

# Chemical Characterization of Particulate Matter in New Delhi, India

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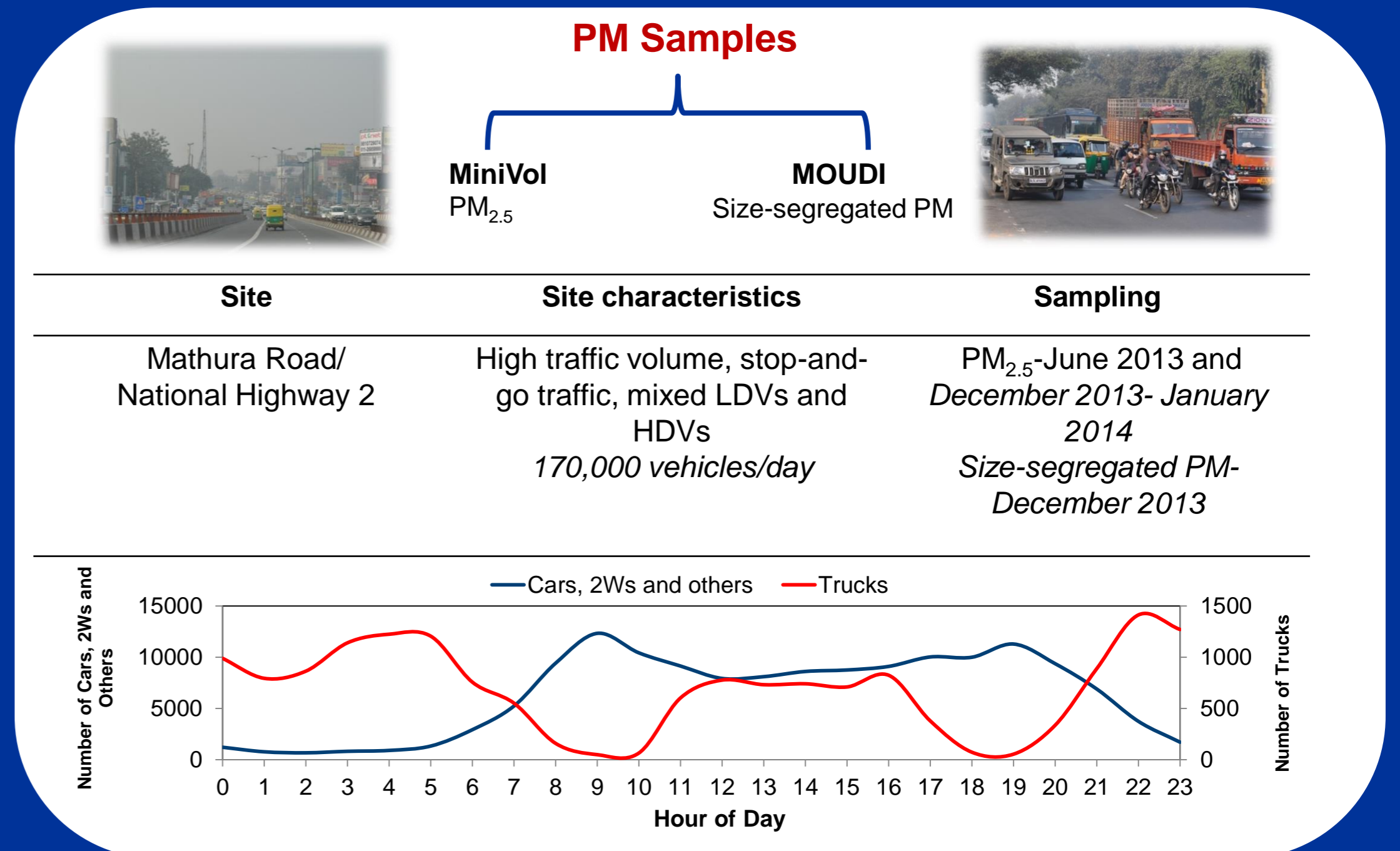
