PUBLICATION DETAILS

Peer-reviewed journal publications

- **Rahman W.,** Beig G., Barman N., Hopke P.K., & Hoque R.R. Ambient ozone over mid-Brahmaputra Valley, India:effects of local emissions and atmospheric transport on the photostationary state, Environ Monit Assess. 193(12),1-17,2021.

Papers in conference proceedings

- **Rahman, W.,** Barman, N., & Hoque, R. R. Understanding characteristics of ambient ozone at a rural receptor site of mid-Brahmaputra Valley, Proceedings of the National Seminar on Climate Change and Society, ISBN: 978-93-84388-19-5, 84--91, 2017.

- Barman, N., **Rahman, W.,** Sudhakar, P. & Hoque, R. R. Elevated aerosols over North-east India: Observational evidences from satellite and ground based measurements, Proceedings of the National Seminar on Climate Change and Society, ISBN: 978-93-84388-19-5, 63--69, 2017.

Conference presentations

- **Rahman, W.,** Barman, N. & Hoque, R. R. Understanding characteristics of ambient ozone at a rural receptor site of mid- Brahmaputra valley. National Seminar on Climate Change and Society, Tezpur University, Tezpur, India, 2017.

- Barman, N., **Rahman, W.,** Sudhakar, P., & Hoque, R. R. Elevated aerosols over north-east India: Observational evidences from satellite and ground based measurements. National Seminar on Climate Change and Society, Tezpur University, Tezpur, India, 2017.

- **Rahman,W.,** & Hoque, R.R. Characteristics of ambient ozone over rural Tezpur. Cpep- 2019, Dept. of Environmental Science, Tezpur University.

- **Rahman W.,** Gogoi D., Ahmed S., Hussain S., Hoque R.R. Characteristics of ambient ozone at rural (Tezpur) site of eastern Himalayan region. INSCIGNIS 2019; Tezpur University, Tezpur .

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Ambient ozone over mid-Brahmaputra Valley, India: effects of local emissions and atmospheric transport on the photostationary state

Warisha Rahman · Gufran Beig · Nivedita Barman · Philip K. Hopke · Raza R. Hoque

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Abstract This study presents the characteristics of ground level atmospheric ozone (O_3) over the rural mid-Brahmaputra Valley region of the northeastern India. Ozone and oxides of nitrogen ($NO_x = NO + NO_2$) concentration data were obtained from continuous measurement of O_3 and NO_x housed at the MAPAN-AQM station at Tezpur University. The meteorological parameters were obtained from the same station. The diel, monthly, and seasonal variations of O_3 were studied. The O_3-NO_x photostationary state (*PS*) was carefully examined and it was found that the *net* O_3 concertation deviated substantially from the *PS* during the winter season. The deviation could be attributed to local biomass burning, biogenic VOC emission from forest and agriculture, and long-range transport of peroxyacyl nitrate (PAN). The long-range transport has been ascertained by examining the ventilation coefficients (VC), which correlated with the steep growth of *net* O_3 concentrations in the morning hours. The HYSPLIT air mass back trajectories were used in concentration-weighted trajectory (CWT) analyses of O_3 to assess the long-range regional transport of O_3 precursors, which positively influenced local O_3 concentrations.

Keywords Ambient O_3 - NO_x - Photostationary state · HYSPLIT · Concentration-weighted trajectories

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W. Rahman · N. Barman · R. R. Hoque (✉)
Department of Environmental Science, Tezpur University, Tezpur 784028, India
e-mail: rrh@tezu.ernet.in

G. Beig
Indian Institute of Tropical Meteorology, 411004 Pune, India

P. K. Hopke
Department of Public Health Sciences, University of Rochester Medical Center, Rochester, NY 14642, USA

P. K. Hopke
Center for Air Resources Engineering and Science, Clarkson University, Potsdam, NY 13699, USA

Introduction

Ground level atmospheric ozone (O_3) is a criteria air pollutant and a major component of photochemical smog. Its formation depends on the chemistry of the precursors, viz., oxides of nitrogen ($NO_x = NO_2 + NO$), volatile organic compounds (VOC), and related species like carbon monoxide (CO), and prevailing meteorological conditions like solar radiation, air temperature, and wind (e.g., Allu et al., 2020; Geddes et al., 2009; Haagen-Smit, 1952; Khalil et al., 2018; Leighton, 1961; Paoletti et al., 2014; Singh et al., 2018; Wahazek et al., 2018; Zhang et al., 2020). The VOC-NO_x-O_3

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Understanding characteristics of ambient ozone at a rural receptor site of mid-Brahmaputra Valley

