international group of researchers led by LSCE (CEA-CNRS-UVSQ) has published a thorough budget of methane sources and sinks* over the last decade in the *Earth System Science Data* journal, complemented by en editorial in *Environmental Research Letters*, both to be published on December 12 2016. These studies show that none of the scenarios of the 5th IPPC[1] report correspond to the observed increase in methane concentrations. The published results highlight the contribution of methane on the climate change.

Methane is the second anthropogenic greenhouse gas after carbon dioxide (CO_2). However, methane, as a greenhouse gas) is 28 times more powerful than carbon dioxide (on a 100-year time horizon.

Since 1750, its atmospheric concentration has more than doubled due to human activities. After a period of stabilizations in the early 2000s, methane concentrations are rising again since 2007, and faster than at any time in the past two decades since 2014.

The methane budget published in *ESSD* shows that:

- **Natural emissions**: Adding-up the individual estimates of all natural sources of methane using process-based approaches leads to much larger total emissions than expected from atmospheric observations.
- **Anthropogenic emissions** represent about 60% of total methane emissions.
- **Fossil related emissions:** Emissions of methane produced more than 50,000 years ago, could represent about 30% of the total methane emission, tough it is still debated. Among them, 30% are natural (geological seepages) and 70% anthropogenic (coal, oil and gas production and use).
- **Methane emissions from agriculture activities and waste management** (enteric fermentation, manure management, rice cultivation, landfills and waste-water handling) represent about 60% of the anthropogenic emissions. Livestock (enteric fermentation and manure management) contribute one third of anthropogenic emissions; rice cultivation about 10% of anthropogenic emissions.

Changes in methane sources still uncertain

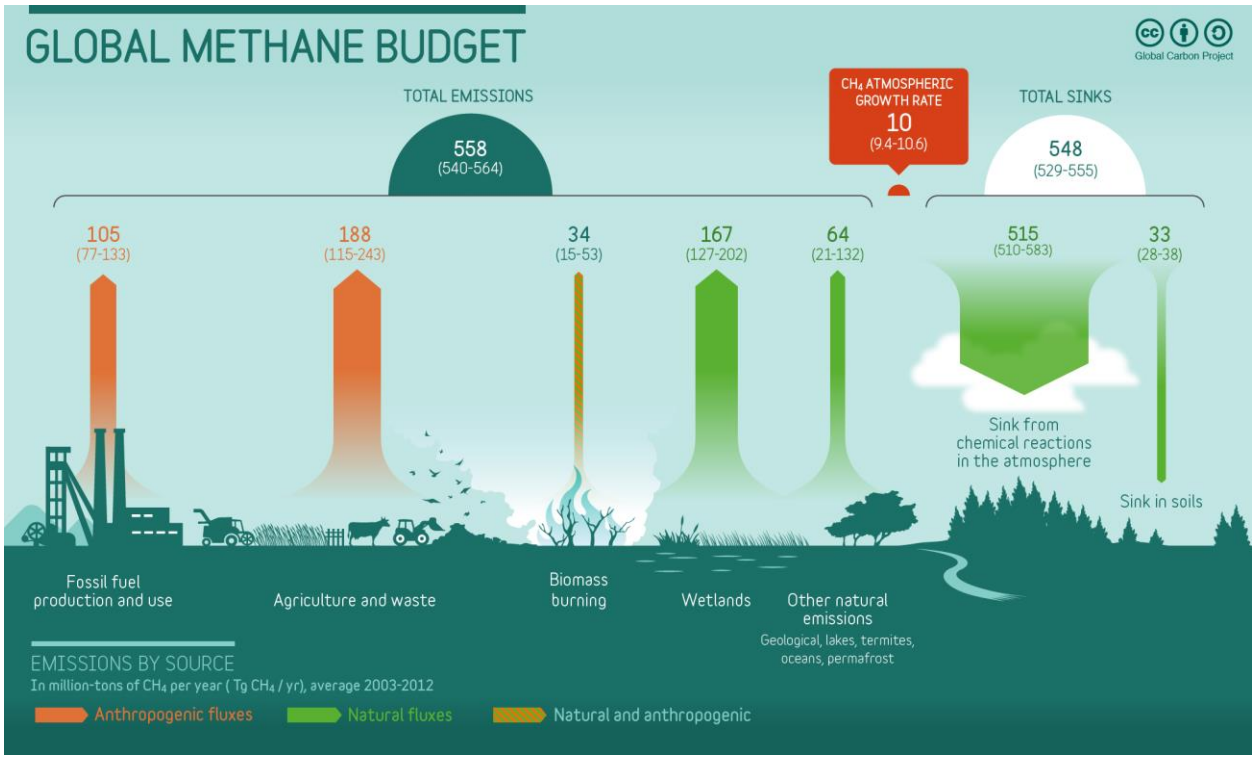
The reasons for the changes in methane concentrations and its rapid increase since 2007 are still unexplained. The increase in global methane concentrations is most likely from biogenic origin, likely from agriculture. Though, a potential contribution from fossil fuel production and use cannot be ruled out.

Discrepancies with the scenarios from the last IPCC[1] report

None of the climate scenarios proposed in the last IPCC report properly represents the actual methane concentration and its increase in the atmosphere: three were too optimistic and the last too pessimistic. Indeed, atmospheric methane concentrations are now approaching the most greenhouse-gas-intensive scenarios of IPCC[2].

Toward a global methane budget

This study (ESSD article) presents the state of the art of our knowledge on each single source of methane from the largest (wetlands) to the smallest (hydrates) thanks to the collaboration of more than 70 researchers worldwide, who have specific expertise on the different methane sources or sinks.
The lead authors also remind "We need to continue updating the methane budget regularly as it is done for CO_2. Methane lifetime is shorter than carbon dioxide's. Thus, methane mitigation offers rapid climate benefits and economic, health and agricultural co-benefits that are highly complementary to CO_2 mitigation… and necessary to keep the temperature change below 2 degree Celsius."



The study was led by Laboratoire des Sciences du Climat et de l'Environnement (LSCE – CEA-CNRS-UVSQ, France) under the umbrella of the Global Carbon Project. The data will be published on the Global carbon Atlas: www.globalcaronatlas.org

* sinks: chemical destruction in the atmosphere and soil uptake
[1] Intergovernmental Panel on Climate Change
[2] Representative Concentration Pathways corresponding to 8.5 Wm^{-2} additional radiative forcing and about +4°C temperature increase in 2100 – RCP8.5

References

The Global Methane Budget 200-2012, Saunois et al., *Earth System Science Data*, 8, 1-55, December 12 2016
The growing role of methane in anthropogenic climate change, Saunois M., Jackson R., Bousquet P., Poulter B. and Canadell J. G., *Environnemental Research Letters*, December 12 2016

About the Global Carbon Project and the Global carbon Atlas

The Global Carbon Project aims at assisting the international science community to collaborate on the carbon budget through a partnership between the International Geosphere-Biosphere Programme and Future Earth. It produces an annual report on the data on the carbon sources and sinks due to human activities and how they affect the environment. Each year, the data set is made available through the Global carbon Atlas thanks to the support of Fondation BNP Paribas. Available in five languages (English, French, Spanish, Chinese and Russian) at www. Globalcarbonatlas.org.

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