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## Estimation of surface CO<sub>2</sub> flux in East Asia and comparison with the national greenhouse gases emission inventory

**Minkwang Cho** and Hyun Mee Kim

Atmospheric Predictability and Data Assimilation Laboratory, Department of Atmospheric Sciences, Yonsei University, Seoul, Korea, Republic of (khm@yonsei.ac.kr)

In this study, surface carbon dioxide (CO<sub>2</sub>) flux was estimated over East Asia using the inverse modeling approach. Two CO<sub>2</sub> mole fraction datasets observed from South Korea (Anmyeon-do (AMY) and Gosan (GSN)), along with ObsPack observation data package, were additionally assimilated in the CarbonTracker system, and the characteristics of the estimated surface CO<sub>2</sub> flux was analyzed over ten years. To see the impact of the inclusion of the two observation datasets in the Korean Peninsula, the other experiment which only assimilated the ObsPack data was conducted and used for comparison.

The result showed that by including two more datasets in the data assimilation process, the surface CO<sub>2</sub> flux absorption was slightly enhanced in summer and the surface CO<sub>2</sub> flux emission was weakened in late autumn and spring. This characteristic was shown particularly in Eurasian boreal and Eurasian temperate regions. Validation was done using independent observations from surface and aircraft (Comprehensive Observation Network for Trace gases by Airliner; CONTRAIL), and it showed smaller root mean square error (RMSE) values and bigger uncertainty reduction effect with the experiment which additionally assimilated two Korean observation datasets.

Meanwhile, the estimated biosphere CO<sub>2</sub> flux from the CarbonTracker was compared with Land Use, Land Use Change and Forest (LULUCF) sector CO<sub>2</sub> emission (or absorption) from the national greenhouse gases emission inventory (NIR). In case of South Korea, the observation density (number of observation sites or number of assimilated data on the area of the region) seemed to be related to some statistic parameters between inventory and CarbonTracker result. More results from model-inventory comparison using other data will be presented in the meeting.

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