

Real-time Source Apportionment of particulate matter in PRC and India

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Real-time Source Apportionment of particulate matter in PRC and India

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Improved Source Apportionment of Particulate Matter

Traditional

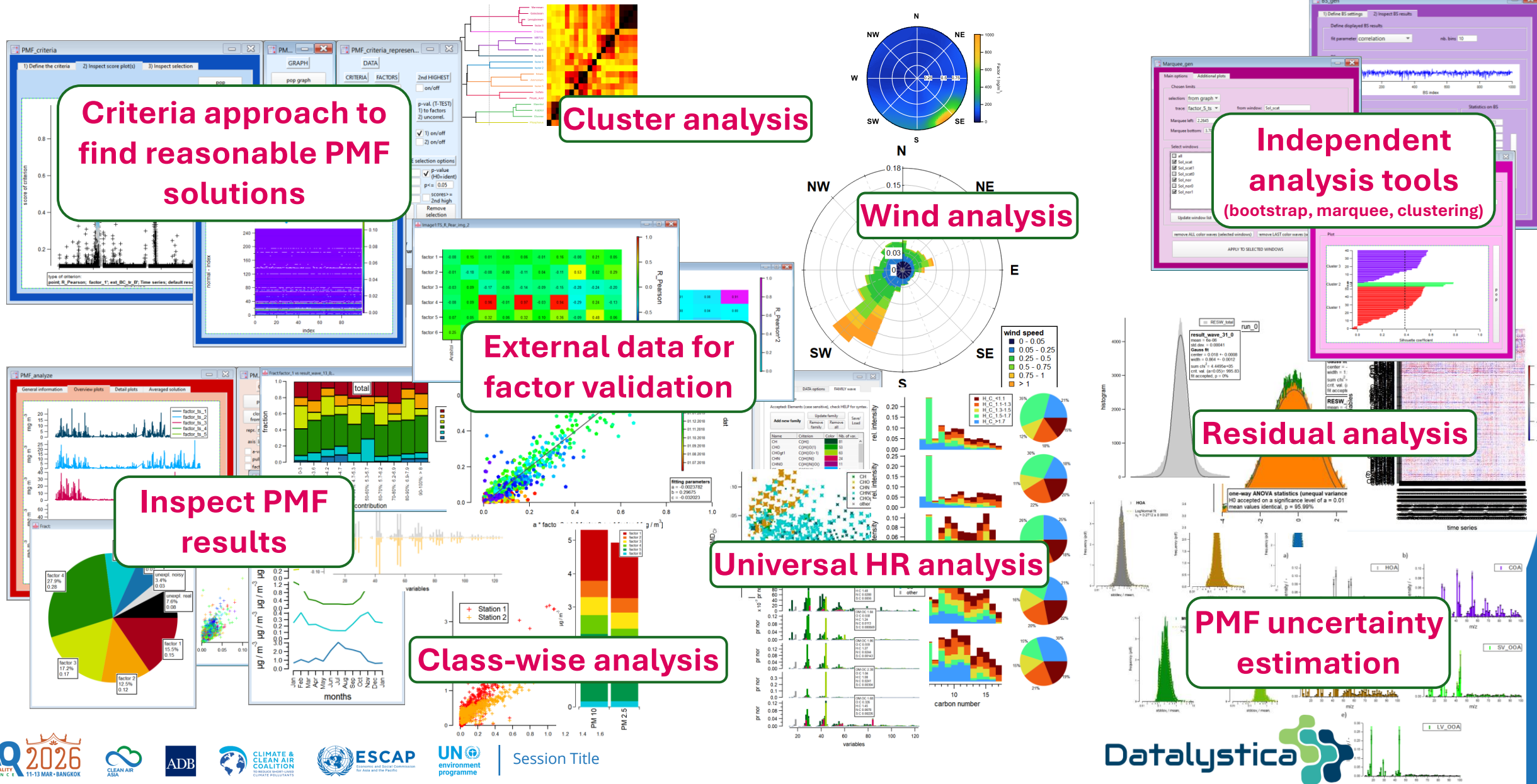
- *Off-line* Analysis of filters with typically 24 hour time resolution. Measurements include ions, elements, EC/OC.
- Traditional source apportionment takes a lot of time. Typically months and more.
- The low time resolution often leads to mixing of sources

Improved (Supersite – approach)

