

## HORIZONTAL DIFFUSION IN EMEP CHEMICAL TRANSPORT MODEL

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**Abstract:** The parameterization of the sub-grid scale horizontal diffusion is still an open question in air quality and turbulence modelling. The diffusion term in the discretized advection-diffusion equation becomes more important as the horizontal resolution of the model increases. As advection schemes become more accurate and the resolution of air quality transport models increases, the explicit horizontal diffusion may become of the same order of magnitude or higher than the numerical diffusivity of the advection scheme used. The Unified EMEP model uses 4th order Bott's advection scheme with no explicit horizontal diffusion. The assumption is that with a 50x50 km<sup>2</sup> grid resolution, numerical diffusion would compensate for the lack of explicit treatment of horizontal diffusion in the model. As resolution increases, up to 10x10km<sup>2</sup> as envisaged for the Croatian application of the EMEP model, this assumption may not be valid anymore. This work presents a new scheme based on the deformation of the wind field and air stability that has been recently implemented in the Unified EMEP model. Theoretical arguments for the implementation of horizontal diffusion scheme are presented and its influence on the results at different resolutions is discussed.