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Twenty years of ozone air quality in Europe: trends in models and measurements

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The EURODELTA-Trends exercise is a multi-model experiment in which seven regional models performed an air quality hindcast over Europe for the 1990-2010 period at regional-scale resolution (25km). This twenty-year lookback was designed to complement an investigation of observed European air quality trends over the same time period, undertaken by the European Monitoring and Evaluation Program Task Force on Measurements and Modeling (EMEP-TFMM). Observations at rural ground-based monitoring stations indicate that peak episodic ozone, represented by, e.g., 98th percentile of maximum daily 8-hour average ozone (MDA8), have decreased in Europe over the 1990-2010 period. Annual average ozone, on the other hand, was increasing during the 1990-2000 period, but showed a decreasing trend over the 2000-2010 period. Here, the first results of the Eurodelta-Trends exercise for ozone will be presented, with a focus on (1) the capability of the participating models to reproduce the observed trends in European ozone between 1990 and 2010 and (2) the assessment of trends causes, such as changes in precursor emissions and/or meteorology.

Seven regional models, including six regional Chemistry-Transport Models (EMEP-MSCW, Chimere, CMAQ, LOTOS-EUROS, MINNI, and Polyphemus) and the online coupled model WRF-Chem, participated in the EURODELTA-Trends exercise, which builds upon previous iterations of the CITYDELTA and EURODELTA projects (Thunis et al., 2007; Bessagnet et al., 2014; Cuvelier et al., 2007). Model simulations for EURODELTA-Trends included a number of time-slice sensitivity experiments for the years 1990, 2000, and 2010, designed to isolate the contribution of European emission changes, boundary conditions (i.e. extra-European influence), and meteorology on surface ozone concentrations. Four of the participating models performed a full 21-year hindcast for 1990-2010. A second 21-year simulation was performed using 2010 emissions for the whole time period, in order to investigate the role of meteorological variability in the modeled trends. Based on these model results, our understanding of tropospheric ozone drivers in Europe will be discussed.

References

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