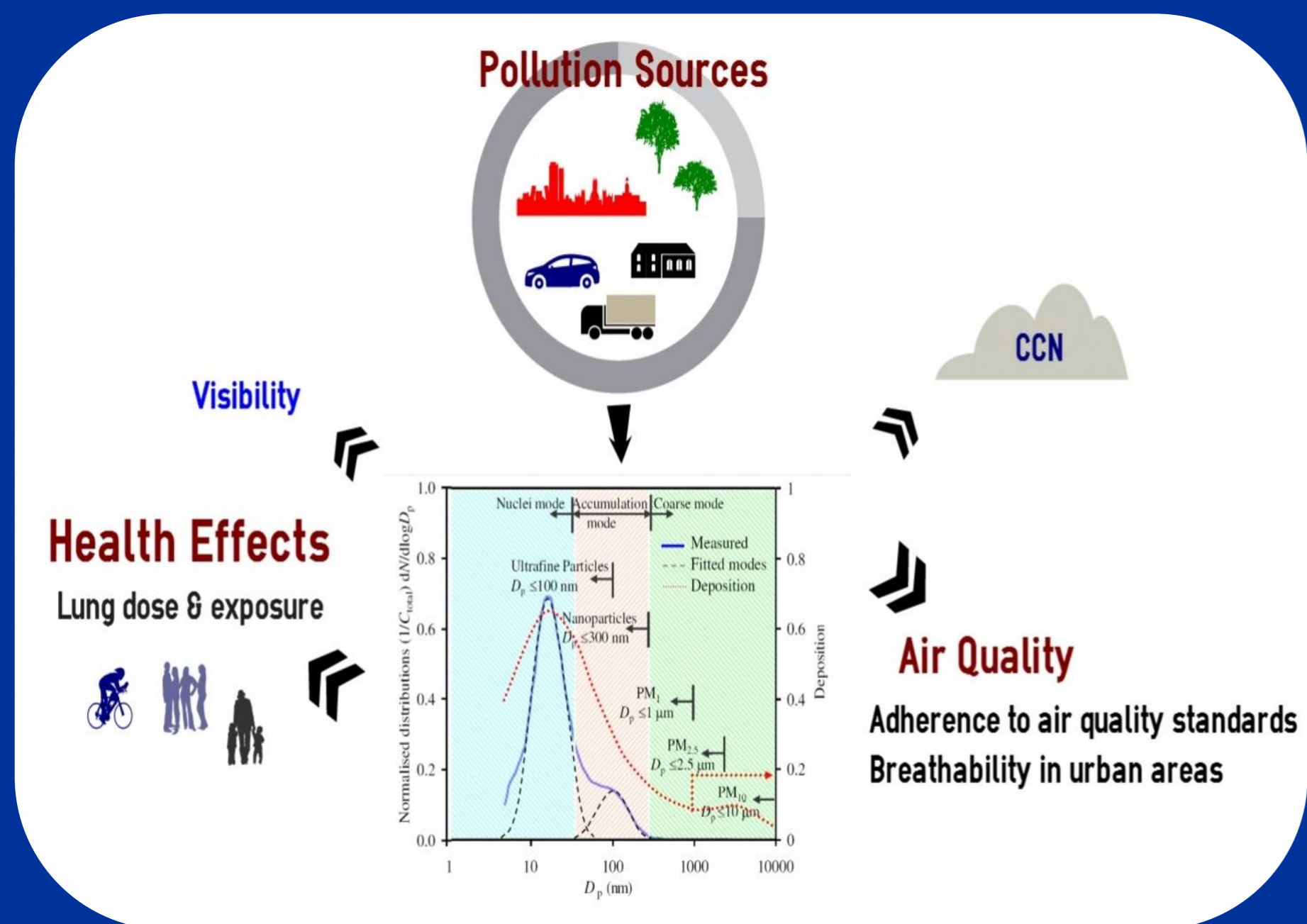
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## Objective: To characterize PM composition and infer sources at an air pollution hotspot in New Delhi