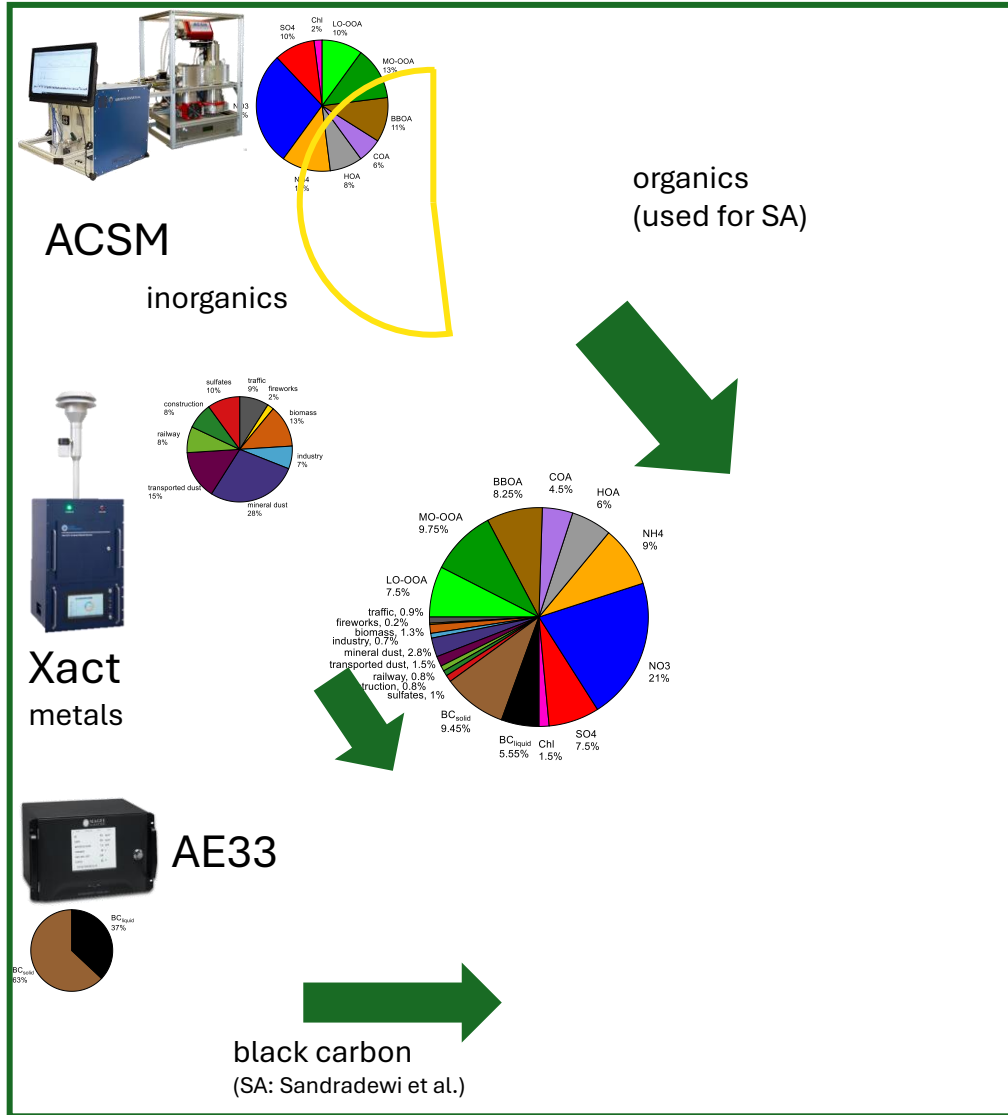
- *Off-line*: modern mass spectrometry improves the source apportionment of organics
- *On-line* measurements in hourly time-resolution is possible yielding improved separation
- Development of software to provide results in real-time (minutes after the measurements)

Source Finder SoFi Pro

Key is to have this evolving «detective tool», adapting rapidly to the needs of the community

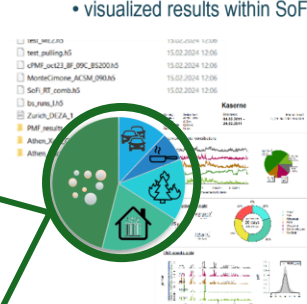


SoFi RT – source apportionment in real-time (there are different versions) using AXA (ACSM, Xact, Aethalometer)

