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Analysis of Information Content of XCO_2 from Remote Sensing for Estimating Surface CO_2 Fluxes

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Spatial and temporal variation of surface CO_2 fluxes can be estimated by a top-down approach that utilizes both atmospheric CO_2 observations and atmospheric transport model. Even though the transport model is used to link the relationship between surface CO_2 fluxes and atmosphericCO_2 distribution, transport error due to imperfection of the numerical model has been an obstacle to the accuracy of top-down approach (Enting, 2002). One more limitation of top-down approach is the lack of observations. There are few ground-based observations. While satellite observation data cover the Earth fairly well, the information is column-mixed, XCO_2, according to flat vertical averaging kernels of the sensors. That is, we do not have enough observations to resolve near-surface CO_2 distribution with the issue of transport errors. Therefore, in this study, we would like to figure out how much information has been blurred by column-mixed observations and explore the way to effectively extract near-surface distribution of atmospheric CO_2 from XCO_2 data with a help of numerical model data under the OSSEs with SPEEDY-C. We also tried to generate near-surface atmospheric CO_2 data at the satellite observation space using neural network model. With the OSSEs, we also plan to consider the impact of transport error as a further study.

Key words: Surface CO_2 fluxes, SPEEDY-C, XCO2, Transport error, Neural Network model

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