



Modeling study of source contributions and emergency control effects during a severe haze episode over the Beijing-Tianjin-Hebei area of China

Huansheng Chen, Jie Li, Baozhu Ge, Wenyi Yang, and Zifa Wang

Institute of Atmospheric Physics, Chinese Academy of Sciences, LAPC, Beijing, China (chenhuansheng@mail.iap.ac.cn)

In February 2014, the Beijing-Tianjin-Hebei (BTH) area of China experienced a weeklong episode of heavy haze pollution. Cities such as Beijing (BJ) and Shijiazhuang (SJZ) issued heavy pollution alerts for the first time in the history and took emergency control measures. This study employed the Nested Air Quality Prediction Modeling System (NAQPMS) to simulate and analyze the three dimensional structure of the source contributions of PM_{2.5} in the BTH area during this pollution episode and quantitatively assess the effects of the emergency control measures. The results showed that during the polluted period (19–26th), surface PM_{2.5} mainly came from local sources (48–72%). In the whole BTH area, southern Hebei (SHB) represented the largest internal contribution (33%), while the main external contributions came from Shandong (SD) (10%) and Henan (HN) (4%). Vertically, the local contribution was constrained below near-ground layer, and rapidly decreased with altitude. The regional transport path from SHB and Shanxi (SX) to BJ appeared in 0.5–1.5 km and 1.5–2.5 km, with contribution of 32–42% and 13–27%, respectively. The non-local source regions for the BTH area were SD below 1 km and mainly SX and HN above 1 km. Compared to the non-polluted period (27–28th), the contribution from regional transport increased during the polluted period, which indicated the key role of regional transport in the pollution formation. The emergency control measures had a relatively large effect on NO_x and SO₂ concentrations, but a limited effect on PM_{2.5}. The stronger regional transport during the polluted period may have weakened the effects of local emergency control measures. These results indicated that coordinated emission control should be implemented not only over the BTH area but also its surrounding provinces (e.g. SD, HN).