Geophysical Research Abstracts
Vol. 21, EGU2019-8795, 2019
EGU General Assembly 2019

Global and regional methane budgets from ground-based and space-born observations by CTE-CH_4 atmospheric inverse model

Aki Tsuruta, Janne Hakkarainen, Tuula Aalto, Leif Backman, and the GCP partners, Global network of observation PIs, GOSAT team

Finnish Meteorological Institute, Helsinki, Finland

Atmospheric methane (CH_4) is a greenhouse gas strongly influenced by human activities. It has increased in recent years as rapidly as in the end of 20th century. The cause of the rapid increase and its interannual variability are still under discussion due to lack of flux information and modelling complexity. Global CH_4 budgets are fairly well understood, but the regional estimates still vary between models. In order to obtain further understanding especially on the regional budgets, we present global and regional methane (CH_4) emission estimates from CarbonTracker Europe-CH_4 (CTE-CH_4) atmospheric inverse model that assimilates 1) the global network of ground-based surface atmospheric CH_4 observations, and 2) column averaged dry-air mole fractions of CH_4 (XCH_4) retrieved from GOSAT TANSO-FTS. Emissions from anthropogenic and natural (wetlands and other soils, biofuel and biomass burning, termites, ocean and geological) sources are taken into account, and among those, emissions from anthropogenic sources and wetlands and other soils are optimized simultaneously based on the ensemble Kalman filter. In the GOSAT inversion, XCH_4 zonal mean differences at 5° latitudinal bands between posterior 3D atmospheric CH_4 fields from the surface inversion and the GOSAT retrievals were removed before the inversion. The two inversions estimate similar global total CH_4 emissions for 2010-2017 (540-545 Tg CH_4 yr^{-1}), with increasing trends in emissions during 2004-2008 and 2013-2016. The seasonal cycle of the emissions was different in the two inversions in the Southern Hemisphere extratropics, and the summer emissions in Northern Hemisphere temperate regions were greater in the GOSAT inversion. The results are evaluated by comparing estimated atmospheric CH_4 with the assimilated and non-assimilated observations, and the emission estimates from other inverse models and process-based models.