4.226 An important mechanism of regional ozone transport over the Yangtze River Delta in East China.

Early Career Scientist

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Abstract:

A severe summer smog extended over the Yangtze River Delta (YRD) in China from east to west during August 24-25, 2016, with hourly surface O_3 concentrations exceeding 300 μg m^{-3} in Nanjing of western YRD on August 25. By combining air quality modeling with environmental and meteorological observation analyses, this serious O_3 pollution episode over the YRD is investigated. The weather pattern during this episode was characterized by eastern prevailing near-surface wind and continuous high air temperature. The features of this episode was generally well simulated by using the air quality model WRF-Chem. According to the observational and WRF-Chem modeling, an important mechanism of regional O_3 transport for summer smog in East China is revealed as follows: On August 24, the high surface O_3 levels in daytime over the eastern cities of YRD with peak value of 250 μg m^{-3} resulted in high O_3 concentrations within the residual layer over the eastern cities of YRD at night, and then under the guidance of eastern prevailing wind, the center of high O_3 concentrations shifted in the nocturnal residual layer westwards to Nanjing, where O_3 concentrations in the residual layer accumulated up to 170 μg m^{-3} due to the cyclonic convergence in the wee hours of August 25. With the disappearance of the residual layer after sunrise, the enhancement of vertical mixing in the convective boundary layer drove the accumulated O_3 from the upper levels downwards to the ground with the maximum transport flux reaching 40 μg m^{-3} h^{-1}, which contributed considerably to the O_3 pollution episode in Nanjing. This mechanism of regional O_3 transport through the residual layer is of great implication for the research of the regional transport of air pollutants and air quality change.