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Chemical-dynamical response to the 11-year solar cycle in a transient CCM simulation of the past

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We present results from a CCMVal REF1 simulation performed with the ECHAM5/MESSy model system. The time period 1960 to 2000 was simulated using the model in T42L90 resolution. The model was forced by observed sea surface temperatures and spectrally resolved solar irradiances as well as greenhouse gases and ozone depleting substances according to the CCMVal recommendations. The QBO was internally generated and major volcanic eruptions were included.

A state-of-the-art multiple linear regression model is used for the analysis. Emphasis is laid on the 11-year solar signal in chemical and dynamical variables such as ozone volume mixing ratio and related radiative heating, temperature and zonal wind. Moreover, the solar impact on planetary wave propagation and the residual circulation is examined as well as the transfer of the solar signal from the stratosphere to the troposphere. The solar influence on variability patterns as the Arctic Oscillation or the North Atlantic Oscillation is studied and we investigate furthermore the impact on tropical precipitation. The results are compared with observations.