



Combining models and measurements for European scale exceedance mapping

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There is a need at the European policy and management level to have access to comprehensive assessments of air quality on the European scale. In support of this need the European Topic Centre for Air Quality and Climate Change carries out, on behalf of the European Environmental Agency, a range of European scale air quality mapping activities. In this paper statistical interpolation techniques have been applied to map and assess the rural background concentrations of PM₁₀ and ozone on a daily basis over all of Europe. These daily maps are further used to determine exceedances of the air quality directive limit values for annual and daily mean PM₁₀ as well as the percentile (26th highest) 8 hour running mean for ozone.

The maps are created using multiple linear regression of both the LOTOS-EUROS and EMEP chemical transport models along with daily air quality data taken from Airbase. Residual kriging of the regression fields is then applied for the final maps. Comparisons are made when using different models, different interpolation methods and when using annual instead of daily statistics. In addition to the assessment maps attention is also given to estimating the uncertainty of the maps. The methodology for determining the uncertainty in exceedances is described and maps of the uncertainty, along with probability of exceedance maps, are provided. By the use of cross-validation methods the quality of the maps is assessed.

The results show that models alone do not provide useful assessment maps of exceedances for either PM₁₀ or ozone. When used in combination with measurements both of the models give similar levels of uncertainty. The uncertainty is, in almost all cases, reduced when daily maps are used to determine exceedances rather than the use of annual statistics.