EMS Annual Meeting Abstracts
Vol. 8, EMS2011-659, 2011
11th EMS / 10th ECAM

Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Can We Statistically Forecast Sudden Stratospheric Warmings?

C. Blume (1,2), K. Matthes (1,2), and I. Horenko (3)

(1) German Research Centre for Geosciences (GFZ), Potsdam, Germany , (2) Institute for Meteorology, Free University of Berlin (FUB), Berlin, Germany, (3) Institute of Computational Science, University of Lugano (USI), Lugano, Switzerland

Sudden stratospheric warmings (SSW) are prominent examples of dynamical wave-mean flow interactions in the Arctic stratosphere during the northern hemisphere winter. They are characterized by a strong temperature increase on time scales of a few days and a disturbed stratospheric vortex leading to a zonal flow reversal. Recent chemistry-climate models are able to reproduce frequencies but predicting SSWs remains a difficult task.

This work proposes multivariate pathways to statistically forecast sudden stratospheric warmings with the help of atmospheric variability factors, like the Quasi-Biennial Oscillation, the El Niño-Southern Oscillation, the Solar cycle, and others. Several linear and nonlinear methods are introduced, validated, and compared with respect to their ability to model and forecast SSWs. The statistical models are trained with ERA-40, ERA-Interim, and NCEP/NCAR reanalysis data.

Once SSWs are modeled successfully, the external factors are ranked according to their impact and statistical importance. Marginalized probability distributions indicate which combinations of factors may lead to a vortex breakdown. Finally, the quality of statistically predicting SSWs is demonstrated for recent winters.