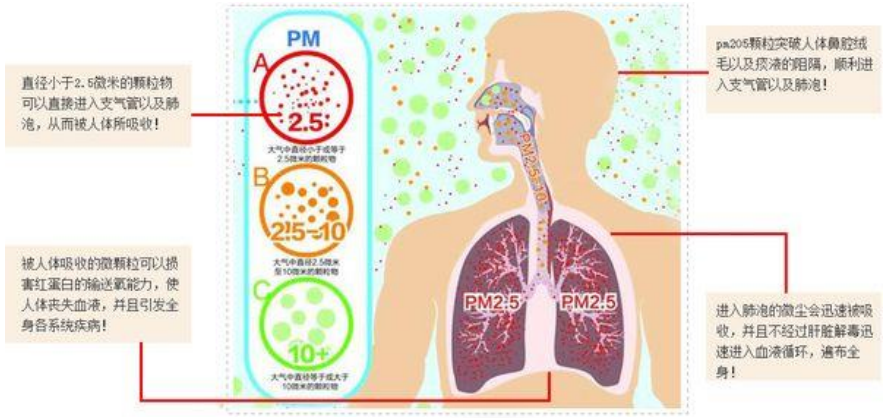
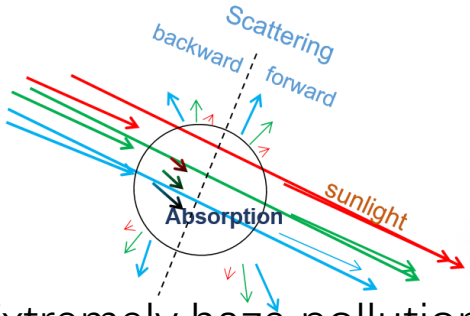
南京大学
NANJING UNIVERSITY

Impact of air transport and secondary formation on haze pollution in the Yangtze River Delta: In situ online observations in Shanghai and Nanjing

2020.5
Peng SUN

Intorduction





Extremely haze pollution in winter in 2013。 **800 Million** Chinese suffered these air pollution

(Huang et al., 2014)

2.1 Sites distribution

33
32
31
30

100 110 120 130
Longitude (Deg E)

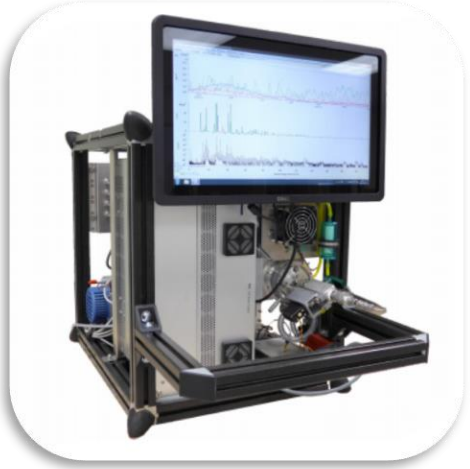
0.2 0.4 0.6 0.8 1.0
Aerosol Optical Depth

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

0 water	4 deciduous_broadleaf	8 woody_savannas	12 croplands	16 barren_or_sparse
1 evergreen_needleleaf	5 mixed_forests	9 savannas	13 urban_and_built_up	17 unclassified
2 evergreen_broadleaf	6 closed_shrubland	10 grasslands	14 crop_nat_veg_mosaic	
3 deciduous_needleleaf	7 open_shrublands	11 permanent_wetlands	15 snow_and_ice	

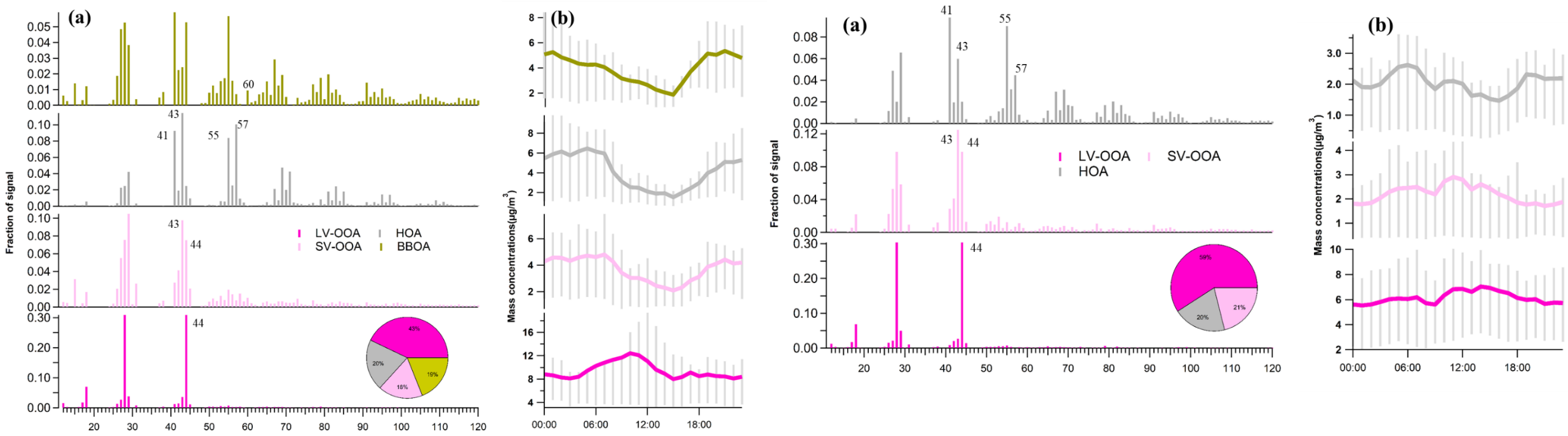
2.2 Instrumentation

	Nanjing	Shanghai
Aerosol chemical composition	Marga:Water soluble ions SunsetOCEC: organic carbon,element carbon AE-31:black carbon	TOF-ACSM:Non-refractory composition of $PM_{2.5}$ AE-31:black carbon
gas phase instruments	NO_x O_3 CO SO_2	NO_x O_3 CO SO_2

