

README document for the Global Fuel Exploitation Inventory (GFEI) version 1 available at the GES DISC <https://doi.org/10.5067/Q28GFYJYFZ7H>.

Dataset filename. Global_Fuel_Exploitation_Inventory_GFEI_CH4_v1_2016.nc

Dataset description. This is a global inventory of methane emissions from fuel exploitation (GFEI) at 0.1 x 0.1 degree resolution. The emission sources represented here include fugitive emission sources from oil, gas, and coal exploitation (following IPCC 2006 definitions for 1B2 category: <https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>) and are estimated using bottom-up methods. The inventory emissions are based on individual country reports submitted in accordance with the United Nations Framework Convention on Climate Change (UNFCCC). For those countries that do not report we estimate emissions following IPCC 2006 methods. Emissions are allocated to infrastructure locations including mines, wells, pipelines, compressor stations, storage facilities, processing plants, and refineries.

GFEI spatially allocates the national inventory estimates of 2016 methane emission as reported to the UNFCCC and spatially allocates them to a grid as described further in Scarpelli et al. [2020]. The purpose of the inventory is to be used as a prior estimate of fuel exploitation emissions in inverse modeling of atmospheric methane observations. GFEI only includes fugitive methane emissions from oil, gas, and coal exploitation activities and does not include any combustion emissions as defined in IPCC 2006 category 1A.

Emission grids are available for more detailed subsectors (e.g. oil production) and emission processes (e.g. venting emissions) at <https://doi.org/10.7910/DVN/HH4EUM>.

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Original dataset citation. Scarpelli, Tia R.; Jacob, Daniel J.; Maasakkers, Joannes D.; Sulprizio, Melissa P.; Sheng, Jian-Xiong; Rose, Kelly; Romeo, Lucy; Worden, John R.; Janssens-Maenhout, Greet, "Global Inventory of Methane Emissions from Fuel Exploitation", <https://doi.org/10.7910/DVN/HH4EUM>, Harvard Dataverse, V1, 2019.

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Dataset usage. Methane emission grids are at 0.1 x 0.1 degree resolution and are separated by fuel type including oil, gas, and coal exploitation. Total fuel exploitation emissions ('total_fuel_exploitation') include the sum of oil, gas, and coal emission grids. Emissions reflect the annual average for 2016. Emission grids have global coverage

with the corresponding latitudes (-90 to 90 degrees North) and longitudes (-180 to 180 degrees East) for grid cell centers also provided.

Dataset availability. Methane emission grids for oil, gas, and coal exploitation emissions in 2016 are available from the Harvard DataVerse (<https://doi.org/10.7910/DVN/HH4EUM>) or the Goddard Earth Sciences Data and Information Services Center (GES DISC; <http://dx.doi.org/10.5067/Q28GFYJYFZ7H>). The Harvard DataVerse also provides emission grids for detailed oil and gas subsectors including exploration, production, processing, transport/transmission, storage, refining, and distribution and for detailed emission processes (fugitive leakage, venting, flaring). Error grids by subsector are also available from the Harvard DataVerse and have the extension "_rsd" for relative standard deviations assuming a normal error probability density function (pdf) or the extension "_gsd" for geometric standard deviations assuming a lognormal error pdf.

Dataset variables:

- **lat** an array of latitude centers from -89.95 to 89.95 with each center corresponding to a row of the emission grids (shape: [1800,]). Units are degrees north.
- **lon** an array of longitude centers from -179.95 to 179.95 with each center corresponding to a column of the emission grids (shape: [3600,]). Units are degrees east.
- **oil_emis_ch4, gas_emis_ch4, coal_emis_ch4** methane emission grids at 0.1 x 0.1 degree resolution for fugitive emissions from oil, gas, and coal exploitation (shape: [1800,3600]). Units are $\text{Mg a}^{-1} \text{ km}^{-2}$. Each grid has global spatial coverage with grid cell centers from -89.95 to 89.95 degrees north latitude and -179.95 to 179.95 degrees east longitude. **total_fuel_exploitation_emis_ch4** provides a summed total of oil, gas, and coal emissions.