

Development of Carbon cycle analysis system using satellite data and LETKF

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We have developed satellite data assimilation system using CO₂ concentration data obtained from satellite measurements using an ensemble-based four-dimensional data assimilation system (LETKF). An online atmospheric transport model (MJ98-CDTM) is employed in the data assimilation system to optimize surface CO₂ fluxes from satellite observations at spatial and temporal resolutions of 6 days and 2.8°, respectively. The features of GOSAT TIR L2 Ver. 1.0 data are their larger data number than that of SWIR L2 (about 10 times) and smaller standard deviation than their former version (TIR L2 Ver. 0.01). We have tested 4 types of satellite bias correction methods (w/o bias correction, monthly mean bias correction, all data bias correction and globally constant bias correction) using independent CO₂ concentration analysis (JMA CO₂ distribution) in our data assimilation system. Our results showed that estimated CO₂ concentration and fluxes are significantly sensitive to bias correction method. This means that we should carefully choose satellite bias correction method. In addition, satellite data bias correction allows modifying surface CO₂ flux almost entire earth surface. In the future, our satellite bias correction concept makes it possible to use multiple satellite observation data simultaneously in CO₂ data assimilation.

Keywords: Carbon Cycle, Data Assimilation, Satellite Observation