A study of three dimensional structure of stratospheric material transport and ozone

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The Transformed Eulerian-Mean (TEM) equations have been widely used to examine wave-mean flow interaction in the meridional cross section. According to previous studies, the Brewer-Dobson circulation in the stratosphere is driven by planetary waves, baroclinic waves, and inertia-gravity waves, and that the meridional circulation from the summer hemisphere to the winter hemisphere in the mesosphere is mainly driven by gravity waves. However, the TEM equations do not provide the three-dimensional view of the transport, so that the three dimensional TEM equations have been formulated. On the other hand, the TEM equations cannot properly treat the lower boundary and unstable waves. The Mass-weighted Isentropic Mean (MIM) equations are the equations that overcome those problems and the formulation of three-dimensional MIM equations have been studied. The present study applies the three-dimensional TEM and MIM equations to the ERA-Interim reanalysis data and examines the three-dimensional structure of Stratospheric Brewer-Dobson circulation. Next, we will discuss material transport due to disturbances on the distribution of stratospheric ozone.

Keywords: residual mean flow, ozone, meridional circulation

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