

Taihu Observation of Particulate Matters

*The analysis to the distribution of
particulate matters between city
and lake based on Taihu lake, China*



YN-Center

汤天然

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Outline

- Background of Experiment
- Purpose of Experiment
- Equipment and Method
- Data and Consult
- Conclusion
- Discussion
- Future Work



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Background of Experiment

- Particles or aerosol with harmful substance will be absorbed by water with deposition and dissolution.
- There are some megapolises around Taihu.
- Taihu is not a deep lake, there is no huge enough volume and abundant living beings to 'digest' the particulate matters .
- The characteristic of Taihu lake's underlying surface is much different with land or city
- Boats on Taihu lake would be a emission source with special characteristics.
- Winter is a serious pollutional season.



Purpose of Experiment

- To find the space distribution of particulate matters in Taihu lake.
- To find the size distribution of particulate matters in Taihu lake
- To compare the characteristics between lake and main cities around.
- To find the effect on particle change of boats' emission.
- Analysis with weather condition of low altitude



Equipment and Method

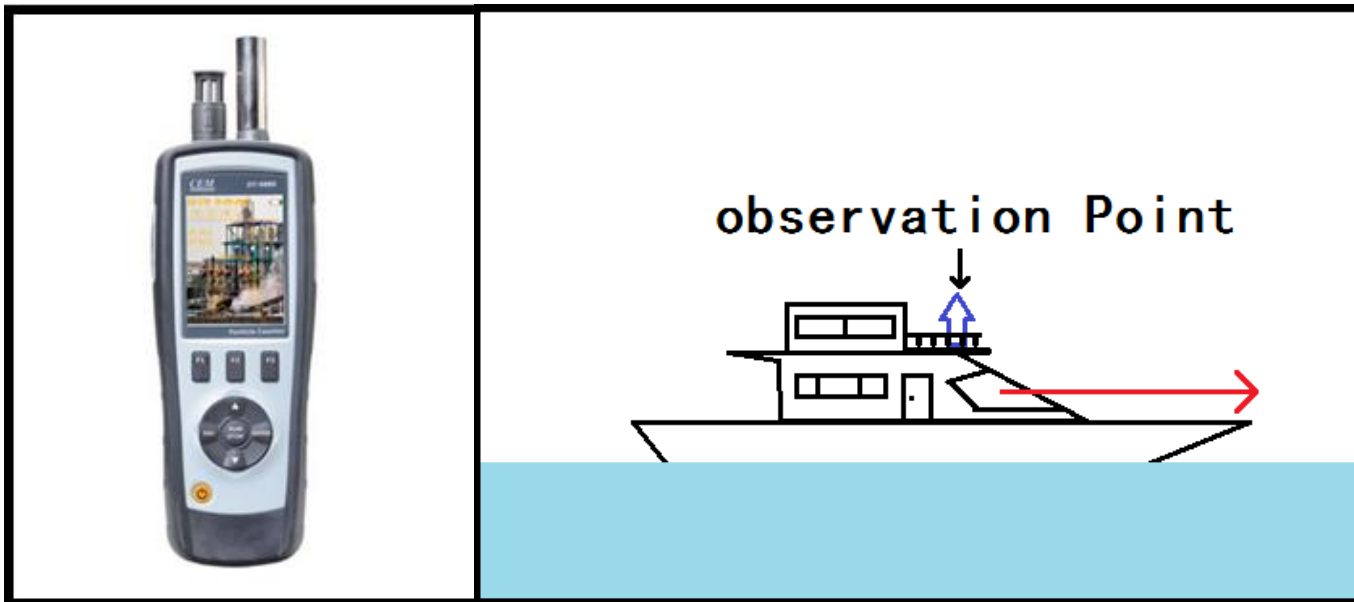
- Mechanism of Observation
- Study Period and Space
- Observation method and Data

