

A formulation of the three-dimensional wave activity flux describing wave propagation on the mass-weighted isentropic time mean equations

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The Transformed Eulerian-Mean (TEM) equations (Andrews and McIntyre 1976, 1978) are powerful tools for diagnosing the meridional circulation and wave-mean interaction in the troposphere and/or middle atmosphere. However, the TEM equations cannot properly treat the lower boundary and unstable waves. The mass-weighted isentropic zonal mean (MIM) equations derived by Iwasaki (1989, 1990) are the equations that overcome those problems and are recently used for analyzing polar cold air outbreak. On the other hand, the MIM equations have not been extended to three dimensions (3D), especially wave activity flux, although the TEM equations have been extended by several studies. In the present study, we formulate the 3D wave activity flux describing wave propagation in the mass-weighted isentropic time-mean equations. A dispersion relation for inertia-gravity waves and Rossby waves on those equations is also derived and used to relate the 3D wave activity flux to the group velocity.

Key words: wave activity flux, isentropic coordinates

References

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