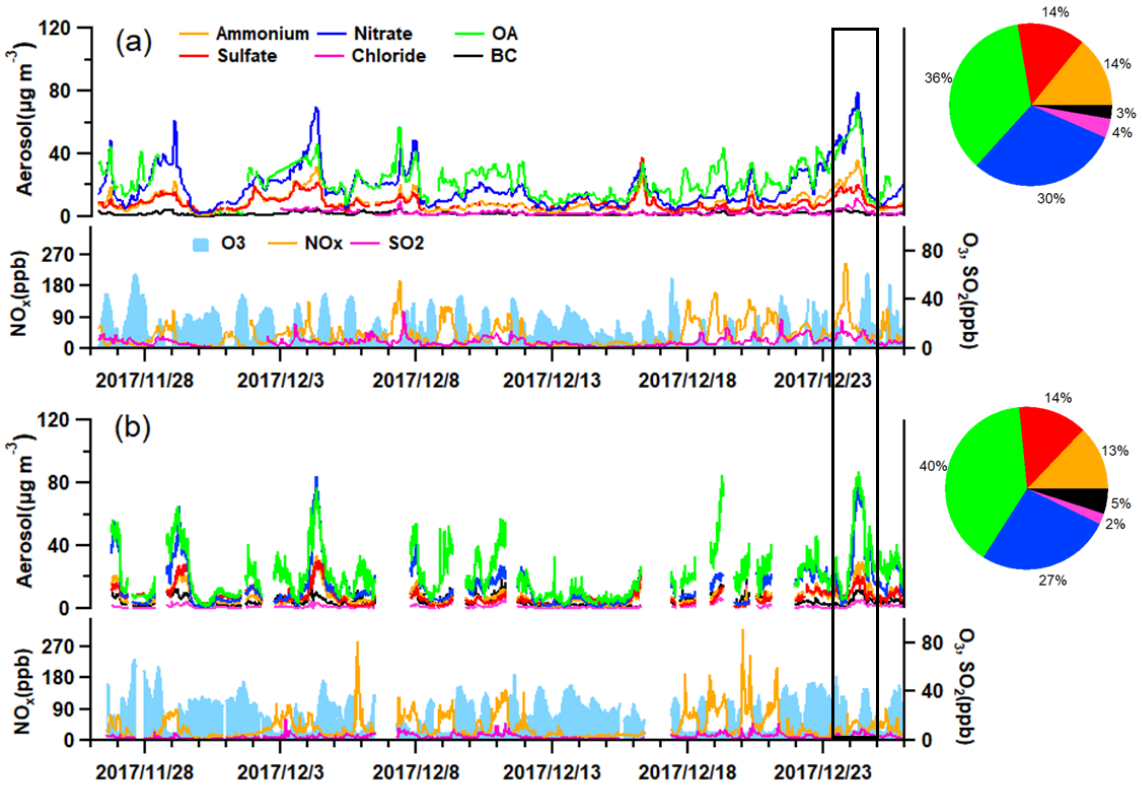


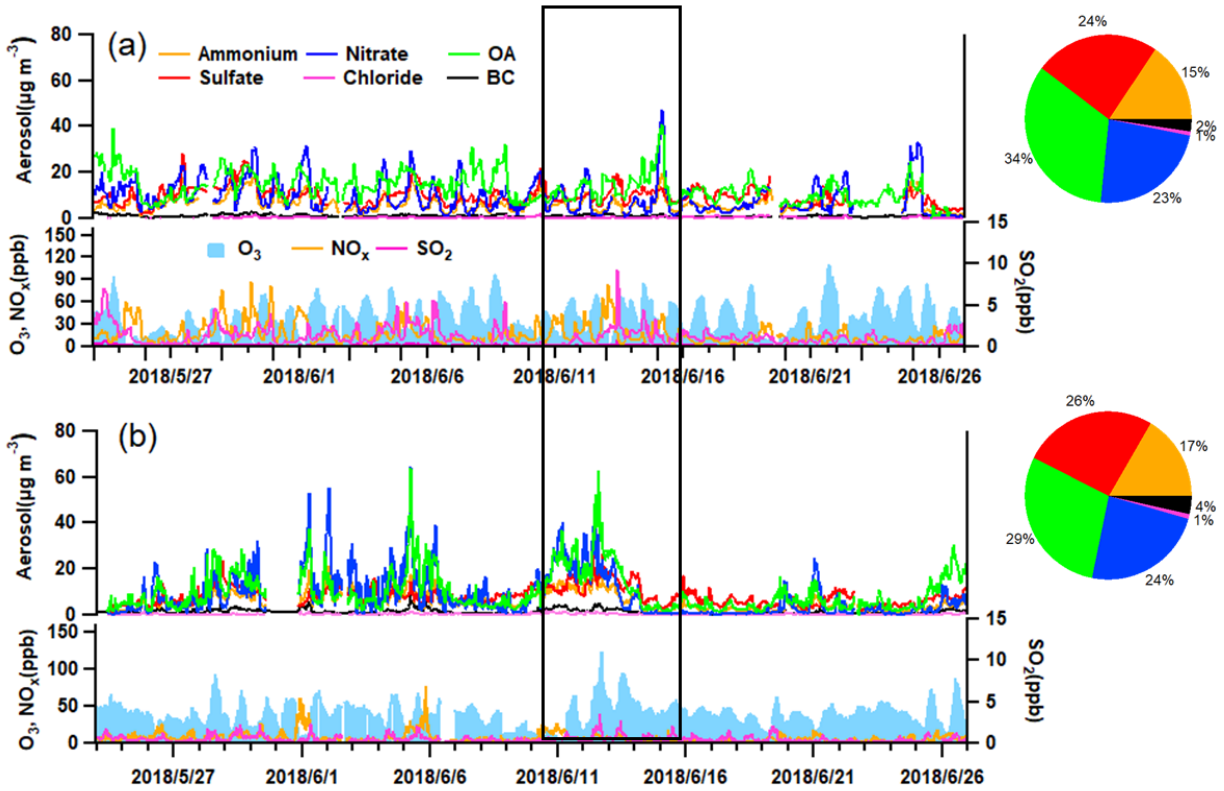
2.3 Method

1. Lagrangian Dispersion Modeling
2. Organic source apportionment: Positive matrix factorization **(PMF)** was performed on organic matrix from TOF-ACSM measurement.



