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Development of a multi-scale greenhouse gas budget estimation system in Japan

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Achievement of the carbon-neutral society is one of the overarching tasks for the sustainability of humanity. Under the Paris Agreement of the United Nations Framework Convention of Climate Change, it becomes an important task for research community to establish a comprehensive, high-precision, and transparent system of greenhouse gas (GHG) budget estimation. In April 2021, a new task-force project will be launched in Japan to develop a GHG monitoring system, provisionally called the Comprehensive Observation and Modeling for Multi-scale Estimation of Greenhouse Gas budgetS (COMM-EGGS), funded by the Ministry of the Environment, Japan. This is a joint project of National Institute for Environmental Studies, Japan Agency for Marine-Earth Science and Technology, Chiba University, and Meteorological Research Institute. The project is composed of three research components: 1) observation and top-down estimation of GHG budget, 2) evaluation of GHG mitigation with an Earth system model, and 3) bottom-up estimation of GHG budget. These activities cover different spatial scales spanning from major city to national and global emissions, by using ground observatory, aircraft, and satellite observations and fine-mesh atmospheric and surface emission models. In the project, we put emphasis on the Asia-Pacific region, in which a comprehensive GHG monitoring system is deficient to date. Through mutual comparison and validation, we will make attempt to improve confidence of the estimation system for GHG budget verification. Finally, the system aims at contributing to the Global Stocktake of the Paris Agreement by providing scientific evidence for GHG emission reduction.