



ABSTRACT

This study focused on the relationship between meteorological and particulate matter (PM_{2.5}) concentrations with seasonal variation. The findings suggested that the prevailing hamattan weather associated with calm, warm and dry dust laden winds caused severely poor air quality during winter. These results justify the crucial role of meteorological parameters in air pollution formation with seasonality.

BACKGROUND AND OBJECTIVE

- Air pollution is an environmental health risk responsible for millions of deaths globally (WHO, 2016).
- Pollutant concentrations are driven by land-atmosphere interactions.
- The mean concentration of PM_{2.5} over Ghana (31.1 $\mu\text{g}/\text{m}^3$) exceeded the recommended standards (10 $\mu\text{g}/\text{m}^3$) by WHO (2016).
- About 28,000 premature deaths have been attributed to exposure to air pollution in Ghana.
- There is the need to monitor the seasonal variation of air pollutants from meteorological dynamics.

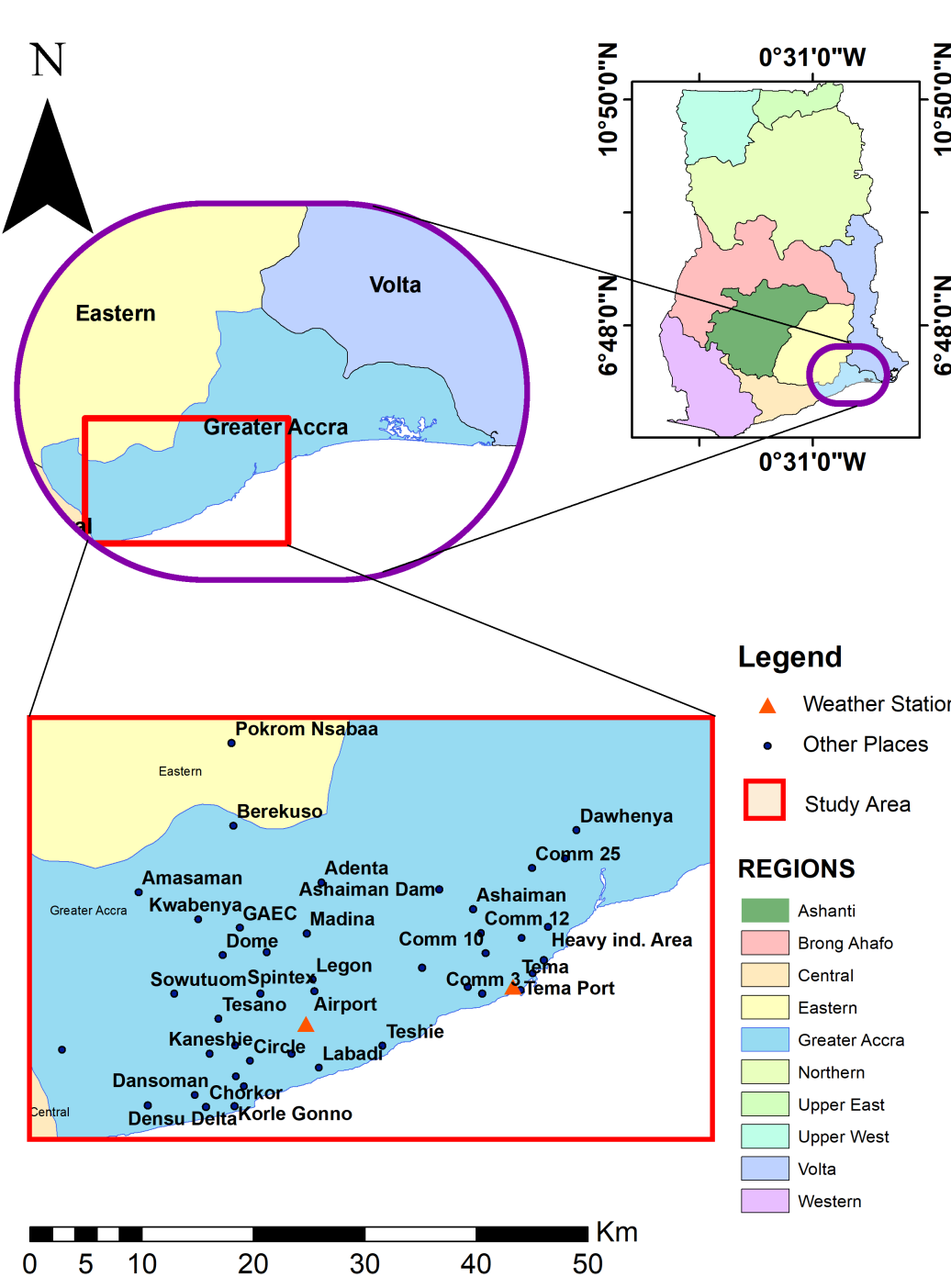


Figure 1: Map of the study area

The objectives of this research is to:

1. assess seasonal variation in meteorological parameters.
2. obtain air quality index (AQI) from PM_{2.5} concentration and assess seasonal variations in the pollutant and AQI.
3. determine the relationship between meteorological parameters and PM_{2.5}.

