

Size-Resolved Aerosols Concentration during Extreme Events over a site in NorthWestern India

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Introduction

Aerosols play an important role in the atmospheric system of our planet. They have a relevant impact on the Earth's radiation budget by direct scattering/absorption of sunlight and by changing cloud properties. Thus they play a major role in the climate system. Aerosol study is challenging due to the complexity of their physical/chemical transformations and the uncertainties in sources/sinks. Thus a long term in-situ dataset is important on regional bases than global average basis.

The aerosol number concentrations (ANC) and size distributions over Jaipur in Northwestern India is studied to identify the potential regional sources. The study investigates the effect of different sources during two special events which are contradictory in nature. One is dust storm (DS) while the other one is Diwali (DW) which is celebrated during winter season in India.

Observational Analysis

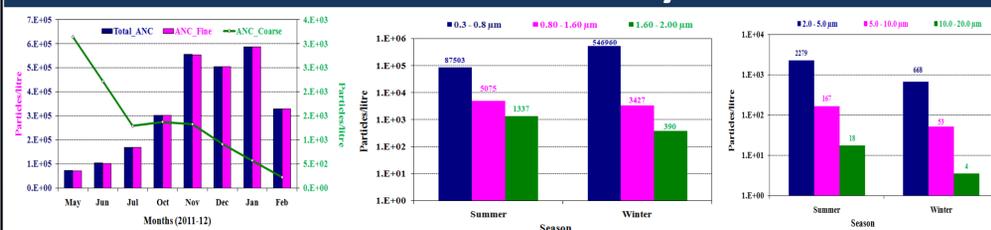


Figure: The size segregated aerosol number concentration during summer and winter seasons

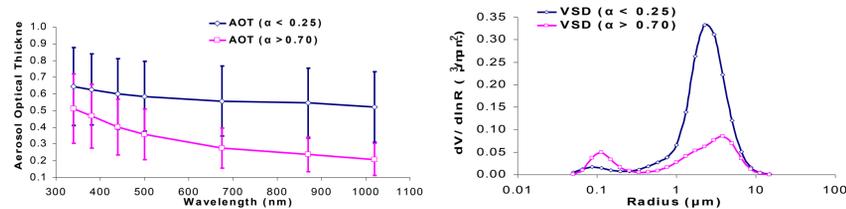


Figure: Diurnal (24 h) variation in fine and coarse particle during (a) dust storm. The observed meteorological parameters (b) during dust storm

We have separated the background aerosol loading (non-dust) conditions from the typical dusty conditions over Jaipur by dividing the AOT retrievals into two groups of low and high A.E. (α) values for AOT and size distribution. Relatively small change in AOT values are observed with a declining slope at increasing wavelengths i.e. $AOT_{340nm}=0.65$ to $AOT_{1020nm}=0.52$ in greater dust loading conditions ($\alpha < 0.25$) while low AOT (< 0.3) values are observed for $\alpha > 0.7$ with a declining steep slope at increasing wavelengths in background aerosol SSA spectra

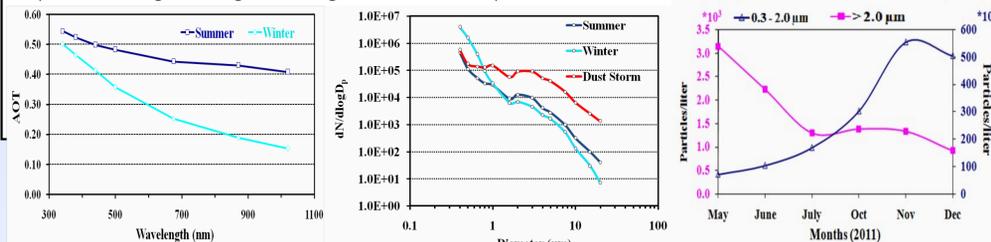
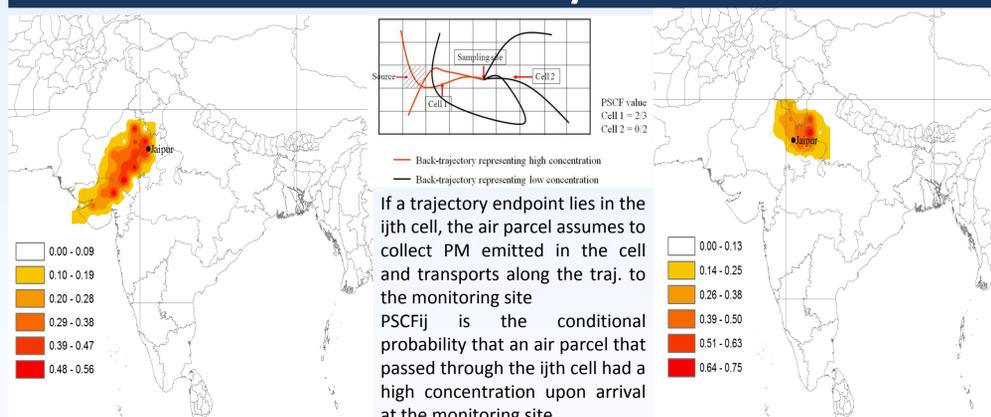


Figure: Diurnal (24 h) variation in fine and coarse particle during (a) Diwali and observed (b) meteorological parameters

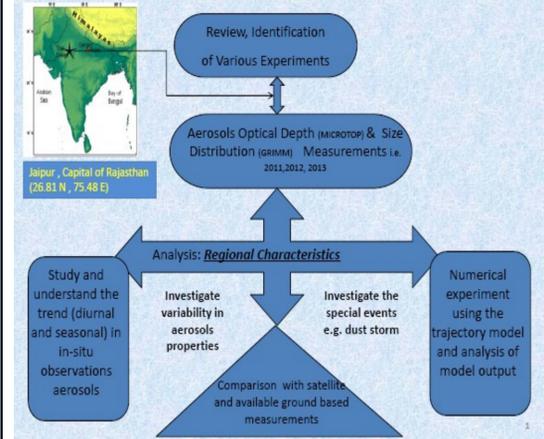
PSCF Analysis



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Work Elements



Jaipur is east side of the Thar Desert and south/west side of the IGP region.

There are lot of studies focussed over IGP region.

One of the most important focuses is the effect of dust aerosol on climate. Elevated heat pump hypothesis is one of them (when it is coated with anthropogenic/black carbon at IGP region).

Conclusions

- ❖ Coarse particle dominates in summer than winter. In winter the fine particle in 0.3 to 0.8 μm range is much higher than summer over Jaipur
- ❖ The feature of Bi-modal distribution is showing in volume size distribution and it is more distinct in winter than summer.
- ❖ Results of PSCF are analyzed to find the different source of regions. It has been found that coarse particle mainly comes from the adjacent desert area whereas the contributions of fine particle is mainly local.
- ❖ In DS, the ANC in coarse mode ($2 < \text{particle diameter} < 20 \mu m$) is significantly high while in DW, the ANC in fine mode ($0.3 < \text{particle diameter} < 2 \mu m$) exhibit higher concentration.
- ❖ During DS the fine and coarse mode particles increased 4.61 and 36.26 times while during DW it increased 3.83 and 0.95 times, respectively. The fine particles increases during diwali festival due to fire crackers burning.
- ❖ The fine particles are not dispersed due to the stable atmospheric condition during winter period in diwali.

References

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