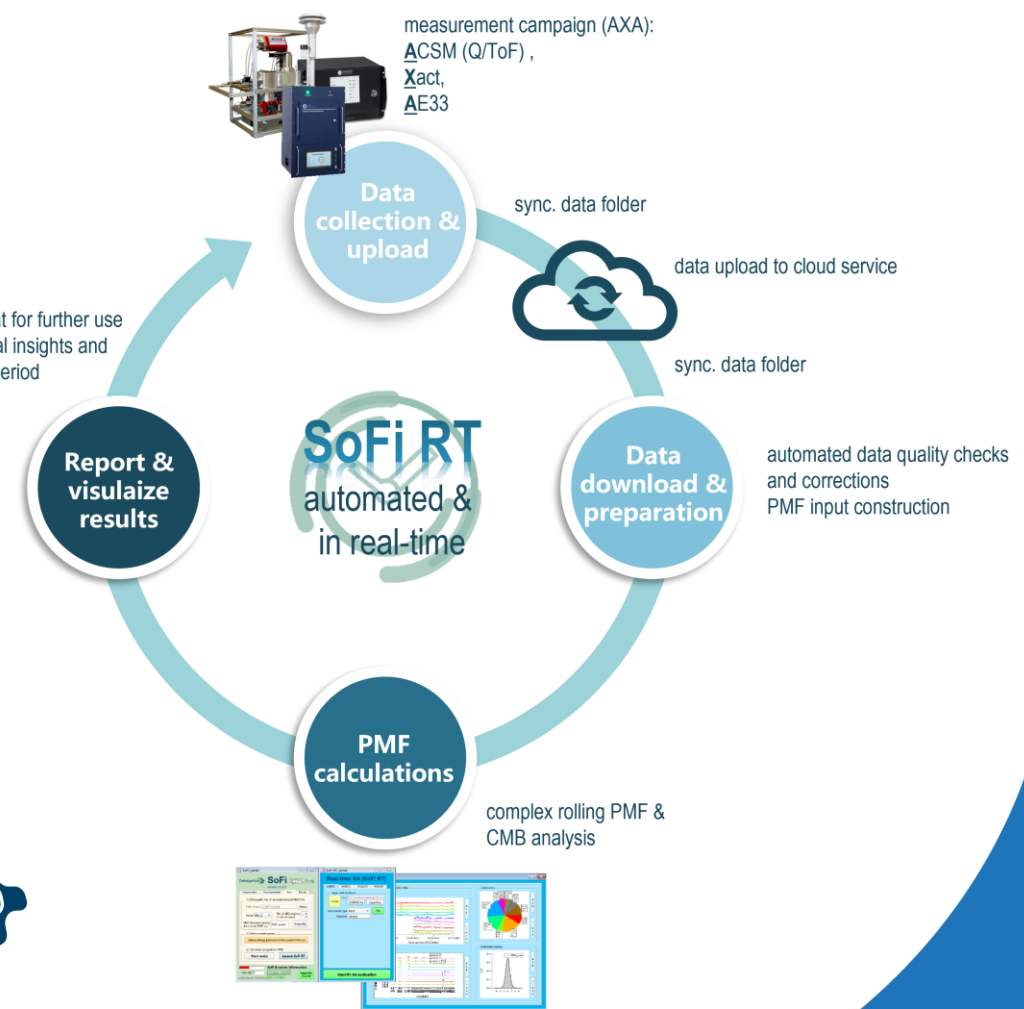


Source apportionment available in minutes after measurements

- results in .HDF5 and .csv format for further use
- automatic reports with additional insights and statistics for the selected time period
- visualized results within SoFi



