

# **Influence of Tourism on Atmospheric Chemistry in the Mountain Laoshan Forest Scenic Areas**

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## **Abstract**

Human activities such as tourism can have a significant impact on the atmospheric chemistry in forest scenic areas. In this work, we measured the levels of volatile organic compounds (VOCs), including carbonyls and non-methane hydrocarbons (NMHCs), in the national forest park of Mountain Laoshan (Mt. Laoshan) in Qingdao, China. We found that during the May Day holidays (May 1-5, 2021), when the number of tourists was high, the average of VOCs total concentration was around  $23.8 \pm 22.6$  ppbv, typically 1.5 times higher than during periods with fewer tourists,  $\approx 16.3 \pm 15.2$  ppbv. Additionally, most VOC species exhibited a bimodal profile diurnal variation during lunch and dinner periods. Using the Positive Matrix Factorization (PMF) model, five anthropogenic sources were identified with liquefied petroleum gas (LPG) usage, and traffic emissions being the two primary sources of VOCs in the Mt. Laoshan forest scenic area, accounting for 54.5% and 36.2%, respectively. This indicates that tourism has a significant impact on atmospheric VOCs levels in the investigated area. Based on a 0-D model, we studied the effects of additional VOCs emission from human activity on the atmospheric chemistry in the Mt. Laoshan forest scenic area. It was found that the additional VOCs emission from tourism human activity had a small impact on the  $\text{NO}_3$  reactivity during the night, but enhance OH formation during the daytime by  $\approx 33\%$ , which significantly increases the local atmospheric oxidation capacity. Therefore, this study emphasizes the significant impact of tourism activities, such as catering and traffic emissions, on the local air quality in forest scenic areas.

## **Early Career Scientist**

NO, I am not an early career scientist.

## **IGAC Activities**

AMIGO: Analysis of eMIssions usinG Observations

## **IGAC Regional Working Groups**

China Working Group