3.1 Overall results





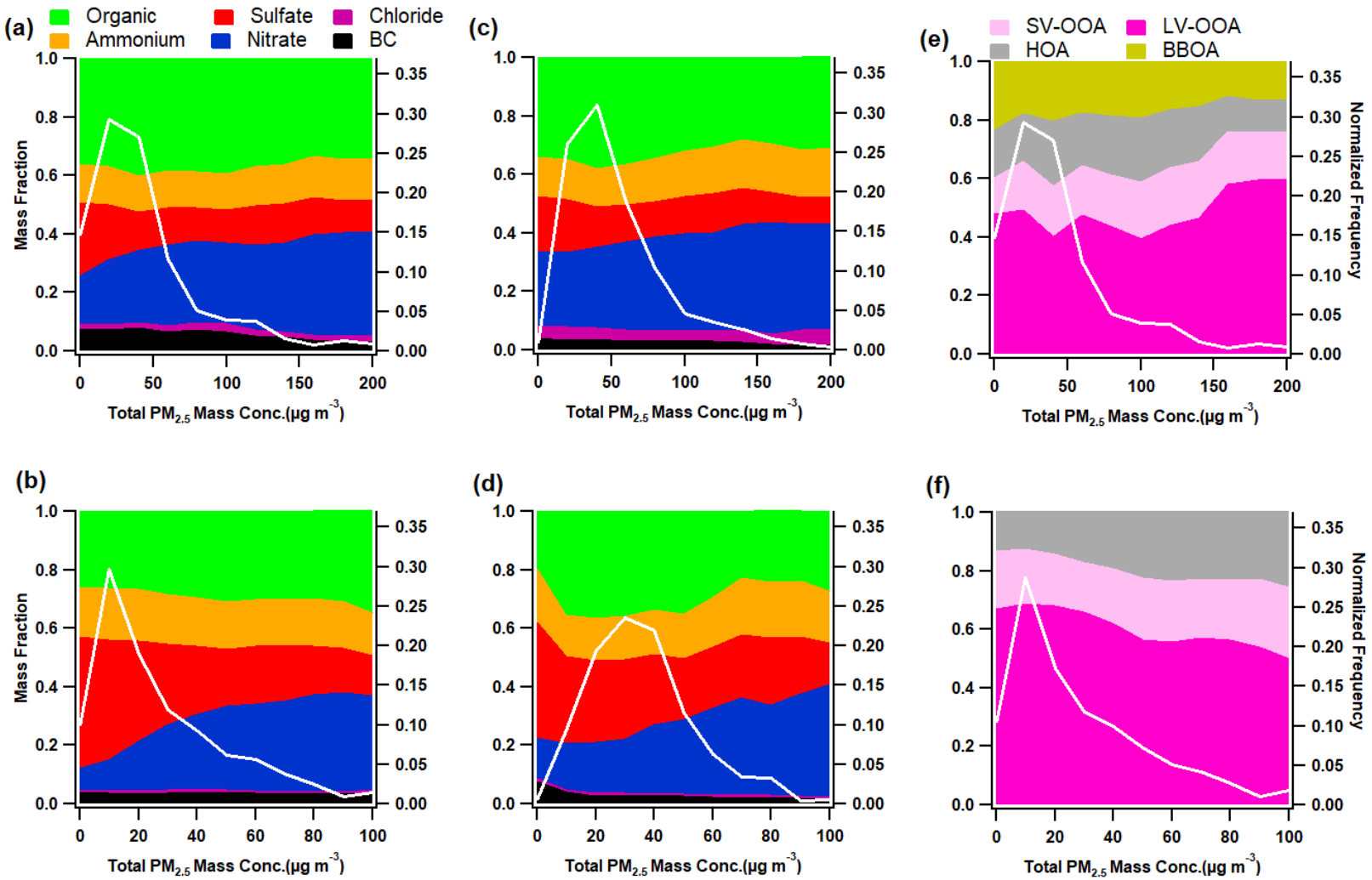
3.1 Overall results

Characteristic pollution:

1.The contribution of nitrate to total PM increased in winter and summer

2.The contribution of LV-OOA increased in winter.

3.The contribution of SV-OOA and HOA increased in summer.



