Geophysical Research Abstracts
Vol. 20, EGU2018-17309, 2018
EGU General Assembly 2018

Methane growth rate anomalies from the atmospheric transport

Sudhanshu Pandey (1,2,3), Sander Houweling (3,1), Ilse Aben (1,3), Thomas Röckmann (2), Narcisa Banda (2), Maarten Krol (1,2,4)

(1) SRON Netherlands Institute for Space Research, (2) Institute for Marine and Atmospheric Research Utrecht (IMAU), (3) Department of Earth Sciences, Vrije Universiteit Amsterdam, (4) Wageningen University and Research Centre, Wageningen, The Netherlands

The atmospheric burden of methane is determined by the net effect of sources and sinks. It is calculated by extrapolating the CH4 mixing ratio measurements, made by global measurement networks like NOAA, CSIRO in space and time. The year-to-year variability in the methane growth rate and its underlying causes are heavily debated among the scientists. The atmospheric transport, in combination with a limited sampling density of atmospheric measurement network, can give rise to growth rate anomalies which are not due to any source or sink changes. In such case, any concentration-to-flux conversion method not accounting for the atmospheric transport, such as box model studies, will erroneously assign the transport/sampling-related anomalies to source/sink changes.

Here we quantify the transport/sampling-related errors using a CH4 atmospheric transport model run with annually repeating sources and sinks. The resulting variability in the concentrations fields of this model run is only caused by transport and sampling. We show that during extreme events, such as the 1998 El Niño and 2011 La Niña, the transport anomalies became significant for determining budgets from hemispheric up to global scales, and seasonal up to annual scales. These transport anomalies become less significant on longer (half-decadal) time scale as the atmosphere gets well mixed.