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Effect of Various Fog Processing Stages on the Oxidation Process of Organic Aerosol

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Kanpur is a highly polluted complex environment in India, situated at the centre of Indo-Gangetic Plain which witnesses frequent and persistent fog episodes during winter time. These fog episodes enhance organic aerosol (OA) loading as well as the fractional contribution of secondary organic aerosol (SOA) to OA. Here, we deployed a High Resolution Time of Flight Mass Spectrometer (HR-ToF-AMS) along with cloud combination probe (CCP, Droplet Measurement Technologies) to study the changes in oxidation process of OA during five fog processing stages, i.e. Pre-Fog-Period (Pr-F-P), Activating-Fog-Period (A-F-P), Fog-Period (F-P), Dissipating-Fog-Period (D-F-P), and Post-Fog-Period (Po-F-P). Oligomerization process was found crucial for the formation of OA along with functionalization of –OH and carbonyl (aldehyde/ketone) moieties during A-F-P and D-F-P, respectively accompanied by acidic aerosol as well as high aerosol liquid water content (ALWC) condition. Also, as a result of these processes, O/C ratio of oxygenated organic aerosol (OOA) remain constant during Pr-F-P to A-F-P while increases during F-P to D-F-P. Moreover, the dominance of the fragmentation process along with functionalization of –RCOOH or carbonyl (aldehyde/ketone) and –RCOOH moieties were observed during F-P and Po-F-P periods, respectively. Both mechanisms were found to be responsible for the enhancement of the O/C ratio of OOA.