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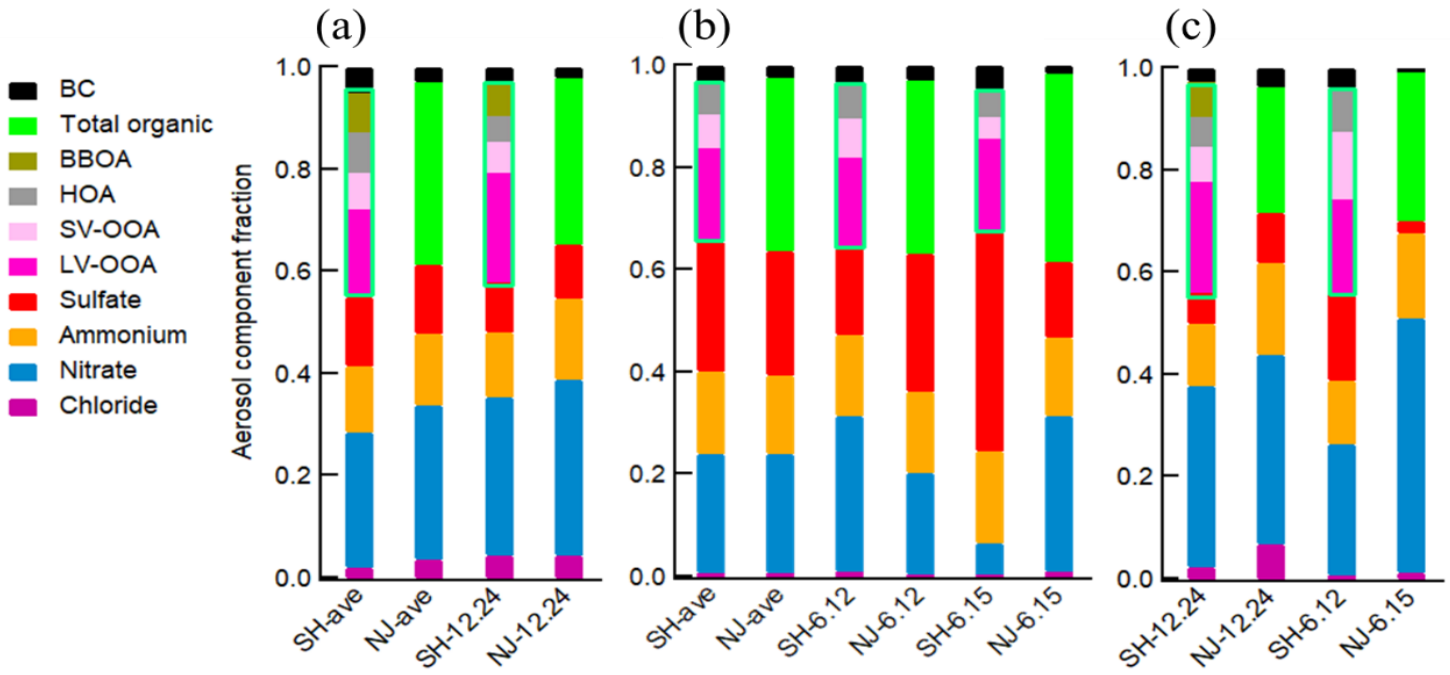
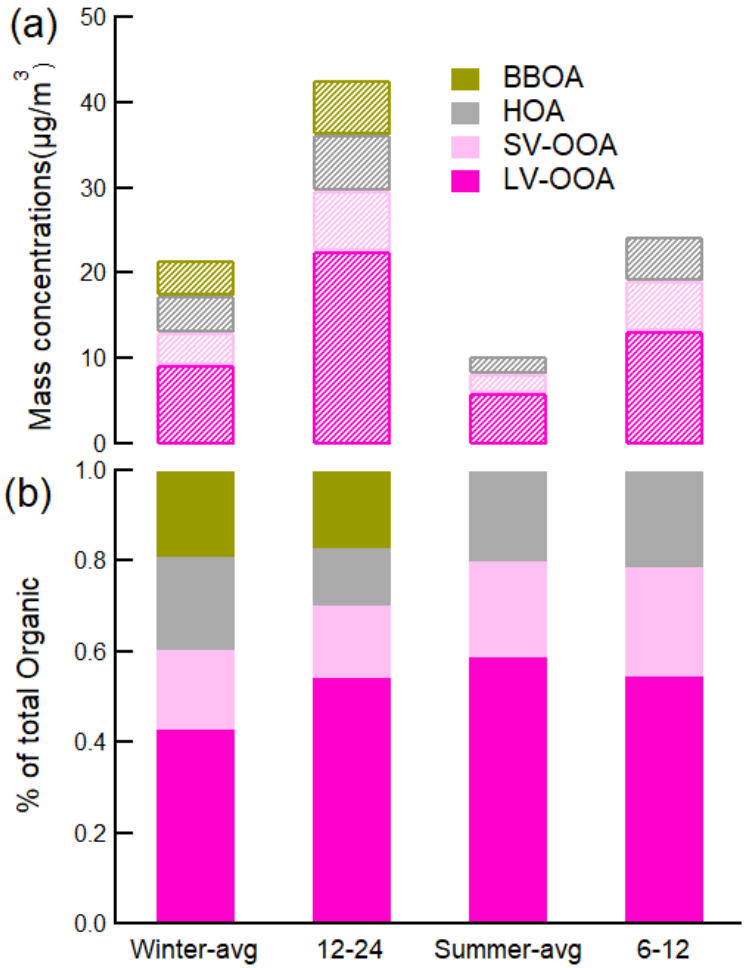
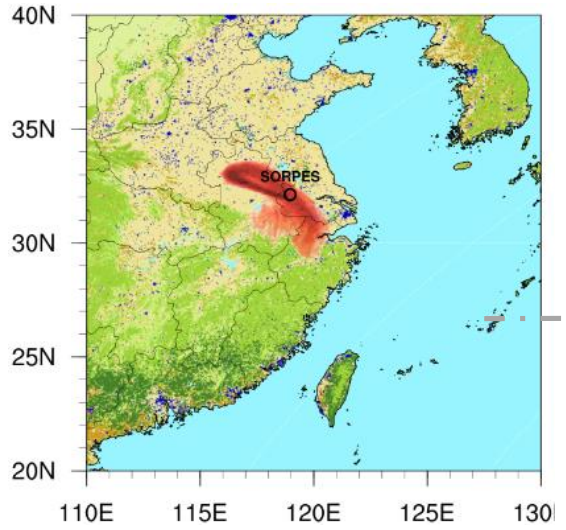
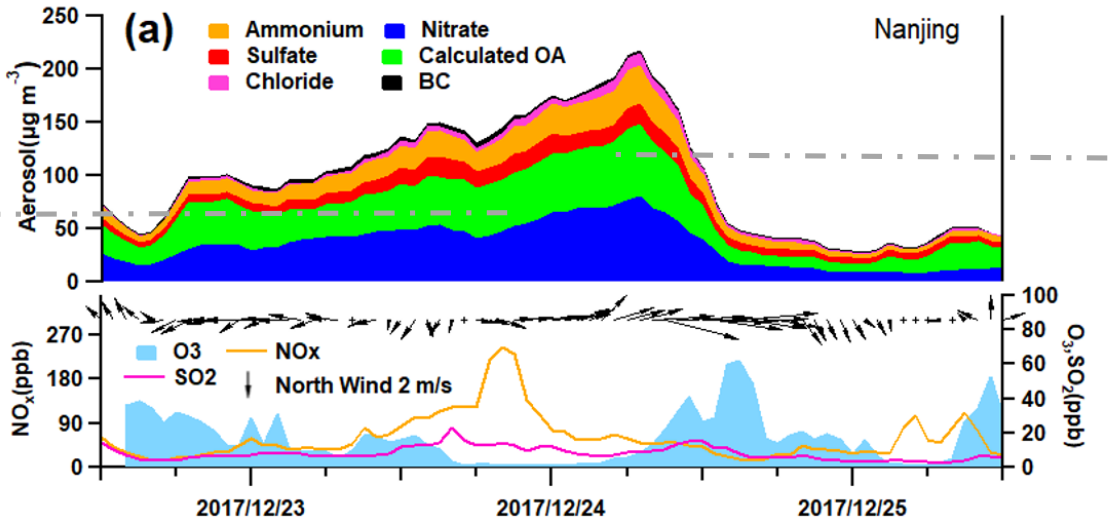
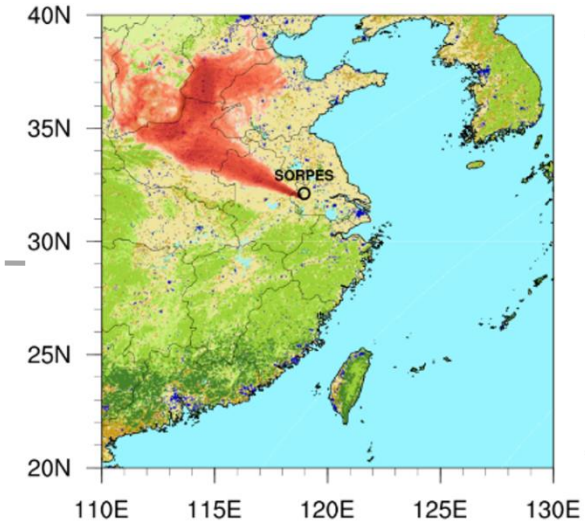


