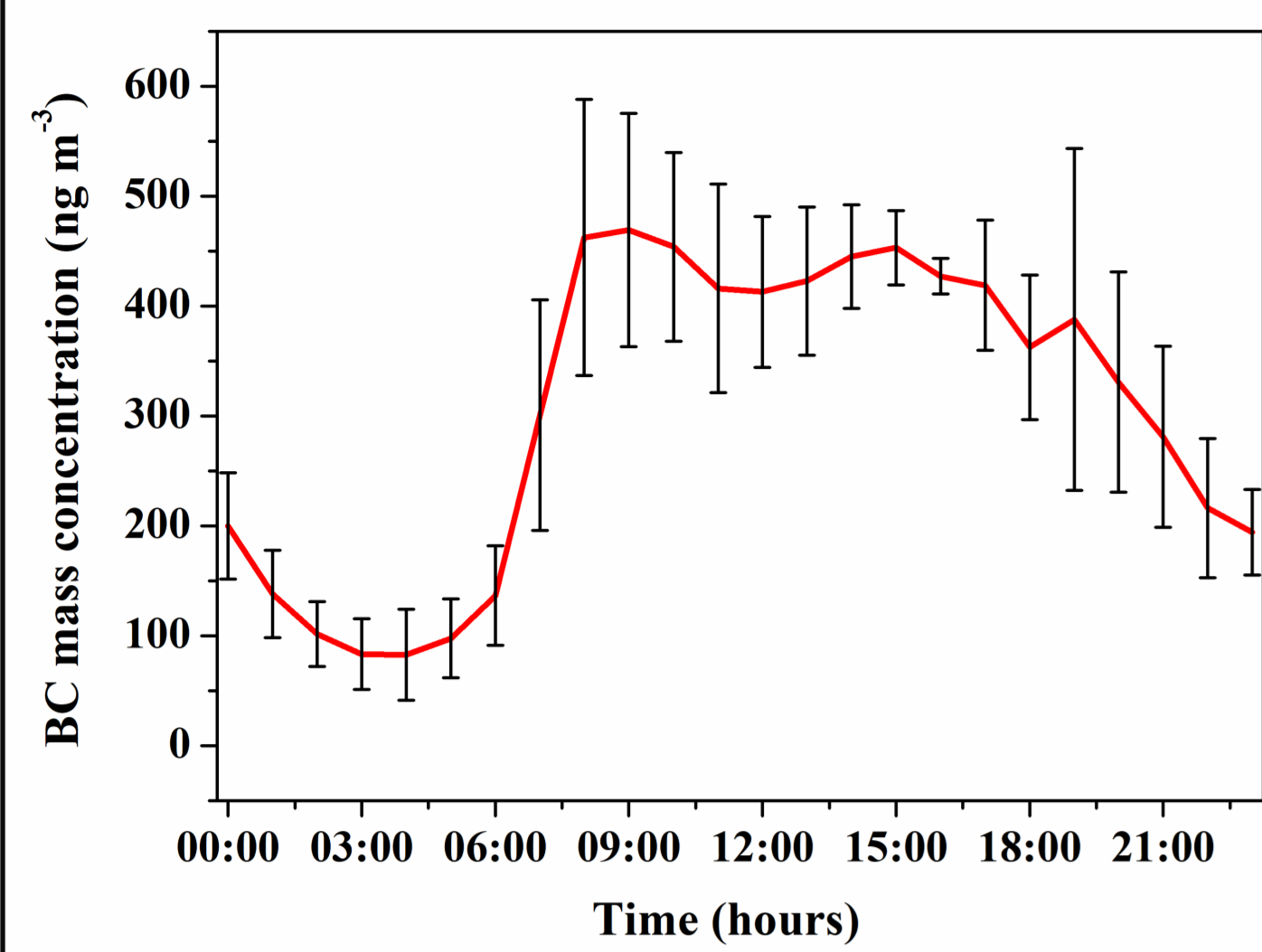


# High Altitude Cloud Physics Laboratory (HACPL)

## Diversity in Aerosol sources, its processing and implication to Cloud condensation nuclei formation

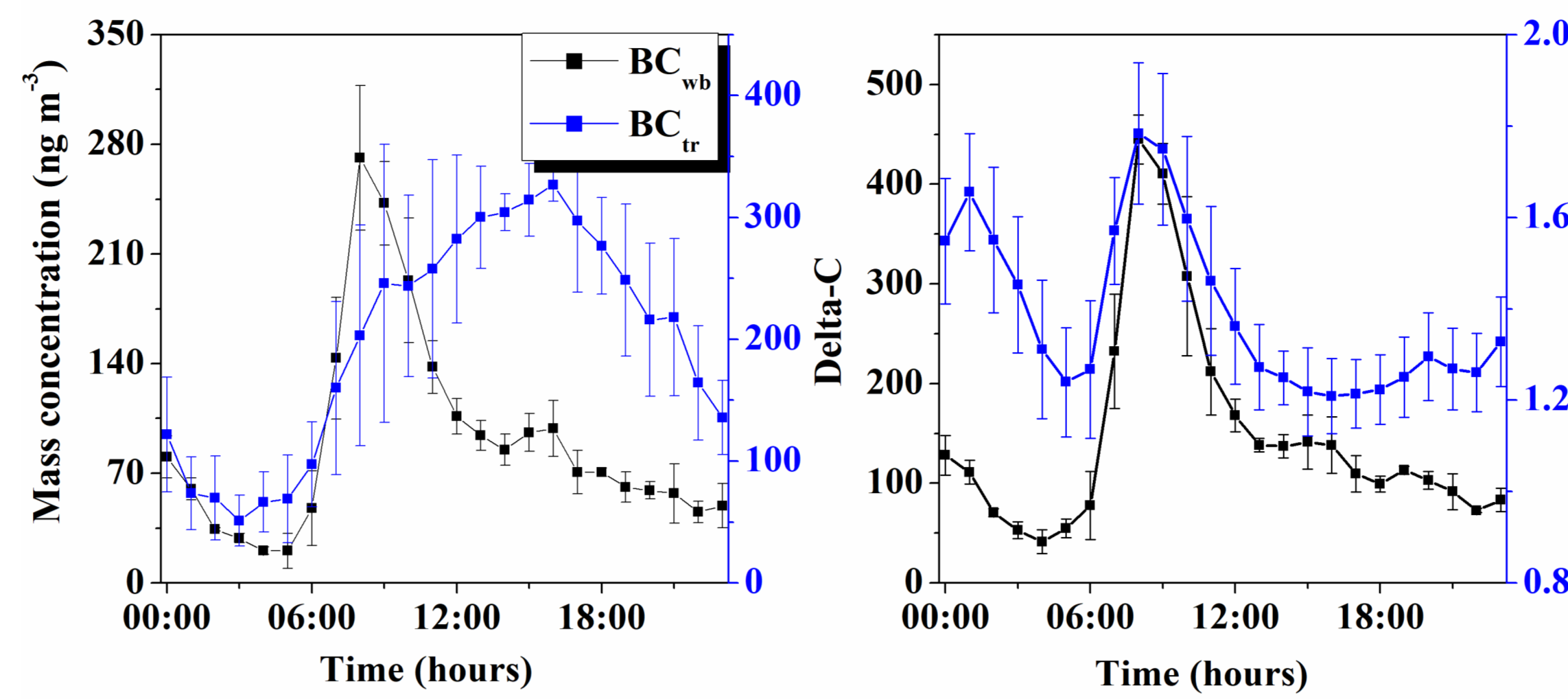
Subrata Mukherjee, Avishek Ray, Dr. G. Pandithurai  
Indian Institute of Tropical Meteorology, Pune, India

