Determining Polarity Distribution of Atmospheric Water-Soluble Organic Matter

Organic matter (OM) accounts for a significant fraction of submicron particulate in the atmosphere. The impact of OM on climate and human health is largely contributed by the water-soluble OM (WSOM). Interplay of WSOM and water leads to hygroscopic growth and cloud formation processes. Magnitude of the organic hygroscopicity can be determined by the polarity distribution of WSOM, yet experimental method to systematically examine the relationship is not available. This thesis presents a novel framework to classify WSOM according to its polarity using the 1-octanol-water partition coefficient (KOW), which often serves as a metric of polarity and water solubility. A theoretical method was developed to classify WSOM. The method was verified by OM from proxy of biomass burning particles, and applied to Indonesian biomass burning particles. WSOM were categorized into three categories with distinct chemical characteristics based on values of KOW. Numerical algorithms were further developed to derive polarity distribution.