Geophysical Research Abstracts
Vol. 18, EGU2016-12002, 2016
EGU General Assembly 2016

Establishing the origin of particulate matter across Europe

Martijn Schaap, Richard Kranenburg, Carlijn Hendriks, and Jeroen Kuenen
TNO, CAS, Utrecht, Netherlands (martijn.schaap@tno.nl)

Exposure to particulate matter (PM) in ambient air leads to adverse health effects. To design cost effective mitigation strategies, a thorough understanding of the sources of particulate matter is crucial. In this paper we like to provide an overview of recent source apportionment studies aimed at PM and its precursors carried out at TNO. The source apportionment module that tracks the origin of modelled particulate matter distributions throughout a LOTOS-EUROS simulation will be explained. To optimally apply this technology dedicated emission inventories, e.g. fuel type specific, need to be generated. Applications to Europe shows that in northwestern Europe the contribution of transport and agricultural emissions dominate the PM mass concentrations, especially during episodic events. In eastern Europe, the domestic and energy sector are much more important. In southern Europe the picture is more mixed, although the frequent high levels of desert dust stand out. Evaluation of the source allocation against experimental data and PMF analyses is challenging as there is only a limited availability of source specific tracers or factors that can be used for direct comparison. Nonetheless, for the available tracers such as vanadium for heavy fuel oil combustion an evaluation is very well possible. The source apportionment technique can also be used to interpret particulate matter formation efficiencies. It will be shown that the conversion rates for the secondary inorganic aerosol precursors (NO_x, NH3 and SO_2) have changed during the last 20 years.
A particular problem is related to the fact that CTMs systematically underestimate observed PM levels, which means that the contribution of certain source categories (natural, agriculture, combustion) are underestimated. Future developments needed to improve the source apportionment information concerning process knowledge, data assimilation as well as model implementation will be discussed. Specific challenges concerning the underlying emission information will be highlighted.