### Different aerosol sources and its impact on CCN



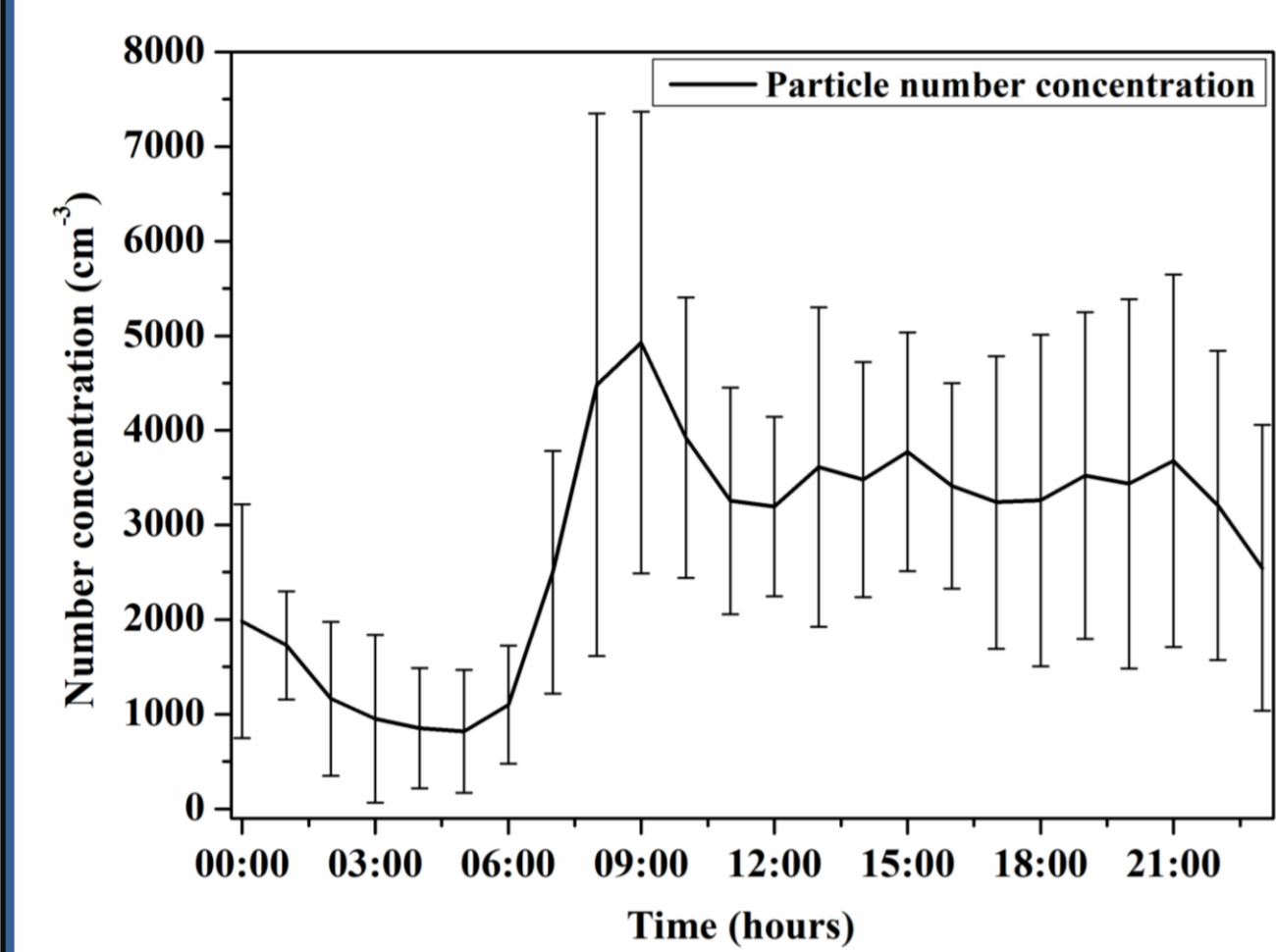
BC diurnal variation During Monsoon

Wavelength dependent source apportionment



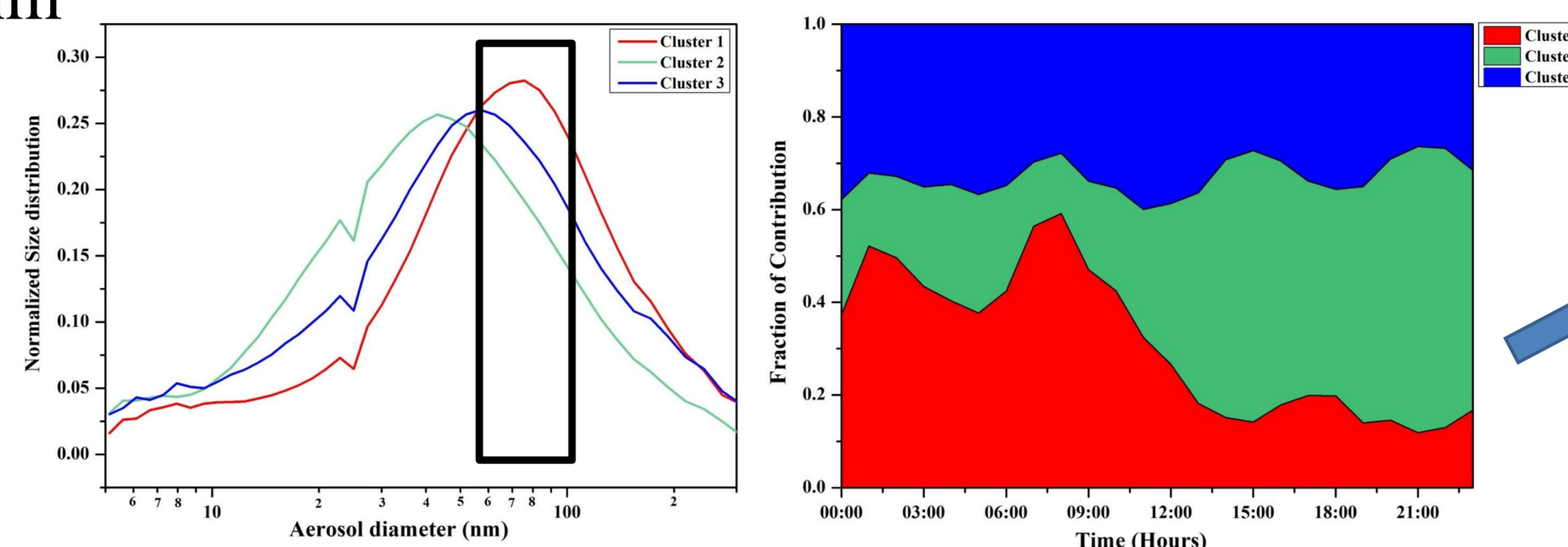
Diurnal variation of estimated biomass burning and fossil fuel contribution to total BC (a) and variation of angstrom absorption exponent (AAE) and delta-C (b)

Biomass burning emission dominated during the morning hours where as traffic emissions were high through out the course of the day. The high value of AAE and delta-C during morning hours also signifies the dominance of biomass burning during morning hours.