ANALYSIS

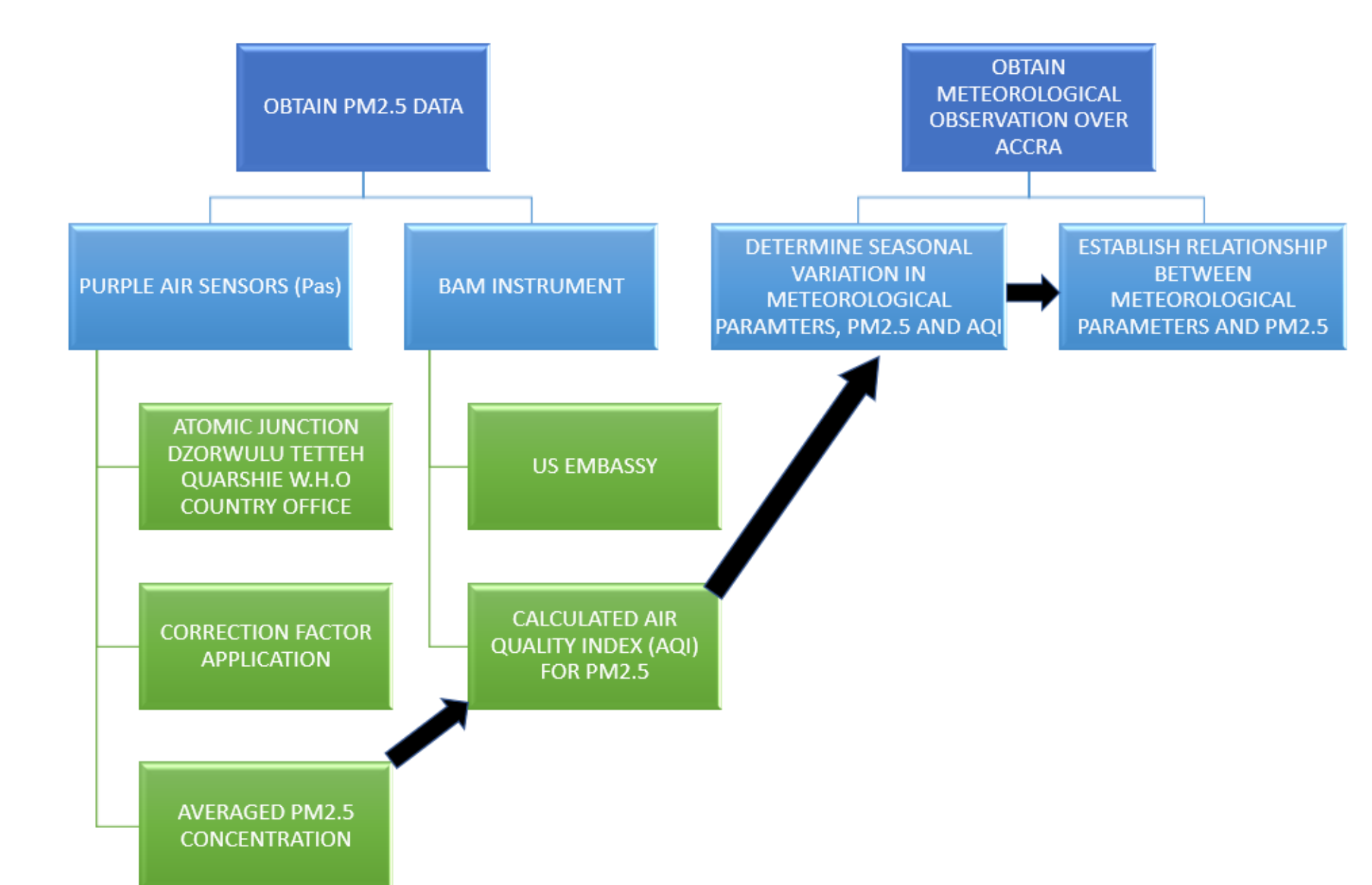


Figure 2: Flow chart of the analysis

RESULTS 1

