

4.018 Enhanced surface ozone during the heat wave of 2013 in Yangtze River Delta region, China.

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Abstract:

Under the background of global warming, occurrence of heat waves has increased in most part of Europe, Asia and Australia along with enhanced ozone level. In this paper, observational air temperature and surface ozone in the Yangtze River Delta (YRD) region of China during summer of 2013, and the regional chemistry-climate model (RegCM-CHEM4) were applied to explore the relationship between heat wave and elevated ground-level ozone. Ozone was found to increase at a rate of 4-5 ppb K⁻¹ within the temperature range of 28-38 °C, but decrease by a rate of -1.3~-1.7 ppb K⁻¹ under extremely high temperature. It was found that chemical reactions play the most important role in ozone formation during HW days, which result in 12 ppb ozone enhancement compared to NHW days. During heat waves, a more stagnant condition, controlled by anti-cyclone with sink airflow, led to less water vapor in YRD from south and contributed to less cloud cover, which favored a strong solar radiation environment and ozone significantly increasing. High temperature also slightly promote the effect of dry deposition velocity, vertical turbulence and horizontal advection, but the magnitude is much smaller than chemical effect. Our study suggests that the chemical reaction will potentially lead to substantial elevated ozone in a warmer climate, which should be taken into account in future ozone related issues.