



# Effect of Road Space Rationing Policy on PM Characteristics: A case study over Delhi



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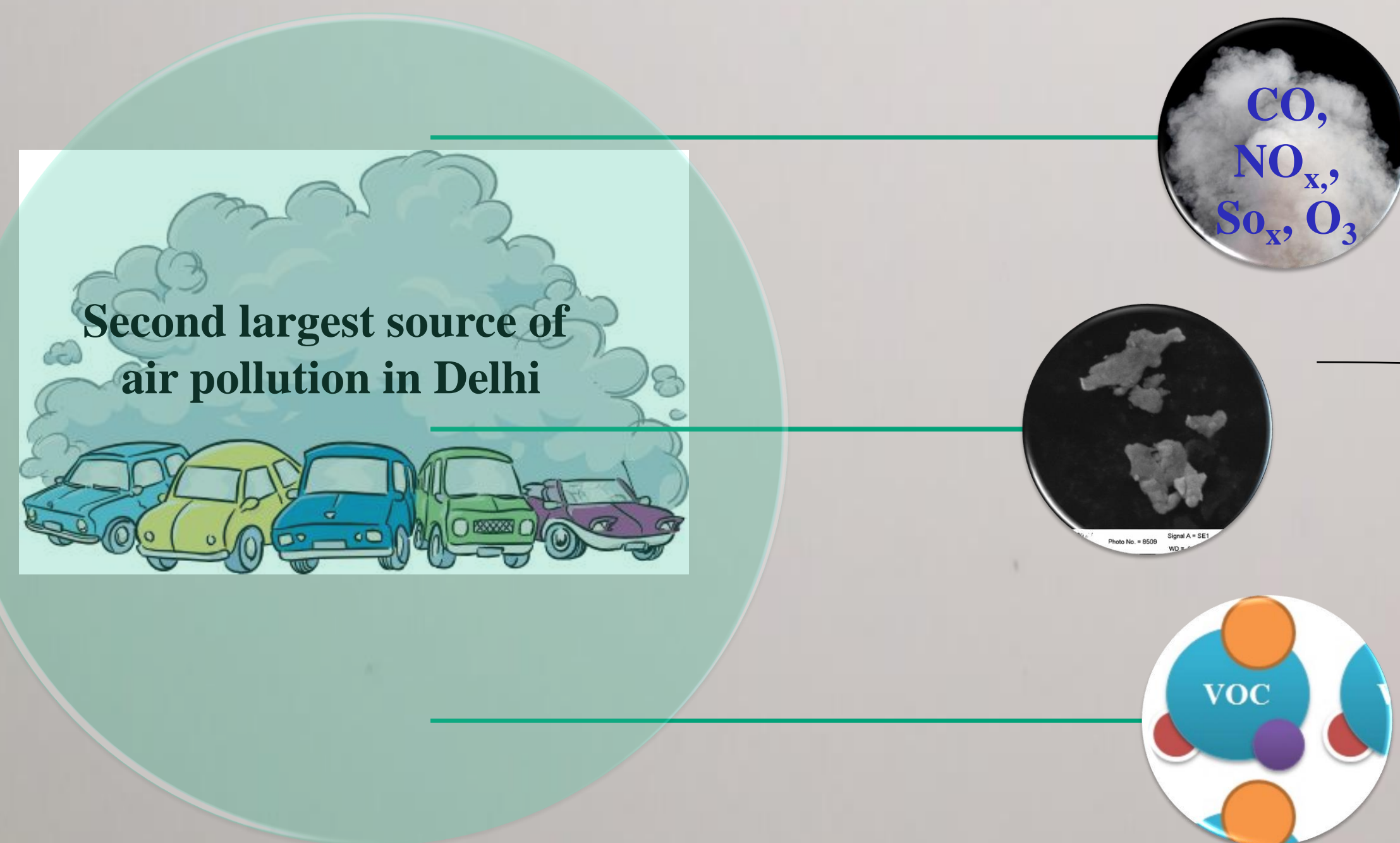
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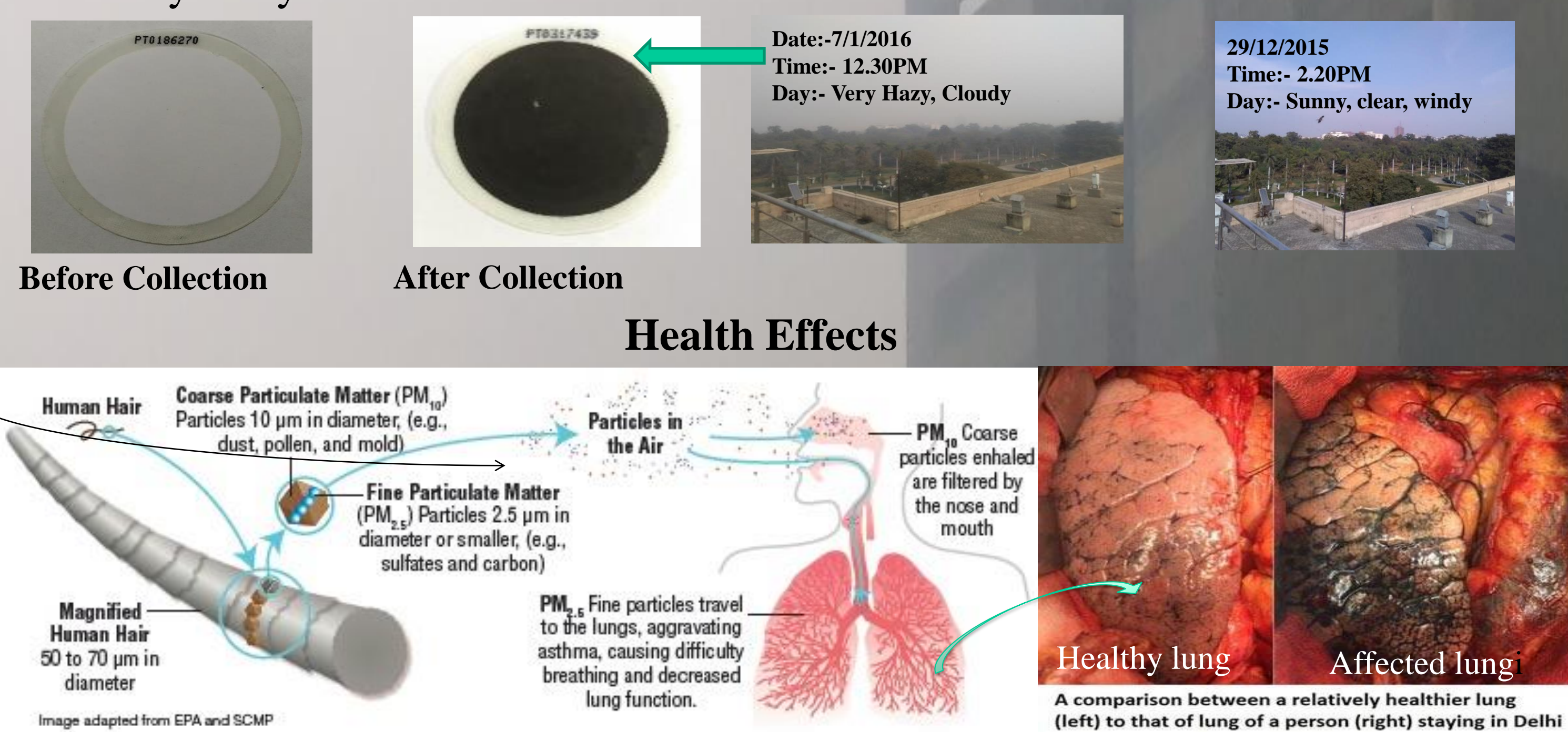
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## 1. Introduction