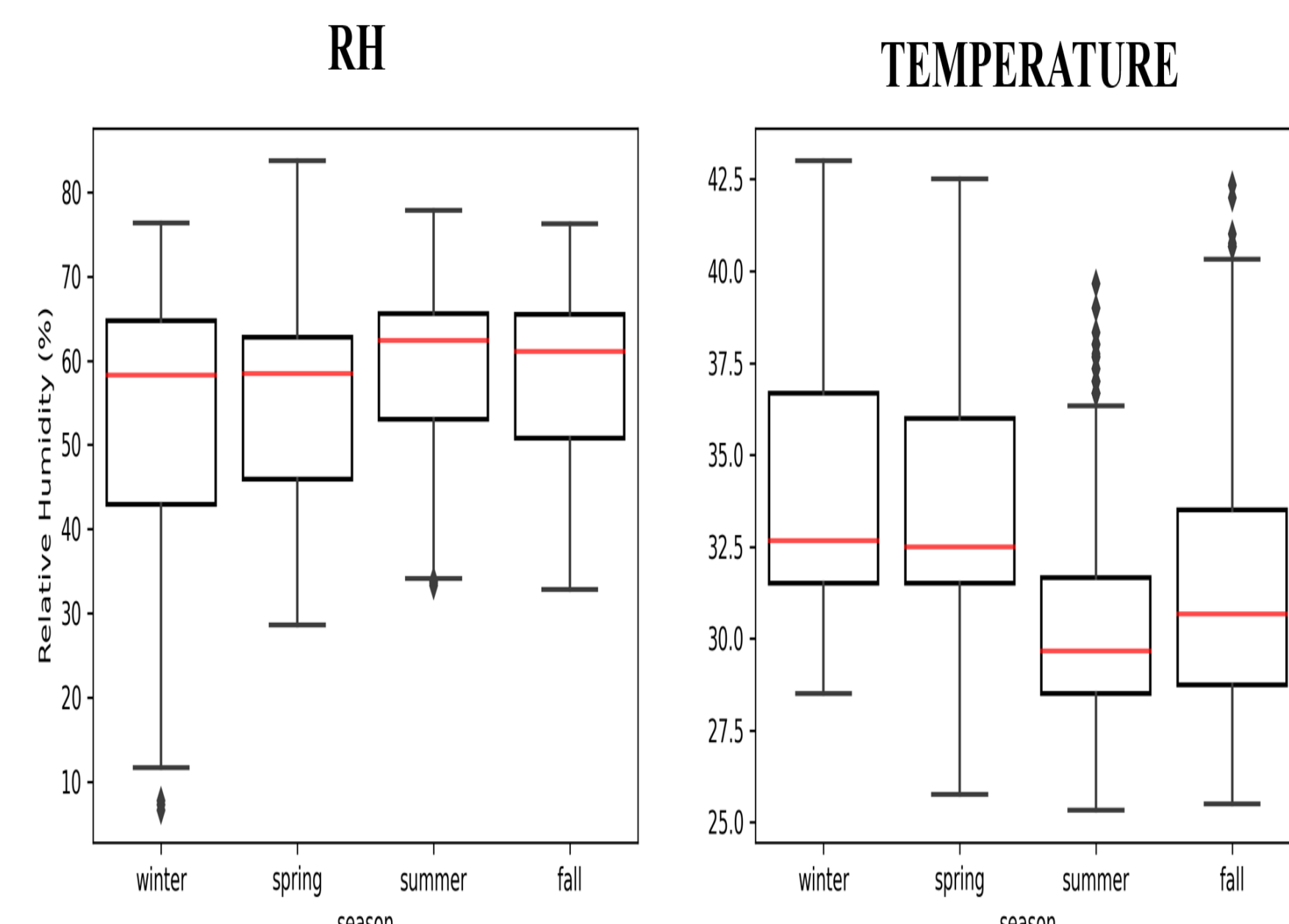


Figure 3: Seasonal variation in Temperature(a) and Relative humidity(b)

