

Historical Emissions For CMIP6 (v 1.0)

Contacts

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Overview

Data for CMIP6 are being provided as part of on-going research efforts to improve historical emissions data. We first describe core datasets that we are committed to providing by Fall 2015 (October) for use by atmospheric chemistry models to produce historical concentration fields. Potential refinements to this data that may be possible by this time will be described separately. Priority for these will be set depending on community feedback.

Data Overview

Anthropogenic Reactive Gas Emissions

- 0.5° gridded emissions of SO₂, NO_x, NH₃, CH₄, CO, NMVOC, BC, OC using spatial distributions from Lamarque et al. (2010) for each RCP sector (see list below)
- Aggregated emissions by region and sector
- Years: 1850 – 1990 (10 year intervals), then: 1995, 2000, 2005, 2010, 2014
- Default will be annual data for most sectors (as in Lamarque et al. 2010), although see below.

Methodology: Historical emissions by country/region from Lamarque et al. (2010) will form the initial basis of this data set. Emissions by sector will be updated from largely the same sources as used in Lamarque et al. (2010) (e.g., country submissions to UNFCCC, similar data directly from countries, and research estimates such as EDGAR and REAS) in order to produce consistent trends over recent years. The main focus for this data product will be to provide consistent trends over the last 2-3 decades using data from the same source for any given country. Discontinuities between newer data and previous Lamarque et al. (2010) data will be resolved in favor of the newer data (which may alter pre-industrial values as well). Data will be compiled at the level of country and sector, and mapped to a spatial grid, likely using the same algorithms as in Lamarque et al. (2010).

Emissions will be extended to 2014 using preliminary fuel consumption data from BP, assuming the same sectoral consumption pattern by fuel for each country using methodologies similar to those in Klimont et al. (2013).

Potential refinements: These will be prioritized based on time available and community feedback. Some of these refinements could be implemented by January 2016 if not completed by Fall 2015.

- A simple method for producing higher resolution emissions data would be to distributing the 0.5° emissions based on the 0.1° distribution of emissions within the HTAPv2 data product.
- Add monthly seasonality for residential combustion emissions using methodologies similar to those used for the ECLIPSE dataset.
- Update estimates for sub-sectors not included consistently in previous data (flaring, waste, other?).

Fossil Carbon Dioxide

- Fossil fuel + cement emissions by country and fuel 1751– 2014 (annual)
- 1° gridded emissions of fossil CO₂, from 1751 – 2014 (monthly resolution 1950 – present), likely downscaled to 0.5° using an appropriate proxy
- CO₂ by RCP sector for at least 1971-2014

Methodology: CDIAC CO₂ emissions will form basis of this data set, along with gridded emissions (Andres et al., 1996). Emissions by sector on a country level will be approximated by scaling CDIAC country totals by sectoral CO₂ emissions proxies derived from the CEDS emission data system (see below). Note that the gridded emissions provided in this product will not be completely compatible at the grid-cell level with the reactive gas emissions provided due to different spatial proxy data used. Consistent gridded data sets for CO₂ and reactive species are planned for a later date.

Open Burning

Open burning consists of fires in forests and grasslands. The default dataset will be the open burning data used in Lamarque et al. (2010). We anticipate that data for recent years will be updated, but details are yet to be determined.

RCP Sectors

The sectoral distribution for will follow the RCP categories (Lamarque et al. 2010).

DOM	Residential and Commercial Buildings
IND	Industry
TRA	Surface Transportation
ENE	Energy Production and Conversion
AGR	Agriculture
AWB	Agricultural Waste Burning on Fields
SLV	Solvents
WST	Waste
ISP	International Shipping
AVI	Aviation

Background: CEDS

The anthropogenic reactive gas and aerosol precursor emissions data are being produced as a first data product from the CEDS (Community Emissions Data System) project. CEDS aims to produce annually updated global emission inventories, with consistent emissions and driver data, over the entire industrial period, with consistent estimates of uncertainty. The data product produced for CMIP6 will focus on the recent decades, with more refined data products to follow, with improved sectoral, regional, and sub-regional gridding, improved consistency over time and space, estimates of emission seasonality, and estimates of emission uncertainty. The CEDS data and data system will be released as open source software.

References

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