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Effects of asymmetric ozone changes in a coupled ocean-middle-atmosphere-model under present day conditions

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In the middle and upper atmosphere the radiative forcing will be controlled by the ozone. In coupeld climate models of IPCC only the zonal symmetric part of the ozone distribution is implemented. In contrast to this approximation the observed trends of ozone during the 1990's shows an increased planetary wave one pattern. The response of such ozone anomalies is studied with the coupled ocean-atmosphere model COSMOS.

The model resolution of the atmosphere part is T31 with 90 levels from the surface to about 80 km height. The ocean model has a 3 degree resolution with 40 levels. After a spinup phase of 200 years three simulations were launched. In addition to the 80 year reference experiments two sensitivity experiments were performed. In both the asymmetric part of the observed ozone during the 1990's is added to the model background ozone northward of 30°N. In the first experiment (S1) the ozone is modified between 500 and 2 hPa and in the second experiment (S2) from 10 to 2 hPa in order to differentiate between whole and only upper stratospheric ozone forcing.

The model responds in both sensitivity experiments with a planetary wave two signal in the upper stratosphere and lower mesosphaere. The significant systematic changes in the troposphere are stronger in the experiment with forcing in the upper stratosphere only (S2). In both experiments the Island low is weakend and the North Pacific low is intensified during northern winter.