Abstract

[Project Information]

Project Title :	Prompt Quantification of National SLCFs Emissions from Combustion Sources in East Asia, and Its Methodological Development
Project Number :	JPMEERF20222001
Project Period (FY) :	2022-2024
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Cooperated by :	Japan Agency for Marine-Earth Science and Technology, Kobe University, Kyushu University, Japan Automobile Research Institute, The University of Tokyo, Hiroshima University
Keywords :	short-lived climate forcer, emission inventory socio-economic assessment, Arctic Council, satellite observation

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Black carbon (BC) is one of key air pollutants that have great impacts on the climate and environment from urban to global scales. BC is recognized as one of short-lived climate forcers (SLCFs), with other species including methane (CH_4), tropospheric ozone and hydrofluorocarbons. There is a general consensus that BC plays a key role in the Arctic climate, causing ice melting. In addition, BC, as one of the constituents of $PM_{2.5}$, has detrimental effects on human health, in particular in developing countries. East Asia is a major source region of BC, with its emissions having approximately 30% contributions to the global total. There exist several "bottom-up" emissions inventories, but they still have huge (approximately 200%) uncertainties. In order to reduce the uncertainties in the BC emissions estimates in East Asian countries, our project aimed to provide the scientific basis that is necessary to make national and international policy decisions, such as mitigation measures, on global environmental changes including climate change and Arctic pollution. The goal was to compile the country-specific BC emission assessments of East Asian countries and publish them as the "East Asian Black Carbon Emission Report 2024" (Tanimoto et al., 2025). Using ground-based/satellite observations and chemistry-transport models (CTMs), we derived "top-down" estimates of BC emissions as independent estimates, for each country of East Asia, and compared them to "bottom-up" emission inventories, with the aim to improve the accuracy, transparency, and reliability of country-specific emission inventories of BC. In particular, we put a great emphasis on promptness in assessing the BC emissions, as the BC emission inventories are not yet reported on

an annual and national basis in many countries, nor reported to international bodies such as the UNFCCC (United Nations Framework Convention on Climate Change), in contrast to the emissions of greenhouse gases (GHGs). This is one step forward to establish a methodology for a Measurement, Reporting, and Verification (MRV) system for the emissions of not only BC but also a broad range of combustion-derived SLCFs. These scientific highlights have important policy implications with a great emphasis on the Asian emissions, contributing to the Arctic Council's "Framework for Action on Black Carbon and Methane" as well as an inventory methodology for SLCFs, entitled "2027 IPCC Methodology Report on Inventories for Short-Lived Climate Forcers", led by the Inventory Task Force of the Intergovernmental Panel on Climate Change (IPCC-TFI).

[References]

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This research was performed by the Environment Research and Technology Development Fund (JPMEERF20222001) of the Environmental Restoration and Conservation Agency provided by Ministry of the Environment of Japan.