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A projection of future O3 concentrations using a synoptic-regression based approach.

M. Demuzere and N.P.M. van Lizpig

Katholieke Universiteit Leuven - GEO Institute, Earth and Environmental Sciences, Physical Geography, Leuven, Belgium (matthias.demuzere@ees.kuleuven.be)

Using a synoptic-regression based approach, this study estimates future maximum 8 hourly mean O3 levels under the future A1B scenario for a rural background area situated in The Netherlands. The statistical downscaling tool was used to downscale the Atmospheric-Ocean Coupled General Circulation Model (AOGCM) ECHAM5-MPI/OM for the present-day 20 Century (20C) control run (1991-2000) and two future A1B scenario periods (2051-2060 and 2091-2100). First, the statistical downscaling tool is evaluated in terms of downscaled O3 levels for the present-day climate, using a long record of observed O3 concentrations. Afterwards, these findings are used to introduce a bias correction on future estimates of O3 concentrations under a changing climate. For the future A1B scenario, overall O3 levels could increase with 2.8 and 10.9 μg/m^3, for the period 2051-2060 and 2091-2100 period respectively, against the present-day 10-year average of 54.1 μg/m^3, with a more pronounced effect in summer. Together with the mean properties, the number of days with high levels (> 120 μg/m^3) of O3 could increase with 7.3 days yr-1 and 20.7 days yr-1 by the 2050s and 2090s respectively. Increase in summer O3 levels are especially due to a decrease in cloud cover associated with an increase in shortwave downward radiation and an increase in maximum temperature. Hereby, the extreme summer of 2003 is shown to be an example of how future European summers (in terms of O3) may look like under a changing change. Next to that, some other issues are put forward to be considered in the prospects of future ozone projections and mitigation in Western and Central Europe.