

Analysis on the Forcing Region of Sudden Stratospheric Warmings by Using Group Velocity of Planetary Wave Packets

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A new analysis method to detect emanation regions and the associated emanation period of planetary wave (PW) packets inducing the stratospheric sudden warming (SSW) is developed. The method traces a 3D wave ray of a PW packet based on its group velocity computed from the 3D wave activity flux for stationary PWs defined by Plumb. By applying the method to a SSW event occurred in December 2001, we detect two key circulation anomalies near the tropopause, from which PW packets propagate efficiently into the stratosphere and subsequently cause the SSW: one is a blocking in the North Atlantic, the other is a cyclonic anomaly residing in East Asia and the North Pacific. The important role of the latter anomaly for the occurrence of the SSW is firstly recognized in our study.

Key words: stratospheric sudden warming, planetary wave packet, blocking