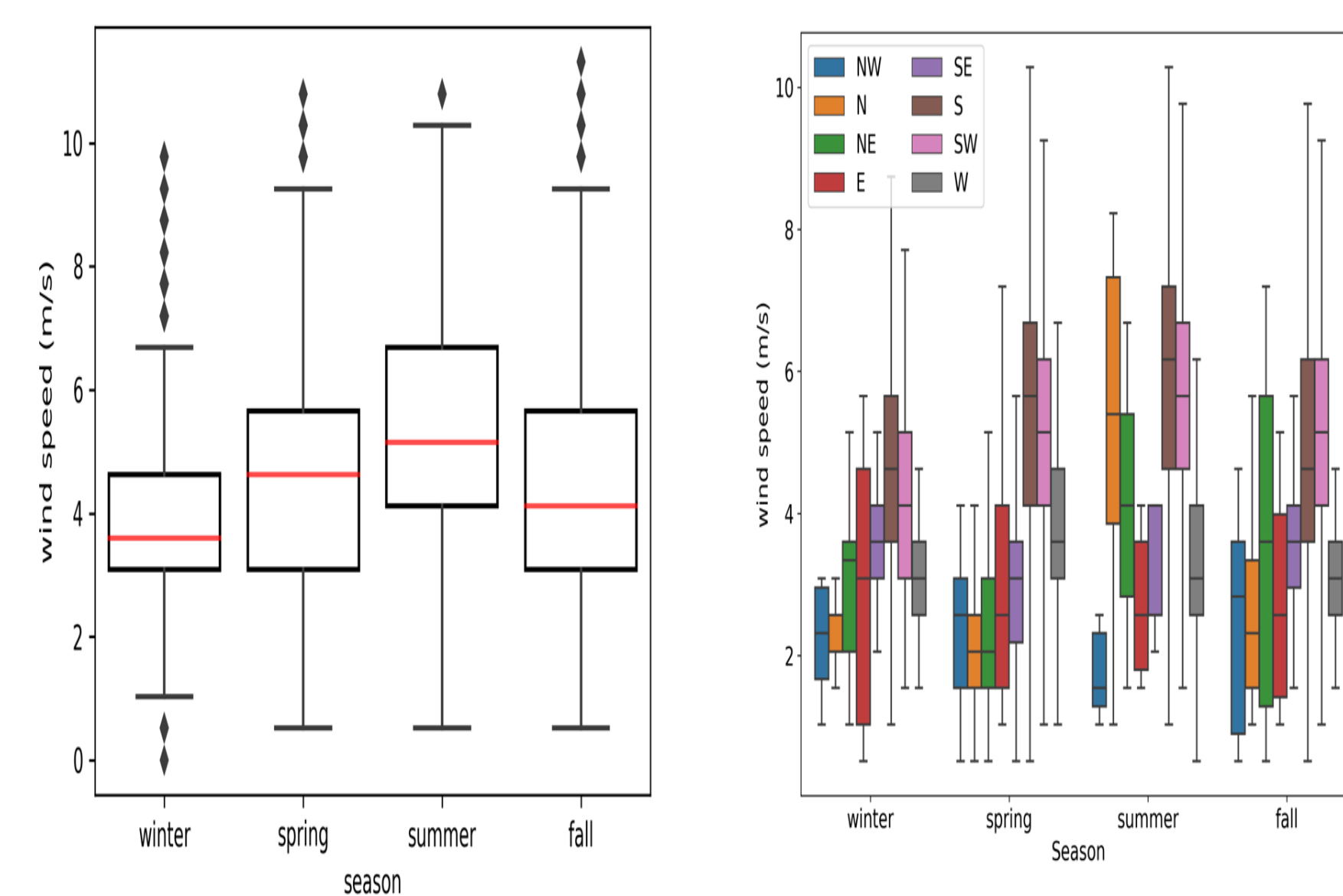


Figure 4: Seasonal variation in wind speed(a) and direction(b)

