Supplement of

The influence of model spatial resolution on simulated ozone and fine particulate matter for Europe: implications for health impact assessments

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We further analyse how the seasonality in O₃ concentrations simulated at the two resolutions varies seasonally and also geographically at the country level (Fig. S1). During winter, O₃ concentrations at southerly locations in Greece and Italy (Fig. S1 red box) show the largest differences between the two resolutions, with an overestimate of ~50 µg m⁻³ at the coarse resolution compared to EMEP measurements. In contrast to the majority of the sites during winter, simulated O₃ concentrations at the finer resolution are higher compared to the coarse resolution for several locations in Austria, Hungary and Slovakia (red circle). Similar to winter, O₃ concentrations at the same locations in Italy are also largely overestimated by both model resolutions in summer (~50 µg m⁻³, Fig. S1c). In autumn, the largest overestimates of low O₃ concentrations at the finer resolution occur at northern European locations in the Netherlands and Belgium (Fig. S1d - red box).

In spring, summer and autumn, O₃ concentrations simulated at both resolutions in Malta are much higher compared to measurements (~40 µg m⁻³; Fig. S1b, c and d - red circle). This is due to the fact that at both resolutions, the grid box covering the Maltese Islands is represented as ocean and not land. Deposition of O₃ is typically less over the sea than compared to over land, potentially leading to an overestimation in simulated O₃ concentration compared to measurements at this location.
Figure S1: Modelled versus observed seasonal mean O$_3$ for a) DJF b) MAM c) JJA d) SON 2007 over a subset of 52 sites across the EMEP network as shown in Fig. 1. The arrow tails mark O$_3$ concentrations at the coarse resolution while the arrow heads represent the corresponding O$_3$ concentrations at the finer resolution.
Figure S2: Difference between global and regional seasonal mean boundary layer height (PBL coarse resolution – PBL finer resolution) for a) DJF b) MAM c) JJA and d) SON for 2007
Figure S3 Seasonal mean modelled vs observed PM$_{2.5}$ for 25 sites across the EMEP network for the year 2007. The arrow tails mark PM$_{2.5}$ concentrations at the coarse resolution while the arrow heads represent the corresponding PM$_{2.5}$ concentrations at the finer resolution. The 1:1 line shows agreement between observed and simulated PM$_{2.5}$.
Figure S4: Difference between coarse and finer seasonal mean convective rainfall rate (mm day\(^{-1}\)) for a) DJF b) MAM c) JJA and d) SON for 2007
Figure S5: a) Difference between MDA8 O$_3$ concentrations with and without population-weighting as simulated by the coarse (orange bars) and finer (blue bars) resolutions b) same holds for annual mean PM$_{2.5}$ concentrations.