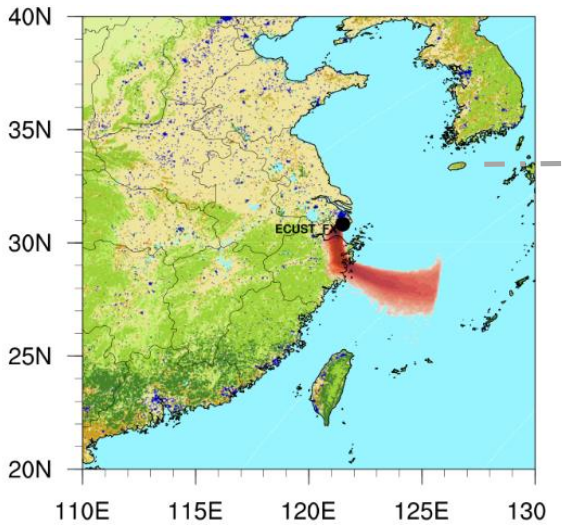


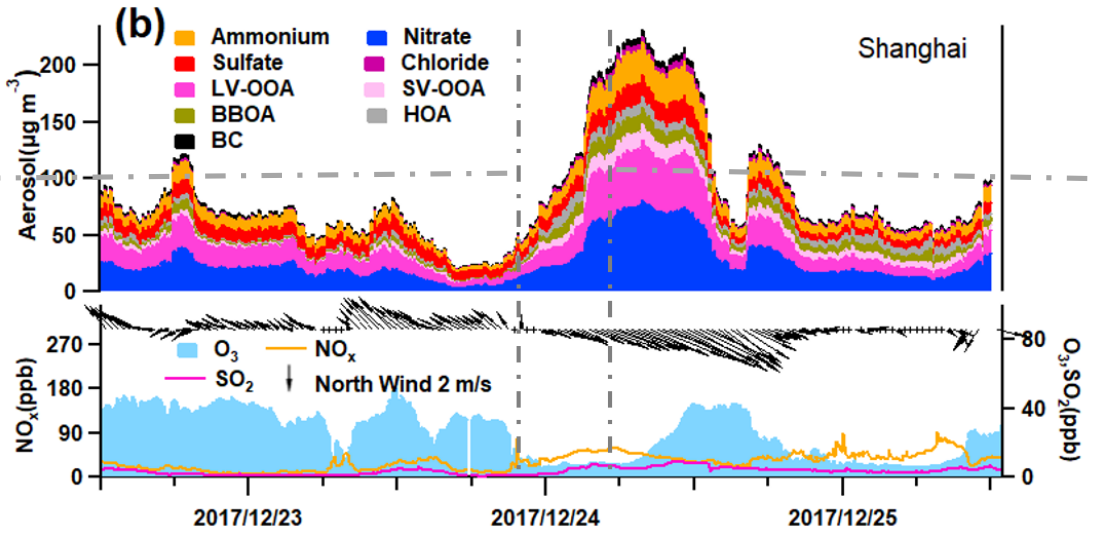
3.2 Winter Case

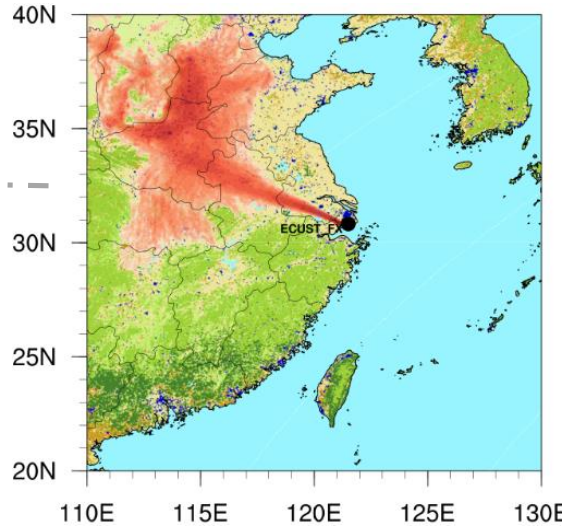












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