THE POLAR UPPER-TROPOSPHERE TO LOWER- STRATOSPHERE COLD BIAS IN GLOBAL WRF SIMULATIONS

Xuan-Tien Nguyen-Vinh and Fumio Hasebe
Graduate School of Environmental Science, Hokkaido University, Japan
nvxtien@ees.hokudai.ac.jp, f-hasebe@ees.hokudai.ac.jp

Abstract

The Weather Research and Forecasting (WRF) model has been conveniently used for various purposes especially for the simulations of mesoscale phenomena taking the advantage of non-hydrostatic configuration among others. On the other hand, its applicability to global scale phenomena is not so emphasized. In the present study, the global version of the WRF model is employed to investigate the stratospheric variations. From a series of 1-month simulations, a cold bias relative to ERA-Interim reanalysis field is found quickly developing in the polar upper troposphere/lower stratosphere (UTLS) in 5 to 10 days after the initialization. This cold bias, a problem commonly appears in GCMs, is distinct from the well-known cold polar-night problem. The model heat budget is compared to that from ERA-Interim data set referring to the Transformed Eulerian-Mean (TEM) thermodynamic equation. The results from some representative months are discussed focusing on the contribution of the mean adiabatic motion to the cold bias.

Key words: cold bias, polar UTLS, global WRF, heat budget, TEM framework