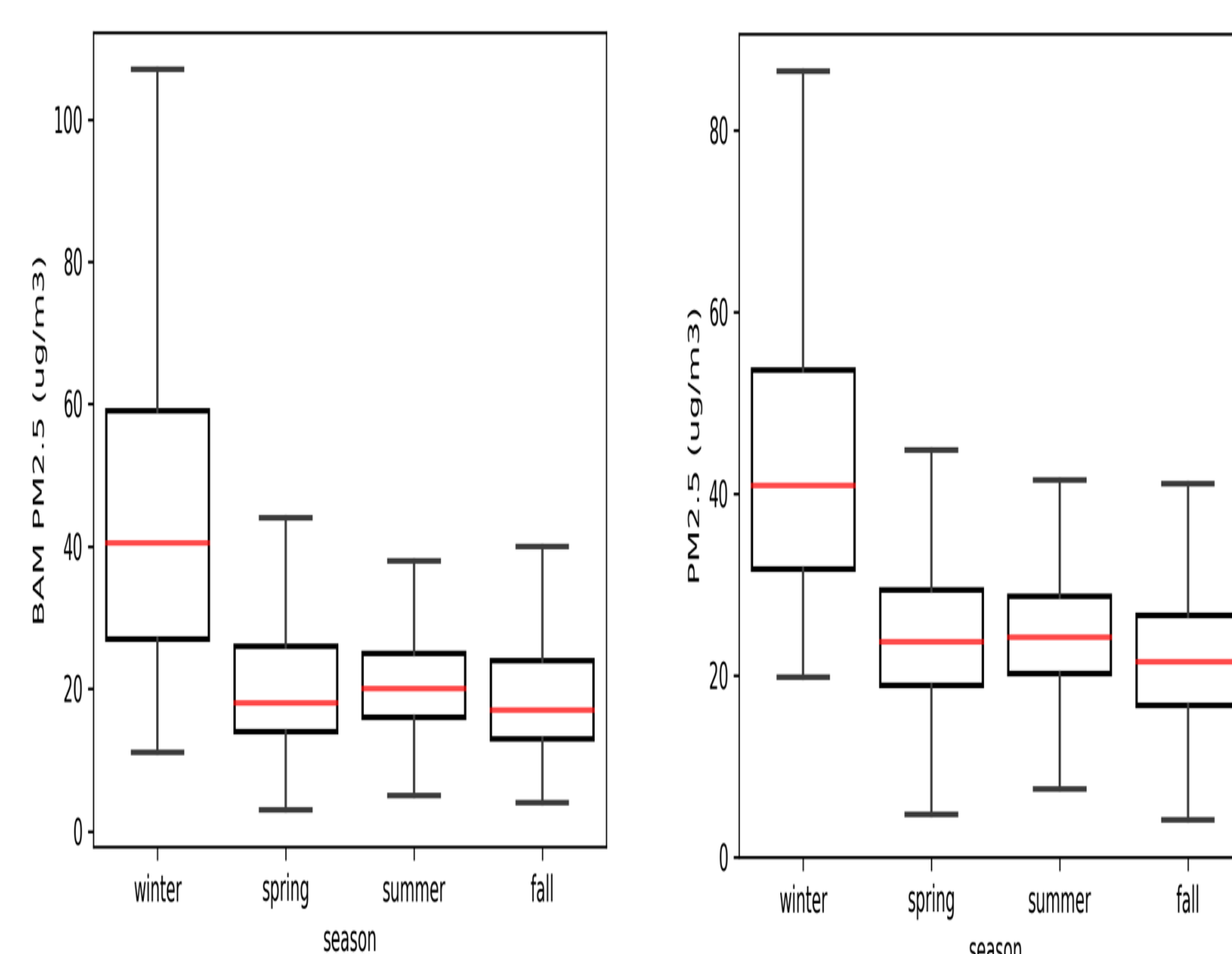


Figure 5: Seasonal variation in PM2.5 for Purple air(a) and BAM(b)