Air pollution has become the fourth highest risk factor for premature death globally. In India itself, air pollution causes nearly 1.59 million deaths per year (Lelieveld et al., 2015). Recently, Delhi has been listed among the most polluted cities of the world where the living beings are suffering from chronic respiratory and other immunological diseases. In view of aforesaid, Delhi government implemented vehicular emission control measures to ensure good air quality in the winter of 2016 by implementing the road rationing scheme which was termed as Odd-Even Policy (1-15<sup>th</sup> January, 2016). According to the scheme, the odd numbered private cars were allowed on the road on odd days only and vice versa.



Once these particles enter in the atmosphere they can enter in our respiratory system and can penetrate deep into the lungs



## 2. Methodology

To investigate the effects of this policy implementation on the composition and concentration of particulate pollution, we carried out synchronous measurements at CSIR-NPL by using fine particulate sampler (for collecting PM<sub>2.5</sub>), aethalometer (for real time black carbon, BC measurement), temperature and humidity sensors. For better understanding the effects of this policy, the sampling period was divided into three categories; pre odd-even (1-31 Dec., 2015), during odd-even (1-15 Jan., 2016) and post odd-even (16-31 Jan., 2016) period.

## 3. Sampling site

- The sampling was carried out at National Physical Laboratory, New Delhi (28.6139° N, 77.2090° E), 227 AMSL.
- Our study was conducted in month of December and January of 2016
- Delhi comes in the Indo-Gangetic plain, it is listed as the most polluted city in the world.
- The region experiences cool winters in December and January which results in severely bad air quality in the region.



