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EFFECT OF THE VERTICAL RESOLUTION IN THE UPPER TROPOSPHERE AND LOWER STRATOSPHERE ON OZONE ABUNDANCE ACROSS THE TROPOPAUSE

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ABSTRACT

Stratospheric chemical transport model of Meteorological Research Institute (MJ98-CTM) is used to investigate the effects of model vertical resolution on the distribution of chemical species, particularly ozone across the tropopause. The dynamical module is a full primitive spectral model, which includes major physical processes. The chemical module treats 34 long-lived species including 7 families, and 15 short-lived species with 79 gas phase reactions, 34 photochemical reactions and 9 heterogeneous reactions on polar stratospheric clouds and sulfate aerosols.
Transport scheme is a flux form semi-Lagrangian type in the vertical and, at once, a simple semi-Lagrangian type in the horizontal with cubic interpolation. Model horizontal resolution is a T42 (2.8 degrees, 64x128 grids in latitude and longitude) truncation and the model top is fixed at 0.01 hPa (80 km). Control run was performed with 45 layers (T42L45), the vertical grid spacing of which is about 2km above the upper troposphere. Two experiments run are made by increasing the vertical resolution to 68 layers of 500 m thickness above 100 hPa or to 80 layers of 500 m above 300 hPa. The experiment runs are found to yields better ozone vertical profiles in the tropical lower stratosphere, indicating that the strength of the simulated Brewer-Dobson circulation was closely dependent on the accuracy of winds and vertical resolution in the tropical and mid-latitude lower stratosphere.

Key words: simulation, ozone, chemical transport model, upper troposphere and lower stratosphere