AEROSOL SOURCE APPORTIONMENT FROM LONG TERM MEASUREMENTS AT THE CESAR TOWER AT CABAUW, NL

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Atmospheric aerosols have large impacts on the climate and adverse health effects. The identification and quantification of aerosol sources is clearly needed, particularly by exploring the aerosol chemical composition. However, its determination is still challenging, especially in case of organic aerosols (OA). In fact, the lack of knowledge on particle composition is a key contribution to the large uncertainty for the determination of the total anthropogenic radiative forcing.

In this work, intensive measurements of aerosol chemical composition were performed with an Aerodyne High Resolution Time-of-Flight Aerosol Mass Spectrometer (HR-ToF-AMS) at the Cabauw Experimental Site for Atmospheric Research (CESAR) in Cabauw, NL, in Nov. 2011 and from May to July 2012. Additionally, an Aerosol Chemical Speciation Monitor (ACSM) was measuring from July 2012 to June 2013 as part of the ACTRIS project. Including black carbon data, average particulate mass concentrations of 9.26 μg m^{-3}, 6.40 μg m^{-3}, and 9.50 μg m^{-3} were observed during the campaign periods, respectively. Within the ACSM campaign, 12 exceedances of the World Health Organization (WHO) $PM_{2.5}$ daily mean limit (25 μg m^{-3}), were observed. The largest contributions to total mass were nitrate (21% - 39%, mainly as ammonium nitrate) and organics (23% - 33%).

Source apportionment of AMS- and ACSM-OA data was performed, using Positive Matrix Factorization (PMF) using the Multilinear Engine 2. It was shown that primary organic aerosols can be attributed mainly to traffic (8% - 35% average contribution to total OA) and biomass burning (8% - 23%). Secondary organic aerosols (SOA, 53% - 84%) dominated the organic fraction during all campaigns, particularly on days with high mass loadings. A PMF factor which is attributed to humic-like substances (HULIS) was identified as a highly oxidised background aerosol in Cabauw. This and the high SOA concentrations show the importance of atmospheric ageing processes of aerosol concentration at this rural site. Due to the large secondary fraction, a reduction of particulate mass is challenging on a local scale.