## 4. Results and Discussion

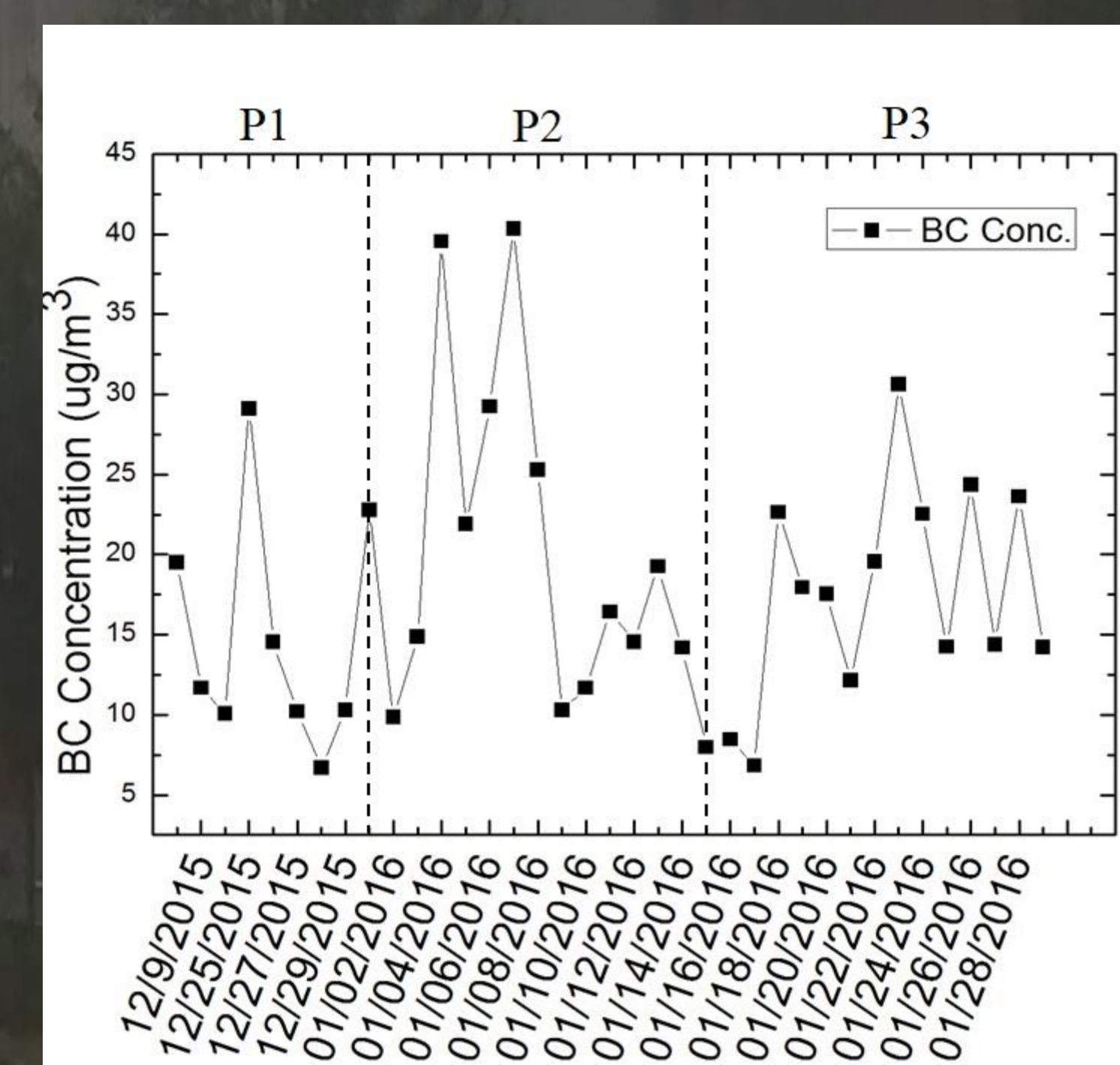
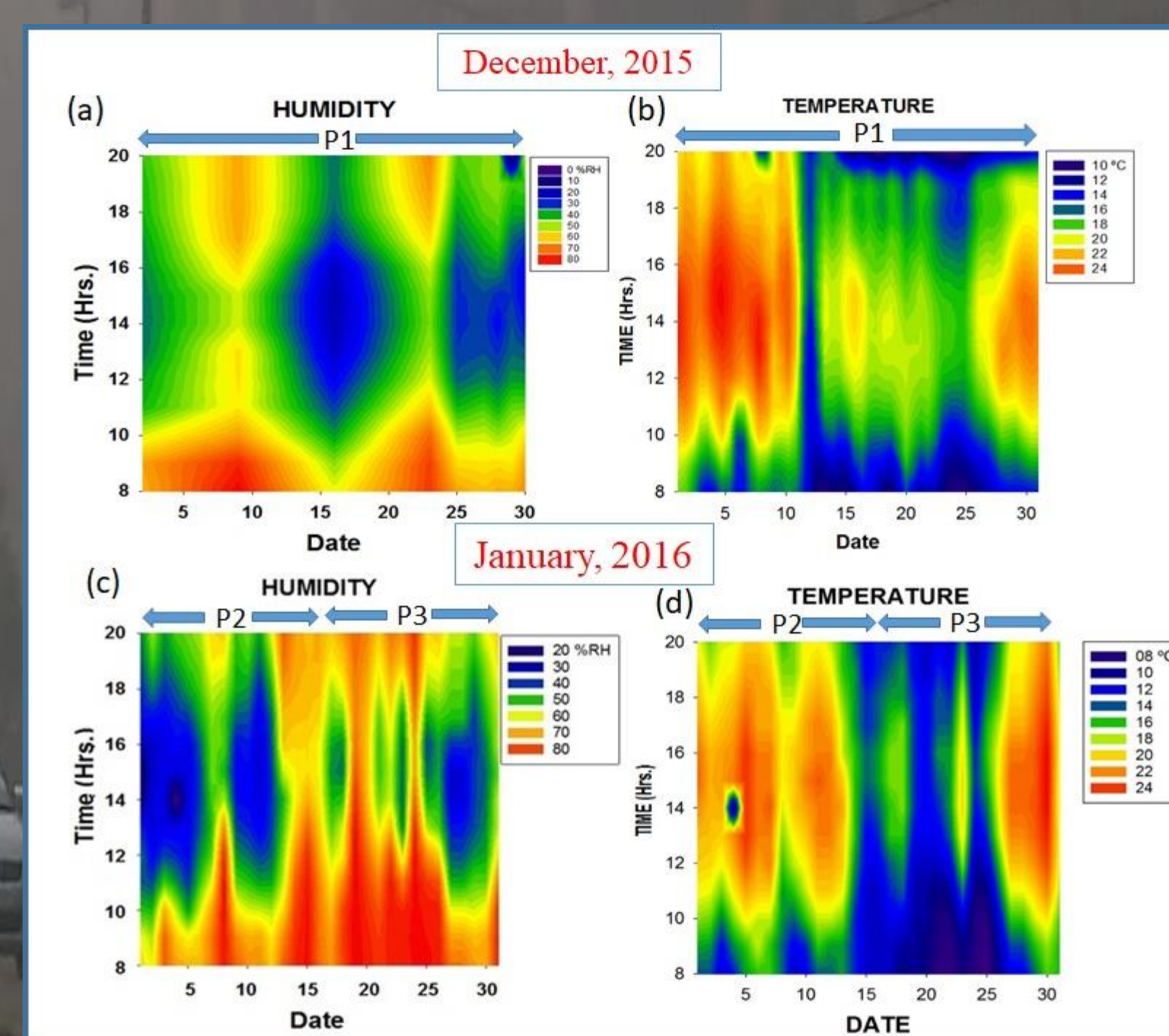
Our results showed the increase in PM<sub>2.5</sub> and BC concentration during the first week of odd-even followed by sharp decrease in the second week

During odd-even period, the high concentration in first week may be attributed to the pre suspended particles (in general the aerosol residence time ~ 7 days) while in second week, the relatively low concentration may be due the wash out effect (more humid days and a dense fog event on 8th January) and less vehicles on the roads

In the post odd-even period, both PM<sub>2.5</sub> and BC concentration was found to increase that could be due to decrease in the temperature and increase in the number of vehicles.