Warisha Rahman*, Nivedita Barman, Raza Rafiqul Hoque
Department of Environmental Science, Tezpur University, Tezpur-784028
**Communicating author, email: wrahman@tezu.ernet.in*

Abstract

Ozone (O_3) and its precursors - the oxides of nitrogen (NOx= NO+NO_2) - and meteorological parameters are being monitored at the Ambient Air Quality Monitoring Station (AAQMS) under the collaborative MAPAN-Tezpur of IITM, Pune and Environmental Science Department, Tezpur University. In this work a dataset of two consecutive years (2013 – 2015) was taken for analysis to understand the variability of O_3, NOx and OX (calculated from the O3 and NOx data). The maximum concentration of O_3, NOx, NO_2, NO and OX for the year 2013-2014 was observed to be 75, 43, 34, 27 and 98 respectively, and 78, 41, 42.3, 19.4 and 98 respectively during 2014-2015. The seasonal and diurnal variations of O_3 and its precursors were also studied for two years. During the first year maximum O_3 concentration (O_{3max}) was seen during pre-monsoon season which could be due to increased vehicular pollution, anthropogenic biomass burning and high temperature and the minimum concentration O_3 (O_{3min})was observed during monsoon season. However, during the next following year O_{3max} was seen during winter and the O_{3min} during monsoon season. Meterological parameters like wind speed, relative humidity, temperatures and relationships were drawn with O_3 concentrations.

Key words: Ozone, NO_X, OX, anthropogenic biomass burning, vehicular pollution.

1. Introduction

Rising ozone (O_3) concentration in ground level atmosphere has led to concern as it has adverse effects on the environment, damaging crops as well as deteriorating human health [1-3].Ozone is ubiquitous in the atmosphere. It is central to tropospheric oxidation chemistry, yet harmful to human and ecosystem health [4].

Ozone is formed as secondary pollutant in the troposphere through series of chain reactions between its precursors i.e. nitrogen oxides and Volatile Organic Compounds (VOCs). Modeling studies have predicted significant economic losses attributable to crop damage by ozone in the next 20 years if ozone levels continue to increase at the same rate [5]. Ozone in the troposphere is also an important greenhouse gas contributing to global warming and climate change [6].

Ozone is also a precursor for formation of highly reactive hydroxyl radical and nitrate radical, which determines the chemical composition of the troposphere during day and night respectively [7]. Two atmospheric conditions generally guide the formation of ozone – NOx

Elevated aerosols over North-east India: Observational evidences from satellite and ground based measurements

Nivedita Barman[1*], Warisha Rahman[1], Prijith Sudhakar[2], Raza Rafiqul Hoque[1]
[1]*Department of Environmental Science, Tezpur University, Assam, 784028, India*
[2]*National Remote Sensing Centre, ISRO, Hyderabad, 500037, India*
**Communicating author: nbarman@tezu.ernet.in*

Abstract

The present study is an attempt to document the atmospheric aerosol behavior over a rural site in Mid- Brahmaputra Valley in different seasons over two years using remote sensing observations from satel- lites and ground based in-situ measurements. Continuous real time ground measurements of particulate matter ($PM_{2.5}$, PM_{10}) and black carbon (BC) recorded highest values in winter while lowest in monsoon season. Columnar Aerosol Optical Depth $(AOD)_{550\,nm}$ values retrieved from Moderate Resolution Imag- ing Spectroradiometer (MODIS) satellite were observed higher during pre-monsoon and lower in post- monsoon season. Weak correlation was observed between AOD and $PM_{2.5}$ in all the four seasons which indicated presence of aerosols at higher altitudes over the study region. Regression analysis and vertical distribution of aerosols from Cloud Aerosol Lidar with Orthogonal Polarization (CALIOP) observations further confirmed the presence of more elevated aerosols during the pre-monsoon season.

Keywords: Columnar AOD, Surface aerosols, Seasonal variation

1. Introduction

Atmospheric aerosols are solid or liquid particles suspended in air, [1] which remain as one of the major sources of uncertainty in climate forcing estimates [2]. Aerosols include particles such as mineral dust, sea-salt, sulfate, nitrate, soot and organic carbon [1]. Atmospheric aerosols may be primary, which are directly emitted as a particle aerosols are classified into nucleation, accumulation and coarse mode particles [4]. Removal of aerosols from atmosphere can be due to dry or wet deposition processes. Dry deposition includes impaction of particles on various surfaces, whereas wet deposition includes rainout and wash out processes [5].

Atmospheric aerosols influence radiation budget of the Earth-Atmosphere system in