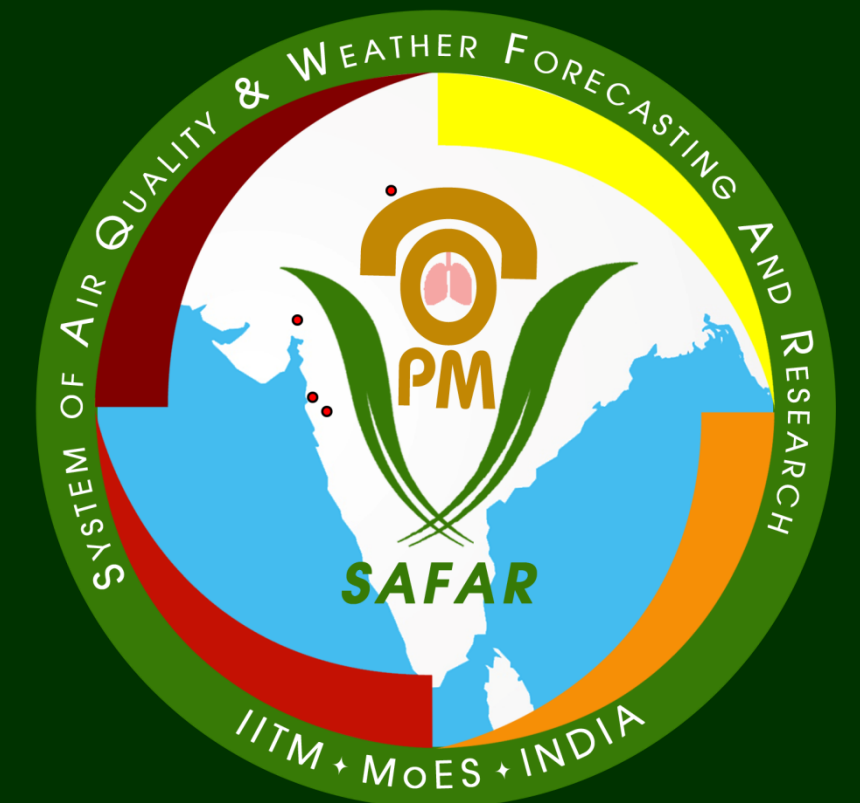




METROPOLITAN AIR QUALITY AND WEATHER SERVICES - SAFAR

Indian Institute Of Tropical Meteorology, Pune, India

VARIABILITY OF VOCs and OVOCS IN GREENER URBAN ENVIRONMENT USING FAST RESPONSE BASED PTR-MS METHODOLOGY



Overview

- ✓ We present here ambient mixing ratio of **Volatile organic compounds (VOCs)** and **Oxygenated-VOCs** measured with proton transfer reaction quadrupole mass spectrometer (PTR-QMS) during winter and pre-monsoon season.
- ✓ Evaluate the impact of meteorological parameters in both season.
- ✓ Estimate the other sources (biogenic and secondary) during study phase

Introduction

VOCs are **short lived compounds** (quick reactions with OH, O₃, NO₃) and having vapor pressure greater than 10 Pa at ordinary/room temperature (25°C).

Global budget of VOCs:

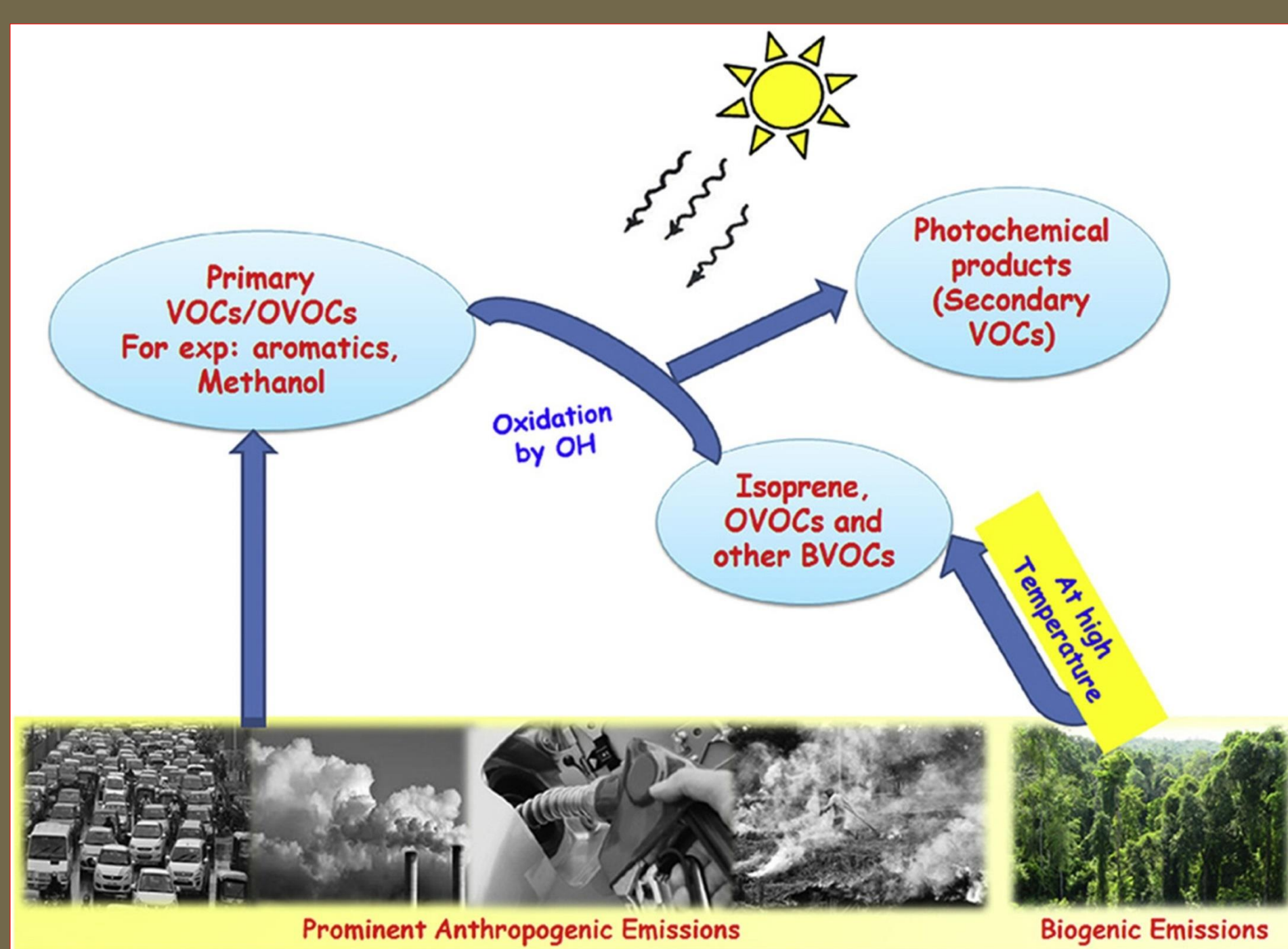
Anthropogenic ~150 Tg C/yr, Biogenic ~1150 Tg C/yr (Guenther et al., 2012)

Importance:

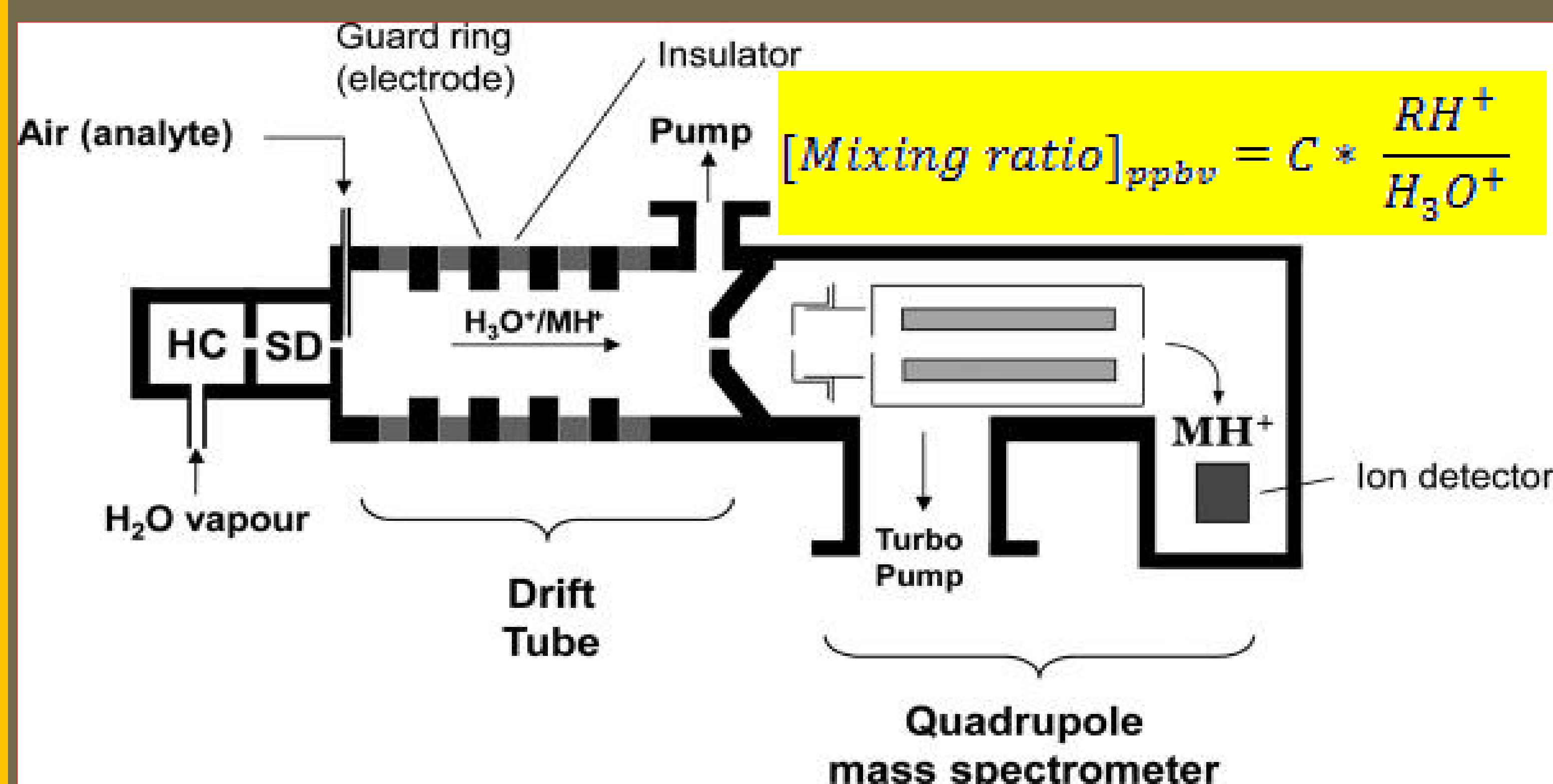
Photochemical formation of surface ozone (O₃)

20-30% contribution to global carbon monoxide (CO) budget

Role in the formation of secondary organic aerosol (SOA)