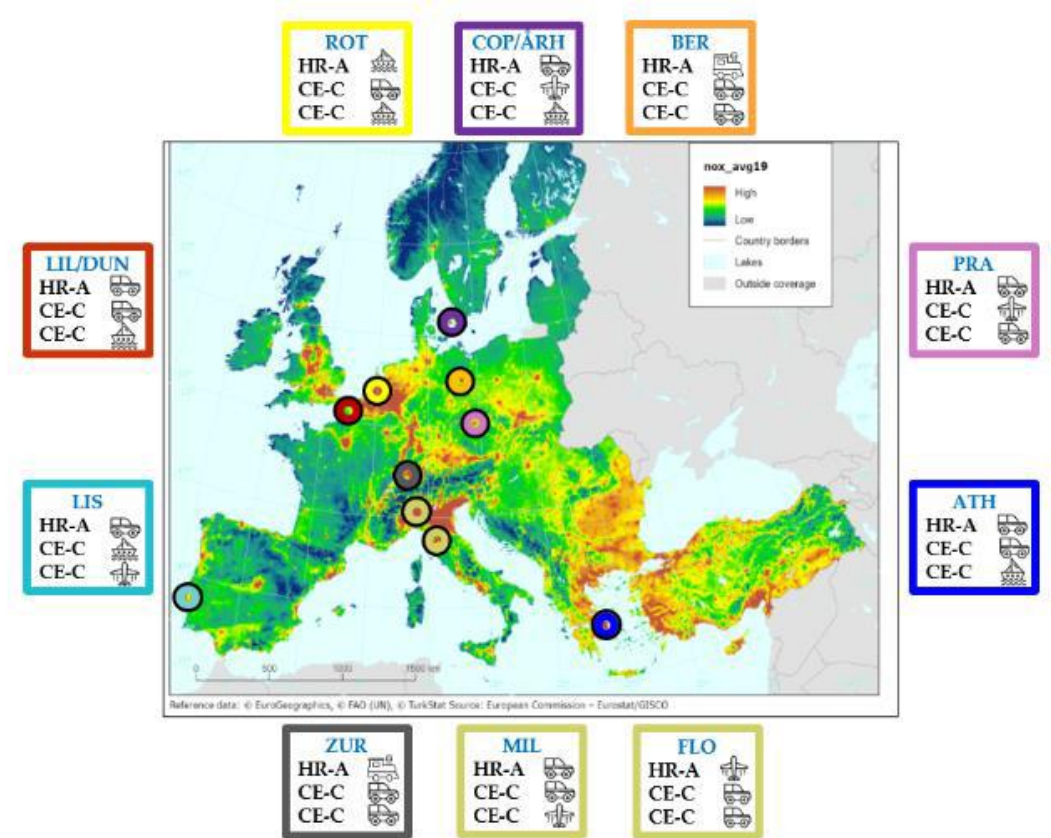
Manousakas et al.
Scientific reports (2026), AMT (2025)



Developed for PRC, Testing in Europe, Delhi and in the future in US



Clean Air China Project supported by the Swiss Agency for Development and Cooperation



