Contribution ID: **686** Type: **Poster**

Stochastic Lagrangian Particle Simulation of Air Pollution Dynamics at a Mountain Base and Vicinity

Tuesday 22 May 2018 15:45 (15 minutes)

The air pollution studies usually scoped on the pollutant convection and diffusion from the emission sources. An emphasis on horizontal directions as how wide the range of pollution can spread out is a key parameter. The study domains are usually set at very large horizontal dimensions (xy-direction) compare with the vertical dimension (z-direction). In a recent work, the stochastic Lagrangian particle model considered turbulent diffusion coefficient being constants in the horizontal directions (i.e. K_x and K_y) because the study region was set in the urban area. However, for the region closes to the obstacle such as being situate near a mountain, the air flow is more complex and the turbulent diffusion parameters should be spatially dependent around the foothill. In this work, the air pollution transport was studied under the influence of the high turbulent diffusion in the region near the mountain. The pollutants transportation used Lagrangian particle models in the calculation. The turbulent diffusion coefficient was varied toward the mountain boundary by three kinds of functions are step function, linear function and exponential function. These kinds of variation functions were used as the variation model of horizontal turbulent diffusion coefficient K_x and K_y to compare with the non-variant or constant K_x and K_y. The results showed that the high concentration of pollution accumulated in different distance and existed further away from the mountain boundary. The highest concentration occurred differently in each function type, the highest concentration existed furthest in the step function and nearer in the exponential function. Whereas, the non-variant of turbulent diffusion coefficient caused the pollutant concentration is highly accumulated at the boundary due to the low turbulent diffusion.

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Session Classification: A017: Statistical and Theoretical Physics (Poster)

Track Classification: Statistical and Theoretical Physics