**Taihu Observation of
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Mechanism of Observation

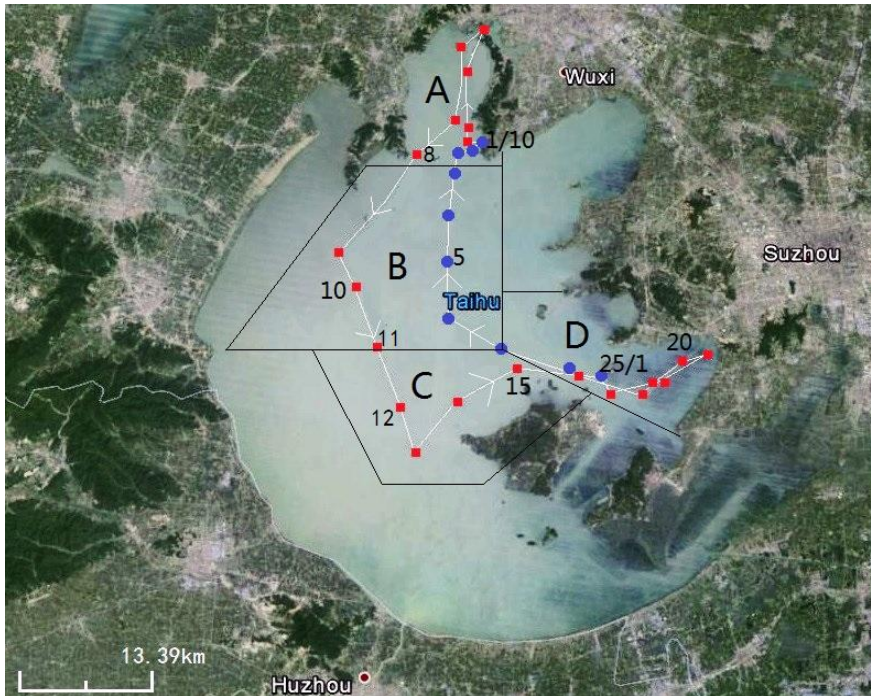
- **PM mass,T,RH:** DT-9880 4 in 1 Particle Counter(CEM)
- **GPS data:** by iphone Compass.





Study Period and Space

- Period: 2 Days
(D1: 0700~1715, D2: 0730~1100)
- Space:



Underlying Surface and Route



Emission Points(mg/m^3)



Observation method and Data

- Observe the concentration of PM10, PM2.5 and PM0.5 every 30min, sometimes add extra observation.
- Each observation will last at least 10 times and get average to represent the characteristics of each point zone.
- During each observation, by using the App Compass of iPhone to record GPS data.
- Do notes to record details during observation.

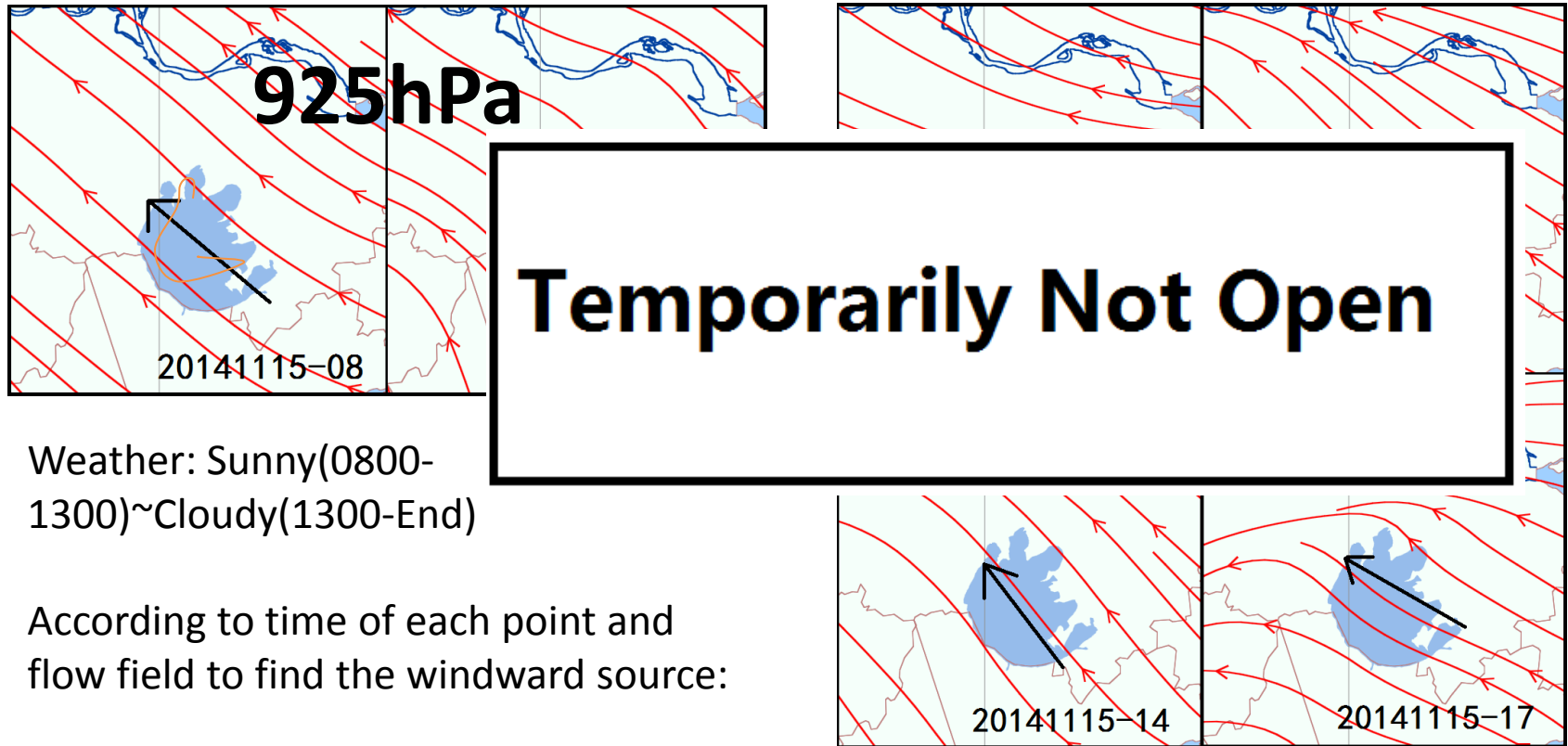


Data and Consult

- Analysis of emission source
- Distribution of Concentration at different zone in 2 days on lake.
- The fluctuation of PM with different diameter types in 2 days on lake.
- Discuss the reasons of situations above.
- Discuss some uncertain factors which impact the change PM concentration.