Methodology

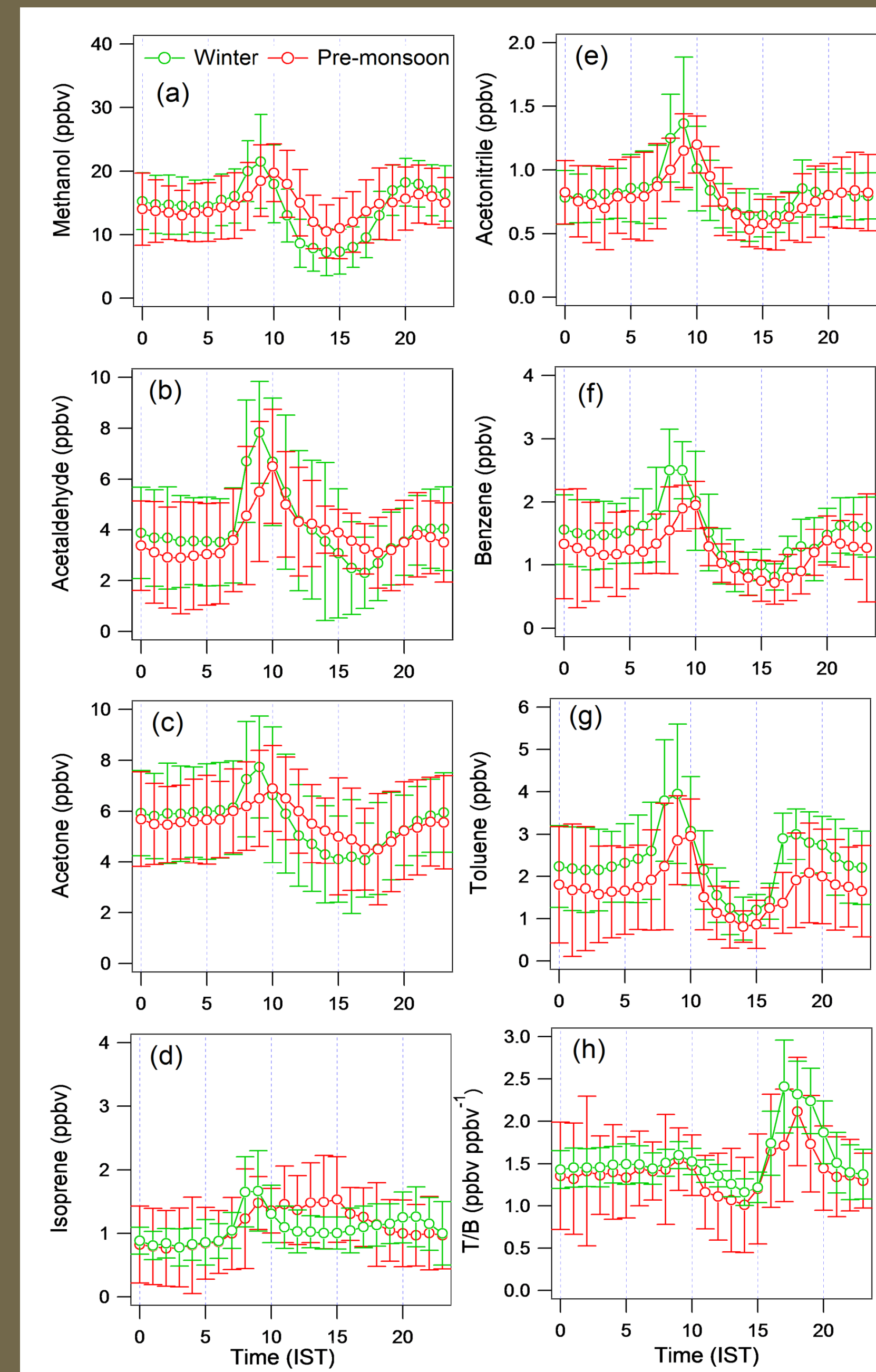


Schematic of a PTR-MS instrument (PTR-QMS, Model-500)

Conclusion and References

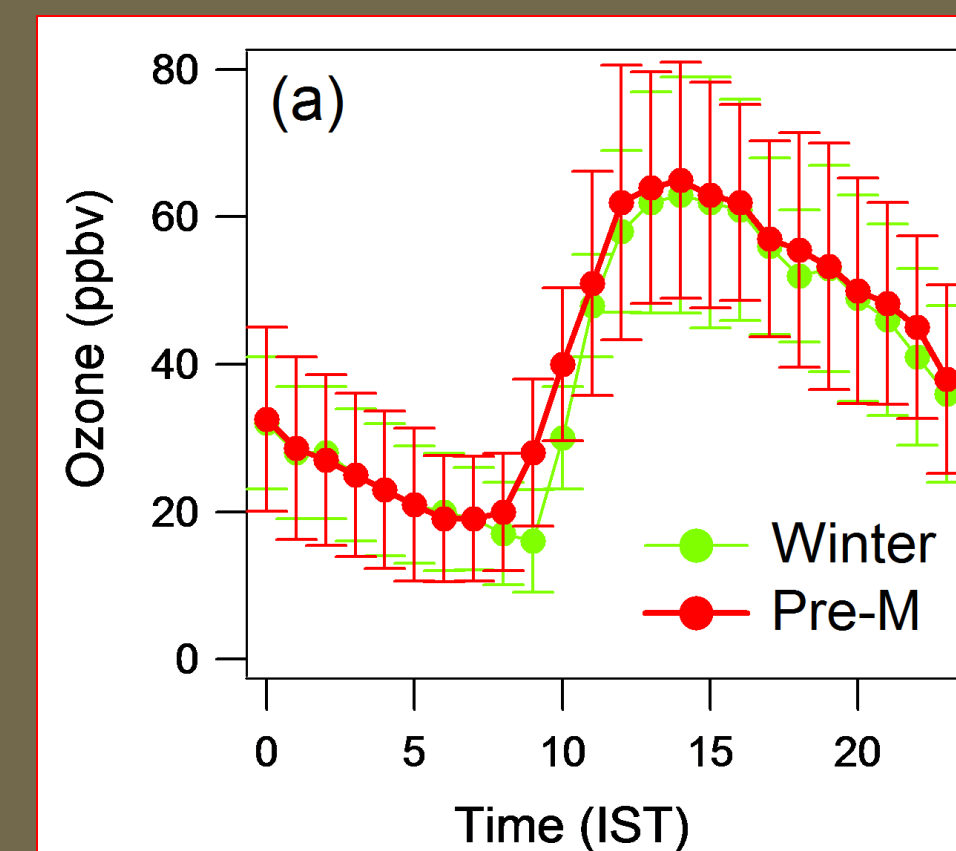
Vehicle exhaust is the major local source, however role of other sources such as biogenic emission, have been assessed in view of the transition from winter to summer. Considerable differences in diurnal variations of VOCs and OVOCS in winter and pre-monsoon

