High-resolution modeling of greenhouse gases using GPV meteorological dataset

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In the concentration retrieval algorithm for data obtained from the Greenhouse Gases Observation Satellite (GOSAT), modeled distributions of carbon dioxide (CO_2) and methane are used as priors. For use in operational processing a high-resolution global atmospheric tracer transport model has been developed, which uses an enhanced version of GPV meteorological dataset prepared by the Japan Meteorological Agency. The dataset has a horizontal resolution of 0.5 degree, 21 vertical resolution levels, and a time interval of 3 hours. The GPV dataset was incorporated into the operation of the NIES off-line global atmospheric tracer transport model. Also, the GPV dataset was supplemented with the 3-hourly PBL height data of the ECMWF forecast model. We evaluated the performance of the transport model by following the experimental protocols of TransCom-1, TransCom-2, and WCRP transport model intercomparison projects. Transport simulations of CO_2 due to fossil fuel burning, radon-222, and sulfur hexafluoride (SF6) were performed in our evaluation. The CO_2 transport examines the model vertical and interhemispheric transport simulation performance, while the transports of radon-222 and SF6 test the regional- and the large-scale simulations, respectively. The simulation results were compared with observational values as well as the outputs of other transport models that participated in the above model intercomparison projects. As part of the model validation process, we analyzed a simulation result comparison with observation data that was obtained at the Hateruma monitoring station in Okinawa.