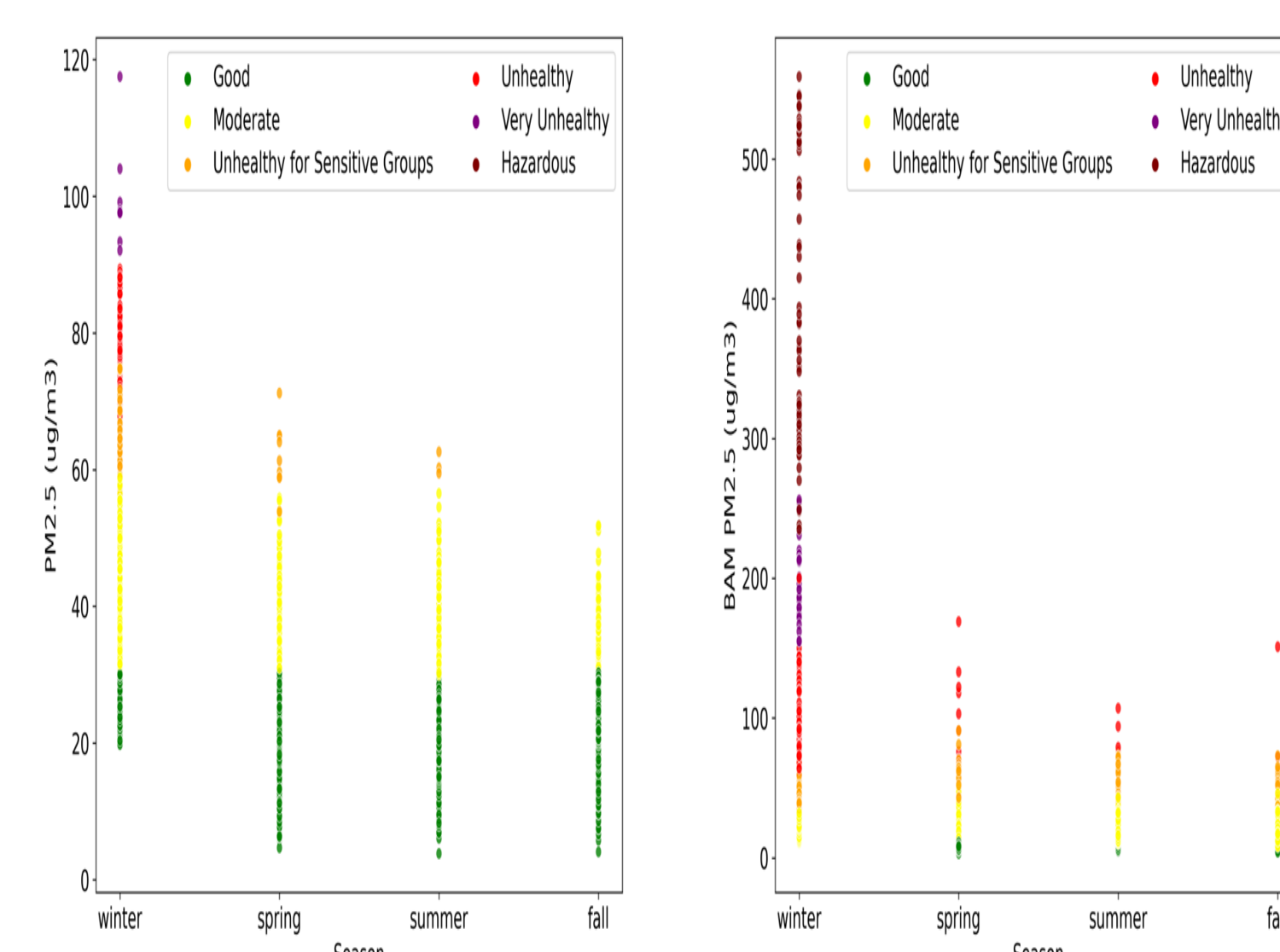


Figure 6: Seasonal variation in AQI for Purple air(a) and BAM(b)

