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Contribution and Formation of Biogenic and Anthropogenic Secondary Organic Aerosols in Beijing

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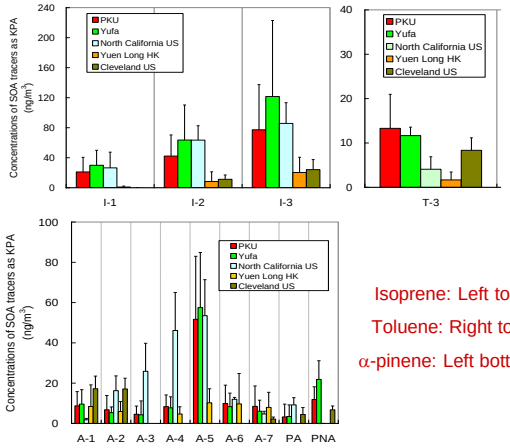
Introduction

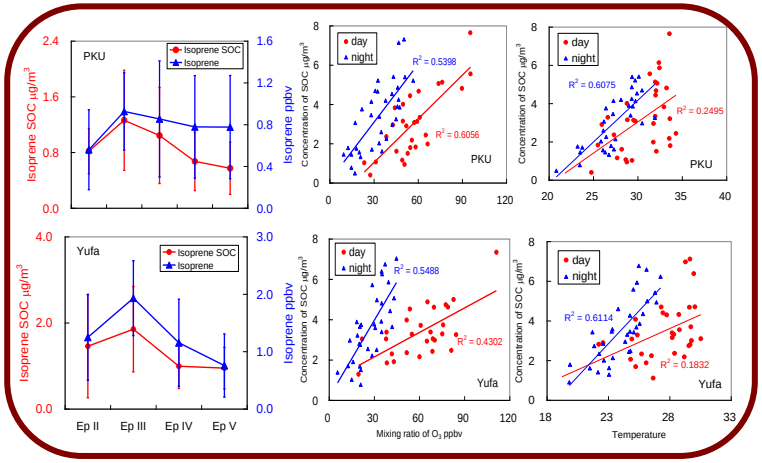
Ambient aerosol samples were collected at an urban site (PKU) and an upwind rural site (Yufa) of Beijing during the CAREBEIJING-2008 (Campaigns of Air Quality REsearch in BEIJING and surrounding region) summer field campaign. 150 particulate organic species were measured, including 14 SOA tracers derived from isoprene, α-pinene, β-caryophyllene, and toluene . Contributions of major primary and secondary sources were estimated by chemical mass balance (CMB) modeling and tracer-yield method. The formation mechanism of biogenic and anthropogenic SOA were discussed.

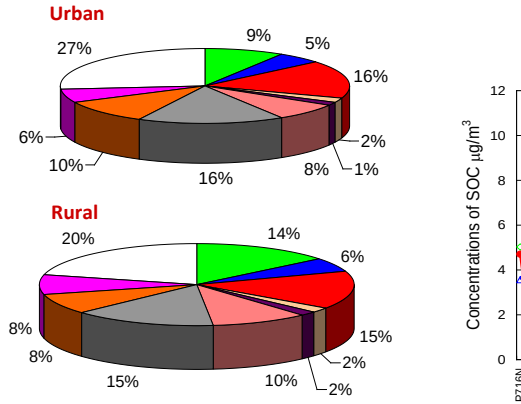


Isoprene: Left top

Toluene: Right top

α-pinene: Left bottom



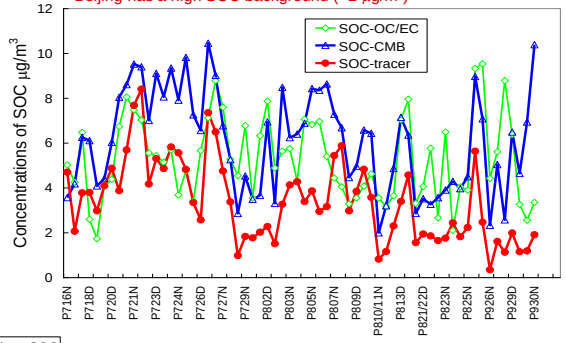


Comparison with other region

Biogenic SOA: Yufa>other rural> PKU>other urban

Anthropogenic SOA: PKU>Yufa>other urban>other rural

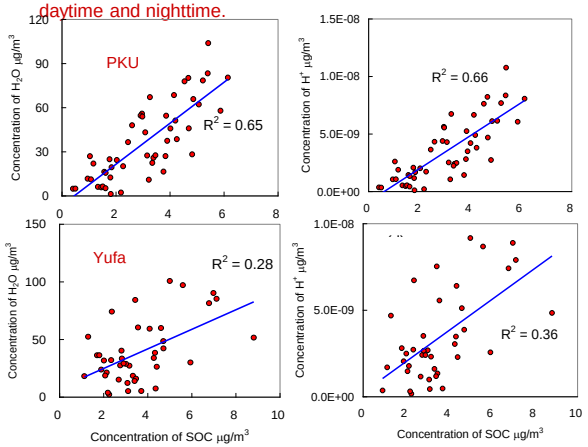
Beijing has a high SOC background (~2 μg/m³)



•Comparison of different SOA estimation

•R^2: 0.55-0.86;Uncertainty: 12.6-24.8%

SOA formation was influenced by precursor and O_3 concentration, as well as temperature. Different correlations imply the different formation mechanisms at daytime and nighttime.



•Aerosol water uptake and acidity were calculated by ISORROPIA model;

•Good correlation between SOA and water/acidity;

•Aqueous-phase reactions are responsible for SOA formation in Beijing

•SOC: urban 34.5±13.9%; rural 38.4±14.4%

•20-25% of the OC is still unknown

Publications:

- Guo, S. , Hu, M., Guo, Q. F., Zhang, X., Zheng, M., Zheng, J., Chang, C. C., Schauer, J. J., Zhang, R. Y. Primary Sources and Secondary Formation of Organic Aerosols in Beijing, China, *Environ. Sci. Technol.*, 2012, 46(18), 9846-9853
- Guo, S., Hu, M, Guo, Q. F., Zhang, X., Schauer, J. J. and Zhang, R. Y. : Quantitative evaluation of emission control of primary and secondary organic aerosol sources during Beijing 2008 Olympics. Atmos. Chem. Phys. Discuss., 12, 32883-32909, 2012

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