Water-Soluble Fraction of Atmospheric Aerosols in the Pristine High-Altitude Western Ghats region: Chemical Composition, Organic Light Absorption and Source Dynamics

Aswini A R

National Centre for Earth Science Studies (NCESS), Thiruvananthapuram, India, India

Author list (excluding presenting author)

Sumesh R. K, Resmi E. A

Abstract

Continental outflows from Southeast Asia and East Asia dominate the widespread dispersal of aerosols and trace gases over southern peninsular India during north-east monsoon period. The influence of this anthropogenic outflow is very important to sensitive ecosystems; particularly the ones that has significant roles in regulating regional climate and rainfall patterns. Understanding aerosol-cloud-precipitation interactions from these pristine mountainous regions is therefore crucial. To study the composition of atmospheric aerosols and document signatures of anthropogenic influence over background atmospheric environments, aerosol samples were collected from a high-altitude, relatively clean site situated in the southern Western Ghats of India. PM_{10} aerosol samples were collected from the high-altitude cloud physics observatory (HACPO; 1820 m above MSL) located on the windward side of southern Western Ghats in, Munnar, Kerala, India. The collected samples were subjected to offline chemical analyses to estimate the different components of water-soluble fraction of aerosols; inorganic ions, water-soluble organic carbon (WSOC) and the light absorbing brown carbon. Results show that water-soluble fraction of aerosols accounted for an average of 62% of the PM_{10} aerosol mass with anthropogenic ions contributing 47%. The dominant chemical species among the water-soluble fraction contributing to the aerosol mass was found to be $SO4^{2-}$, NH_4^+ and Water-soluble Organic Carbon (WSOC). Source apportionment using PMF analysis identified and quantified the factors contributing to the observed aerosol composition. The findings from this study underscores the significant presence of anthropogenic aerosols over the pristine region of Western Ghats, comparable to that observed over other regions in peninsular India during continental outflow period. Understanding the characteristics of these transported aerosols in this tropical hill station, which experiences relatively pristine atmospheric background conditions, can provide valuable insights into their impact on hygroscopic growth and CCN activity within the existing aerosol system.

Early Career Scientist

YES, I am an early career scientist.

IGAC Activities

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

IGAC Regional Working Groups

MANGO: Monsoon Asia and Oceania Networking Group