Geophysical Research Abstracts
Vol. 21, EGU2019-3276, 2019
EGU General Assembly 2019


# Spectroscopic investigation of multiple reactions on the aqueous organic aerosol surface

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Adsorption of low volatile organic compounds onto aqueous aerosol surface results in aqueous aerosol coated by organic film. This structure is generally like inverted micelle. Langmuir monolayer is a good model for investigating the surface properties of organic film on the aqueous aerosol. Polarization modulation-infrared reflection absorption spectroscopy (PM-IRRAS) is surface-sensitive technique and used to in situ detect multiple reactions on the organic monolayer. Surface pressure and its variation with area showed that different atmospheric metal ions (such as Zn2+, Fe3+, Ca2+ and Al3+) and anions (such as Br−, Cl−, $NO_3-$ and SO42−) induced the compression or expansion characteristics of fatty acid and phospholipid monolayers. IRRAS results indicated the packing and ordering of organic monolayer could change the dissolution and partitioning behavior of aqueous aerosols. The miscibility and stability of mixed fatty acid/phthalate ester and fatty acid/fatty alcohol films were dependent on the composition of mixture. Sea salts in the aqueous phase improved the stability and lifetime of mixed film on the aerosol surface. Photochemical aging of unsaturated lipid film with light-absorbing brown carbon in the aqueous phase can produce lipid hydroperoxides, leading to the surface area increase of organic film. The new band detected by IRRAS after irradiation confirmed the mechanism of photosensitized reaction for unsaturated lipids at the air-aqueous interface. The change in surface organization of organic film may have significant impacts on the evaporation of water vapor, hygroscopic growth of droplet and the transport of atmospheric pollutants.