学 位 論 文 内 容 の 要 旨

博士（環境科学）　　氏 名 **Md. Mozammel Haque**

学 位 論 文 題 名

Molecular compositions and seasonal variations of organic compounds in atmospheric aerosols from subarctic Alaska

（亜北極アラスカにおける大気エアロゾル中の有機化合物組成と季節変動）

Organic constituents are recently highlighted because they account for a substantial portion of atmospheric particles, up to 50% in mass. Global models predict that biomass burning emissions and secondary organic aerosols (SOA) formation from biogenic volatile organic compounds (BVOCs) are the two major sources of organic aerosols (OA). Most of them are water-soluble and they can act as cloud condensation nuclei and ice nuclei, affecting climate by altering the hygroscopic properties of aerosols. Anhydro-sugars and lignin & resin acids are specific tracers from biomass burning emissions. Total of 32 total suspended particle (TSP) samples were collected from Fairbanks, Alaska in June 2008 to June 2009 using a low volume air sampler. Here, we report the molecular compositions and seasonal variations of anhydro-sugars (levoglucosan, galactosan and mannosan), primary sugars (glucose, fructose, sucrose, trehalose and xylose), sugar alcohols (erythritol, arabitol, mannitol and inositol), lignin & resin acids (4-hydroxybenzoic, syringic, vanillic and dehydroabietic acids) and biogenic SOA tracers (isoprene, *α*-/*β*-pinene and *β*-caryophyllene SOA tracers) which were measured using solvent extraction/TMS-derivatization technique followed by gas chromatography-mass spectrometry (GC-MS) determination. The average concentrations of anhydro-sugars, primary sugars, sugar alcohols, lignin & resin acids, isoprene SOA tracers, *α*-/*β*-pinene SOA tracers and *β*-caryophyllene SOA tracers were 30.6 ng m^{-3}, 10.1 ng m^{-3}, 8.72 ng m^{-3}, 3.03 ng m^{-3}, 4.14 ng m^{-3}, 2.01 ng m^{-3} and 1.53 ng m^{-3}, respectively. We found clear seasonal variations for identified organic tracers. Anhydro-sugars and lignin & resin acids are dominant in winter and autumn, whereas primary sugars, sugar alcohols and biogenic SOA tracers (except *β*-caryophyllene tracer) are dominant in summer and spring. Positive Matrix Factorization (PMF) analysis demonstrated that the contribution of biomass burning (61.6%) is important in the Alaskan aerosols. Wildfire or forest fire has been considered the major source of BB tracers in the Alaskan region. However, the analyses of air mass back trajectories and fire spots demonstrated that domestic activities were the main emission source for BB tracers during study period. In this study, we observed mixed air masses in all seasons, suggesting that local emission is the important source for organic aerosols. Marine aerosols also might significantly influence the central Alaskan atmosphere. Alaska pollutants can be transported to the Arctic. The current study will be useful to better understand the effect of organic aerosols on Arctic or subarctic atmosphere.