RESULTS 2

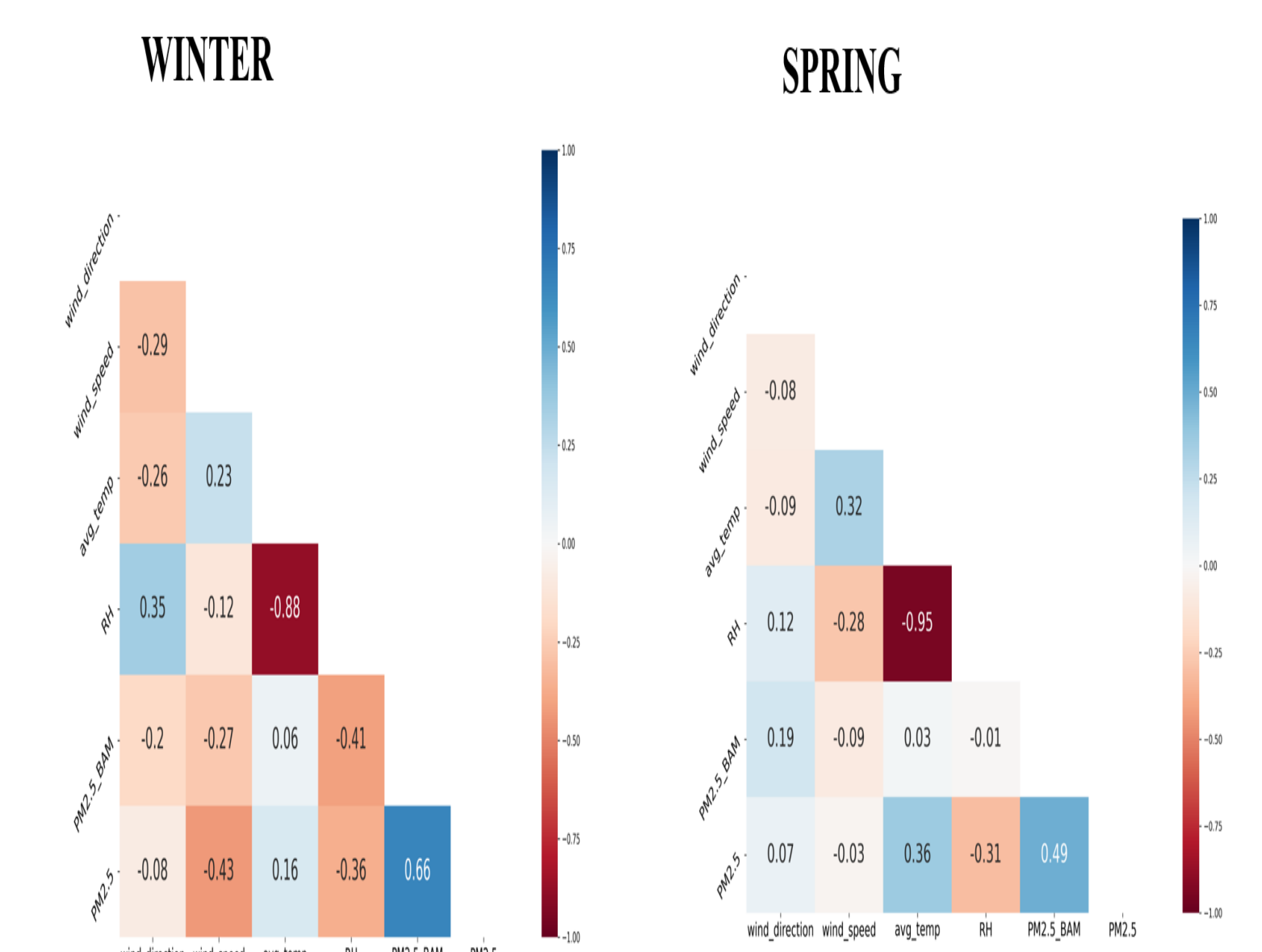


Figure 7: Correlation between meteorological parameters and PM_{2.5} in winter(a) and spring(b)

