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Westerly acceleration during the recovery of the stratospheric sudden warming in the high-resolution AGCM

Yoshihiro Tomikawa[1*], Shingo Watanabe[2], Yoshio Kawatani[2], Kazuyuki Miyazaki[2], Masaaki Takahashi[3], Kaoru Sato[4]

[1]National Institute of Polar Research, [2]JAMSTEC, [3]AORI, the University of Tokyo, [4]School of Science, the Univ. of Tokyo

Stratospheric sudden warmings (SSWs) have occurred almost every year in the 2000s. The SSWs in Jan. 2004, Jan. 2006, and Jan. 2009 showed a common feature that the stratopause and the polar-night jet were reformed at an altitude of about 80km after the SSWs. While the polar stratosphere is supposed to be warmed by the meridional circulation driven by the momentum deposit due to planetary waves, it is not clear how the subsequent warming and westerly acceleration around 80km is caused.

In the T213L256 CCSR/NIES/FRCGC AGCM which was integrated over three years, the SSW similar to that mentioned above has occurred. Relative contributions of meridional circulation and different kinds of waves to the westerly acceleration after the SSW were investigated using a momentum budget analysis based on the transformed Eulerian-mean equations. It showed that, while the planetary waves with zonal wavenumber 1-3 mostly contributed to the momentum budget during the SSW, the momentum advection due to the meridional circulation played a primary role in the westerly acceleration above 50km after the SSW.

Keywords: stratospheric sudden warming, planetary wave, meridional circulation