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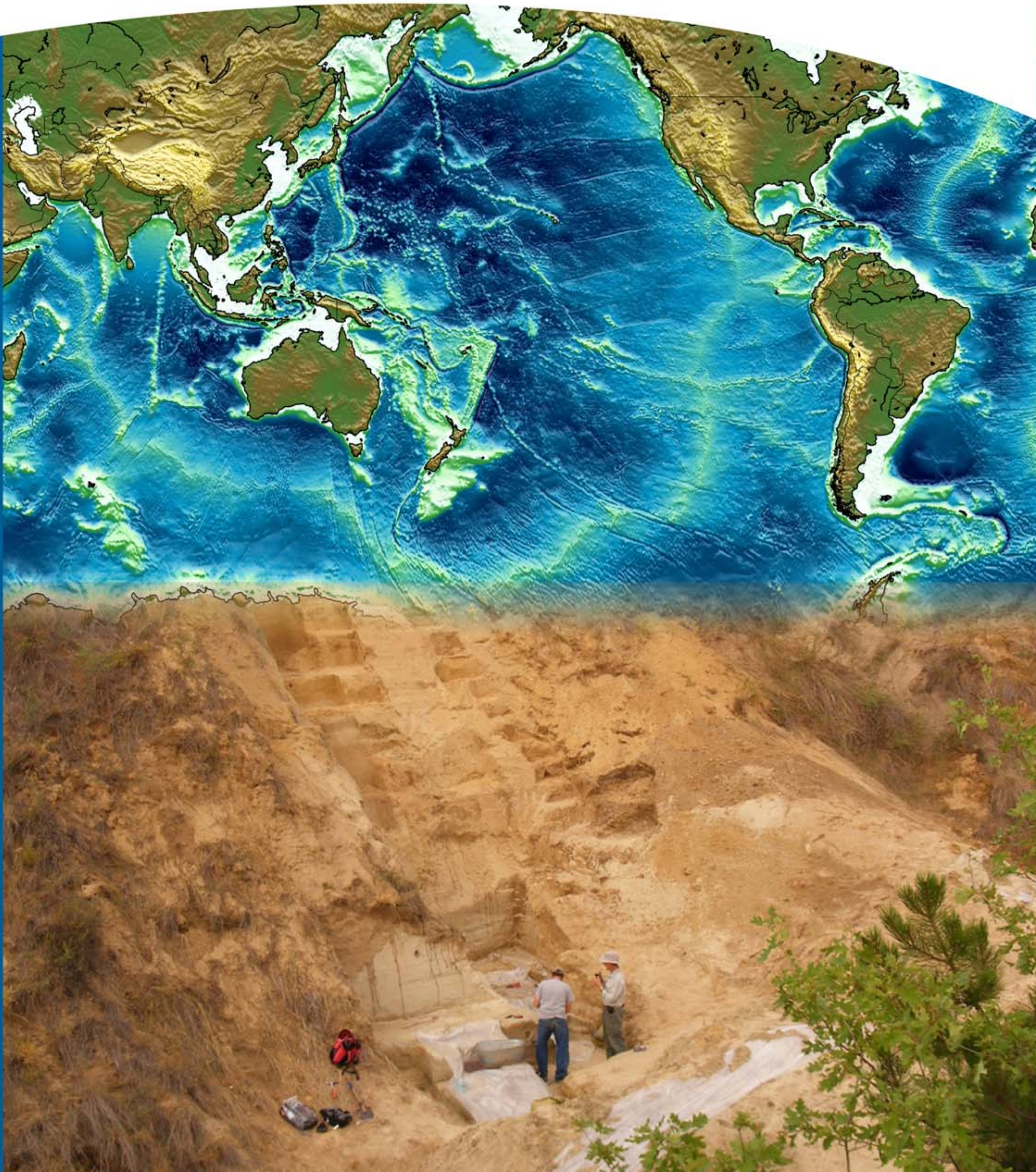

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Research Paper

AIR QUALITY ASSESSMENT BY MODIS SATELLITE DATA IN AND AROUND SANDUR TALUK, BELLARY DISTRICT, SOUTH INDIA

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Atmosphere consists of minute particles in the range of 0.1 to 1.0 micron size known as aerosols and also called as Suspended Particulate Matter (SPM). The knowledge of aerosol optical properties plays an important role in estimation of the direct aerosol forcing. The paper describes the aerosol optical thickness obtained from MODIS satellite imageries. The study focused on air pollution by mining activity in and around Sandur taluk. Due to anthropogenic and mining activities the Aerosols Optical Thickness (AOT) are more fluctuating. AOT values are obtained from MODIS at 550 nm. The Sandur taluk is more affected by Iron ore mining, leads to an environmental pollution. Environmental Impact Assessment (EIA) is carried out for Air pollution. In the present study the air pollution identification is done by using MODIS satellite data. Distribution of dust particles over the study area since from 2000 to 2010 is analyzed. AOT fluctuates more in the years from 2005 to 2010 which affected Sandur natural eco-system, that leads to serious natural hazards. The results shows entire study area covered by dust particles, size ranging from 0.26 to 0.74. In the year 2009, severe air pollution has been detected.

