

The Effect of VOCs Photochemical Consumption on Regional Background O₃ Concentrations and Atmospheric Reactivity in the Pearl River Estuary of Southern China.

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Abstract

Understanding of the photochemical ozone (O₃) pollution over the Pearl River Estuary (PRE) of southern China remains limited. We performed an in-depth analysis of volatile organic compounds (VOCs) data collected on an island (i.e., the Da Wan Shan Island, DWS) located downwind of Pearl River Delta (PRD) from 26 November to 15 December 2021. Abundances of O₃ and its precursors were measured when the air masses originated from the inland PRD. We observed that the VOCs levels at the DWS site were lower, while the mixing ratio of O₃ was higher, compared to those reported at inland PRD, indicating the occurrence of photochemical consumption of VOCs during the air masses transport, which was further confirmed by the composition and diurnal variations of VOCs, as well as ratios of specific VOCs. The simulation results from a photochemical box model showed that the O₃ level in the outflow air masses of inland PRD (O_{3(out-flow)}) was the dominant factor leading to the intensification of O₃ pollution and the enhancement of atmospheric radical concentration (ARC) over PRE, which was mainly contributed by the O₃ production via photochemical consumption of VOCs during air masses transport. Overall, our findings provided direct quantitative evidence for the roles of outflow O₃ and its precursors from inland PRD on O₃ abundance and ARC over the PRE area, highlighting that alleviation of O₃ pollution over PRE should focus on the impact of photochemical loss of VOCs in the outflow air masses from inland PRD.

Early Career Scientist

YES, I am an early career scientist.

IGAC Activities

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