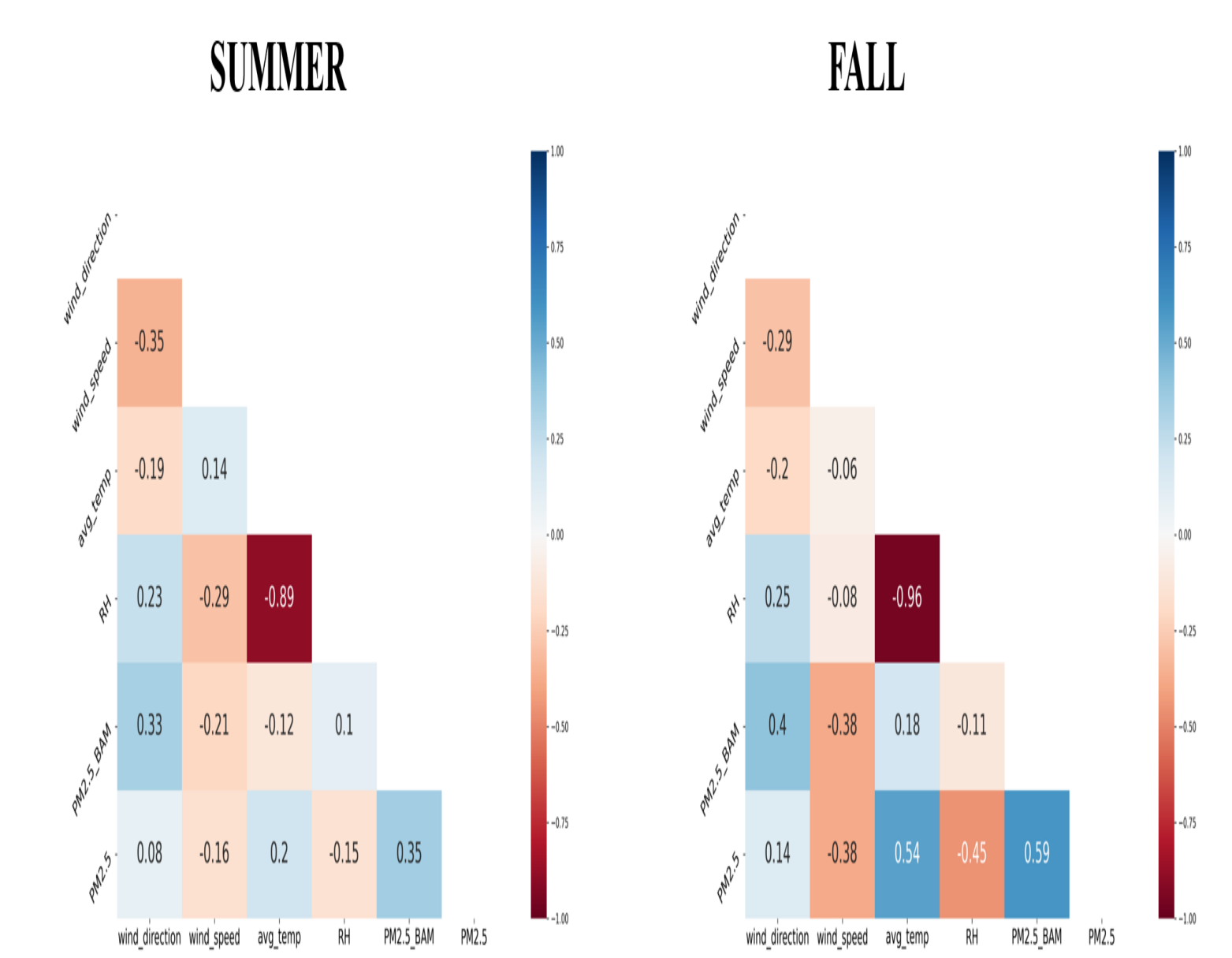


Figure 8: Correlation between meteorological parameters and PM_{2.5} in summer(a) and fall(b)

DISCUSSION

- Seasonality was observed in meteorological parameters, PM_{2.5} and AQI. PM_{2.5} concentrations were higher in winter with severely poor air quality. This corresponds with relatively higher temperatures and lower relative humidity and calm winds.
- Generally PM_{2.5} correlated positively with temperature and negatively with wind speed and relative humidity with weak and seasonal correlation variations.
- Poor air quality dominates during the winter period due to harmattan mostly associated with dusty calm and warm North-easterly winds with dry conditions.
- The findings suggests prevailing weather conditions greatly modulates air quality in Accra aside the anthropogenic activities and emissions.

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Email/Phone: danielmw@ldeo.columbia.edu/+1 (845)365-8194 **Email/Phone:** vikowusu@gmail.com / +233(0)501650744

REFERENCES

WHO (2016). Ambient air pollution: A global assessment of exposure and burden of disease.