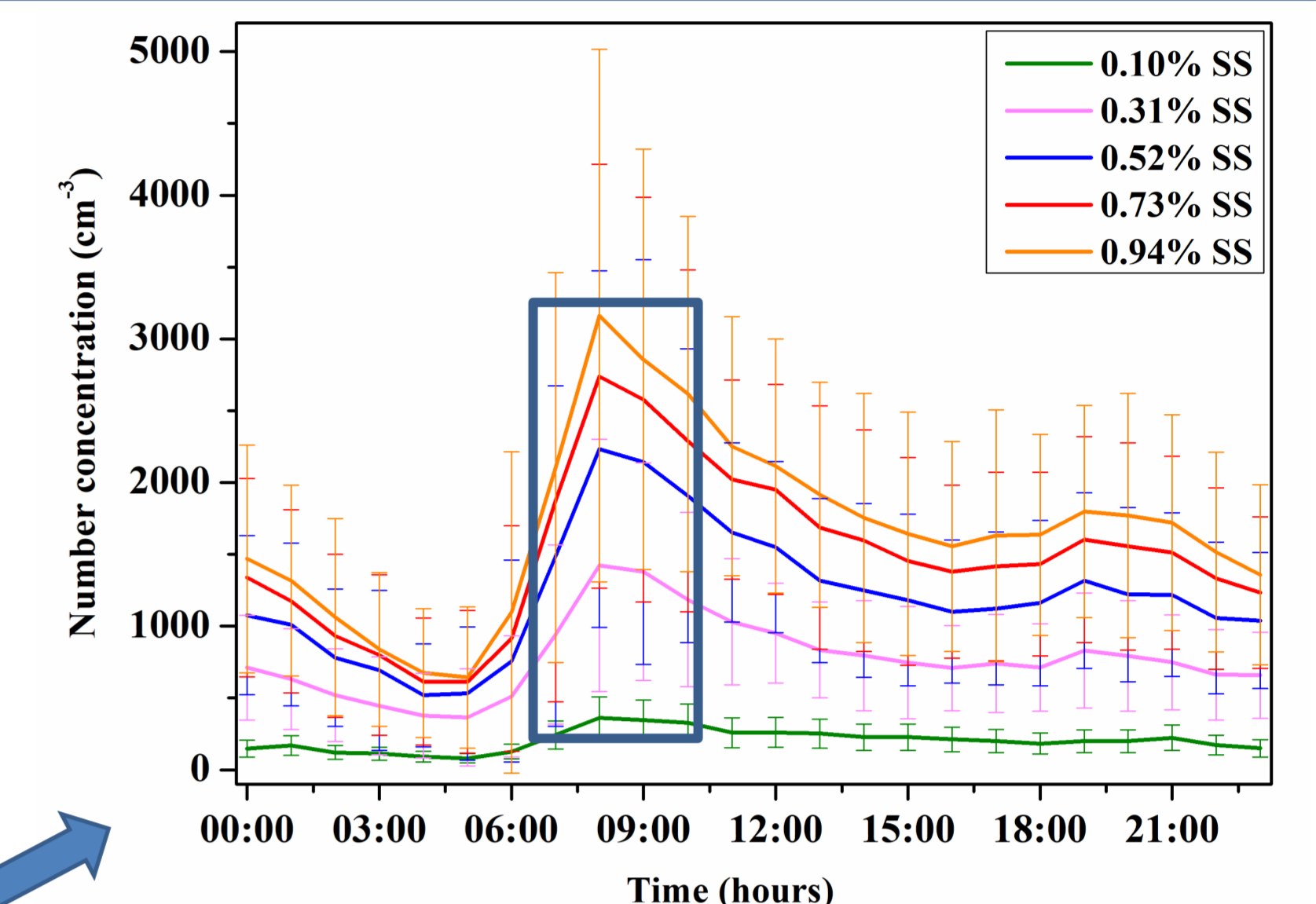


Particle number concentration from SMPS

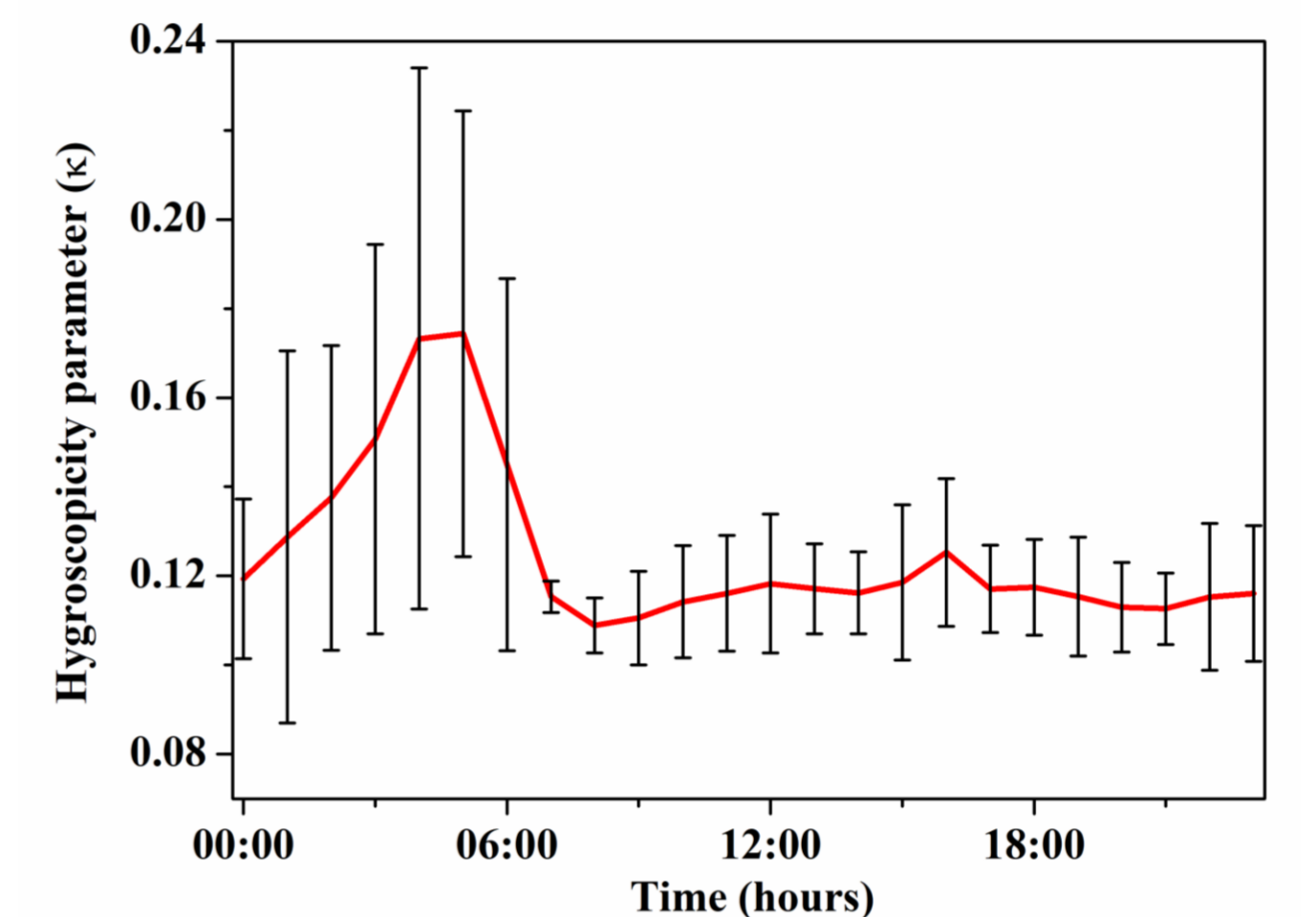
K-means clustering with fuzzy algorithm



Size distribution and fractional contribution of different clusters



CCN concentration at different SS



Estimated Hygroscopicity

### Conclusion

Primary emission contributed by Biomass burning majorly contribute to the 70-100nm size range which efficiently act as CCN, where as emission from traffic emission do not contribute much to the atmospheric CCN enhancement

