# Field Evidence of Brown Carbon Light Absorption Characteristics Dependence on the pH

Tarun Gupta

Department of Civil Engineering, IIT Kanpur, India

## Author list (excluding presenting author)

Prerna Kandpal

## Abstract

Organic segment of light-absorbing aerosols called Brown Carbon (BrC) has extremely uncertain but significant effects on atmospheric warming and the climate system. The uncertainty associated with this aerosol fraction due to its non-static optical properties provides a significant challenge in the measurement of the perturbation caused by them in the Earth's radiative budget. This variability is due to the continuous formation of Secondary BrC and decay of existing BrC influenced by various physicochemical and metrological factors in the atmosphere. Aerosol acidity affects the optical properties of BrC by influencing its atmospheric chemistry of formation and decay. The objective of this research is to investigate how the liquid water content of aerosols and pH affect their optical properties, namely their absorption coefficient. For this task, aerosol particle samples collected from Jorhat, a representative sub-urban site in the less explored Eastern part of India during extreme winters have been utilized. Aerosol pH was determined using a thermodynamic model ISORROPIA II, yielding an average pH value of 3.30 ± 0.16 for the study duration. The study reported a linearly increasing trendline of absorption coefficient with increasing pH or decreasing aerosol acidity in the ambient atmosphere. A 3.96 $Mm^{-1}$ increase in absorption coefficient per 0.1 unit increase in pH, shows that aerosol pH is one of the key factors influencing BrC chemistry. Additionally, decreasing absorption with an increase in free H+ ion was observed. The results also showed an inverse relation of absorption coefficient with ALWC, which might be due to the formation of more absorptive nitrogenous compounds at lower ALWC, and hygroscopic growth at higher ALWC resulting in increased scattering at lower wavelength. The results conclude sensitivity of BrC chemistry towards aerosol acidity and liquid water content in the ambient atmosphere and its importance while evaluating BrC absorption.

## Early Career Scientist

NO, I am not an early career scientist.

## IGAC Activities

BBURNED: Biomass Burning Uncertainty: ReactioNs, Emissions and Dynamics, Allin-Wayra: Small Sensors for Atmospheric Science, ACAM: Atmospheric Chemistry and the Asian Monsoon

## IGAC Regional Working Groups

MANGO: Monsoon Asia and Oceania Networking Group