The increasing pattern of PM<sub>2.5</sub> mass concentration during first week of odd-even may be due to following reasons

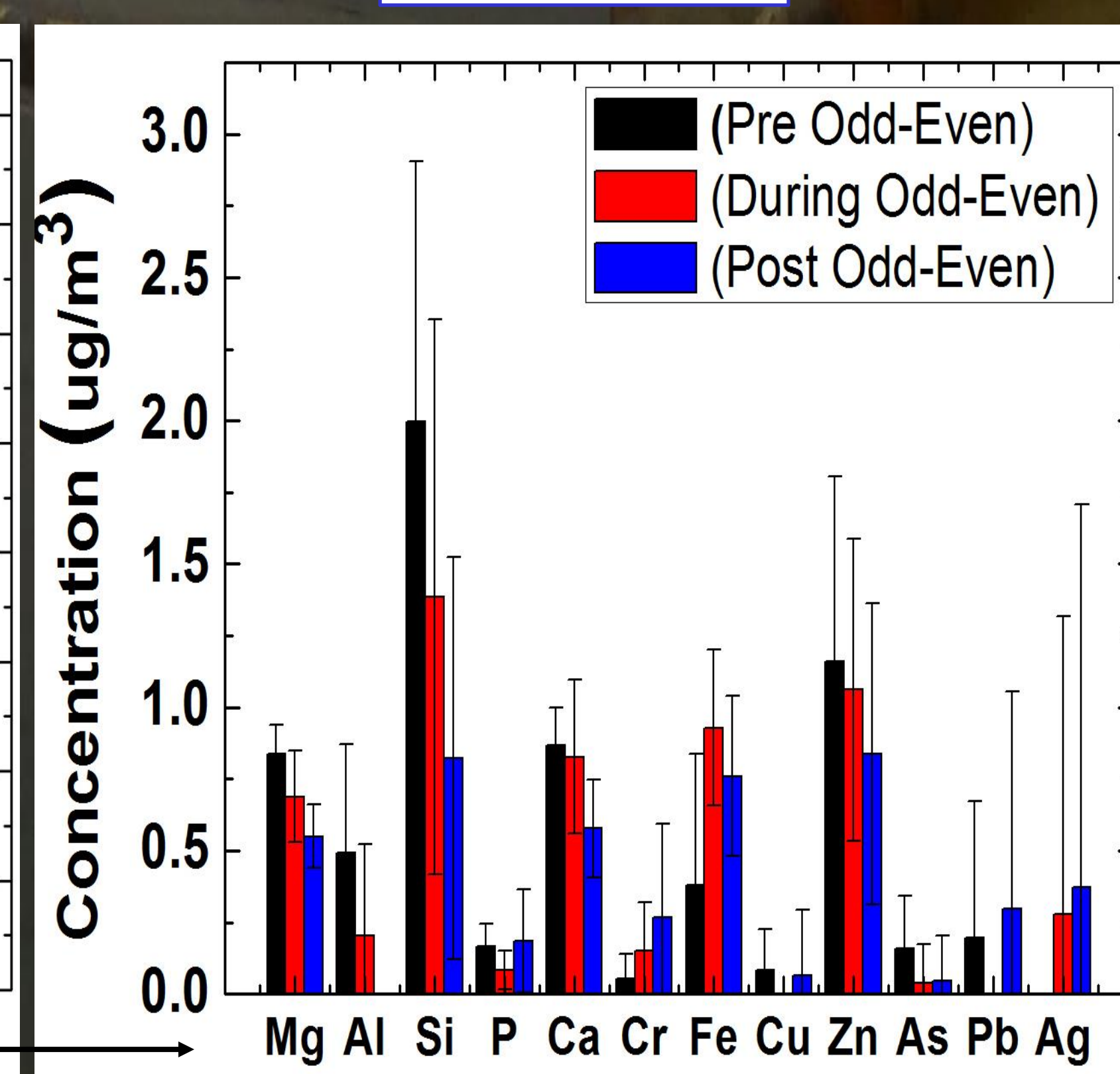
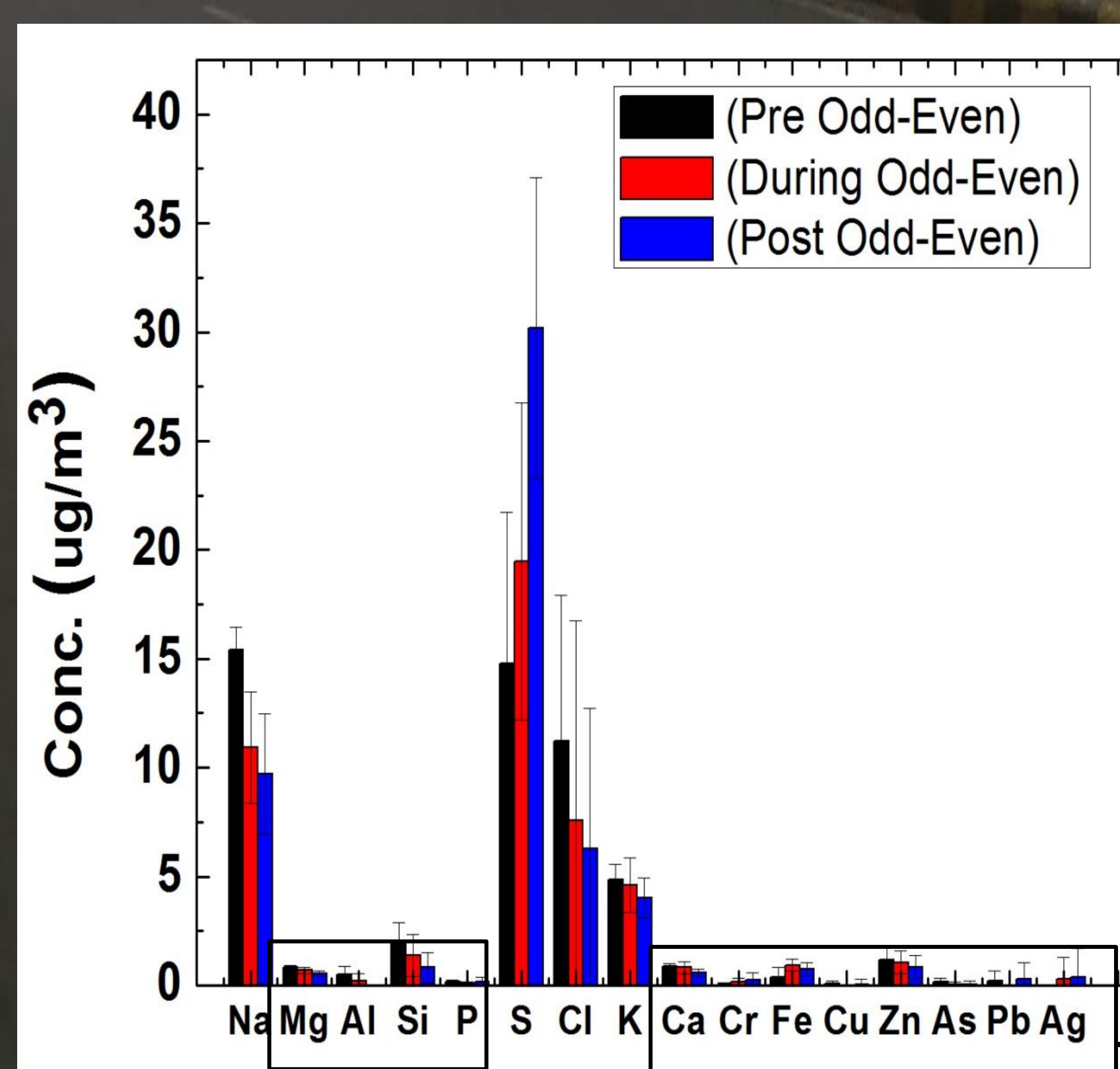
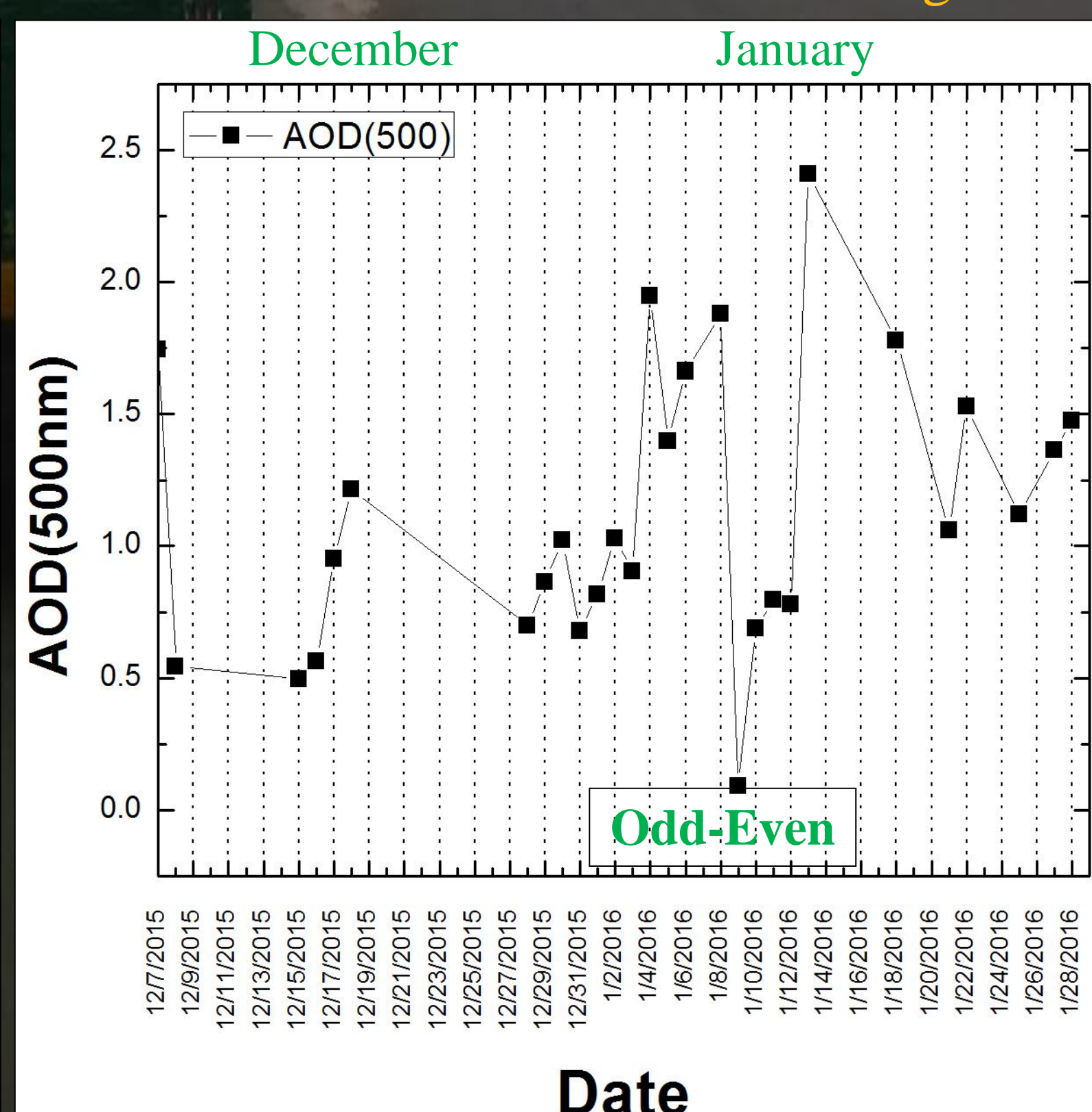
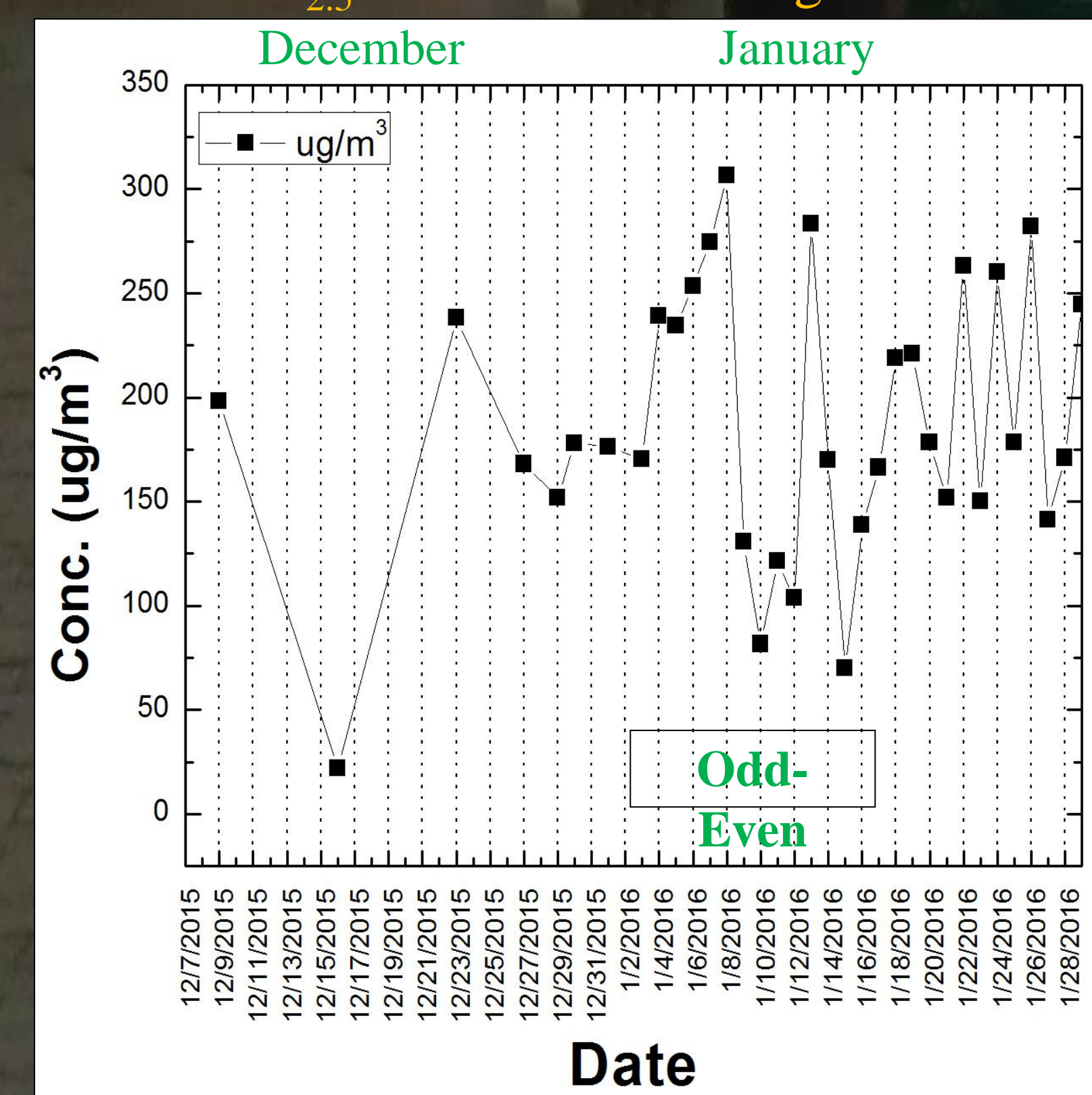
The variation in PM<sub>2.5</sub> mass concentration has been observed to be in good agreement with that of AOD (Aerosol Optical Depth) measurements using Microtop



PM<sub>2.5</sub> concentration in ug/m<sup>3</sup>

AOD measurement at 500nm wavelength

Trace Elements



## 5. Conclusions

## References

- Lelieveld, J., Evans, J.S., Fnais, M., Giannadaki, D., Pozzer, A. The contribution of outdoor air pollution sources to premature mortality on a global scale. Nature 525, 367–371., 2015.
- Dr. Naresh Trehan, India Today, 10 Dec 2015

## Acknowledgements

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The fate of air pollution depends on the cumulative effect of various parameters like meteorological conditions (temperature, humidity, wind speed and inversion conditions) and emissions from various sources. During odd-even period, a decline in PM<sub>2.5</sub> and BC concentration was observed in the second week but the most prominent factor behind this decline seems to be the meteorological conditions not the odd-even policy.