Mi-TRAP Project supported by the Swiss Agency for Development and Cooperation

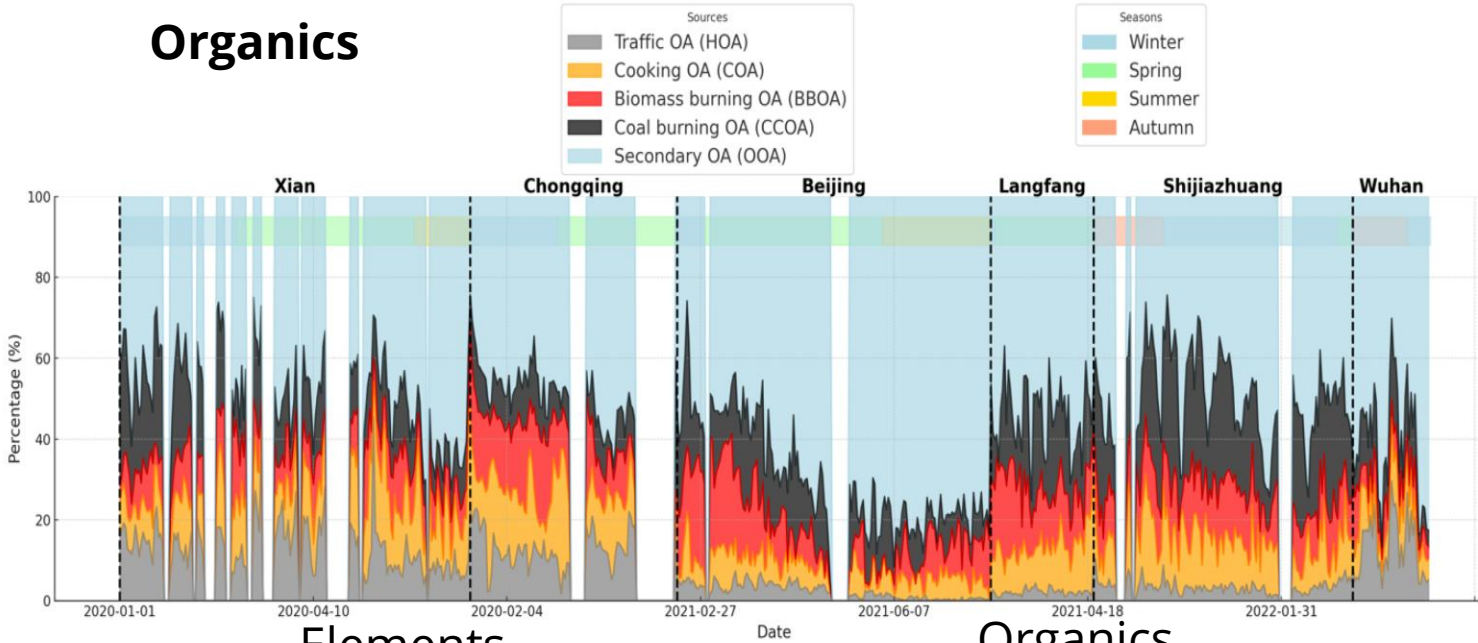
Examples for PRC and Delhi

Real-time and Reference analysis very similar

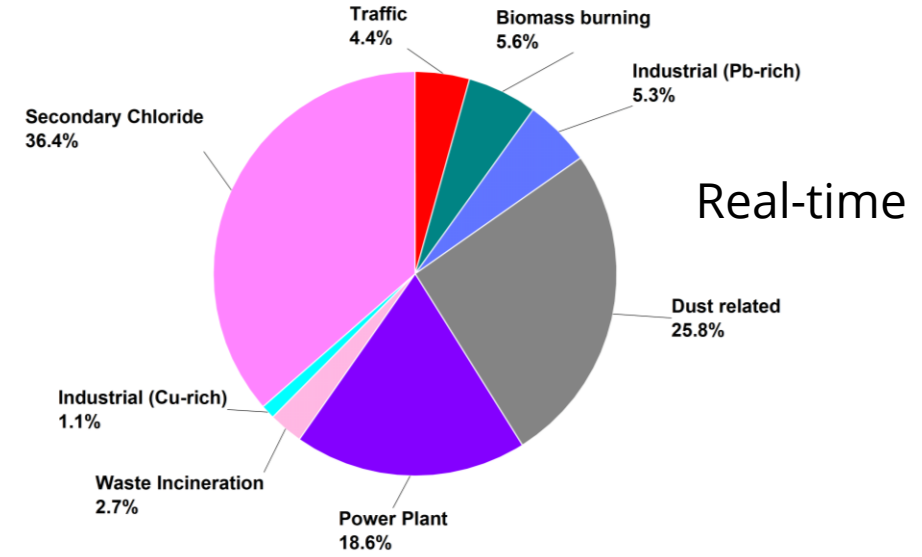
Manousakas et al. 2026

Faisal et al., in prep.

