

## Chemical characteristics of water-soluble organic carbon in the Asian outflow

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Semicontinuous measurements of water-soluble organic carbon (WSOC) and organic carbon (OC) in  $PM_{2.5}$  were made at Gosan, Korea, in March-April 2005 during Atmospheric Brown Clouds-East Asian Regional Experiment (ABC-EAREX). For the interpretation of the measured organic compounds, thermal analyses of organic standards were made in the laboratory. Thermograms of a single standard of WSOC species showed that carbon evolved at high temperatures (600-870C) was generally associated with high molecular weight (MW) polar compounds with MW on the order of hundreds, while carbon that evolved at low temperatures (lower than 300C) was associated with low MW compounds (MW lower than 180). On average, the WSOC/OC ratio for all air masses observed at Gosan was  $0.30 \pm 0.12$  ugC/ugC, whereas the ratio was  $0.34 \pm 0.13$  ugC/ugC in air masses originating from northeast China identified by trajectories. WSOC correlated well with CO ( $r^2 = 0.54$ ) in the Chinese outflow, suggesting that a major part of the observed WSOC and/or their precursors were of combustion origin co-emitted with CO. WSOC also positively correlated with  $O_3$  ( $r^2 = 0.42$ ) and  $SO_4^{2-}$  ( $r^2 = 0.32$ ), suggesting that a significant fraction of the observed WSOC was secondary products. A positive matrix factorization (PMF) analysis deduced three organic compound groups, which were interpreted to be low, medium, and highly refractory compounds based on the thermal characteristics of OC. On average, highly and low refractory compound groups accounted for 79% and 21% of the WSOC mass concentrations, respectively. Highly refractory compound groups significantly contributed to WSOC not only in the Chinese outflow, but also in marine-influenced air masses. These results of field measurements together with laboratory experiment suggest that regardless of air-mass origin, high MW polar compounds significantly contributed to the mass concentrations of WSOC observed at Gosan.