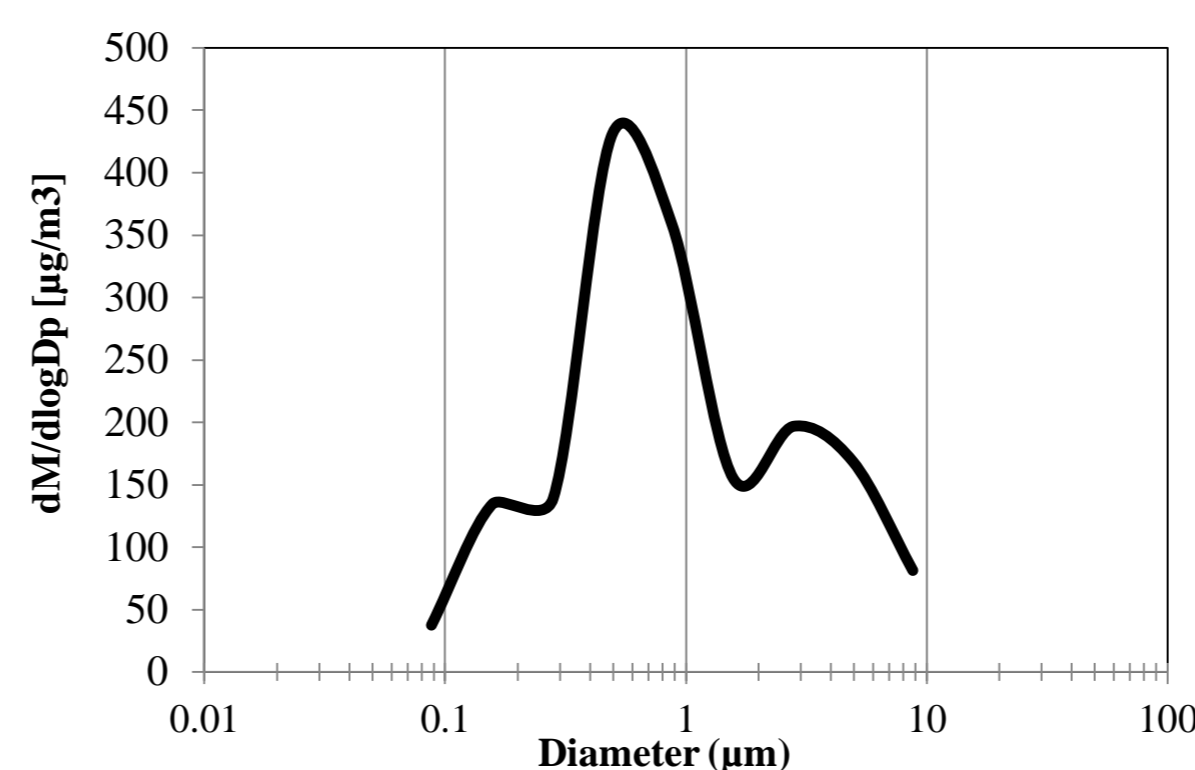


### PM characteristics

12h concentrations higher than the NAAQS (60 $\mu\text{g}/\text{m}^3$ ) observed on several days in summer and all data in winter

Summer (mean  $\pm$  sd) - **58.2  $\pm$  35.0**

Winter (mean  $\pm$  sd) - **276.9  $\pm$  99.9**



### Mass size distribution

PM- Trimodal with two peaks in accumulation mode (0.15  $\mu\text{m}$  and 0.55  $\mu\text{m}$ ) and one peak in coarse mode ( $\sim$ 3  $\mu\text{m}$ )