Results

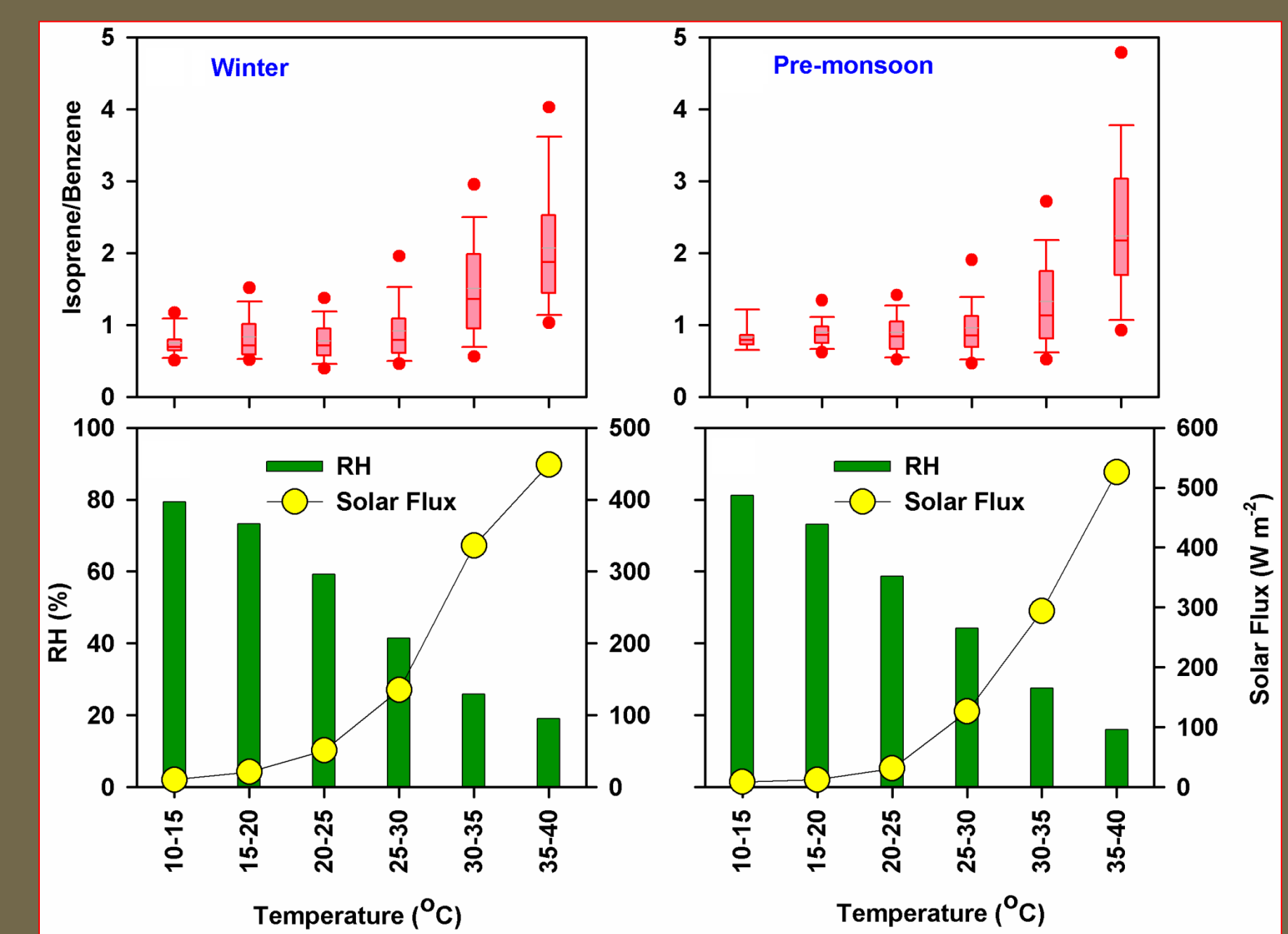
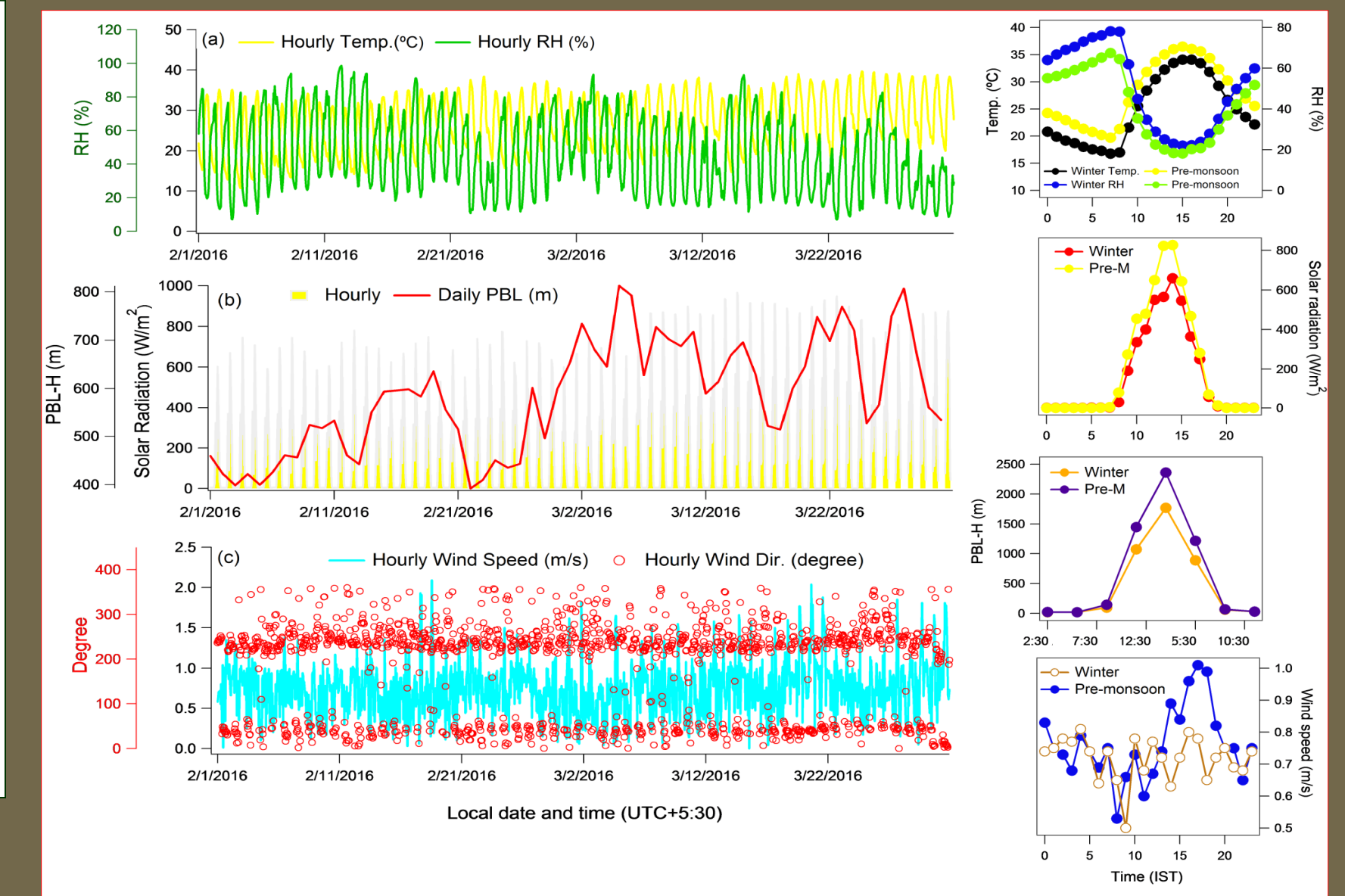


Highest mixing ratios of all VOCs were found at 8-9h in the winter season while their high values observed at 9-10h in Pre-monsoon season.

