

# The Vertical Structure and Influencing Factors of Ozone in the Guangdong-Hongkong-Macao Greater Bay Area

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## Abstract

Based on the daily ozone sounding data obtained at Yangjiang, Qingyuan and Hong Kong Observatory (HKO) since 2013 and 2019-2023, the corresponding tropospheric column ozone (TCO) datasets from satellite Ozone Monitoring Instrument OMI/MLS, the ground-based ozone Lidar and the unmanned aerial vehicle (UAV)-based measurement, the detail vertical distributions of tropospheric ozone, the comparison between them and its influencing factors are presented in Guangdong-Hong Kong-Macao Greater Bay Area. On the whole, ozone profiles observed at Yangjiang, Qingyuan are in accordance with that of the HKO in terms of the vertical structures, indicating OMI/MLS product underestimates the TCO level in the region. The average deviation of ozone concentration between ozone sounding and ground-based Lidar is -16.8%~15.2%, the greater the deviation as the altitude increases. The ozone vertical structure is mainly influenced by weather system. Tropical cyclone storm can result in low ozone strata in the upper troposphere. The stratosphere-troposphere exchange (STE) is the main factor causing the ozone peak in the middle and upper troposphere. The regional ozone could be vertically well mixed at different levels in the lower troposphere by various physical and chemical processes. Typhoons could intensify the chemical interactions between anthropogenic and biogenic emissions, resulting in extreme ozone pollution in the area. Biogenic emission and cross-regional ozone transport are greatly enhanced by approaching typhoons. Ozone formation efficiency has more than doubled because of abundant precursors and active photochemistry.

## Keywords

Ozonesonde, Ozone Vertical Distribution Characteristic, Low Ozone Strata, Ozone Peak, Stratosphere-Troposphere Exchange (STE), Typhoon