## Impact of aerosol hygroscopicity in the activation of Cloud Condensation Nuclei

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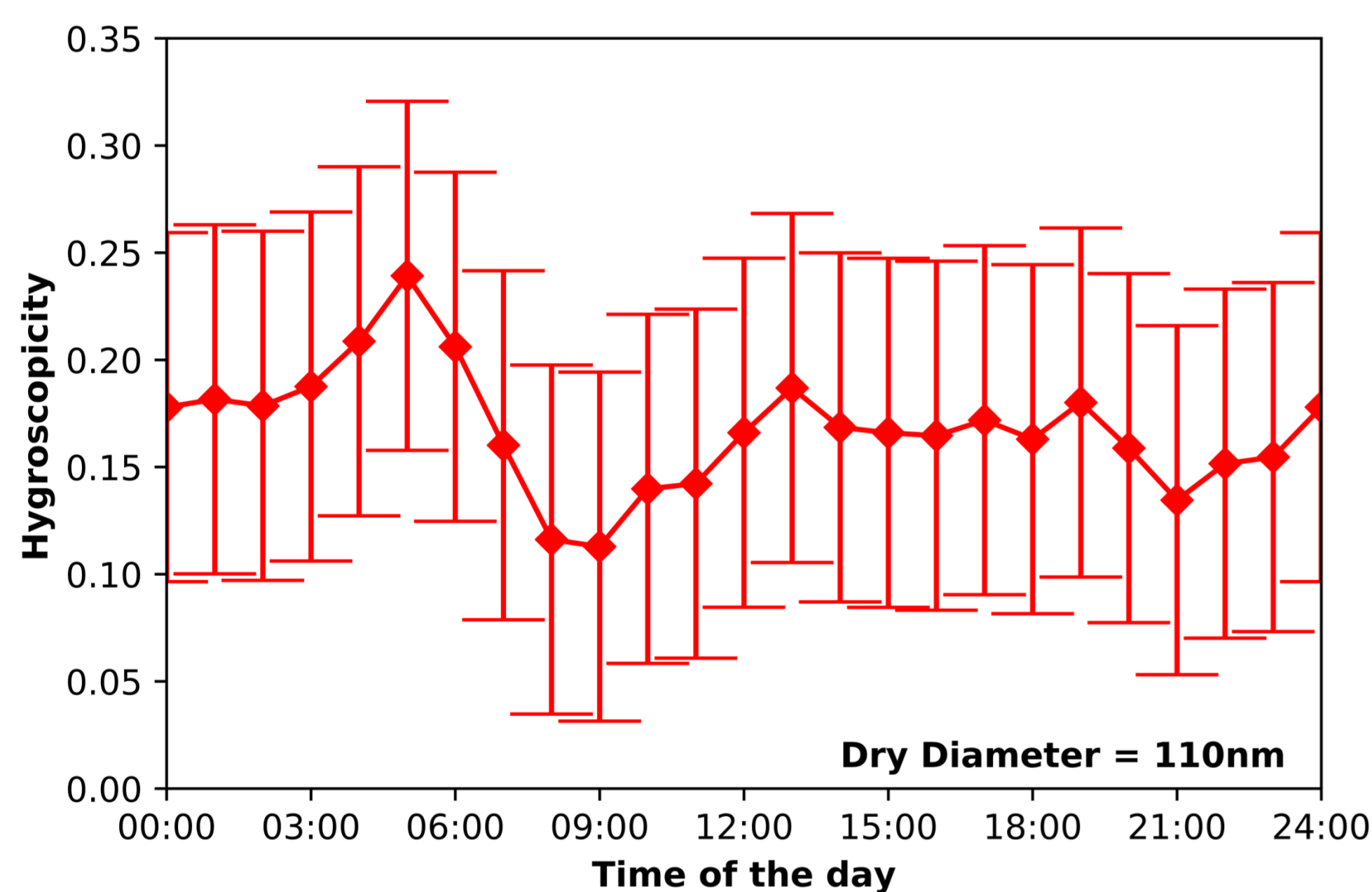


Figure 1: Diurnal variation of hygroscopicity (September, 2019)

➤ Two prominent peak, night time and afternoon hours. The night time high of hygroscopicity can be attributed to the presence of higher fraction of inorganic aerosols than that of organic aerosols, as extent of primary emission during night hours are expected to be less.

➤ The afternoon peak of hygroscopicity can be a result of photochemical aging.

