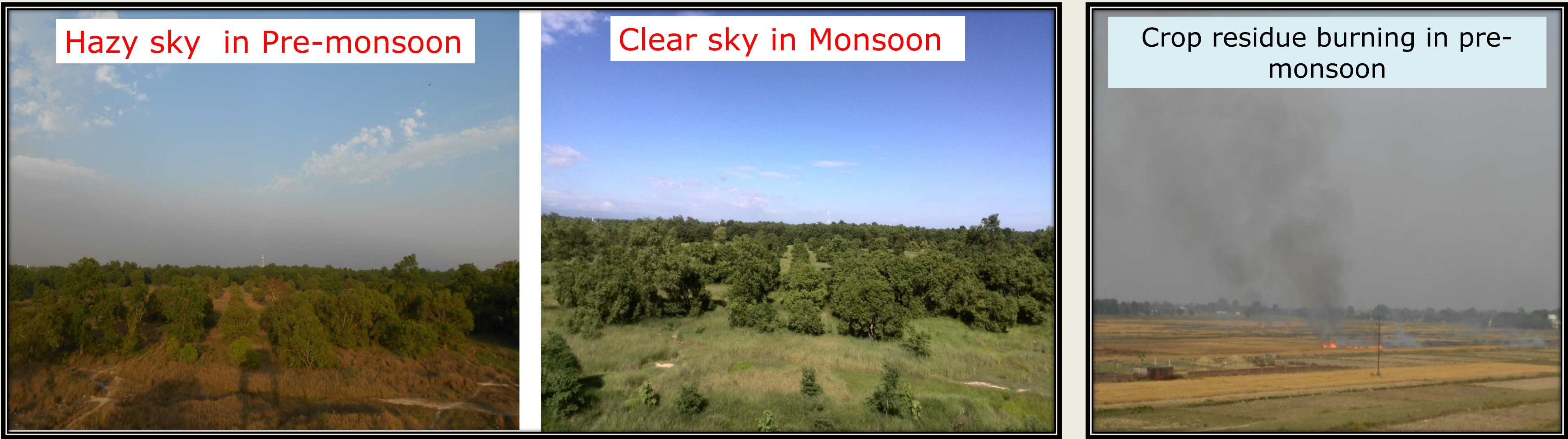
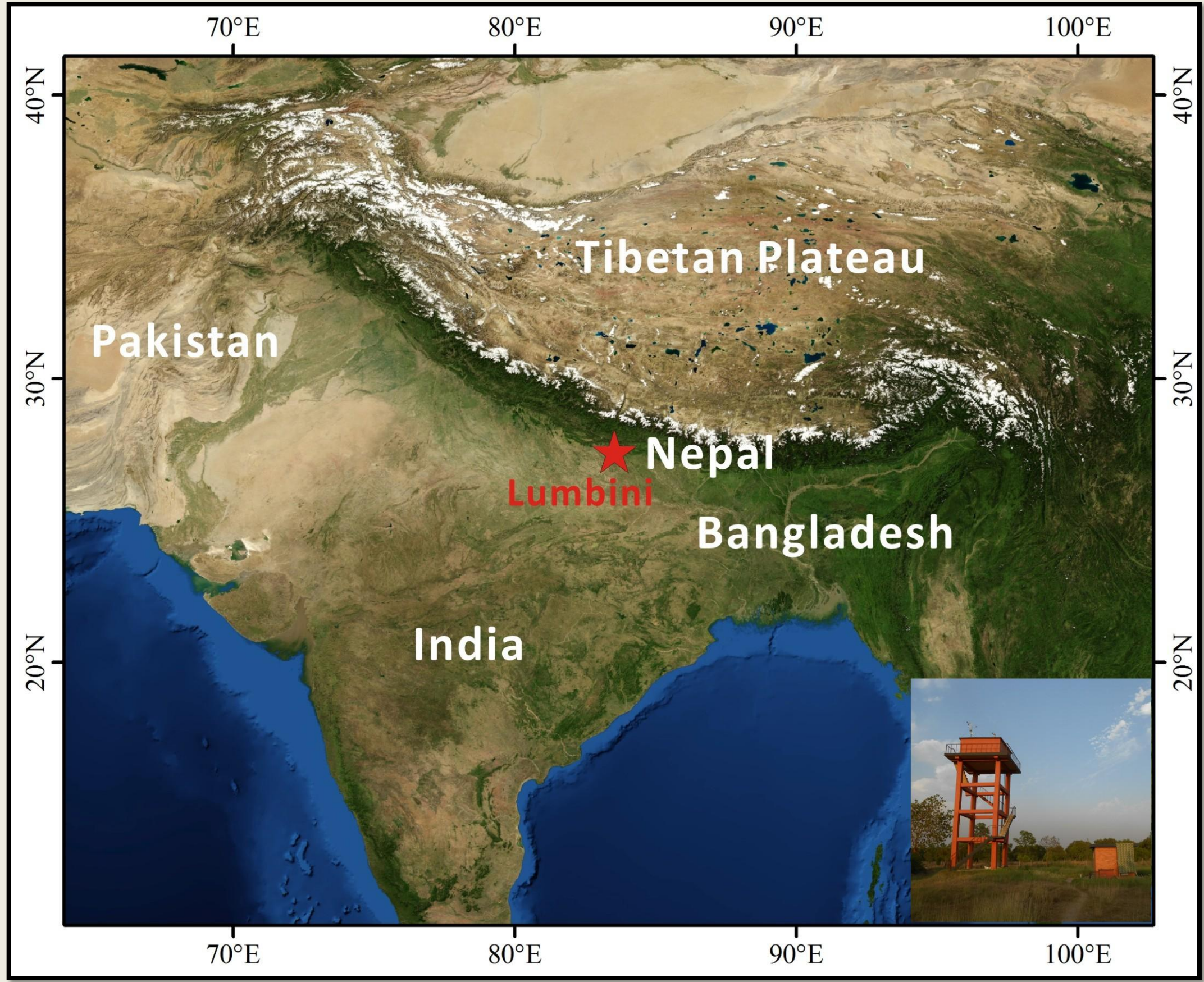


Buddha's Birthplace: A sacred garden with filthy air

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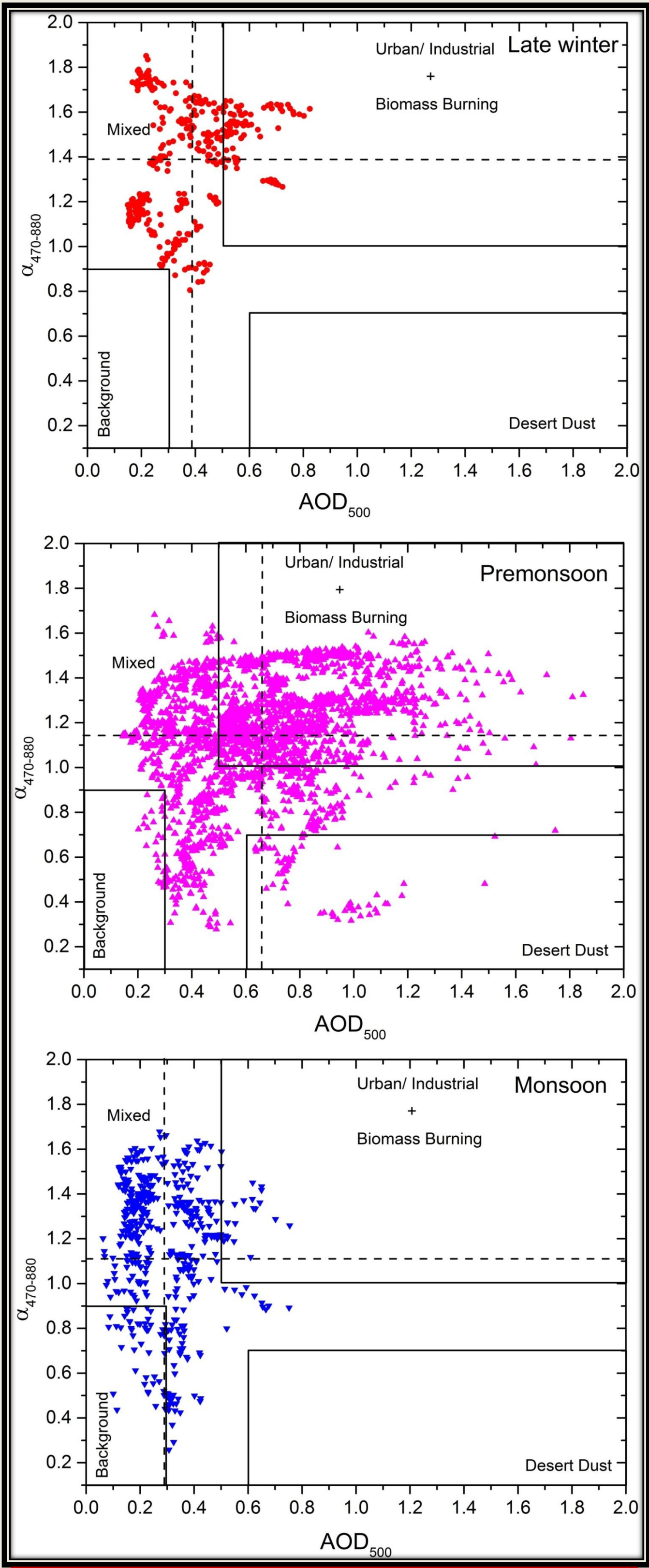
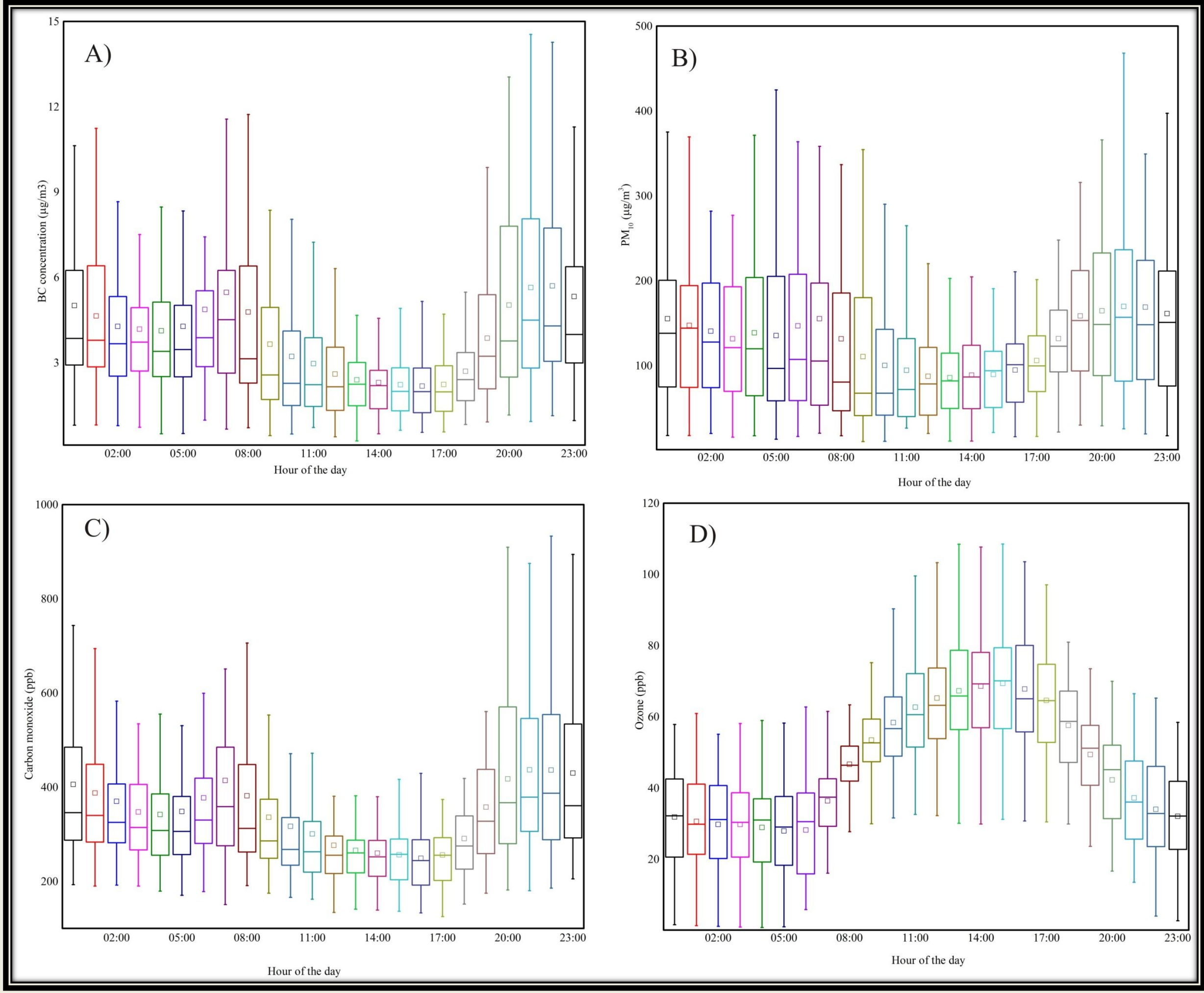
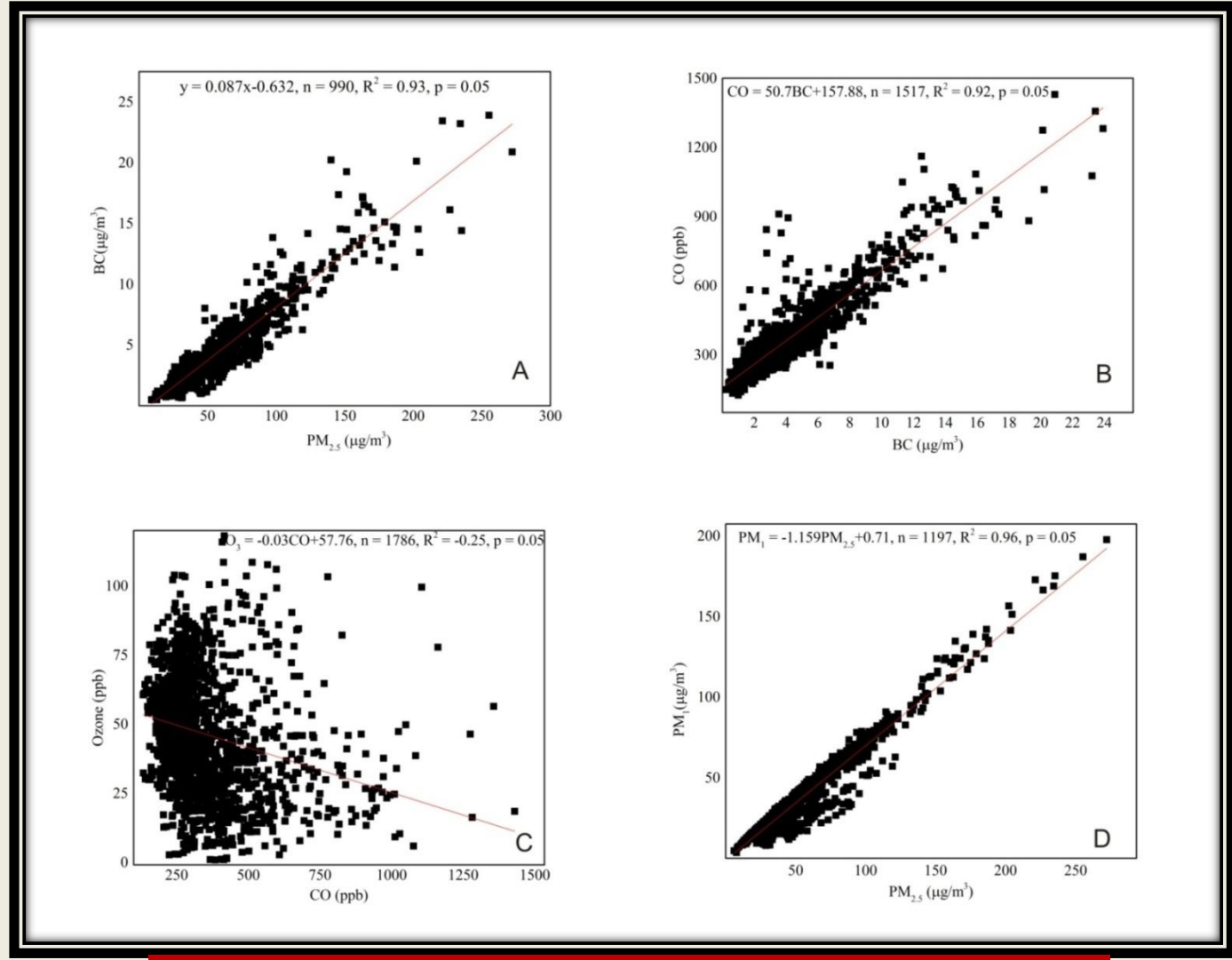
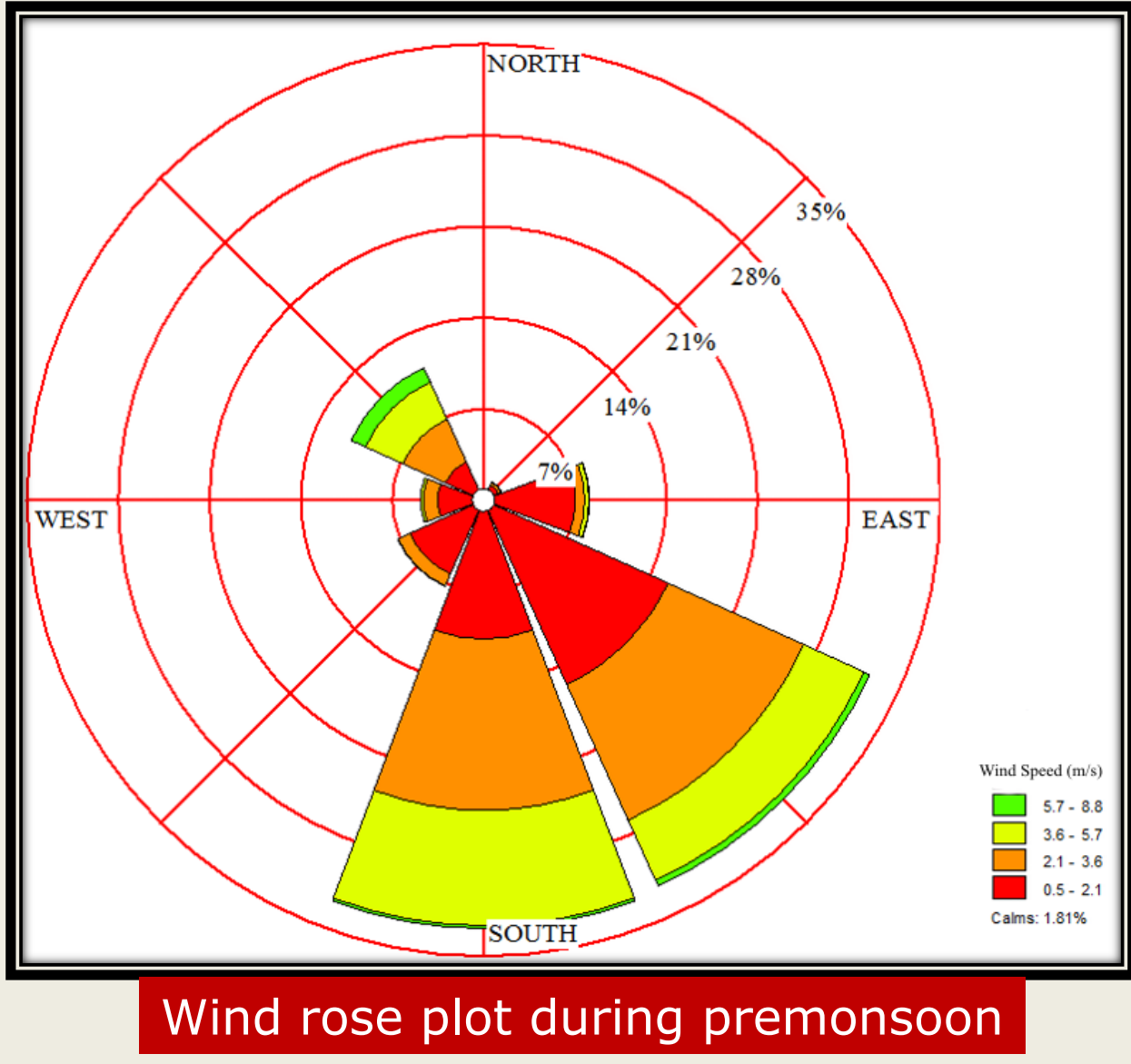
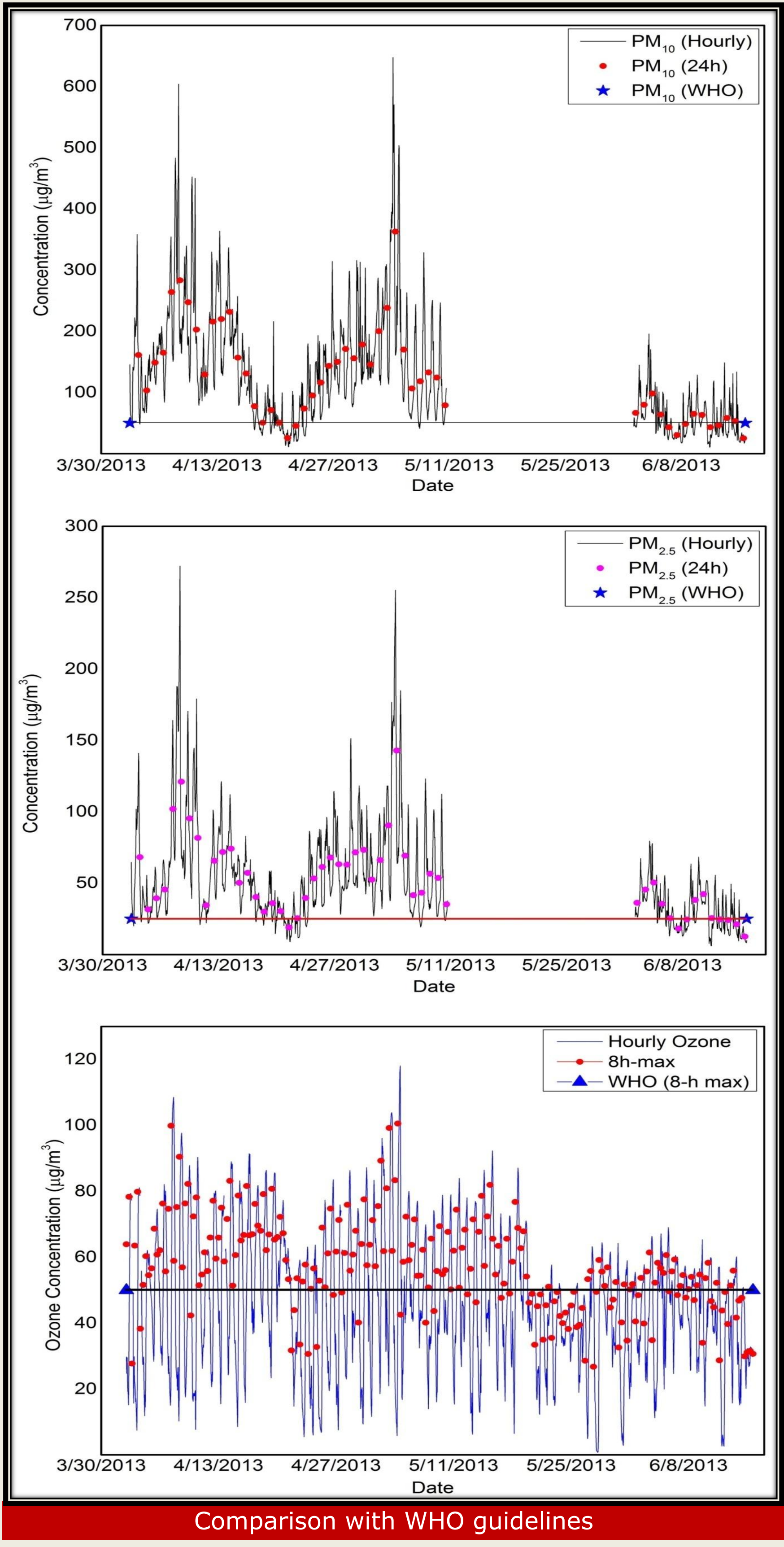


Lumbini, the birthplace of the Buddha, is a UNESCO world heritage site of universal value. Over recent years, there