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Inter-comparison of Bottom-up and Top-down Air Pollutant Emission Inventories in Northeast Asia

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Northeast Asia is one of the major air pollution region in the world. Governments in this region, such as China and Korea, has been putting more stringent air pollution control policies for years. In order to seek effective ways to mitigate air pollution, it is essential to understand the current status of air quality. Emission inventories are one of the key dataset required to understand air quality and find ways to improve it. Status of emissions amounts and spatial-temporal distributions are, however, not easy to understand even though they are the key factors. In this study, we first inter-compare multiple bottom-up inventories to understand discrepancies among the dataset, including inter-annual variability. The top-down emission estimates then inter-compared with bottom-up ones to understand uncertainties of the databases. The bottom-up emission inventories used for this study are: MEIC (Multiresolution Emission Inventory for China), CREATE (Comprehensive Regional Emissions inventory for Atmospheric Transport Experiments), REAS (Regional Emission inventory in ASia), and ECLIPSE(Evaluating the Climate and Air Quality Impacts of Short-Lived Pollutants). The satellite-derived top-down emission estimates are from the DECSO (Daily Emission derived Constrained by Satellite Observations) algorithm inventory from the GlobEmissions website. The analysis shows that substantial differences in terms of total emissions, sectorial emission shares and spatial distribution among the bottom-up datasets. We tried to analyze the reasons of difference in the bottom-up inventories by analyzing inter-annual changes and spatial distributions by sector. Differences in the bottom-up inventories are less than 20% for NO_x as smallest but more than 30% for NH3 for China. The discrepancies of emission amounts are very high for the most of pollutants in North Korea, which show much less amounts in year 2015 compares to the previous years. The satellite-driven top-down estimates also support lower emissions in the North Korea. The emissions in South Korea show reasonably stable amounts from the both bottom-up and top-down emission estimates. These analysis are helpful for the development of more reliable inventories with the aim of reducing the uncertainties in air quality study. More results will be presented at the conference.

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