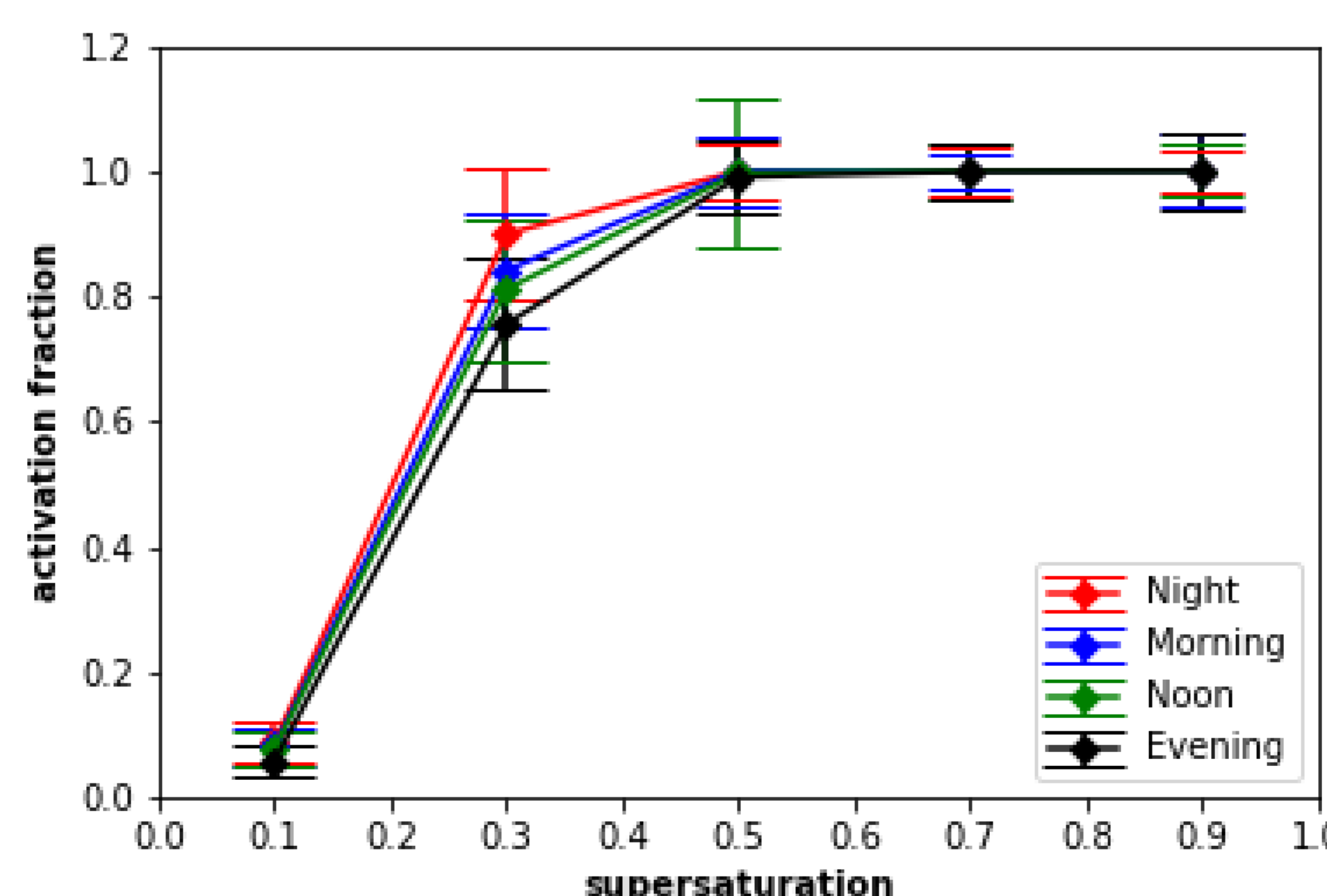


Figure 2: Cloud condensation nuclei (CCN) spectra expressed in terms of activation supersaturation

$$\text{activation fraction} = \text{supersaturation}^k$$

Time	k
Night (20:00 – 07:00)	0.358
Morning (07:00 – 11:00)	0.379
