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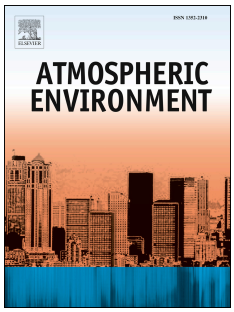

Possible sources of two size-resolved water-soluble organic carbon fractions at a roadway site during fall season

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PII: S1352-2310(14)00326-4

DOI: 10.1016/j.atmosenv.2014.04.054

Reference: AEA 12937

To appear in: *Atmospheric Environment*

Received Date: 29 November 2013

Revised Date: 24 April 2014

Accepted Date: 28 April 2014

Please cite this article as: Park, S.-S., Kim, J.-H., Possible sources of two size-resolved water-soluble organic carbon fractions at a roadway site during fall season, *Atmospheric Environment* (2014), doi: 10.1016/j.atmosenv.2014.04.054.

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Possible sources of two size-resolved water-soluble organic carbon fractions at a roadway site during fall season

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Abstract

To examine the formation pathways of two size-resolved water-soluble organic carbon (WSOC) fractions, a total of 16 sets of size-segregated aerosol samples were collected using a 10-stage Micro-Orifice Uniform Deposit Impactor (MOUDI) at a roadway site in Korea from September 29 to October 29, 2010. A XAD7HP (non-ionic aliphatic acrylic polymer) resin column was used to separate the filtered extracts into hydrophilic ($WSOC_{HPI}$) and hydrophobic ($WSOC_{HPO}$) WSOC fractions. Also the size distributions of water-soluble inorganic species and oxalate were examined to determine the formation pathways of size-resolved $WSOC_{HPI}$ and $WSOC_{HPO}$ fractions.

The size distribution of $WSOC_{HPI}$ showed a dominant mode at 0.55 μm, while the $WSOC_{HPO}$ had dominant modes at both 0.17-0.32 μm and 0.55 μm. On the basis of the size distribution characteristics, it was found that the formation pathways of both $WSOC_{HPI}$ and $WSOC_{HPO}$ were dependent on the particle size; in the condensation mode (0.17-0.32 μm), both the $WSOC_{HPI}$ and $WSOC_{HPO}$ could be produced through atmospheric processes similar to those of SO_4^{2-} and oxalate, which were derived from the gas-phase oxidations of organic compounds. In the droplet mode (0.55-1.8 μm), the cloud processing of both the organic compounds and biomass burning emissions could be a major pathway for the $WSOC_{HPI}$ formation. However, the droplet mode $WSOC_{HPO}$ was likely produced through cloud processing and heterogeneous reactions or aerosol-phase reactions. In the coarse mode (>3.1 μm), the $WSOC_{HPI}$ formation was more likely associated with soil-related particles ($Ca(NO_3)_2$ and $CaSO_4$) than with sea-salt particles ($NaNO_3$ and Na_2SO_4).

Keywords: Roadway, aerosol size distributions, water-soluble organic carbon (WSOC) fractions, size-resolved WSOC fractions, production pathways

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