Keywords: MODIS Terra, Giovanni, Mining Activity, Sandur taluk, Suspended Particulate Matter (SPM)

INTRODUCTION

The Indian subcontinent is undergoing a phase of rapid urbanization. Inevitable fallout of this process is a concomitant increase in air pollution much of which can be attributed to the infamous great Indian haze phenomena. Atmosphere consists of minute particles in the range of 0.1 to 1.0 micron size aerosols. One observes that the aerosol size distributions vary considerably (Ghanti *et al.*, 2010). Aerosols are only one part in a billion of the mass of the atmosphere and have the potential to influence the climate. These particles influence the net radiation budget of the earth. The rapid temperature change of the earth's surface has been attributed to a balance between absorption of incoming solar radiation and emission of thermal radiation from the earth system. The aerosol plays a major role in this process, by dampening the surface temperature rise (Prakash *et al*., 2009; Chakley *et al*., 1983: Satheesh *et al.,* 2000 and 2001; Suresh *et al.,*

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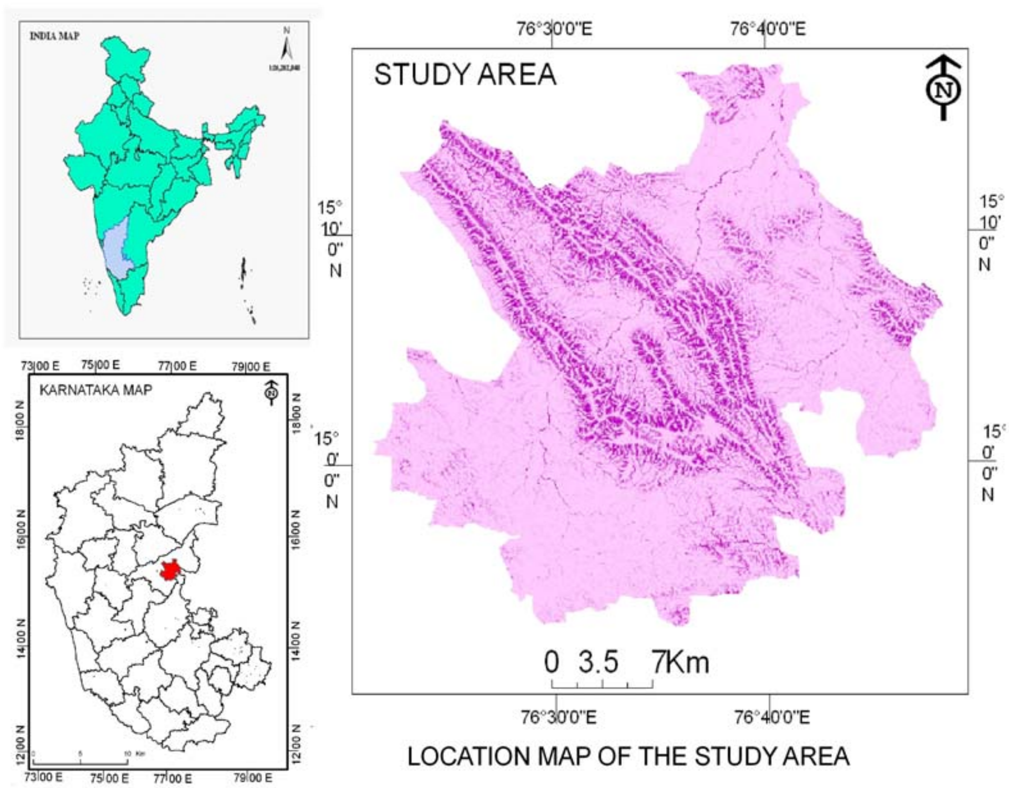
1999 and 2005). The atmospheric aerosols may be of natural origin such as the wind-blown mineral dust or of anthropogenic origin such as those from Mining Activity industry, automobiles or other human activities in the urban and rural areas. They may originate from gas-phase reactions of low volatile vapors in the atmosphere (Hoffmann *et al.,* 1997). The effect of radiative forcing by anthropogenic aerosols is one of the largest sources of uncertainty in the climate prediction (Bates *et al.,* 1998). The tropical Indian atmosphere system acts as a natural experiment for observing the radioactive forcing by the anthropogenic aerosols. MODIS aerosol data are useful for detailed studies of local, regional, and global aerosol loading, distribution, and temporal dynamics, as well as for radiative forcing calculations (Ichoku *et al.,* 2004). The paper describes Aerosol optical thickness obtained from MODIS satellite data for Sandur taluk Bellary District, South India.

