

# Analysis of the aerosol and the ozone observations at a southwest peninsular coastal station using microtops sunphotometer

C A Babu<sup>1</sup> and P Sivaprasad<sup>2\*</sup>

<sup>1</sup>Department of Atmospheric Sciences, Cochin University of Science and Technology, Kochi 682 016, India

<sup>2</sup>Institute of Ocean and Earth Sciences, University of Malaya, Kuala Lumpur 50603, Malaysia

Received: 25 May 2017 / Accepted: 02 August 2018

**Abstract:** This study analyses the variations of aerosol optical depth, total column ozone and water vapour, measured by a Microtops-II (MICRO-processor based Total Ozone Portable Spectrometer) ozonometer/sunphotometer over a coastal station in southwest peninsular India, Kochi. Observations of ozone and aerosols are analysed for a period, May 2012 to May 2013. Satellite data sets available over the region are also analysed, and a comparison is made with the in situ data. Sunphotometer measured 1020 nm aerosol optical depth (AOD) shows a temporal variability with an increase in AOD during the summer (high value of 0.35 in May 2012) and fewer values near 0.2 during the winter and the post-monsoon seasons. Satellite observations also show a similar pattern of variability with high AOD during the summer. Water vapour is maximum (near 3.5 cm) during the pre-monsoon and the summer monsoon and minimum (below 2 cm in January 2013) during the winter. Ozone shows seasonal variability with a minimum concentration during the winter (230 Dobson Unit (DU) in January 2013) and maximum (280 DU in May 2012) during the summer. OMI (Ozone measuring Instrument) onboard Aura satellite overestimates the column ozone by 10 DU in comparison with the Microtops ozonometer. However, the sunphotometer and satellite observations show a similar pattern of temporal variability with a small difference in magnitude during certain months. The zonal ozone distribution shows a seasonal variability with a reverse gradient between the summer and the winter.

**Keywords:** Aerosol; Ozone; Microtops; Southwest India

**PACS Nos.:** 42.68.Jg; 92.60.-e; 92.60.H-; 92.60.Jq; 92.60.Mt; 92.60.Sz

## 1. Introduction

The present study analyses the variability of AOD, water vapour and total column ozone over Kochi and its surrounding region using the Microtops-II ozonometer and the satellite data sets. The station is located in the southwest coast of India. Southwest India is the gateway of the Indian summer monsoon, hence experiences strong wind and heavy rainfall during the monsoon season. Variability of the aerosols and the ozone over the region around the station is studied in detail owing to its key position in the monsoon regime. In situ measurements were made for the first time using a sunphotometer over the station and are utilised for this study.

The aerosol distribution over south India is entirely different from that of north India [1]. Compared to the Indo-Gangetic plane, the emission of aerosols is reported to be less over the south Indian region [2, 3]. Over a tropical station in peninsular India, [4] showed that the aerosol size spectra are a combination of the power law and the bimodal distributions. A bimodal aerosol distribution was observed by [5], near the coastal Bay of Bengal due to the air mass exchange between the land and the ocean. Kochi is a coastal station, and its atmosphere is significantly affected by the Arabian Sea. Hence, the atmosphere of the station is affected by the aerosols of oceanic and continental origin.

Microtops ozonometer used in this study provides in situ measurements of the AOD, the column ozone content and the column water vapour content. The algorithm to estimate AOD is based on the extra terrestrial radiation (corrected for the Sun–Earth distance) and the ground-level

\*Corresponding author, E-mail: savimarine@yahoo.com