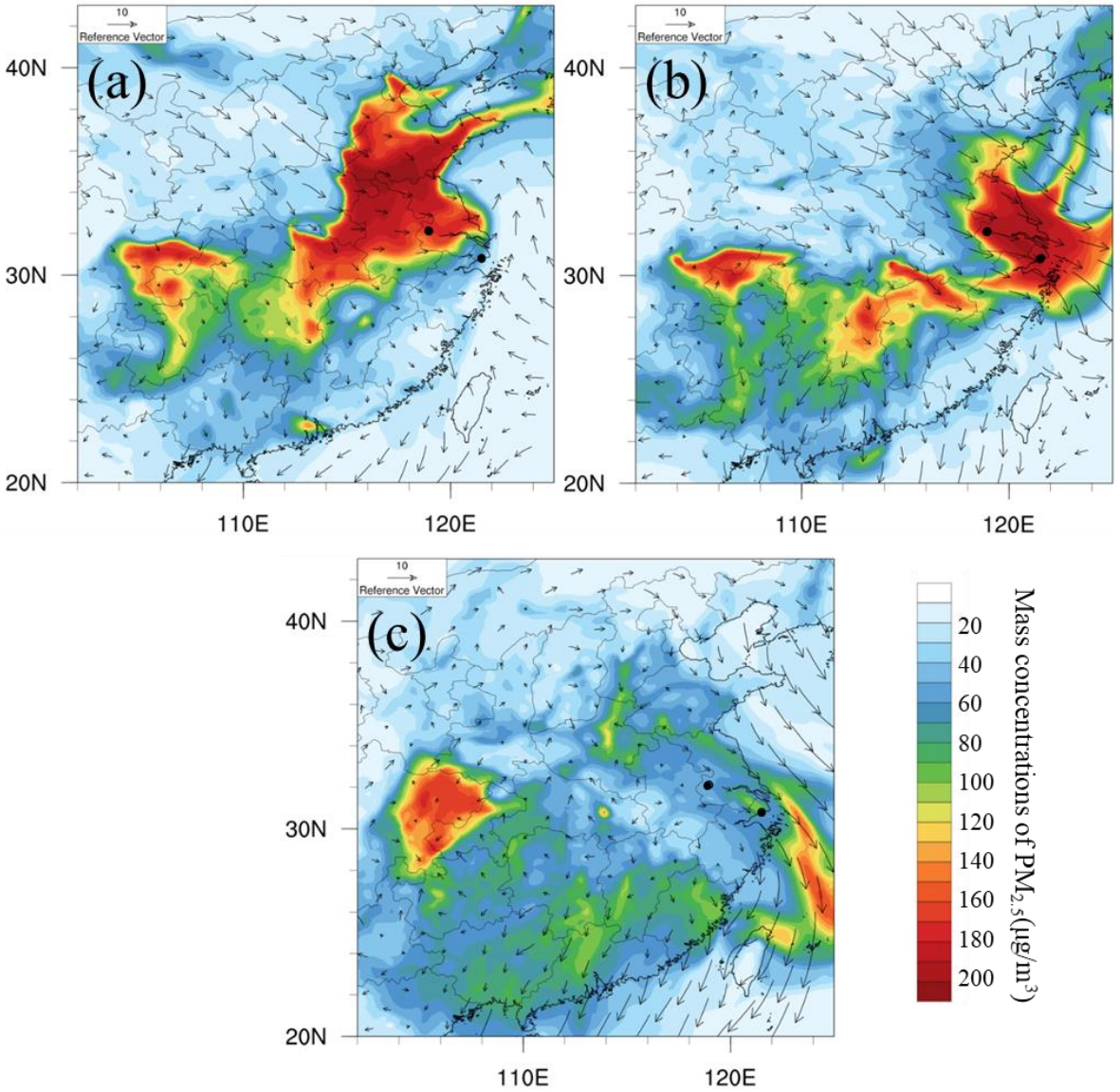
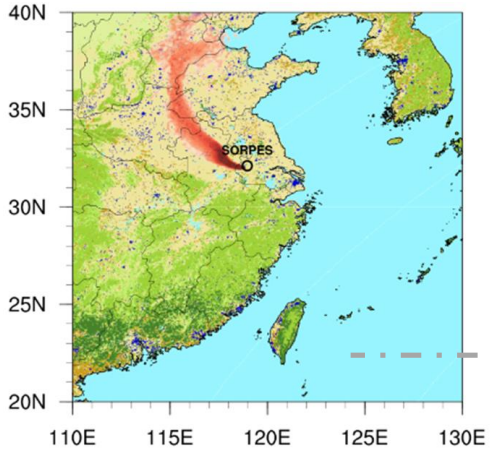
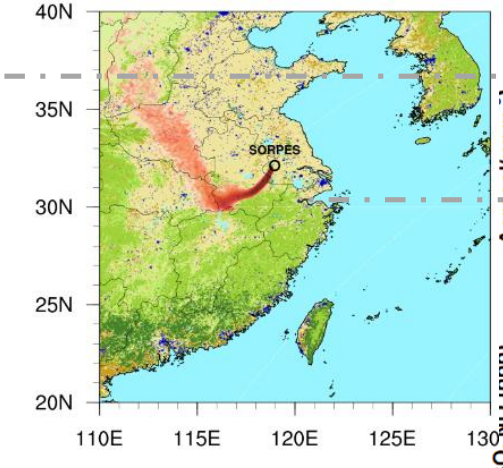
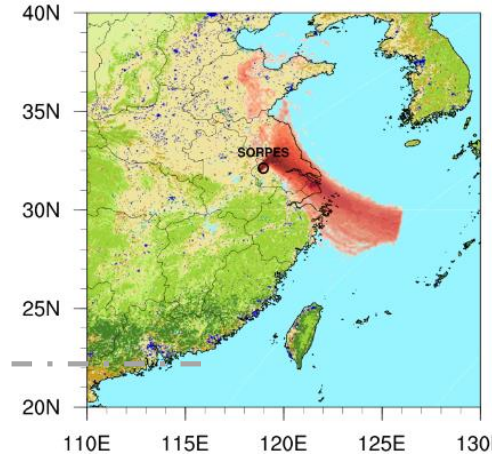
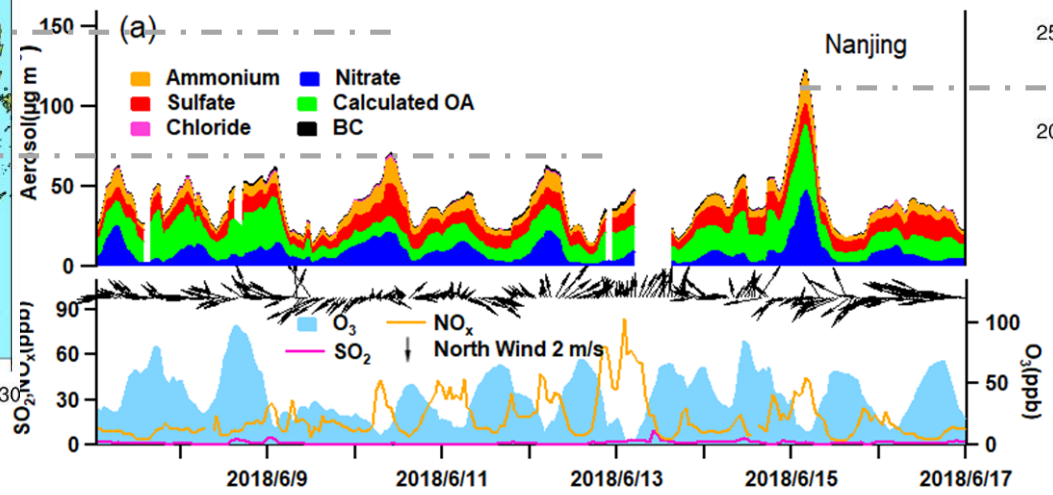