DATA USED

Moderate Resolution Imaging Spectro radiometer (MODIS) was used with Ocean color sensors and Giovanni data has been obtained from March 2000 to December 2010. The measurements values obtained AOT at 550 nm. SeaWiFS Data Analysis System (SeaDAS) was used to process the obtained MODIS images. A Global Positioning System (GPS) provided information on the location, altitude and pressure.

Figure 1: Location Map of the Study Area



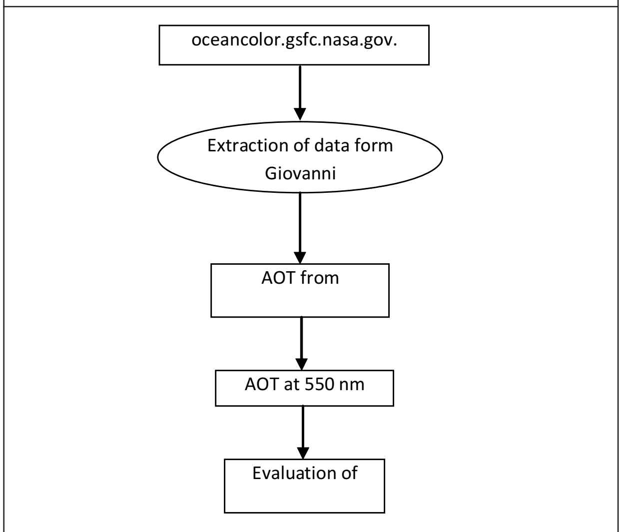
STUDY AREA

The area, study area falls under parts of Survey of India toposheets, 57 A/8, A/12, A/16 and 57 B/9, between the latitudes 15° 00¢ N and 15° 15' N and 76° 20' E and 76° 55' E. The study area is well known for its Iron occurrences and there are several operating open pit mines and abandoned Manganese open pits are located in the area. The lowest elevation is 625 m above the MSL and the highest elevation 997 m above the MSL. Covers an area of 1224.91 sq km, within the Dharwar craton (Figure 1).

METHODOLOGY

The methodology includes seven step approach (Figure 2). Step 1. AOT readings are obtained from Giovanni. Step 2. Cloud free MODIS aqua satellite images are downloaded from the oceancolor.gsfc.nasa.gov. Step 3. Processing and analysis of MODIS data using SeaDAS software. Step 4. Ground truth verification of the study area. Step 5. Time Averaged maps generated from Giovanni. Step. 6. Year wise AOT was plotted to know the dust pollution. Step 7. Evaluation of AOT distribution.

Figure 2: The Methodology Flow Chart for the AOT Analysis



SeaDAS program was used to process the downloaded raw MODIS data (level 0). Level 1A files contain radiance counts at each channel received by the MODIS sensors. Errors were eliminated by the atmospheric correction algorithm at level 1B. Level 1A is processed by Geoprocessing to get geo location file which contains latitudes and longitudes. Level 1A is processed to get the Level 1B file, it will check for meteorological, ozone, and other files for necessary data. Level 1B file is processed to get Level 2 file, and finally processed MODIS image.

RESULTS AND DISCUSSION

The study area is one of the active mining areas, The MODIS Terra images and data of the study area provides the distribution of Aerosol optical thickness in Sandur taluk, Bellary District, South India. The aerosol optical thickness is measured at 550 nm, the particle size is varies from 0.1 to 0.58. Since from 2000 to 2004 (Figures 3 and 4.) western and south western parts of the taluk shows fine particulate matter, i.e., 0.1 µm to 0.26 µm where as Central and northern parts of the taluk shows large particulate matter (Dust), i.e., 0.26 µm to 0.58 µm. From 2005 to 2010 (Figures 5 and 6) the mining activity at Sandur Taluk has drastically Increased and the results shows the entire study area covered by dust particles, size ranging from 0.26 to 0.74. It is noticed that in the year 2009 the savior Air pollution noticed by Mining and anthropogenic activities. Figure7 is the Graph showing year wise dust particle fluctuation in the study area. In the year 2000-2001, draught is associated with mining activity, hence the AOT is at about 0.74.