Noon (11:00 – 16:00)	0.393
Evening (16:00 – 20:00)	0.422

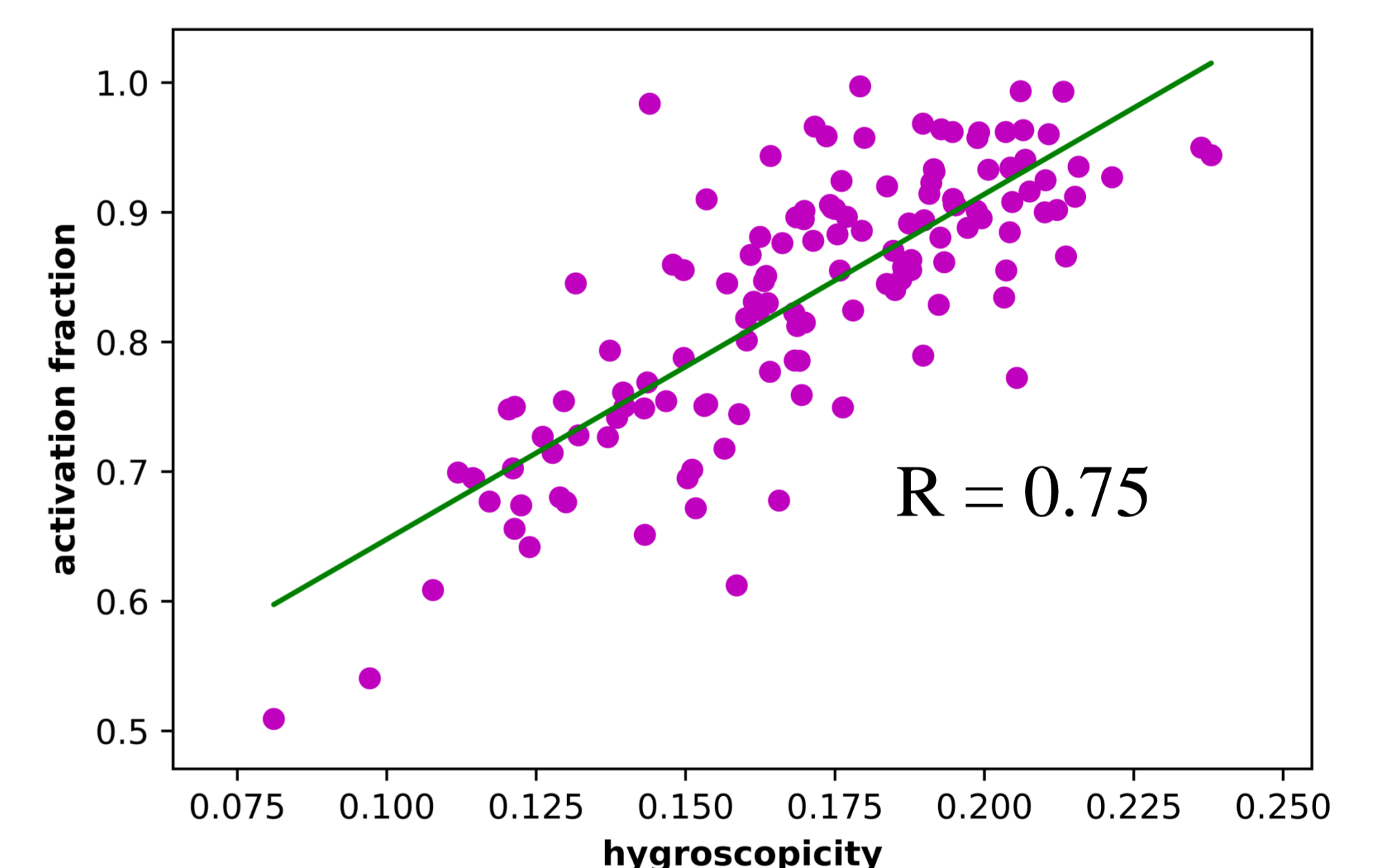


Figure 3: Correlation between the hygroscopicity parameter and activation fraction of aerosol having dry diameter = 110 nm at supersaturation = 0.3

