

Spatial and Temporal Distributions of PM₁, PM_{2.5} and PM₁₀ in the Coast of Korea

HYO CHOI¹, DOO-SUN CHOI¹, MILTON SPEER²

¹*Dept. of Atmospheric Environmental Sciences, Kangnung National University, Kangnung, Kangwondo 210-702, Korea*

²*School of Mathematics, The University of New South Wales, Sydney, NSW, Australia 2052*

The concentrations of 100 nano-particle size to 20 μ m³ in the eastern coastal region of Korea have been measured by GRIMM aerosol samplers from March 29 through April 3, 2004, at two aerosol sampling points in the high mountain (Mt. Taeguallung; 896m) of upwind side in the west of which Gangwon Regional Meteorological Administration (GRMA) of Kangnung coastal city adjacent to the East Sea in the east. PM₁₀, PM_{2.5} and PM₁ near the ground surface at the city until 1200 LST, March 30 before the passage of dust storm were very low less than 35, 40 and 50 μ m³, and PM₁ and PM_{2.5} concentrations were about a half of PM₁₀ concentration. The second maximum concentration of PM₁₀ from March 30 before dust storm occurred near the beginning time of office hour around 0800 ~ 0900LST and the first maximum concentration near the ending time of office hour around 1900 LST, due to the increase of fuel combustion of vehicles on the street. During the day, especially about noon, as particulate matters could be uplifted in convective boundary layer developed over the ground surface, PM concentrations were generally lower than ones in the morning and at night. From the afternoon on March 30 through April 1, when a great amount of dust particles passed through Korean peninsula and finally reached the city under westerly wind, PM₁₀ concentration reached 245 μ m³ and PM_{2.5} and PM₁ concentrations were 50 μ m³ and 35 μ m³, showing five times higher concentration of PM₁₀ than PM_{2.5}, respectively. The majority of dust transported from China consisted of larger particle size than PM_{2.5} and PM₁. The fractions of PM₁₀-PM_{2.5}/PM_{2.5} and PM_{2.5}-PM₁/PM₁ before, during and after dust storm event were given in detail. Even if a great amount of dust particles were transported from China into the city of Korean coast, the occurrence time of high concentration of particulate matters was detected at 0900 LST on the similar time like the beginning time of office hour and after the ending time around 2000~2300LST at night. On the other hand, low concentrations of PM₁, PM_{2.5} and PM₁₀ during the dust storm period, similarly to non-dust storm period were detected near noon. After sunrise, the transported dust from the upwind side in the west (mountain area) under the westerly wind toward to the downwind side (Kangnung city) were combined with the particulates emitted from vehicles, boilers from resident area of the city driven by easterly sea-valley breeze blowing from sea into the city and resulted in a high concentration of particulates at the beginning time of office hour, 0900 LST. For daytime, the upslope wind combined with easterly sea breeze and valley wind drove the dust particles or particulates in the city to be dissipated into the mountain side in the west, resulting in the decrease of particulates at the coastal city near noon.