



## **Model analysis of seasonal variation of PM<sub>2.5</sub> across Japan and its regional-scale transport in East Asia**

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In Japan, an atmospheric environmental standard for PM<sub>2.5</sub> was newly introduced in September 2009. According to one year of data observed at ambient air quality monitoring stations in Japan main islands in fiscal 2010, PM<sub>2.5</sub> concentrations exceed the environmental standard at the large part of monitoring stations. In particular, concentration levels at almost all the monitoring stations in the western part of Japan exceed the standard value. Besides Japan main islands, PM<sub>2.5</sub> concentrations monitored at Fukue Island, a remote island in the most western part of Japan and close to the Asian continent, clearly exceeds the short-term standard value. These results suggest that regional-scale transport in East Asia affects the spatial and temporal variations of PM<sub>2.5</sub> across Japan. To investigate seasonal variations of PM<sub>2.5</sub> and estimate the influence of trans-boundary air pollution in East Asia, we performed emission sensitivity simulations for the full year 2010 by using a chemical transport model (Weather Research and Forecasting model /Community Multi-scale Air Quality model). The source regions in East Asia were divided into six areas: Japan, Korean Peninsula, northeast China, central north China, central south China, and south China. In each sensitivity simulation, the anthropogenic emission was reduced by 20% in each source region. The sensitivity of each source region was obtained by taking the difference of simulated PM<sub>2.5</sub> concentration between each sensitivity and base run. The model generally well reproduces the seasonal variation pattern of PM<sub>2.5</sub> concentrations across Japan; in the western part of Japan, PM<sub>2.5</sub> concentration decreases in summer, whereas it increases during summer in the eastern part of Japan. However, the absolute concentrations were underestimated by the model in the entire Japan throughout the year. We estimated the relative contributions from each source region to annual mean PM<sub>2.5</sub> concentrations in Japan. The contribution of domestic pollution is estimated at about 30% except the major urban areas. The contribution from central north China accounts for 30-40% of PM<sub>2.5</sub> in western Japan, and for 20-30% in eastern Japan. Central south has the relative contribution of 10-15% in western Japan. The contribution from northeastern China accounts for about 30% in northern Japan. The contribution from the Korean Peninsula is estimated at about 10% in western Japan.