Geophysical Research Abstracts, Vol. 8, 07278, 2006
SRef-ID: 1607-7962/gra/EGU06-A-07278

Impact of ENSO events on chemical climate variability in the Northern Hemisphere

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El Niño / Southern Oscillation (ENSO) plays a crucial role in interannual climate variability. Yet, the impacts of ENSO on chemical climate variability in the northern stratosphere are not completely understood to date. Knowledge about the performance of chemistry-climate models (CCM) in reproducing past ENSO events is therefore highly relevant both as a test for current climate models as well as to improve our current understanding of the mechanisms linking ENSO with the northern stratosphere.

Here we present results of CCM SOCOL transient runs applied to reproduce the El Niño events of 1940/41 and 1986/87 and the La Niña events of 1988/89 and 1975/76. SOCOL is a middle atmosphere version of ECHAM4 (MPI, Hamburg), which is coupled to the chemistry-transport model MEZON (PMOD/WRC, Davos). The simulations were applied in ensemble-mode prescribing sea surface temperature, sea ice distribution, volcanic aerosols, solar variability, greenhouse gases and ozone depleting substances.

We analyse ozone, temperature, geopotential height, zonal wind as well as Eliassen-Palm (EP) flux in the Northern Hemisphere troposphere and stratosphere and compare model results with observations. For the difference between the El Niño winter 1987 and the La Niña winter 1989 the model shows low surface air temperatures in North Eastern Europe, a negative North Atlantic Oscillation index, a weak polar vortex and negative and positive total ozone anomalies in the Tropics and at middle to high latitudes, respectively. These results are generally in good agreement with observational data sets (NCEP/NCAR and ERA40 reanalyses, TOMS total ozone, SAGEII ozone profiles, CATO assimilated ozone data). Evidence of increasing planetary wave activ-

ity is found in the EP flux both in the model and the observations, consistent with the above results and implying a strengthening of the Brewer-Dobson circulation during El Niño (compared to La Niña).