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# Water-soluble inorganics in PM2.5 and PM10 and precursor gases at an urban area in Hong Kong: Long-term trends and composition variability

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Gravimetric analysis has long been used to monitor the trends of the bulk aerosol mass in both PM2.5 and PM10 while offline chemical speciation analysis of filter-based samples offered daily or lower frequency measurements. However, long-term and chemical speciated aerosol measurements with high temporal resolution are in limited availability. The Monitor for AeRosols and Gases (MARGA 2S, Applikon B.V., NL) allows for the identification and quantification of water-soluble inorganics (WSIs) in PM2.5 and PM10 (NH4+, $NO_3$-, SO42-, Cl-, Na+, K+, Mg2+, Ca2+) and precursor gases (HCl, HONO, $HNO_3$, $SO_2$ and NH3) at hourly resolution.

The present study covers 4-year continuous observations of PM2.5, PM10 and their precursor gases using the MARGA 2S at the Yuen Long Air Quality Monitoring Station (YLAQMS) in Hong Kong from July 2013 to June 2017. YLAQMS is one of the representative urban sites with heavy traffic flows. Major secondary inorganic aerosols (SIAs) including ammonium, nitrate and sulfate were found to be the dominating species of WSIs in PM2.5 while nitrate was also found to make the largest contribution to the WSIs in PMCoarse (PM10-PM2.5) in the sampling site. Our results confirm that nitrate, as a significant component in fine particle, could also have comparably abundant presence in the coarse particle. This provides evidence of considerable processing of sea spray and crustal dust aerosol species, particularly Na+, Mg2+ and Ca2+, in the coarse mode with $HNO_3$. Nitrate could be formed by heterogeneous reactions of $HNO_3$ with particulate even in ammonium poor regime and facilitated by a local source and/ or transport of crustal dust and sea spray aerosol. Our study also investigates the partitioning behaviours of nitrate between fine and coarse modes in order to quantify factors and processes governing nitrate in PM2.5 and PMCoarse.

The preliminary results of temporal variations, composition variability and factors affecting nitrate in fine and coarse mode will be shown. The results of this analysis support for the study of SIAs formation mechanisms in different regimes.

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