

Mesoscale-model study on an extratropical tropopause inversion layer

Shigeo Yoden[†]; Shigenori Otsuka; Megumi Takeshita

[†] Kyoto University, Japan

Leading author: yoden@kugi.kyoto-u.ac.jp

Tropopause inversion layer (TIL) in the extratropics is investigated with Non-Hydrostatic Model (NHM) of Japan Meteorological Agency. The operational numerical weather prediction model is used for a numerical study of TIL associated with an observed extratropical cyclone with an increased vertical resolution of 200 layers for 25-km height from the surface. The TIL obtained in the control run has similar characteristics as previous observational studies, including dependence on local relative vorticity: stronger TIL in negative vorticity areas while weaker TIL in positive vorticity areas. In an experimental run, water vapor is removed above 300 hPa level in the initial condition to investigate the temperature response to the radiative forcing by water vapor perturbations around the tropopause. The explosive development of the extratropical cyclone is not different from the control run very much, but the TIL becomes stronger in the experimental run. The vertical profile of static stability becomes sharper due to weak cooling above the tropopause with decreased water vapor. Quantitative analyses on the formation of the TIL are done in detail to see the relative importance of dynamical and radiative forcing mechanisms.