

Simple technique of PM_{2.5} measurement in Higashi-Hiroshima city using a portable particle counter

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In recent years, we are anxious about the trans-boundary air pollution by PM_{2.5}. Therefore the development of various measurement, monitoring methods is demanded. It was begun the full-time monitoring in Hiroshima from FY.2012. It is only ten places at the end of May, 2013 to measure PM_{2.5} among 39 places of atmosphere measurement station in the prefecture. In addition, because there is not the PM_{2.5} measurement station in Higashi-Hiroshima city that population continues increasing, we did not understand the situation of PM_{2.5}. Therefore, in this study, a technique to measure PM_{2.5} with a relatively cheap portable particle counter (PPC) was considered. At first each particle size (the number of each particle more than diameter 0.3, 0.5, 0.7, 1.0, 2.0, 5.0 μ m) included in the atmosphere was measured using PPC (KR-12A, RION Ltd.) near Inokuchi Elementary School station (34.37268 degrees N, 132.38475 degrees E) that was one of the observation stations of Atmospheric Environmental Regional Observation System (AEROS) in order to estimate PM_{2.5} from PPC. All 11 data set measured was used on May 25, June 8, June 22, August 3. The number of the particles less than 2.5 μ m (C_{2.5}) was calculated by the relationship between cumulative particle number (CPN) and particle size. After having aspirated the atmosphere of 1L per 1 measurement, CPN of each particle size is measured by the scattering intensity of the semiconductor laser at 790nm. On the other hand, CPN for 195 days from March, 2013 to April, 2014 were observed to check PM_{2.5} in Higashi-Hiroshima. On the other hand, CPN were measured for 195 days (only on weekdays) from March, 2013 to April, 2014 to check PM_{2.5} in the city. Statistically high correlation was observed the relationship between CPN (total count of all particle size) and the in-situ PM_{2.5} in Inokuchi station. The measurement limit of PM_{2.5} and the estimation error (RMSE) were 4.1-12.8 μ g/m³. The environmental standards of PM_{2.5} in our country are 35 μ g/m³ by one-day average now. Therefore, the measurement limit by this method is judged to be a value quite lower than these standard values. This simple technique can be used enough as how for it to be careful of PM_{2.5} at least. Moreover, as a result of creating the time series variation diagram of PM_{2.5} in Higashi-Hiroshima using this observation method, the percentage which exceeds environmental standards in Higashi-Hiroshima was about 16%. Moreover, the season when the probability which exceeds the standard is the highest was in August.

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