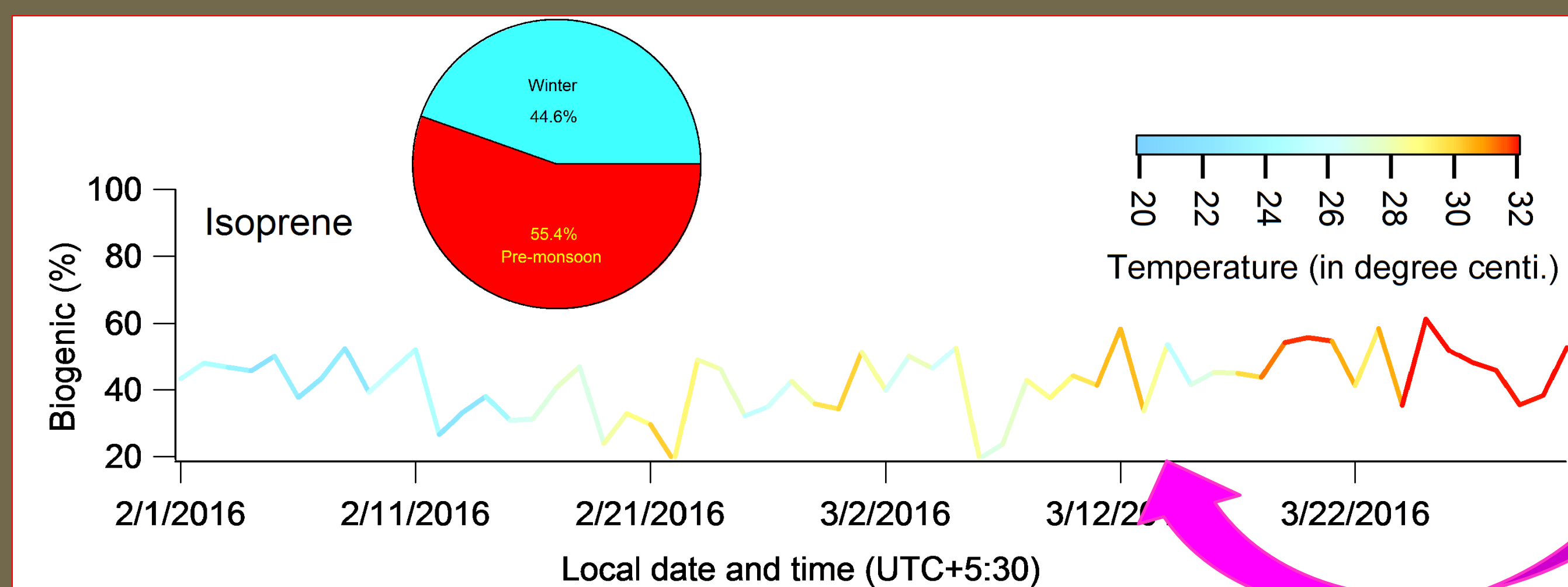
However, the day time values of OVOCS and isoprene were highest in pre-monsoon.



Biogenic and increased secondary production due to photochemical activities as a result of the higher temperatures and solar flux



Estimation Of Biogenic Emission



$$A_x = A_{xc} + A_{xb} + A_{xr}$$

$$A_{xc} = \left(\frac{\Delta I}{\Delta B} \right) \times \text{VMR of benzene}$$

$$A_{xb} + A_{xr} = \text{VMR of Isoprene} - A_{xc}$$

Measurements site (18.53° N, 73.80° E) is located in the campus of IITM, Pune, India.

Experiment conducted : winter and pre-monsoon season/2016

VOCs measured using PTR-MS technique

PTR-MS is an advanced technique used for measurements of VOCs and OVOCS in the air.

In PTR-MS, gas phase hydronium ion (H₃O⁺) is used as reagent for soft ionization of VOCs.

At high temperatures, during Pre-monsoon, Isoprene was influenced by biogenic emissions.

Emission ratios of Isoprene relative to benzene calculated from nighttime data were used to estimate the relative contributions of vehicle exhaust and other sources.

Maji et al., (2019), <https://doi.org/10.1016/j.envpol.2019.113651>

Guenther et al., (2012), <https://doi.org/10.5194/gmd-5-1471>

