

1.104 Downscaling air quality data from global to local scales.

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Abstract:

Regional air quality models are regularly used for assessing health impacts over country or continental scales. However, these models lack sufficient resolution to represent pollution gradients near sources, particularly in the case of road traffic emissions, and are based mostly on top-down emission inventories. Local scale models on the other hand, often based on Gaussian plume parameterizations and using bottom-up emissions inventories, are also applied for health impact assessments but rarely beyond the city scale. In this paper a methodology for downscaling regional scale concentrations from the EMEP/MSC-W air quality model to local scales is presented. The EMEP/MSC-W model is used operationally in Europe and in China for air quality forecasts and analyses at regional scales, forced by global boundary conditions from the Copernicus Atmosphere Monitoring Service (CAMS). Currently the maximum operational resolution is 0.1x0.1 degrees but through downscaling this resolution is improved for exposure and exceedance applications. The method is referred to as *u*EMEP ('urban EMEP') and is made up of two parts: The first is a new scheme within the EMEP/MSC-W model for determining the local contribution from emissions within a rectangular area to each EMEP grid cell and its neighboring grids. This is valuable information for local air quality policy makers to decide on various emission reduction measures. The second part is based on a Gaussian plume model redistributing these local contributions at high resolution (250 to 50 m), resulting in fine scale air quality maps used as input to population exposure and health impact studies. The method also reveals differences between top-down/bottom-up and regional/local scale methodologies and thus provides a path for assessing the quality of urban emissions used in regional models. Successful applications are presented for Norway (population exposure to NO₂ and PM_{2.5}) and the problems encountered when regional and local scales meet are discussed.