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Characteristics of urban thin fog or mist in Yokohama, Japan

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Context/Purpose: Fog was formed frequently over 50 years ago, but is rarely formed recently for the warming temperature and the improving air pollution in Yokohama. Thin fog or mist, whose visibility is larger than that of fog, over 1 km but less than 10 km, occurs frequently recent years, and it is difficult to characterize urban thin fog because of its very low liquid water content. The characteristics of the droplets in urban areas, in Yokohama, are investigated, and will be reported.

Methods: The concentrations of the droplets were estimated via the determination of water-soluble components of the aerosol and the observation of the imprints of the droplets on a MgO-coated glass slide. The pH of the mist droplets, whose diameter was larger than 10 μm , was estimated from the equilibrium calculation with the data of the Gran plot of the solution of the dissolved coarse particles, the inorganic ion concentrations of aerosol larger than 10 μm , and the estimated volume of mist water.

Results: Thin fog or mist is easily formed during early morning and the diameter of most of droplets is 10 to 50 μm . When the humidity increased over 75%, the deliquescence proceeded, and the diameter of the nucleation aerosol of NaCl grows to be over 10 μm . The droplets contain highly concentrated air pollutants as about 1 eq/L total concentration for typical inorganic ions, although pH is not so low, ca. pH5, because of acid consumption materials in the droplets in Yokohama.

Interpretation: Mist events occur frequently in many urban areas. Highly contaminated mist droplets may severely affect respiratory systems, plants, and materials in urban areas because of their aqueous properties. Accurate observation of small droplets and the characteristics of acid consumption materials are the agendas for further studies.

Conclusion: Such highly concentrated droplets may have intense environmental effects.