Research on the Temporal and Spatial Distribution Characteristics of Ozone Based on Differential Absorption Lidar over the Yangtze River Delta, China

Yan Xiang[a,b], Jianguo Liu[a], Tianshu Zhang[*a], Guangqiang Fan[a], and Lihui Lv[a,b]

1 Key Laboratory of Environment Optics and Technology, Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, Hefei 230031, China

2 University of Science and Technology of China, Hefei 230026, China

Surface ozone, an important secondary air pollutant, has become the primary pollutant in China during the summer. During the 18 days between August 24 and September 10, 2016, the ozone heavy pollution incident occurred four times in the Yangtze river delta(YRD), one of Chinese most developed areas. It lasting 2 to 5 days every time, the maximum concentration reaching to 550ppb. A high concentration of ozone pollution layer with vertical and horizontal transmission showing at altitude 1-2km, which has a significant impact of near-grounded ozone pollution. It has been observed simultaneously by two differential absorption lidars(DIAL). Diurnal variation in near-grounded ozone concentration of a single peak and single valley, the average minimum value is 75ppb, appearing at around 02:00 LST, and the average maximum value is 90ppb, appearing at around 12:00 LST. However, the daily ozone concentration of the upper air is not obvious. In order to obtain the temporal and spatial variation characteristics of ozone concentration in the whole YRD region and the influence of meteorological factors on ozone concentration, the WRF-Chem model is used to simulate the pollution process. The results show that the simulation results of ozone concentration are in good agreement with the lidar monitoring values. The meteorological elements play an important role in the change of ozone concentration. Strong solar radiation, high temperature and low relative humidity are favorable environmental conditions for ozone pollution, while high wind speed has a diffusion effect on ground ozone, and rainfall has a good effect on ozone removal.

Keywords: Ozone, Differential Absorption Lidar, WRF-Chem, Regional Pollution, Yangtze River Delta, China