

1.017 Impact of ship emissions and port-industrial activities on the chemical characteristic of urban PM_{2.5} in southeastern China.

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Abstract:

Port activities have become a substantial source of atmospheric particles due to the flourishing seaborne trade and have an important impact on air in and around major ports. In this study, daily PM_{2.5} samples were simultaneously collected at an urban site (UB) and the nearby port-industrial site (PI) on the coast of southeastern China from April, 2015 to January, 2016. PM_{2.5} concentration was $46.4 \pm 20.9 \mu\text{g m}^{-3}$ at the UB and significantly higher at the PI ($51.9 \pm 25.9 \mu\text{g m}^{-3}$, $P_{t\text{-test}} < 0.01$). Chemical components including organic carbon (OC), elemental carbon (EC), water-soluble inorganic ions and several elements were analyzed for PM_{2.5} samples. The concentration of V at the PI was 1.5 times of that at the UB and was moderately correlated ($p < 0.05$) between sites, implying that ship emissions have an impact on both the PI and UB, but a more significant impact on the PI. Six source factors were extracted from the positive matrix factorization (PMF) analysis; they were secondary aerosols, coal combustion, biomass burning, mixed sources of industry and ship emissions, traffic emissions, and fugitive dust. The contribution of industry and ship emissions to PM_{2.5} at the PI (26.1%) was approximately double of that of the UB (13.2%). The difference of each source contribution among the trajectory clusters that included significant difference and insignificant difference from the UB to PI, which gave an insight into the role of local impacts. Conditional probability function (CPF) further identified that ship emissions and port activities distributed in the NE-E-SSE wind sectors were responsible for the source contribution of industry and ship emissions and secondary aerosols. This study well assesses the impacts of ship emissions and port activities on the surrounding air environment using the land-based measurements.