國立中央大學大氣物理研究所書報討論

Date: 2023/12/29

Location: S1-713

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# Mobile monitoring of urban air quality at high spatial resolution by low-cost sensors: impacts of COVID-19 pandemic lockdown

## Abstract

Urban air pollution is a serious health threat to more than 80% of the world's urban population and exceeds WHO guidelines. The major gas-phase air pollutants such as CO, $NO_2$, and $O_3$ show variation within cities due to complex flow patterns and emissions. However, traditional stationary monitoring and satellite sensing of gas-phase air pollutants have limitations in capturing the detailed dynamics of urban air pollution. In this study, mobile samplers were deployed in a taxi fleet to continuously measure CO, $NO_2$, and $O_3$ concentrations in the urban area of Nanjing's for one year (October 2019-September 2020), and geographic information system (GIS) technology was used to assess pollutant distribution in 50×50m grids.

This study derived consistent hotspot analyses by averaging values within grid cells, identifying 17 hotspots each for CO, $NO_2$, and $O_3$. Decreasing CO and $NO_2$ concentrations were observed to correlate with traffic flow and congestion indices in urban areas of Nanjing. During the COVID-19 lockdown (January 24-31, 2020 and February 17-24, 2020), $NO_2$ decreased by 47.1% and traffic emissions decreased by 52.6%. During the Post-lockdown period (March to September 30 2020), $NO_2$ increased by 48.2%, and traffic emissions doubled. Ozone increased by 35.7% during lockdown and 48.7% afterward. The impact of traffic emissions on ozone was variable, decreasing by 32.5% during the lockdown but increasing by 39.3% afterward, highlighting the significant role of traffic in urban air pollution. This research demonstrates the power of mobile urban air pollution monitoring, providing detailed information for source attribution, accurate tracking and potential urban micro-scale mitigation strategies.

## Keyword

High spatiotemporal resolution air quality observation

Low-cost sensors

## References

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