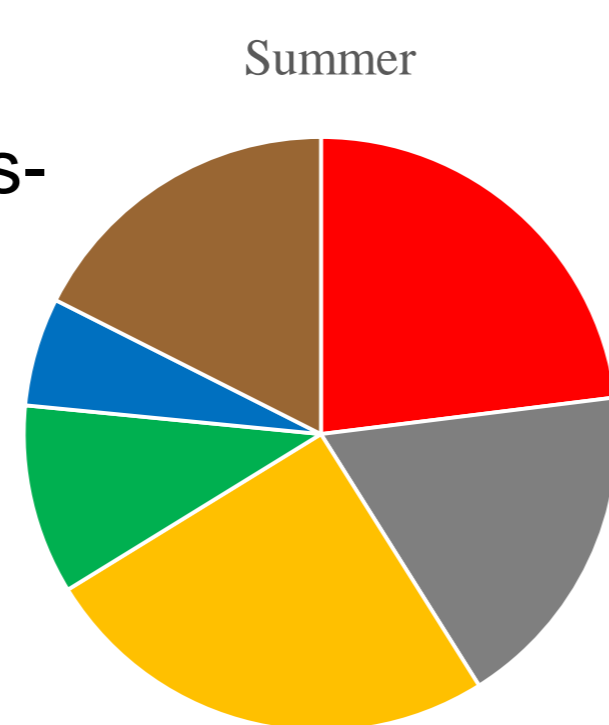
3/4<sup>th</sup> of PM mass in fine range

For elements, unimodal [Al, Cu]/ bimodal [S] and multimodal [Sb] distributions observed

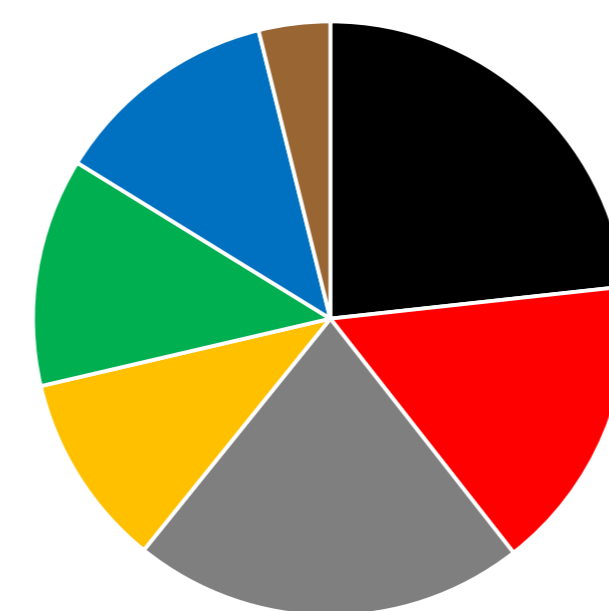
### Mass Closure

Sources inferred using following tracers-

- **Traffic-** Elemental Carbon
- **Biomass-** Levoglucosan
- **Crustal material-** Al, Si, Fe, Ca, Ti
- **Secondary inorganic aerosol-** Molar ratios
- **Other OM** - Organic Carbon



Winter



- Woodsmoke
- Traffic OM
- Other OM
- (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>
- (NH<sub>4</sub>)NO<sub>3</sub>
- (NH<sub>4</sub>)Cl
- Crustal Material

### Key contributors

- **Organic matter (OM)** was the highest contributor in summer and winter
- Higher contribution from **sulphate, crustal material** in summer and **nitrate** in winter
- **Traffic** contributed 16% in winter and 23% in summer

### Conclusions

- Concentrations in winter  $\gg$  summer, especially for combustion-related species
- High contribution from biomass burning in winter, crustal dust in summer
- High enrichment for elements such as Pb, Zn, Cd, Ti, Sb, Cu



- Traffic/industry/crustal material- potential sources
- Size distributions are characteristic of winter season
- Droplet mode observed for several elements, and expected to be associated with hygroscopic growth

### What's next

- Receptor modelling using Indian and other source profiles
- Characterization of source emissions

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