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Solar Effects on Chemistry and Climate Including Ocean Interactions

U. Cubasch (1), U. Langematz (1), A. Kubin (1), C. Brühl (2), T. Spangehl (1,3), A. Baumgärtner (2,4)

(1) Meteorologisches Institut, Freie Universität Berlin, Berlin, Germany (cubasch@zedat.fu-berlin.de), (2) Max-Planck-Institut für Chemie, Mainz, Germany (Christoph.bruehl@mpic.de), (3) Deutscher Wetterdienst, Offenbach, Germany (Thomas.Spangehl@dwd.de), (4) DLR-PT, Bonn, Germany (Andreas.Baumgaertner@dlr.de)

In the Project on Solar Effects on Chemistry and Climate Including Ocean Interactions (ProSECCO) fundamental questions of the impact of solar variability on Earth's Climate have been investigated with improved climate system models and observations. On the decadal time scale, the atmospheric signatures of the 11-year Schwabe cycle and the underlying mechanisms have been studied using a comprehensive troposphere-stratosphere-chemistry model. This study included the impact of variations in UV radiation (with 27d rotational cycle) and particle precipitation on stratospheric chemistry and ozone, as well as on the solar signal in the troposphere and on climate. A clear solar signal can be detected not only in the stratosphere, but also in the troposphere.
On the centennial to millenium time scale, effects of solar variability on climate of different pre-industrial periods, focusing on the Maunder Minimum and the mid-Holocene, have been addressed using a coupled troposphere-stratosphere-ocean model. A link between the stratospheric polar vortex strength and the solar variability can be detected on the decadal and centennial timescales. A tropospheric signal as response to the solar forcing, for example in the North Atlantic Oscillation, becomes visible once the stratosphere is treated in a realistic way.