Analysis of emission source(1115)



Weather: Sunny(0800-1300)~Cloudy(1300-End)

According to time of each point and flow field to find the windward source:

Zone A(MLW):particulate matters from Wuxi.

Zone B, C, D: particulate matters from Suzhou.



Distribution of Concentration at different points(1115)

Temporarily Not Open

- In Zone A: The PM concentration of bank and lake are lower than Wuxi's.
- In Zone B,C&D: The PM Concentration of lake are lower than Suzhou's.
- The PM concentration of Wuxi are much higher than Suzhou's.
- The PM Concentration of Point 11 gets growing(at **red circle** of chart above), according to the note of observation, there was a diesel boat coming in a lateral distance of about 50m.Further more, there was some smoke emission and the diesel boat is in the windward direction, which should be a important reason that caused the PM growing.



The fluctuation of PM with different diameter(1115)

Temporarily Not Open

- To PM with different diameter type in fog day, there is also showing that the spatial distribution unevenness of PM concentration on lake is $PM_{10} > PM_{0.5} > PM_{2.5}$, which also means that the life cycle from long to short is $PM_{2.5} > PM_{0.5} > PM_{10}$.



Analysis of emission source(1116)



- Weather: heavy fog~ light fog
- According to time of each point and flow field to find the windward source:
 - Mainly impacted by particulate matters transported from Wuxi after Point 3(Zone A&B).
 - Before(Include) Point 3(Zone D),mainly impacted by the naturally spread from Suzhou.



Distribution of Concentration at different points(1116)

Temporarily Not Open

- There is an unexpected event that the PM concentration of Suzhou appears $PM_{2.5} > PM_{10}$ in morning at 0700 and 0800. Therefore I just compare the PM_{10} between lake and city.
- It's obvious that PM_{10} on lake is higher than Suzhou's in Zone D.
- After Zone D, the PM concentration of lake is still higher than Wuxi's which is windward source.



The fluctuation of PM with different diameter(1116)

Temporarily Not Open

- To PM with different diameter types in fog day, there is also showing that the spatial distribution unevenness of PM concentration on lake is $PM_{0.5} > PM_{10} > PM_{2.5}$, which also means that the life cycle from long to short is $PM_{2.5} > PM_{10} > PM_{0.5}$.



Conclusion

- The PM concentration of Suzhou is obviously lower than Wuxi's.(Including concentration of city and bank)
- In none fog day, thanks to no strong emission on lake and stronger absorbing ability, the PM concentration of lake is obviously lower than bank and city's, which proves that the lake is able to reduce the concentration of PM in none fog day. Furthermore, to PM with different diameter type in fog day, there is also showing that the spatial distribution unevenness of PM concentration on lake is $PM_{10} > PM_{0.5} > PM_{2.5}$, which also means that the life cycle from long to short is $PM_{2.5} > PM_{0.5} > PM_{10}$.
- In fog day, thanks to strong vapor from lake and stable atmosphere condition which is active for aerosol to exist stably and be born, the PM concentration of lake is obviously growing by the distance to the bank and higher than bank and city's. Furthermore, to PM with different diameter types in fog day, there is also showing that the spatial distribution unevenness of PM concentration on lake is $PM_{0.5} > PM_{10} > PM_{2.5}$, which also means that the life cycle from long to short is $PM_{2.5} > PM_{10} > PM_{0.5}$.
- The emission of boat is an important source on lake, which would increase the local PM concentration. However, the quantity and density of boats emission is much lower than city's emission. The particle will be diluted by atmospheric action



Discussion

- The PM concentration of Zone A(near Wuxi's) is higher than Zone D(Suzhou's), which proves that the atmospheric environment of near city area is similar to city area's. However, the atmospheric environment in lake which is far from city would be different from city. While the rate of different source of PM(including from city or biogenic emissions of lake surface) and the components of PM on lake need further study.



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Future Work

- We have collected several typical rain samples at roof of Wendelou by using the APS-3A so far since spring(Mar) which were used to do the research of wet deposition. We have measured the PH and Conductivity of them. After the new lab getting used. We will start to analyze the ionic composition and carbon composition.
- We will also analyze the efficiency of wet deposition by using the PM collection data of the corresponding period.





Thanks~