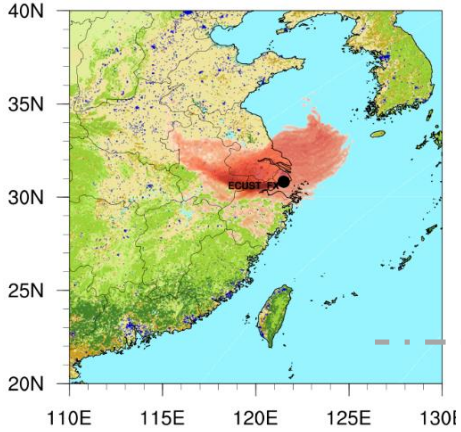
3.3 Summer Case

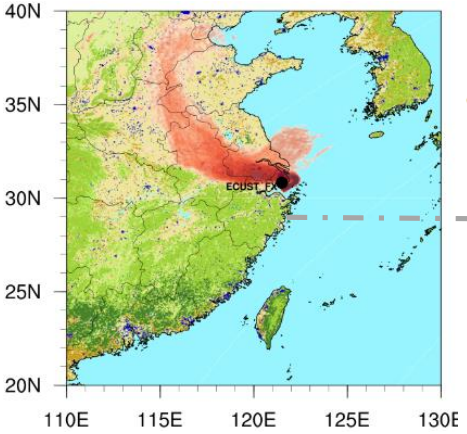


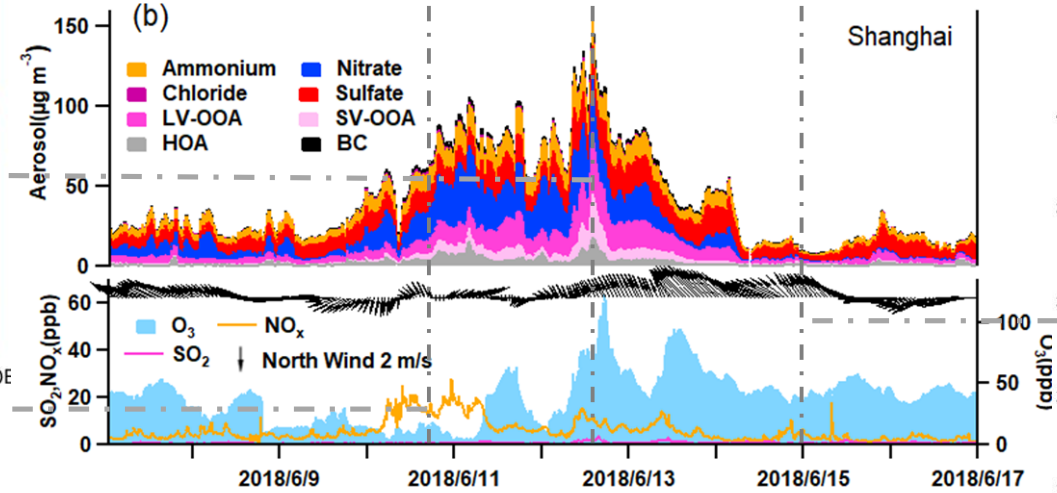


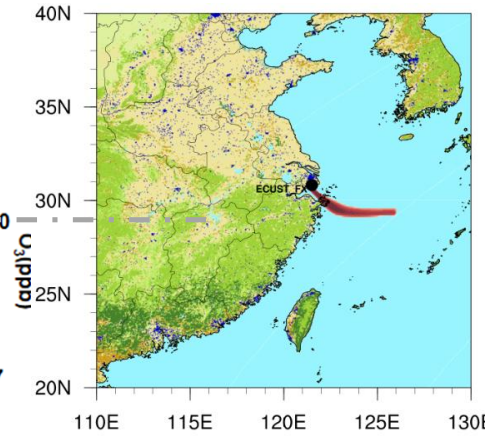












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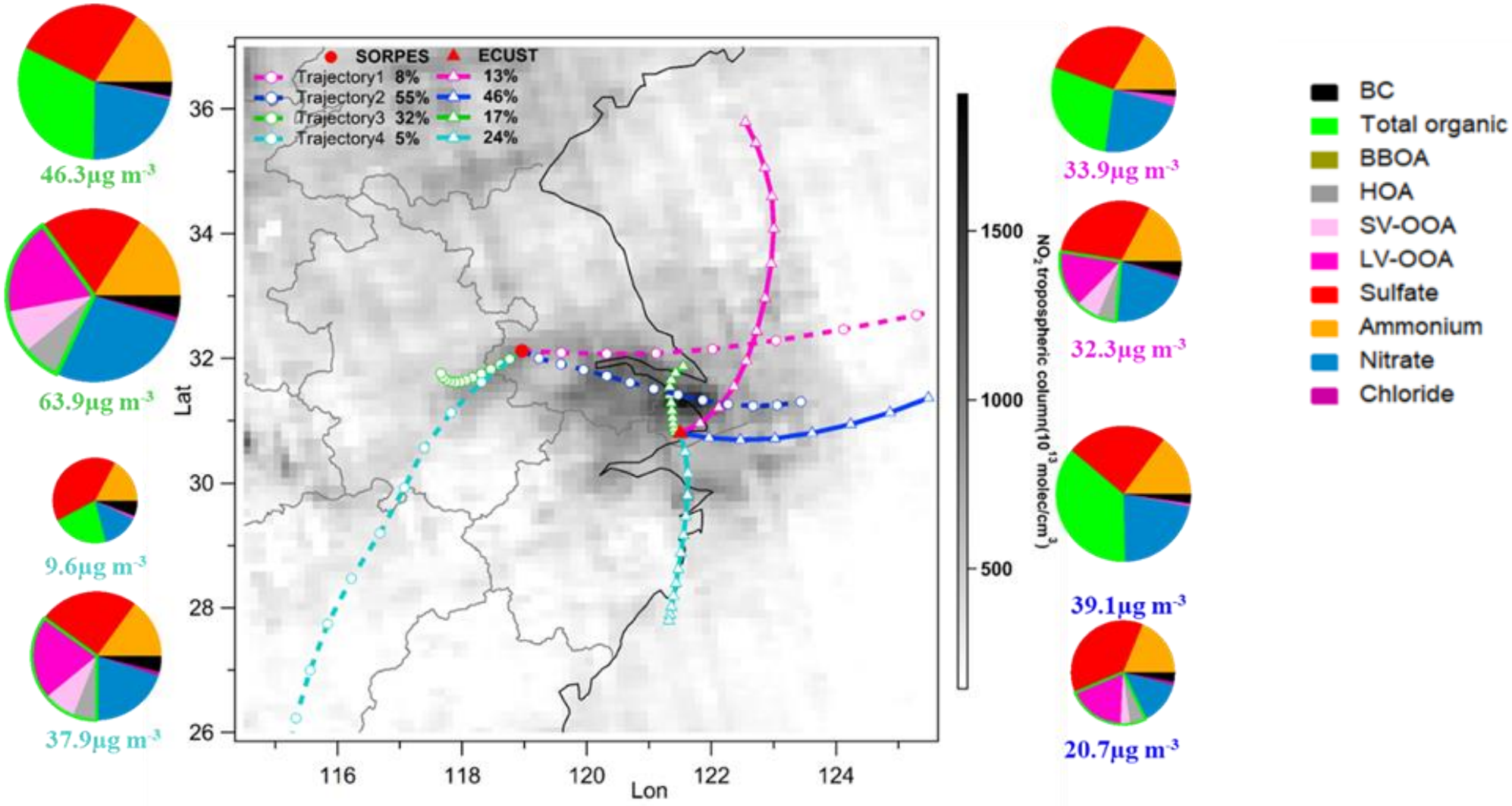
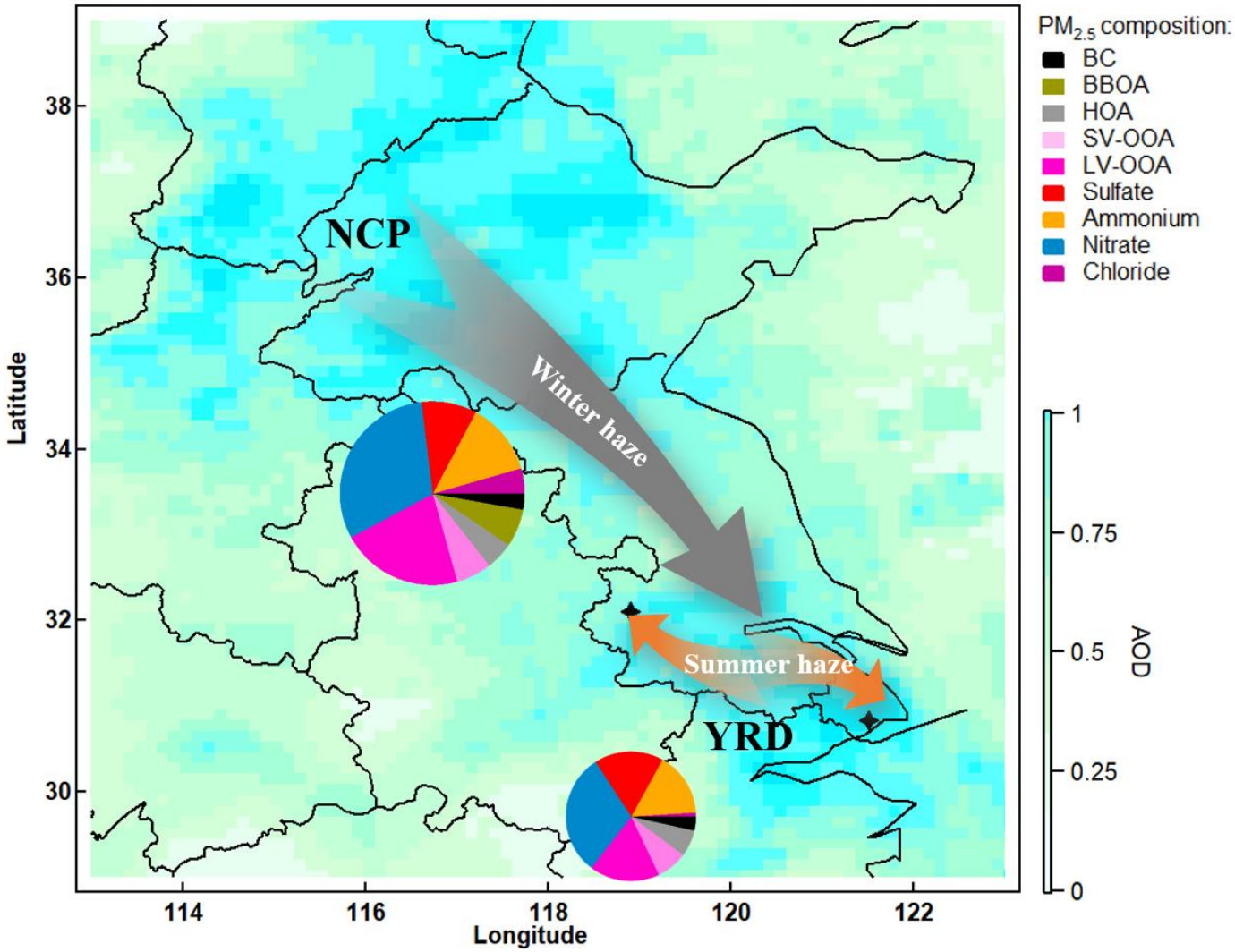


3.4 Summary



Sun P., Nie, W., ……Zhang, Q., Ding, A.J., 2020. Impact of air transport and secondary formation on haze pollution in the Yangtze River Delta: In situ online observations in Shanghai and Nanjing, Atmospheric Environment, Volume 225, 117350

4 Conclusions

- 1.Averaged $PM_{2.5}$ mass concentrations in Shanghai (Nanjing) in winter and summer were 53.9（65.7）and 32.8（37.3）ug/m^3.$PM_{2.5}$ were dominated by secondary species.
- 2.In winter and summer, the contribution of nitrate in $PM_{2.5}$ increased with the increased PM mass.
- 3.In winter, the most severe regional pollution episodes were caused by the long-range air transport from north China Plain with higher contribution of LV-OOA and nitrate. The pollution pattern is influenced by the cold front.
- 4.In summer, the pollution in Nanjing and Shanghai didn't occur at the same time. Short-term transport within the YRD region brought the pollution air masses to the measurement sites, resulting in higher contritbuion of nitrate HOA and SV-OOA.
- 5.Our results highlight the importance of building regional observation net of aerosol.

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Thanks!

Questions