

Observation studies on the influence of atmospheric boundary layer characteristics associate with air quality in dry season over the Pearl River Delta, China

Shaojia Fan, Meng Wu, Haowen Li, Zhiheng Liao, Qi Fan, and Wei Zhu
Sun Yat-sen University, Guangzhou, China (eesfsj@mail.sysu.edu.cn)

The characteristics of atmospheric boundary layer (ABL) is the very important factors influence on air quality in dry season over the Pearl River Delta (PRD), China. Based on the sounding data at six stations (Xinken, Dongguan, Sanshui, Nanhai, Shunde, and Heshan) which obtained from three times ABL experiments carried in dry season over PRD, the influence of wind and temperature vertical structure to the air quality over PRD has been studied with wind and temperature profiles, inversion layer, recirculation factor (RF), atmospheric boundary layer height (ABLH) and ventilation index (VI). It was found that the vertical wind of PRD could be divided in typical three layers according two wind shears appeared in 800 m and 1300 m. The thickness of calm or lower wind speed layer in pollution days was 500-1000m thicker than that of clean days, and its last time also much longer than that of clean days. The frequency of surface inversion in pollution days was about 35%, the mean thickness was about 100 m. With the influence of sea breeze, the frequency and thickness of surface inversion layer at Xinken station was a little lower than that in inland. Influenced by sea-land breezes and urban heat-island circulation, the RF of pollution days in coastal and urban area was quite smaller than that of clean days. During sea-land breezes days, the pollutants would be transported back to inland in nighttime with the influence of sea breeze, and resulted in 72.7% sea-land breezes was pollution days. The evolution of ABL was very typical in PRD during dry season. In pollution days, daily ABLH in PRD was lower than 500 m, daily VI was about 500-1500 m²/s. In clean days, daily VI was much larger than 2500 m²/s. An improved conceptual model of ABL influence on poor air quality and the parameters of the ABL characteristics associate with poor air quality in dry season over PRD had been summarized.