is an increasing concern about air quality degradation in Lumbini and the surrounding regions. However, there are only very limited observations on the atmospheric composition in this region. Measurement of air pollutants in Lumbini, southern plain of Nepal - on the northern edge of the vast Indo-Gangetic plain (IGP), is important for understanding the key characteristics of air pollutants in the region: local versus regional sources, composition, and transport of air pollutants from southern Asia etc. Ambient concentrations of key air pollutants (BC, PM_x, CO, O₃) and other atmospheric parameters (AOD, meteorological parameters) were measured continuous in Lumbini during an intensive measurement period of three months (April-June 2013) in the pre-monsoon season. These are the first measurements of this nature in Lumbini, and generally in southern Nepal. The measurements were carried out as a part of the *SusKat-ABC* (Sustainable Atmosphere for the Kathmandu Valley - Atmospheric Brown Cloud) international air pollution measurement campaign.



Instruments: GRIMM Environmental Dust Monitor (EDM164), Magee Scientific Aethalometer (AE-42), Thermo Trace level CO analyzer (48i TLC), Thermo Ozone Analyzer (49i), CIMEL sun photometer and Campbell Scientific AWS

- Range of daily average concentrations; PM₁₀: 25-350 (128±74) µg/m³, BC:1-11.4 (3.75±1.94) µg/m³, CO: 173-772 (343±106) ppb, O₃: 0.8-118 (46±20) ppb.
- PM₁₀, PM_{2.5} and O₃ exceeded the WHO guideline values during 85%, 94% and 88% respectively; of the sampled