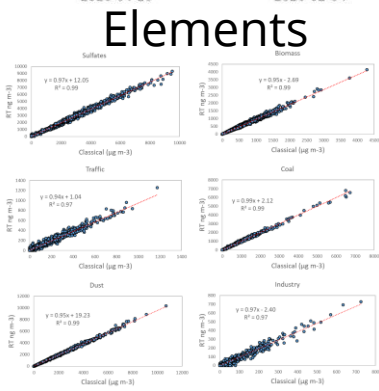
Organics



Elements

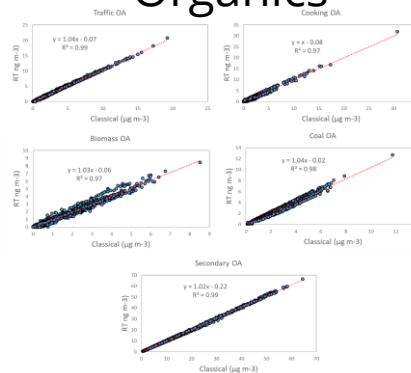


Real-time

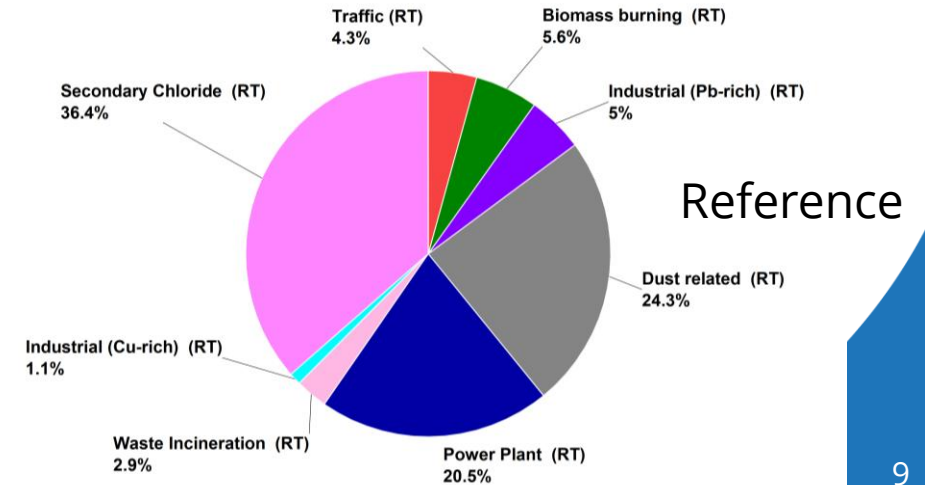


Reference analyses

Organics



Reference analyses

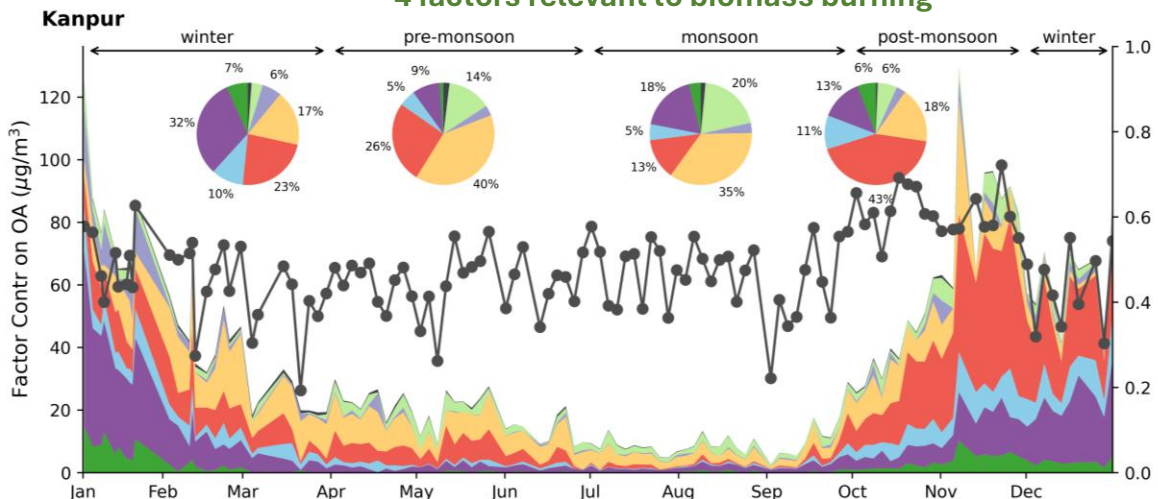


Improved off-line Source apportionment of organics with EESI-ToF mass spectrometry

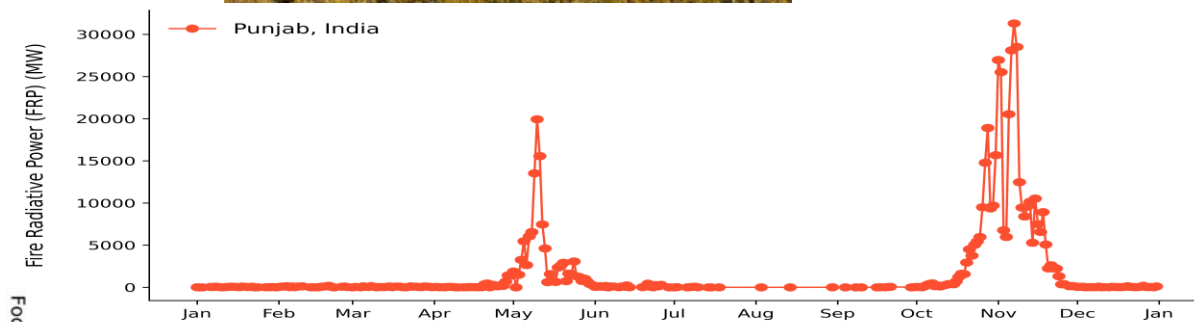
Hao et al., 2025, Environment International

