Geophysical Research Abstracts
Vol. 16, EGU2014-12620, 2014
EGU General Assembly 2014

Role of Stratospheric Dynamics in the Ozone-Carbon connection in the Southern Hemisphere

Chiara Cagnazzo (1), Elisa Manzini (2), Pier Giuseppe Fogli (3), Marcello Vichi (3,4), and Paolo Davini (5)

(1) Istituto di Scienze dell'Atmosfera e del Clima - ISAC-CNR, Rome, Italy (c.cagnazzo@isac.cnr.it), (2) MPI for Meteorology, Hamburg, Germany, (3) CMCC, Bologna, Italy, (4) INGV, Bologna, Italy, (5) ISAC- CNR, Torino, Italy

The role of stratospheric dynamics in past and projected future long-term changes of the Southern Hemisphere climate is examined with a special regard to the oceanic carbon uptake, by comparing results from two sets of simulations performed with the high-top version and the low-top version of the CMCC-Carbon Earth System Model. An improved description of the stratospheric dynamics results in weakened ($\sim$20% to 25%) annual-mean Southern Ocean air-to-sea carbon fluxes in the 1990-2005 period, with implications for the global ocean carbon uptake. Simulated changes in the Southern Hemisphere climate are reproduced in both model simulations and are consistent with numerous previous studies. However, the low-top model is unable to fully capture the observed stratospheric cooling, because the component associated with the changes in stratospheric circulation is missing. Smaller trend of the stratospheric polar vortex found in the low-top model (in response to stratospheric ozone and GHG changes) is followed by a smaller trend of the poleward- shifted tropospheric jet in the troposphere. The latter implies smaller ($\sim$10%) wind stress increase in the November to February season and a smaller projection on Sea Level Pressure changes. Our results point out the importance of including a proper representation of stratospheric dynamics, at least with a certain degree of detail, in order to obtain more reliable long-term climate simulations and projections in the Southern Hemisphere circulation patterns and air sea fluxes.