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The effects of Intercontinental emission sources on european air pollution levels

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This study is based on model results from TF HTAP (Task Force on Hemispheric Transport of Air Pollution). TF HTAP is organised under the auspices of the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP Convention) The model results from TF HTAP will in the future serve as input to assessments of the impacts of control strategies on the contribution of regional and extra-regional emissions sources to the exceedance of air quality standards and to impacts on human health, ecosystems and climate.

Under TF HTAP a set of source receptor model experiments have been defined, reducing global (and regional) anthropogenic emissions by 20% in different source regions throughout the globe. Calculations for several years are requested, but year 2010 has the highest priority. All the participating models use the same set of emissions. Results from a number of models are now available. Comparisons of model results to measurements will be shown for European surface sites and for ozone sondes, but the main focus of this presentation will be on the contributions to European ozone levels from different world regions.

The calculations show that for ozone the contributions from the rest of the world is larger than the effects from European emissions alone, with the largest contributions from North America and East Asia. There are also considerable contributions from international shipping, but so far only a few models have made the calculations for this source. Whereas ozone from European sources peaks in the summer months, the largest contributions from non European sources are calculated for the spring months when ozone production over the polluted continents starts to increase, while at the same time the lifetime of ozone in the free troposphere is relatively long. At the surface the largest contributions from non European sources are calculated for the western rim of the European continent and for mountainous regions. However, contributions from non European sources are of similar magnitude for all European sub regions considered, defined as TF HTAP receptor regions (northwest, southwest, east and southeast Europe). Ozone from non European sources are mainly transported in the free troposphere. Vertical transects upwind of the European continent and ozone columns of the contributions from non European sources will be discussed.

There are considerable spread in the model results, in terms of calculated ozone levels and the contributions from the different source regions. The spread in model results are caused by a number of factors, such as model resolution, advection, chemistry etc. Differences between the models will be highlighted by showing model results also for other species than ozone such as CO, NO_x, PAN and passive tracers in an attempt to explain the causes of the differences in model results.