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Observation characteristics and their influence factors of photochemical pollution in Pearl River Delta region, China

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Clouds and aerosols are the most important factors affecting the solar radiation reaching the surface, and play an important role in the earth climate system. Currently, the disturbance of high-concentration anthropogenic aerosols resulting from urbanization to the earth-atmosphere radiation system is significant. It also affects the amount of ultraviolet radiation reaching the ground, which has a significant impact on urban ecosystems, species chemical cycle, especially photochemical reactions. UV radiation is the energy driving source of atmospheric photochemical reactions, and plays a key role in the formation of OH free radicals and ozone.

Through comprehensive analysis using the data of aerosol radiative parameters, the surface UV radiation, photolysis rates, photochemical precursor observed in Pearl River Delta region, show that there are significant differences between different regions regarding aerosol radiative properties in PRD region, when aerosol optical thickness (AOT_{500nm}) reaches 0.6, the yield of ozone photochemistry was inhibited at noontime, the ozone yield calculated by chemical model is very sensitive to aerosol single scattering albedo. The formation of ozone in Pearl River Delta region exist some problems of the photo-limited. Compared with the measured photolysis rates, the J (NO_2) simulation value was lower, while the J (O^1D) simulation result was higher. That is to say, the formation rate of the O_3 was under-estimated, while its depletion rate was over-estimated, which was a generally important cause which led to the model having a lower simulation of O_3. At the same time, the control area of the formation of ozone in Pearl River Delta region presented a daily variation from VOC-limited (in the morning) to NO_x-limited (noon). When peak ozone appeared during summer and autumn in which the high ozone episode was easily happened, NO_x regulation could reach the goal of ending the event of high ozone episode. Ozone formation was always in VOCs control regime in spring and winter. As a result, in addition to the reduction of VOCs, NO_x regulation should be done to control the high ozone concentration for the control of ozone in Pearl River Delta region.