

WILL THE AEROSOL DERIVED FROM THE OCM SATELLITE SENSOR BE REPRESENTATIVE OF THE AEROSOL OVER GOA?

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Introduction

Studies of the aerosols have gained equal importance of recent due to its importance on the regional and global impact on the climate and environment, as compared to the greenhouse gases. [Kaufman, 2002]. Since there are spatial and temporal variations and also on the types of aerosols, information about the aerosol content and their properties play an important role in the atmospheric correction algorithms for satellite. However due to their spatial and temporal variability particularly near the coastal regions and their combinations of various sizes, absorption properties and concentrations, computing the contribution due to aerosol in the total path radiance is a difficult task. From the ship cruise measurements in the Arabian Sea and the coastal waters off Goa, it has been observed that the values of satellite-derived products such as Chlorophyll a have large errors in the coastal regions as compared to the open ocean, which is attributed to the atmospheric correction algorithms. [Elgar, 2001]. Results of the our study of the variations of aerosol over the this coastal site, indicate seasonal variations, with high values of aerosol load being observed during the summer and relatively lower values being observed in winter. There is seasonal variation of Angstrom exponent, with large particles being observed during summer. [Suresh, 2005] (See Fig. 1). Apart from the seasonal variation, there is a definite diurnal variation. Here we assume that the variations observed at Dona-Paula would be valid for the aerosol over the costal waters off Goa. The ocean color satellite sensors such as SeaWiFS, IRS-P4 OCM and MODIS are sun synchronous and have overpass at the site during the day at 1200-1400 Hrs, local time. Since there is a diurnal variation of the aerosol on most of the days, the aerosol derived from satellite at noon may not be representative of the average aerosol load for the day

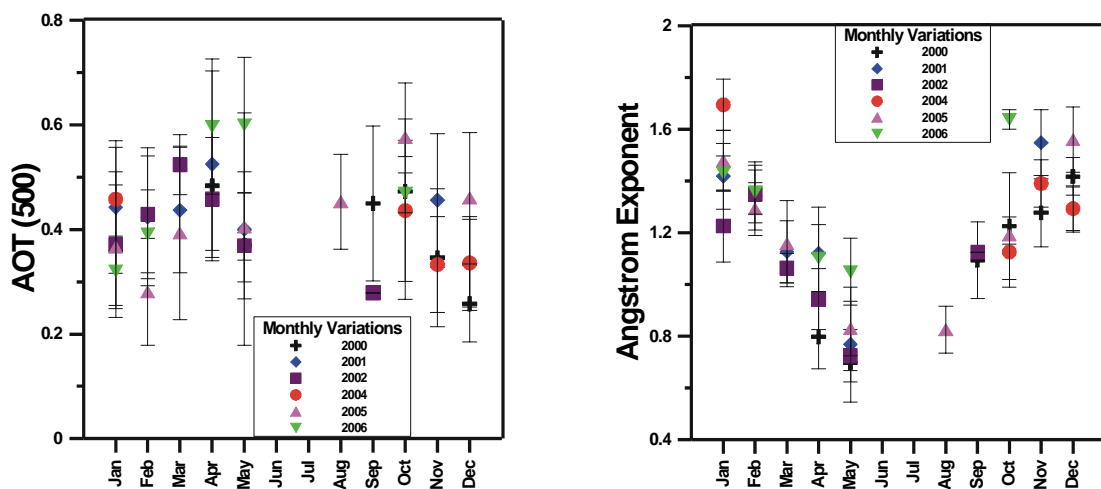


Fig. 1 Seasonal variation of AOT (500) and Angstrom exponent

Method

All the measurements given here were carried-out at National Institute of Oceanography, Dona-Paula, Goa, India, [15.456° N, 73.801° E]. The measurement site, Dona-Paula is on the west coast of India and less than 500 m away from the Arabian Sea. The aerosol optical thickness (AOT) were obtained using a handheld sunphotometer, MicroTops-II (Solar Light Co., USA) at five wavelengths 440, 500, 675 (2 nm FWHM), 870 and 936 nm (10nm FWHM) and the instrument has a field of view of 2.5°(<http://www.solar.com>).

