Geophysical Research Abstracts,
Vol. 11, EGU2009-7227-2, 2009
EGU General Assembly 2009

Does the ECHAM5 climate model represent breaking Rossby waves adequately?

A. Béguin, O. Martius, M. Sprenger, P. Spichtinger, and D. Folini
ETH Zurich, Institute for Atmospheric and Climate Science, Zurich, Switzerland

We undertake an object-based verification of the ECHAM5 climate model to find an answer to this question. The focus is set on synoptic-scale breaking Rossby waves because they are a frequent features of the tropopause level flow that influence the surface weather evolution and they can trigger extreme precipitation events in the sub- and extratropics. The ability of climate models to represent them correctly is a precondition to reproduce extreme precipitation accurately.
In the upper-level PV field the breaking waves are identified as elongated and narrow intrusions of stratospheric, high potential vorticity (PV) air into the troposphere and referred to as PV streamers.
We analyze the spatial frequency distribution of PV streamers in three 44 year present day runs of the ECHAM5 climate model with resolutions of T42, T63 and T106 respectively, and compare them to streamer frequencies in the ERA40 reanalysis. First results from the T63 run for DJF indicate that the ECHAM5 model is well capable of representing the PV streamer distribution in the extra-tropics, except for some discrepancies along the storm tracks. In the ECHAM5 output a positive bias in the streamer frequency per gridpoint is found in the Atlantic in the storm track's entrance region and a negative bias at its exit. Differences along the Pacific storm track are of opposite sign and equal amplitude. There is less agreement in the subtropics. Here we find an equatorward displacement of the streamer maximum by about 5 degrees and an overestimation of streamer occurrence frequency by about 10 %. In parallel, the height of the tropopause in the model and reanalysis datasets, as well as the location of the subtropical tropopause break disagree. This is expected to have implications for the location and strength of the subtropical jet.