Geophysical Research Abstracts
Vol. 16, EGU2014-13949, 2014
EGU General Assembly 2014

A multi-metric global source–receptor model for integrated impact assessment of climate and air quality policy scenarios

Rita Van Dingenen, Joana Leitao, and Frank Dentener
Joint Research Centre, European Commission, Ispra (VA), Italy (rita.van-dingenen@jrc.ec.europa.eu)

As a response to emerging needs for swift and integrated evaluation of air quality and climate policy scenarios at the regional and global scale, the European Commission Joint Research Centre has developed the 'Fast Scenario Screening Tool TM5-FASST'. TM5-FASST is a global simplified source-receptor model, calculating various air quality and climate impacts resulting from emissions of short-lived air pollutants and methane.
TM5-FASST makes use of semi-linear relations expressing the sensitivity of pollutant concentrations in any receptor location of the globe to a change in pollutant emissions in any source region. The tool operates with 56 pre-defined source areas, defined as countries or country clusters. The source-receptor sensitivity matrices were calculated with the global chemical transport model TM5 by applying a 20% emission perturbation on year 2000 emissions for each of the 56 source regions, and for all relevant air pollutants.
The model evaluates metrics relevant for health impacts (pollutant concentrations, premature mortalities from exposure to PM2.5 and O_3), for vegetation and ecosystems (AOT40 and seasonal mean daytime O_3, N and S deposition), as well as climate-relevant metrics of relevant short-lived climate pollutants (instantaneous forcing, AGWP and AGTP for various time horizons, black carbon deposition to snow surface). Climate metrics include short term impacts of O_3 precursors (i.e. the direct formation of O_3 as a greenhouse gas), as well as long-term effects on the oxidative capacity of the atmosphere with impacts on the methane lifetime and background O_3. It is a strong feature of the model that all impacts, both air quality and climate related, are calculated from the same set of underlying pollutant concentration fields, and hence are internally consistent with respect to impact categories and with respect to geographical coverage.
Here we will present in more detail the methodologies used in TM5-FASST, demonstrate its validity and limitations, show some recent examples of application, and illustrate in particular how the tool can produce a region-specific multi-metric emission-based 'impact quality label' for the major air pollutants.