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Variation of aerosol characteristics in the detail scale of time and space

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In this work, we intend to demonstrate the spatial and temporal variation of atmospheric aerosols around AERONET/Osaka site. Osaka is the second big city in Japan and a typical Asian urban area. It is well known that the aerosol distribution in Asia is complicated due to the increasing emissions of anthropogenic aerosols in association with economic growth and in addition behavior of natural dusts significantly varies with the seasons. Therefore local spatially and temporally resolved measurements of atmospheric particles in Asian urban city are meaningful. We equip various ground measurement devices of atmosphere in the campus of Kinki University (KU). The data supplied by the Cimel instrument are analyzed with a standard AERONET (Aerosol Robotics Network) processing system. It provides us with Aerosol optical thickness (AOT), the Ångström exponent and so on. We set up a PM sampler and a standard instrument of NIES/LIDAR network attached to our AERONET site. The PM sampler provides particle information about the concentrations of PM2.5, PM10 and OBC separately. In addition to the simultaneous measurements, we make observation of the air quality at several locations in the neighbour-hood using portable sun-photometers (Solar-Light Company Microtops-2).
The simultaneous measurements of aerosols and numerical model simulations indicate that the spatial and temporal factors influence the characterization of atmospheric particles especially in dust event. Then we observe the air quality at such several locations within a few 10 km area from KU, as Izumi and Nara, in ordinal days and dust days. Izumi site locates near industrial area and Nara is in the east of KU beyond the mountain-Ikoma. It is found from the simultaneous measurements at these three sites that AOT at Izumi in ordinal days is the highest and Nara's lowest. It indicates that the Ikoma-mountains block off the polluted air from the west. However in dust days, AOT at Nara is as large as that at Higashi-Osaka. We guess dust aerosols are transported over the mountains because dust aerosols exist higher than usual.
In order to investigate change of aerosol properties before and after dust event, we analyze particulate matter with scanning electron microscope (SEM) coupled with energy dispersive X-ray analyzer (EDX). It is found from the scaling of particle size and ratio of major and minor axis for PM2.5 sampling on 21 March, 2010 when dust event occurred that at the peak of dust event nonspherical particles with large particle size are dominant. A componential analysis also presents temporal variation of aerosol properties. Sulfur is major component before dust comes but Si becomes major component with dust event.