Geophysical Research Abstracts
Vol. 19, EGU2017-6558, 2017
EGU General Assembly 2017

The multi-model and multi-resolution estimation of stratosphere-troposphere exchange

Yousuke Yamashita (1), Masayuki Takigawa (1), Kentaro Ishijima (1), Hideharu Akiyoshi (2), Hisashi Yashiro (3), Masaki Satoh (4,1)

(1) Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokohama, Kanagawa, Japan (yyousuke@jamstec.go.jp), (2) National Institute for Environmental Studies, Tsukuba, Ibaraki, Japan, (3) RIKEN Advanced Institute for Computational Science (AICS), Kobe, Hyogo, Japan, (4) Atmosphere and Ocean Research Institute, The University of Tokyo, Kashiwa, Chiba, Japan

The stratosphere-troposphere exchange (STE) of atmospheric mass is important to understand the oxidizing capability of troposphere as well as the atmospheric chemistry and climate interaction, since the lower stratospheric ozone is efficiently transported to the troposphere with the synoptic- and small-scale mechanisms of the STE. This study identifies the mass flux of STE from the outputs of the multi-model and multi-resolution simulations in March. We perform the CCSR/NIES-MIROC3.2 Chemistry-climate model simulations (T42 horizontal resolution with 34 vertical layers from surface to mesopause) and the multi-resolution simulations (3 horizontal resolutions and 2 vertical resolutions) of the Nonhydrostatic Icosahedral Atmospheric Model (NICAM). The horizontal resolutions of the NICAM are about 220 km (GL05), 56 km (GL07), and 14 km (GL09), and the vertical resolutions around tropopause are about 0.7–1.5 km for 40 layers and about 0.4 km for 78 layers (upper limits of the model are about 40 km for 40 layers and 50 km for 78 layers). The results show that the March average of the STE flux is large in magnitude for the coarse vertical resolutions and for the high horizontal resolutions. In addition, we find the spiral structure of the STE around the cutoff cyclones from the high horizontal and high vertical resolution simulations. These results imply that the resolution dependency of the STE is possibly related to the oxidizing capability of troposphere, which will be simulated with the chemistry interactive version of the NICAM.