Geophysical Research Abstracts, Vol. 9, 09766, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09766

Solar brightening – a consequence of strong aerosol decline – and the rapid temperature rise in Europe

R. Philipona (1), C. Ruckstuhl (2), S. Nyeki (3), M. Weller (4), C. Mätzler (3) and L. Vuilleumier (5)

(1) Physikalisch-Meteorologisches Observatorium Davos, World Radiation Center, Davos Dorf, Switzerland, (2) Institute for Atmospheric and Climate Science, Swiss Federal Institute of Technology (ETH), Zürich, Switzerland, (3) University of Berne, Berne, Switzerland, (4) Meteorologisches Observatorium Lindenberg, Deutscher Wetterdienst, Lindenberg, Germany, (5) Station Aerologique, MeteoSwiss, Payerne, Switzerland (rolf.philipona@meteoswiss.ch

The rapid temperature increase of 1.2 ˚C over mainland Europe since the 1980s is considerably larger than expected from anthropogenic greenhouse warming. Solar radiative forcing, recently termed solar brightening, and water vapour feedback, apparently added to the temperature rise. Aerosol optical depth (AOD) measurements at six remote locations from the North Sea up to 3580m a.s.l. in the central Alps show aerosols decreasing by about 60 percent from 1986 to 2000, followed by reduced decline and a present stabilization of AOD. Concurrent, solar radiation measured under cloud-free skies and averaged over 30 Swiss radiation stations below 1000m a.s.l., shows significant increase of 1.3 $\pm$0.7 $Wm^{-2}dec^{-1}$ between 1981 and 2005, but reduces to 0.6 $\pm$1.0 $Wm^{-2}dec^{-1}$ from 1995 to 2005. The strong AOD decline and consequent solar brightening most likely steepened the temperature rise at the end of the century, whereas, the observed aerosol stabilization, which ends solar brightening, suggests reduced temperature rise as already observed since the turn of the century.