Geophysical Research Abstracts
Vol. 21, EGU2019-3504, 2019
EGU General Assembly 2019

Numerical simulation of mid-latitude upper level zonal wind response to the change of North Pacific subtropical front strength

Qiuyu Chen (1), Haibo Hu (2), Xuejuan Ren (3), and Xiuqun Yang (4)

(1) Nanjing University, School of Atmospheric Science, China (dz1628001@smail.nju.edu.cn), (2) Nanjing University, School of Atmospheric Science, China , (3) Nanjing University, School of Atmospheric Science, China , (4) Nanjing University, School of Atmospheric Science, China

Using the Weather Research and Forecasting model (WRF3.5), several numerical experiments with reconstructed ideal zonally uniform sea surface temperature (SST) were designed to discuss the mid-latitude upper level zonal wind response to the change of subtropical front strength over the North Pacific and related dynamical process in winter. The results show that the enhancement of the subtropical frontal zone (STFZ) leads to stronger upper zonal wind, without considering the lateral boundary disturbances in this regional model. Lower level atmospheric meridional temperature gradients and baroclinicity get stronger through upward sensible heat flux (SHF) firstly after the increase of STFZ, leading to the acceleration of lower level zonal wind because of the increased thermal wind. In addition, the temperature gradient anomalies spread to middle and upper troposphere by baroclinic waves, causing the increasing of Eady growth rate and enhanced storm tracks on the southern side of STFZ, but the decreasing on the northern side. On the one hand, the strengthened synoptic-scale transient eddy activies arise stronger mid-latitude westerly jet accompanied with a southward movement through more barotropical energy conversion. On the other hand, stronger Rossby Wave Breaking (RWB) are aroused due to more active transient eddy activities, resulting in the enhancement and southward movement of upper zonal wind finally.