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Solar- and greenhouse radiative forcings and the rapid temperature rise in Europe during the last two decades

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During the last two decades, surface temperature rise over main-land Europe is twice as large than over the northern hemisphere, and considerably larger than expected from anthropogenic greenhouse warming. Solar radiative forcing, also termed solar brightening, and water vapor feedback, apparently added to the temperature rise. Recent aerosol optical depth (AOD) analyses from six measurement sites from the North Sea to 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, shows significant increase of 1.3 $\pm$0.7 $Wm^{-2}dec^{-1}$ between 1981 and 2005, which reduces to 0.6 $\pm$1.0 $Wm^{-2}dec^{-1}$ after 1995. Also, from 1995 to 2005 measurements show high correlation between cloud-free longwave downward radiation and increasing temperature and absolute humidity, demonstrating greenhouse forcing with strong water vapor feedback. The strong AOD decline and consequent solar brightening apparently let to the steep temperature rise at the end of the century, whereas, the observed aerosol stabilization after 2000, which ends solar brightening, suggests reduced temperature rise in the new century that is just due to greenhouse warming.