The ACCMIP, RCPs and and MACCity anthropogenic emissions

The ACCMIP surface emissions cover the historical period (1850–2000) in decadal increments at a horizontal resolution of 0.5° in latitude and longitude. The primary purpose of the development of this inventory was to provide consistent gridded emissions of reactive gases and aerosols for use in chemistry model simulations needed by climate models for the Climate Model Intercomparison Program #5 (CMIP5) in support of the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5).

The ACCMIP emissions represent a combination of existing global and regional inventories of anthropogenic and biomass burning emissions.

The ACCMIP emissions in 2005 are used as a starting point for the development of the Representative Concentration Pathways (RCPs), which provide the emissions for the future used in the IPCC AR5 report.

The ACCMIP and MACCity emissions are available for download from the ECCAD database (http://eccad.sedoo.fr), which provide visualization and analysis tools, as well as a documentation for most datasets used in this study.

The ACCMIP and MACCity emissions are available for the past three decades at global and regional scales.

These comparisons highlight the significant decrease in the emissions in Europe and North America, as well as the large increases in Asia and Africa.

Changes in the distribution of anthropogenic emissions 2000–2009

MACCity CO (top), NOx (middle) and SO2 (bottom) anthropogenic emissions for a) 2000, b) 2009, and c) the difference between 2009 and 2000.

Surface emissions of CO (top) and of BC (bottom): global (left), South America (middle) and Africa (right). The emissions show large differences, but all datasets display a maximum value in 1997–1998 linked to an intense El Niño episode. The values provided by the AMMA-BB inventory are much larger than the other emissions: this is due to larger savanna burned areas than the areas used in other datasets.

For BC, some inventories do not show large changes from the considered period, while other inventories show large decreases in the considered period, while other inventories show large changes.

Future work: this will be extended to other species, i.e. methane, organic carbon and volatile organic compounds.

Comparison of anthropogenic total emissions for different regions

Comparison of available inventories for Western Europe (1st row), Central Europe (2nd row), the USA (3rd row) and China (4th row) for CO (1st column), NOx (2nd column), SO2 (3rd column) and BC (4th column).

The emissions display large differences for all years and regions. For CO, NOx and SO2, most inventories display a downward trend over the past three decades, as well as a large upward trend in China. For BC, some inventories do not show large changes during the considered period, while other inventories show large changes.

Future work: this work will be extended to other species, i.e. methane, organic carbon and volatile organic compounds. Comparisons for different emission sectors will also be performed when possible, since emissions are not provided for the same sectors for all datasets.

Summary

In order to provide a rough classification of the more and less well known emissions at the global scale and for the considered regions, the ratio between the highest and lowest emissions for 1980, 1990, 2000 and 2005 for the four species considered in this work is given in the bar charts for which the ratio is closest to one can be considered to be the value with the best consensus.

Numbers lower than 1.3 appear in green, values between 1.3 and 1.7 are in yellow, and values higher than 1.7 are in red.

It should be emphasized that consensus does not necessarily imply that uncertainty is low. In some cases, a higher level of consensus may be due to similar assumptions being used because of the lack of detailed information.

List of inventories used in the study

The datasets used in this study are all publicly available or published in peer-reviewed journals. The references for all the dataset are available in Granier et al., Climatic Change, 2011.

Future work: this work will be extended in the coming months: other recent inventories, such as EDGAR+4, EDGAR-HTAP will be added to the comparisons.

Comparison of biomass burning emissions

Surface emissions of CO (top) and of BC (bottom): global (left), South America (middle) and Africa (right). The emissions show large differences, but all datasets display a maximum value in 1997–1998 linked to an intense El Niño episode. The values provided by the AMMA-BB inventory are much larger than the other emissions: this is due to larger savanna burned areas than the areas used in other datasets.

For BC, some inventories do not show large changes from the considered period, while other inventories show large decreases in the considered period, while other inventories show large changes.

Future work: in order to better understand the origin of the large differences between the datasets, an international comparison of fuel consumption, fuel loads, and burned efficiencies used in all the different inventories will be started during the coming months.

References: