5.053 Development of accurate low-cost PM2.5 instruments and measurements in Asian countries.

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Abstract:

We have developed a new palmtop-sized optical $PM_{2.5}$ sensor. For accurate measurement of $PM_{2.5}$ mass concentrations, the sensor is designed to be able to estimate particle sizes from the distributions of light scattering intensities from single particles. The validation of the compact PM2.5 sensors was performed by simultaneous measurements with large beta-attenuation monitor (BAM) instruments and good correlation factors were obtained. Even when the PM2.5 concentrations were high than 1000 mg m^{-3} in New Delhi, India, good correlation was obtained.
We are planning many applications of the compact, low-cost and simple PM2.5 instruments. In urban areas, many instruments can be installed with high densities. Local PM2.5 sources in the urban areas can be detected with the PM2.5 instruments. We have also developed personal exposure measurement system for PM2.5. The system consists of the PM2.5 sensor and a smartphone. The measured PM2.5 and GPS position data are automatically transmitted to a cloud server.
The new PM2.5 instruments are especially suitable for the measurements in Asian countries. Many Asian countries suffer from serious environmental problems of extremely high PM2.5 concentrations and their health effects. The PM2.5 observations in rural areas of the Asian countries have difficulty to install valuable and delicate PM2.5 instruments such as BAM because of many serious difficulties about space, electric supply, dust, temperature, roof leaks, insects, transportation, maintenance access, standard-gas supply and so on. The new low-cost PM2.5 instruments can be installed and operated in those conditions. The PM2.5 instruments widely distributed in high PM2.5 concentration area are suitable for epidemiological studies.
In this presentation, we will present the features of the compact PM2.5 instruments, and also present the measurement results in India, Vietnam, and Mongolia for more than one year.