Figure 3: SPM Over the Study Area in 2000

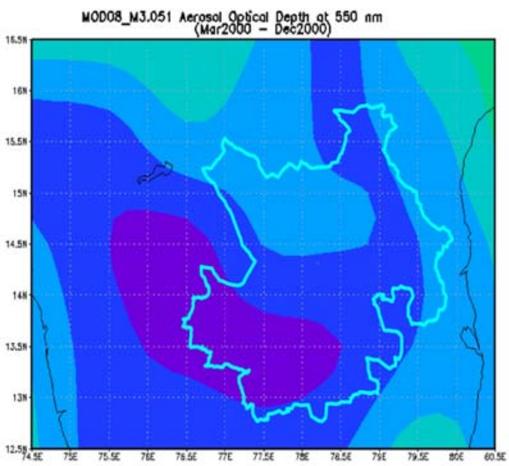


Figure 4: SPM Over the Study Area in 2004

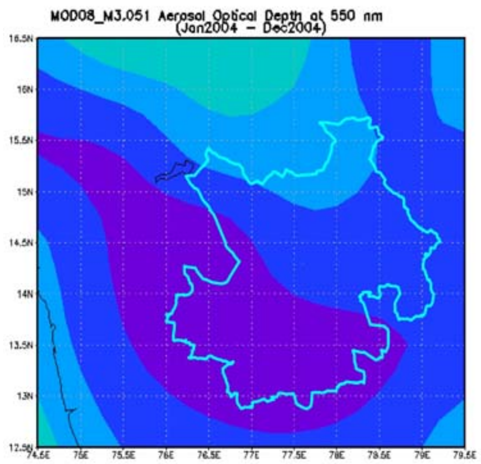


Figure 5: SPM Over the Study Area in 2005

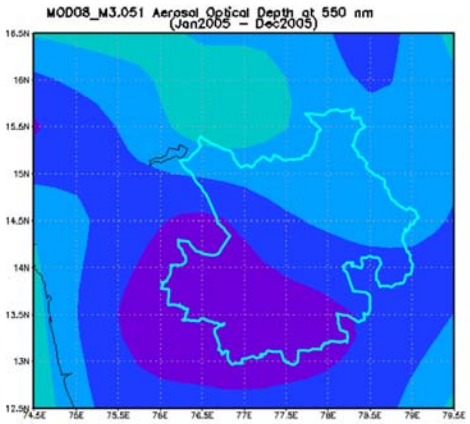


Figure 6: SPM Over the Study Area in 2010

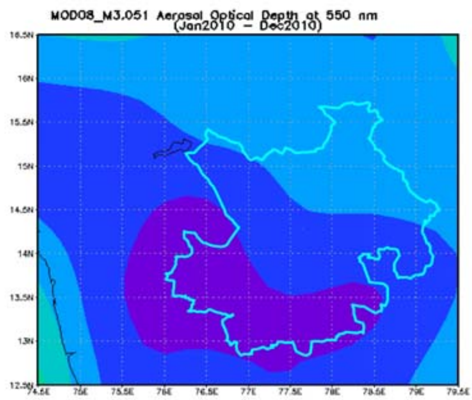
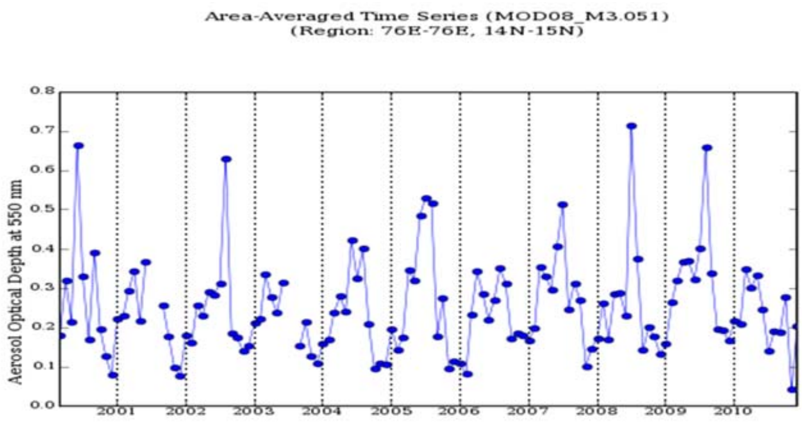


Figure 7: Graph Showing Year wise Dust Particle Fluctuation in the Study Area



CONCLUSION

The mining blocks were more in central and northern parts of the Sandur taluk. Mining activity has rapidly increased from 2000 to 2010. The aerosol optical thickness measured from satellite derived MODIS data. The measurements were taken at the wavelength of 550 nm spectral region. Since from 2000 to 2004 western and south western parts of the taluk shows fine particulate matter, i.e., 0.1 µm to 0.26 µm where as Central and northern parts of the taluk shows large particulate matter (Dust), i.e., 0.26 µm to 0.58 µm. From 2005 to 2010 the mining activity at Sandur Taluk has drastically Increased and the results shows the entire study area covered by dust particles, size ranging from 0.26 to 0.74. It is noticed that in the year 2009 the extreme air pollution noticed by Mining and anthropogenic activities. The aerosol optical thickness is high at 550 nm and decreases at 870 nm spectral regions. Also, AOT is high at Central and north eastern blocks and low at western and South-western parts. The variation in the aerosol optical thickness is the result of natural as well as more anthropogenic activities.

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