period. This indicates that poor air quality pose serious health risk in Lumbini and surrounding areas.
- Very good correlation among BC, PM and CO was observed, which indicates likely common sources of these pollutants. The aerosol and gaseous pollutants exhibit the diurnal patterns with two peaks coinciding with cooking and traffic rush hours. It is also controlled by the evolution of boundary layer mixing height.
- Furthermore, average AOD₅₀₀ was found to be 0.58±0.29 (0.06-1.85) with highest values during pre-monsoon (average: 0.66±0.28, range: 0.14-1.85), with mixed (biomass and fossil fuel) aerosols as most prevalent aerosol type followed by aerosols of urban/industrial origin. High AOD and AE indicated the presence of anthropogenic aerosols.



- Conclusions:**
- First intensive atmospheric observation in the Nepalese IGP site.
 - Prevalent winds were from south and southeasterly direction during the measurement period in pre-monsoon.
 - Very good correlations among BC, PM and CO indicates common source of air pollution.
 - Clear diurnal cycle in PM, BC and CO with morning and evening peaks coincident peak cooking and traffic hours- indicative of common sources.
 - Type of aerosols: dominance of mixed and urban/industrial along with biomass burning aerosols.
 - Poor air quality in Lumbini region is a concern for air quality, public health, crops, and climate in the region.
 - Long term monitoring is essential to understand the air quality during other seasons.

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