8th International Conference on Fog, Fog Collection and Dew
Taipei, Taiwan, 14–19 July 2019
IFDA2019-27

The Interaction of Aerosol Composition, Properties and Fog Formation

Ting-Yu Chen, Chia-Li Chen, Ren-Ting Huang, and Hui-Ming Hung
Department of Atmospheric Sciences, National Taiwan University, Taiwan

Hygroscopic aerosol particles can act as cloud condensation nuclei in the atmosphere to affect the fog and cloud formation. The possible aqueous phase reactions can be enhanced with the formation of the cloud (or fog) droplets and further modify their chemical composition. To investigate the interaction of different types of fog, aerosol hygroscopicity and aerosol major chemical composition, the results from two field studies, Kinmen in April 2017 and Xitou Experimental Forest of National Taiwan University in December 2018 were discussed. The fog formation mechanism for these two sites is different: fog in Kinmen tends to be advection fog caused by moist air from the sea while the fog in Xitou is upslope fog formed by local land-sea breeze. The single hygroscopicity parameter, κ, of aerosol as a function of aerosol diameter was derived based on the measurements of a cloud condensation nuclei counter (CCNc), an ultrafine condensation particle counter (UCPC) and a scanning mobility particle sizer (SMPS). The major aerosol composition was determined based on the absorbance of selected functional groups measured by a Fourier transform infrared spectroscopy-attenuated total reflection (FT-IR-ATR) for the filter samples collected using a multi-orifice uniform deposit impactor (MOUDI). The preliminary result suggests that κ in Kinmen shows an increasing trend with the dry aerosol diameter for the size range of 50-200 nm. For both Kinmen and Xitou cases, κ value during the fog event is slightly higher than that of non-foggy days. During the strong new particle formation event, the particle with its diameter less than 100 nm might have κ value of less than 0.1. That might be caused by the composition was less aged and had lower hygroscopicity. With the differentiation of carbonyl groups at 1520-1820 cm^{-1} to determine the neutralization level using FT-IR-ATR, small particles tend to have higher acidity whereas large particles are more neutralized as carboxylates. The size, composition, and the hygroscopicity of aerosol may affect fog formation but can be further modified by the aqueous chemical reactions inside the fog droplets. More detail analysis of the interaction between aerosol particles and fog droplets will be discussed during the conference.