- Urban OA
- Delhi Industrial OA
- Biogenic SOA
- Hydrocarbon-like OA
- Fresh-BBOA
- Aged-BBOA
- Nitrogen OA
- Agricultural fire OA

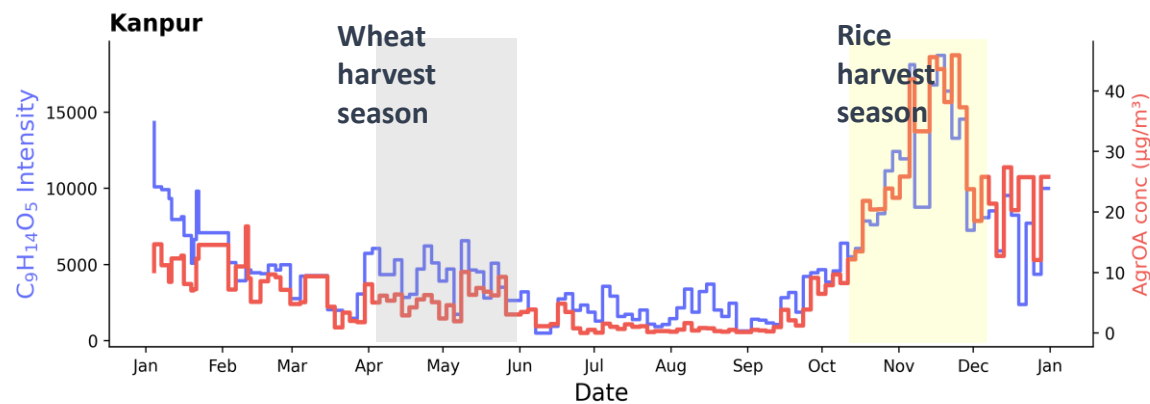
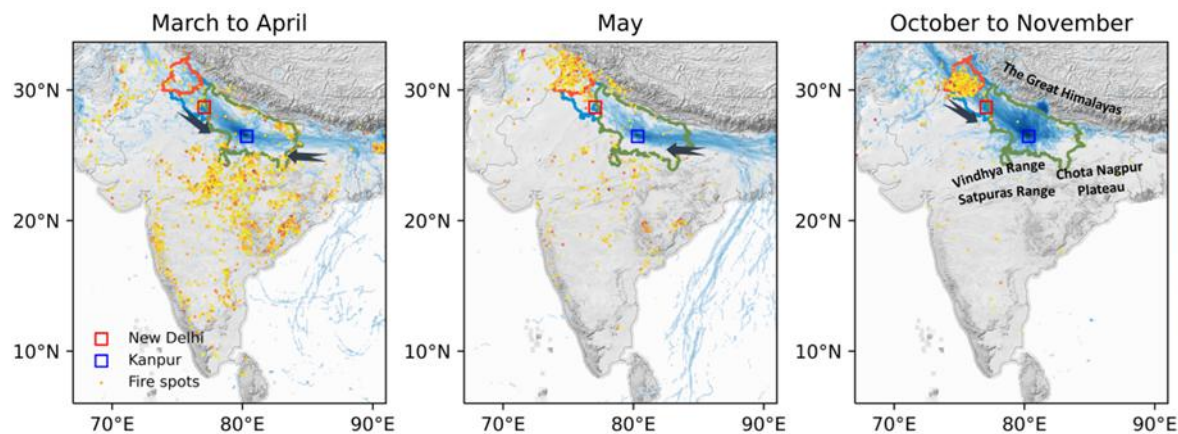
4 factors relevant to biomass burning



Rice-wheat rotation system forces rapid field clearing, making open burning as the fastest and most practical option for farmers in Punjab.



Footprint Retroplume ($\text{mass m}^{-3} \text{s}^{-1}$)



Conclusions

- Real-time source apportionment is possible and is of high quality. It provides timely information on the reasons for high concentrations. It is costly, so mostly for supersites as suggested by the EU air quality directive.
- Classic off-line analysis is also costly, takes a lot of time and manpower and is of lower quality.
- A good investment can be the archiving of filters (ideally Hi-Vol) in the freezer and seek collaboration with research groups to do advanced off-line source apportionment of organic aerosols to distinguish different kind of biomass burning and secondary organics, and also to study health relevance by e.g. oxidative potential.

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Thank you for listening!

