Estimating global air–sea and air–land CO2 flux fluctuations over the past forty years with an Earth system model incorporating a data assimilation system

*Michio Watanabe[1], Hiroaki Tatebe[1], Hiroshi Koyama, Tomohiro Hajima[1], Masahiro Watanabe[2], Michio Kawamiya[1]

1. Japan Agency for Marine-Earth Science and Technology, 2. The University of Tokyo

Increased atmospheric CO2 concentration causing global warming, which means the need for accurate prediction of fluctuations in atmospheric CO2 concentration is increasing. Uptake of CO2 at the ocean and land surfaces is one of the fundamental processes in the global carbon cycle, and it is known to fluctuate in response to inherent climate variabilities such as the El Niño–Southern Oscillation (ENSO). Therefore, representation of the interannual fluctuation of CO2 fluxes in Earth system models (ESMs) is essential for both investigation of the response of the carbon cycle to human-induced radiative perturbations and prediction of future global CO2 concentrations. In this study, we attempted to reproduce observed air–sea CO2 flux fluctuations and to reconstruct air–land CO2 flux fluctuations using an ESM, to which observed oceanic and/or atmospheric physical data were assimilated. When we assimilate both of oceanic and atmospheric data into the ESM, the most consistent results with previous estimates for CO2 flux fluctuations were obtained.We will discuss on the relationship between the assimilation variables and the resulting CO2 flux.

Keywords: Earth system model, data assimilation, air-sea CO2 flux, air-land CO2 flux

