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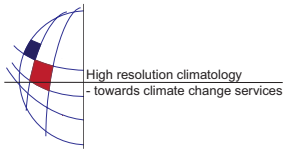

Climate change impact on future air quality in Europe

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It has become widely recognized that climate change could affect air pollution concentrations, through the assumption that air quality is strongly dependent on meteorological conditions and therefore sensitive to climate change. Changes in climate affect air quality by perturbing ventilation rates (wind speed, mixing depth, convection, frontal passages) precipitation scavenging, dry deposition, chemical production and loss rates, natural emissions, and background concentrations. This study describes the development, evaluation and application of an empirical-statistical model to examine the synergistic effects of climate change on air quality. It is based on the concept that temperature is a capable predictor for the ozone concentrations.
More specifically, the model is used to investigate the potential impact of increasing future temperatures due to climate change on ozone exceedance days in Europe. In our study we have used available gridded daily maximum temperatures and hourly ozone observations from different non-urban stations within the aforementioned area as well as daily maximum temperatures for two different future time periods 2021-2050 and 2071-2100 from the RACMO2 regional climate model with a horizontal resolution of 25 x 25km. Statistically significant correlations between daily maximum temperatures and maximum 8-h average ozone concentrations are determined. Subsequently, calculated cumulative distribution probabilities of maximum 8-h average ozone concentration with daily maximum temperature are applied in two ways: firstly, to evaluate the performance of the empirical-statistical model and secondly to provide estimates of the future ozone exceedance days for the periods 2021-2050 and 2071-2100. The evaluation analysis reveals that the empirical-statistical model exhibits skill in capturing temporal patterns of ozone cumulative probability distributions with temperature and therefore it can be used as a quick indicator of ozone sensitivity to climate change.