correlation ( R ) = 0.75 indicates that hygroscopicity has also impact on activation of CCN which is the central part of cloud formation

### Future direction

- Role of secondary organic aerosol in the CCN activation processes.
- Development of CCN parameterization scheme with size and chemical information
- Quantifying the contribution of BVOCs on regional SOA budget.

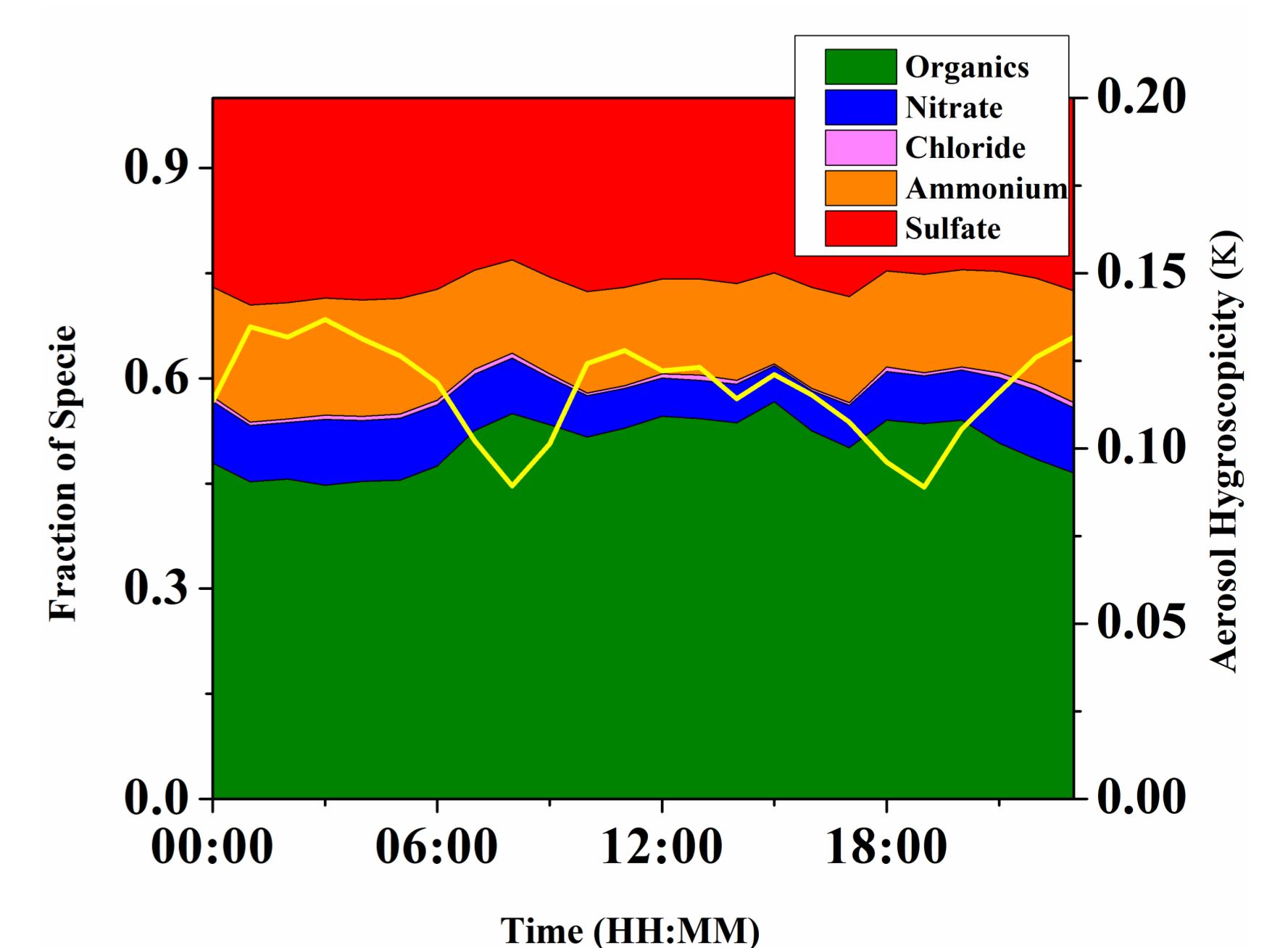


Figure 4: Comparison of chemical composition and aerosol hygroscopicity