

# Multi-Year Variation of NR-PM<sub>1</sub> Particles at a High-Altitude Site of Western Ghats of India

Sonal Kumari

Indian Institute of Tropical Meteorology, Pune, India

## Author list (excluding presenting author)

G. Pandithurai, Subrata Mukherjee, Sachin Patil, M.Y. Aslam, Rohit Patil

## Abstract

The study presents the first long-term online measurement of non-refractory submicron particulate matter with aerodynamic diameter less than 1  $\mu\text{m}$  (NR-PM<sub>1</sub>) at a high-altitude site in the Western Ghats of India. The measurements were carried out using an Aerosol Chemical Speciation Monitor (ACSM) from August 2015 to May 2020. The mean NR-PM<sub>1</sub> concentration observed during the study period was  $9.5 \pm 8.5 \mu\text{g}/\text{m}^3$ , dominated by organic aerosols (OA, 57%) and followed by sulphate (SO<sub>4</sub>, 25%), ammonium (NH<sub>4</sub>, 10.5%), nitrate (NO<sub>3</sub>, 6%), and chloride (Cl, 1%). Source apportionment of OA was carried out using Positive Matrix Factorization (PMF). Four sources were identified in summer, post-monsoon and winter seasons: hydrocarbon-like OA (HOA), biomass burning OA (BBOA) and two oxygenated OA (OOA). OOA dominated OA composition, in summer (56.7%), monsoon (39.7%) and post-monsoon (67.1%) seasons while BBOA in winter season (41%) due to local biomass burning and long-range transport of crop-residue fire emission in winter. Large seasonal variations of NR-PM<sub>1</sub> concentrations were observed, with highest concentration observed during winter followed by post-monsoon, summer and monsoon seasons. Seasonal mass fraction of NR-PM<sub>1</sub> as a function of NR-PM<sub>1</sub> mass concentration showed increased contribution of SO<sub>4</sub> with mass concentration in winter, post-monsoon and monsoon seasons. Comparison of mass concentration of NR-PM<sub>1</sub> and its species during March-May 2016-2018 (lockdown period) with same time period in 2020 showed similar NR-PM<sub>1</sub> mass concentration however, a statistically significant enhancement in OA mass concentration in 2020 was found.

## Early Career Scientist

NO, I am not an early career scientist.

## IGAC Activities

MAP-AQ: Monitoring, Analysis and Prediction of Air Quality

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