Results and Discussion

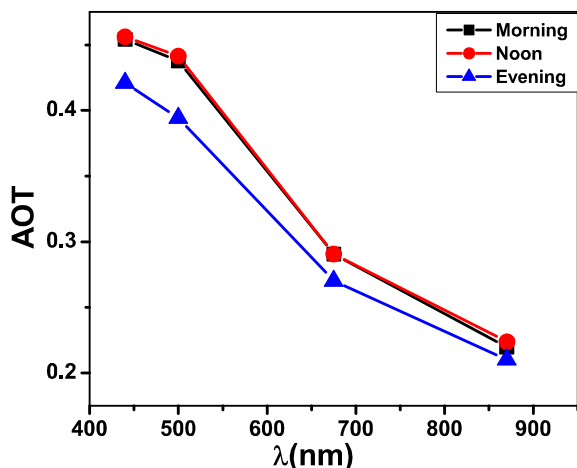


Fig. 2 Diurnal variation of AOT

Diurnal variations of the aerosol optical depths were observed almost on all days. On most of the days AOT increased gradually in the morning to a maximum value during the noon and declined in values in the evening. (Fig. 2).

Our analysis of the data for the period 2000-2006 show that the average absolute percent deviation of the mean value during the day from the mean value during the noon are 7.0, 7.4, 10.0, and 10.5 in the spectral channels of 440, 500, 670 and 870 nm. This is slightly less than observed value of 11% for the data collected from the stations of AERONET. [Kaufman,

2000]. The mean variation in the Angstrom exponent is found to be 8.87%.

Maximum deviations of AOT are observed for the channels in the longer wavelength during winter and post-monsoon period, while they are relatively higher in the shorter wavelengths during summer. For the lower wavelengths during winter the variations from the value at noon are marginal. During most of the seasons the AOT values in the morning are comparable to the values at noon. (See Fig. 3). Most of the variations are observed to be within 10%, which is within a tolerable limit considering the error in the instrument, measurement and satellite-derived values. Thus it can be concluded that the aerosol load derived from the satellite sensor would be representative of the aerosol over the coastal waters.

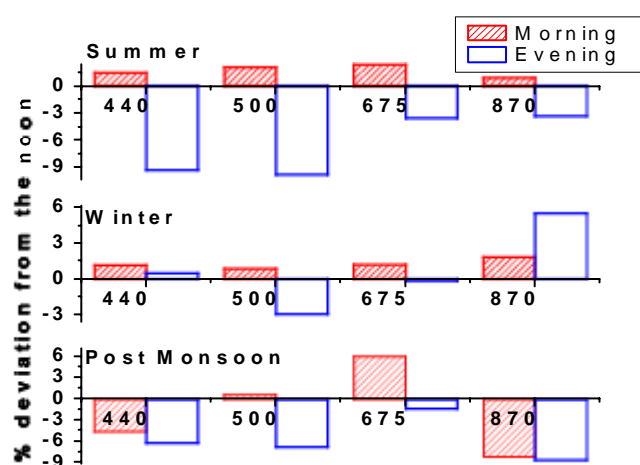


Fig. 3 Deviation of AOT the value at noon

Seasonal variations are also observed of the variations of the aerosol data at noon from those in the morning and evening. Variations of data in the morning and evening were found to be large during summer compared to winter and post-monsoon period. The diurnal variations are also observed of the Angstrom exponents, which indicate the temporal variations in the size of the aerosol particles.

The observations at Goa using lidar during the summer season (March) has shown that the aerosol optical depths are much higher during the night compared to the values observed during the day. This is attributed to the decrease in

the boundary layer at night and topographical effect on air mass and land-sea breeze effect. [Alfaro, 2003, Chazette, 2003]. It is hypothesized that during night the land breeze blowing from region around bring in lot particles raising the aerosol content, while during the day the sea breeze bring in lot more clean air, which reduces the aerosol content.[Pillai, 2001]. The high values of AOT often observed during the morning are probably the remnant effect of the aerosol loading at night.

Acknowledgement

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