EMS7/ECAM8 Abstracts,
Vol. 4, EMS2007-A-00519, 2007
7th EMS Annual Meeting / 8th ECAM

ENSO signal propagation through the tropopause in two different resolution simulations with WACCM

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The ENSO signal propagation from the troposphere to the stratosphere has been already analyzed using reanalysis data and model simulations. In this study we will focus on the effects of different model resolutions on the ENSO propagation. Two groups of three realizations have been performed with the latest version of the Whole Atmospheric Community Climate Model (WACCM3) from 1950 to 2004. Each group has been run at a different spatial (latitude x longitude) resolution, 4x5 degrees and 1.9x2.5, named 4x and 2x respectively. The ensemble mean of each group has been computed, the strongest ENSO events of the period selected according to the Nino3.4 index and the composites computed for temperature and zonal wind.

Upward Rossby wave propagation through the tropopause is observed at middle latitudes in the winter hemisphere up to 40 km with the largest anomalies in the 2x simulation as expected from better resolved waves. However, despite this more intense wave propagation in 2x, the response at high latitudes in the winter hemisphere in both zonal wind and zonal mean temperature is much less intense and appears later in time in the 2x simulation compared with 4x. A weaker and warmer polar vortex is observed in the 4x simulation during the first three months after the maximum of N34. These differences seem to be due to different wave-zonal mean flow interactions at high latitudes together with a more intense polar vortex in the 2x simulation which makes its perturbation more difficult.