

CarbonTracker Asia 2016: an Estimation of CO₂ Fluxes Centering on Asia

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CarbonTracker is the inverse modeling system developed by ESRL/GMD. The method estimates the surface CO₂ flux. In the Tracer Model, version 5 (TM5) which simulates carbon dioxide (CO₂) concentrations on the globe and ensemble, Kalman filters are employed. As part of carbon monitoring, National Institute of Meteorological Sciences (NIMS) in the Republic of Korea is now operating CarbonTracker Asia. CarbonTracker Asia adopts two-nested grids centered on East Asia (3°×2° global, 1°×1° Asia), and Ryori, Yonagunijima, and Minimitorishima (RYM) CO₂ observation data provided by Japan Meteorological Agency (JMA) are assimilated. Those three data fields have never been assimilated before in CarbonTracker in ESRL/GMD. Furthermore, an aircraft data assimilation module was implanted to our CarbonTracker. We use the data obtained from the Comprehensive Observation Network for Trace gases by AirLiner (CONTRAIL) project. In the meantime, CarbonTracker 2016 was released in Feb. 2017 by ESRL/GMD. That being said, studies on CarbonTracker Asia had been carried out based on 2013B. For this reason, we updated CarbonTracker Asia 2013B to 2016. In this study, we introduce CarbonTracker Asia 2016, which was newly updated in 2017. Then, the retrieved data for the period of 2000~2015 are presented. In addition, in order to verify the impact of the observation data, we also provide additional data as follows: (1) Difference before and after the aircraft data assimilation, (2) Difference in results on whether RYM observations are assimilated. Fig. 1. and Fig. 2. show the effect of the assimilation of RYM observations. Fig. 2. shows the uncertainty reduction which is calculated as $100 \times (\sigma_{\text{norym}} - \sigma_{\text{rym}}) / \sigma_{\text{rym}}$, the subscript ‘rym’ means RYM observations are assimilated, and ‘norym’ means the opposite.

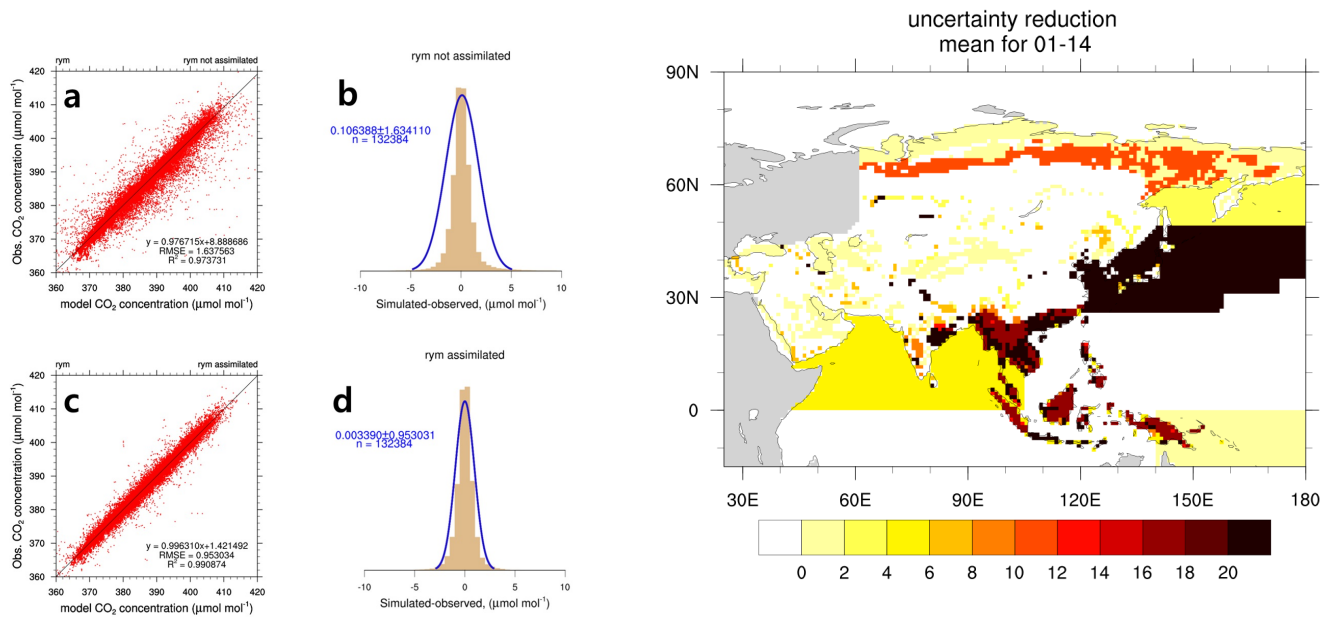


Figure 1. a), c) The scatter plots between measured and simulated CO₂ concentrations at RYM for 2000.01.01~2015.11.21, information at the right top tells whether RYM data assimilated or not. b), d) The histograms and its density function of the simulated minus measured CO₂ concentrations. Then, the number at the left middle show the average with standard deviations and ‘n’ denotes the number of data.

Figure 2. Average uncertainty reduction for 2001~2014 on Asia.