**I-T-6**

# IMPACT OF BIOMASS BURNING ON AEROSOL PROPERTIES A STUDY USING SATELLITE DATA AND GROUND BASED MEASUREMENTS

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Tropical biomass burning and associated emissions of aerosols into the atmosphere play a vital role in atmospheric perturbation and climate change. Aerosols containing black carbon are emitted primarily in the tropical and subtropical regions of the globe accounting to the release of almost 100 million tons of smoke into the atmosphere as a result of biomass burning. In India, 55% of the total forest cover is prone to fires annually, which are mainly attributed to anthropogenic factors, like slash and burn agricultural practices, controlled burning, deforestation, fire-wood burning and others. Therefore, monitoring of forest fires and associated emissions of aerosols over India needs more attention to understand the cause-effect scenarios. Conventional methods in the quantification of aerosols involving ground inventory aided with information given by remotely sensed data from space-borne sensors are capable of addressing the problem with well-defined scientific and technical strength. The availability of aerosol data sets from sensors such as MODIS, TOMS-OMI, and MISR provide a unique opportunity to study the spatial and temporal variability of aerosols over large regions. The forests of northeast India are subjected to severe fire episodes during the January-May period every year mainly due to slash-and-burn agricultural practices. Daily active forest fire locations over the northeastern region were derived using the nighttime satellite data from the Defense Meteorological Satellite Program – Operational Line Scan system (DMSP-OLS). These data were compared with variations in the Aerosol Index (AI) derived from the Ozone Monitoring Instrument (OMI) flown on the EOS Aura spacecraft, along with column integrated Aerosol Optical Depth (AOD) at 550nm derived from the Moderate Resolution Imaging Spectroradiometer (MODIS) on a daily basis. The fire occurrences derived from MODIS and DMSP were compared with optical data from the Indian Remote Sensing Satellite (IRS-P6) Advanced Wide Field Sensor (AWiFS). In the northeastern region of India, forest fires start early in February and continue till May with a significant peak in March and April. The majority of the forest fires were detected in Meghalaya, Mizoram, Manipur, Nagaland and Tripura states. This is primarily attributed to the slash-and-burn agricultural practices, which are highly applied in the study area during February to May over moist deciduous and wet evergreen forests. This also leads to high biomass burning aerosol loading during March – April over the northeastern region of India each year. This is confirmed by comparing the nighttime forest fires data with OMI Aerosol Index (AI) values. The positive values of OMI AI were only considered, corresponding to biomass burning aerosol (BBA) loading. As, AI is a very useful qualitative indicator of the presence of absorbing aerosols. AI values increased in accordance with the increase in the number of fire occurrences over the region. The AI values varied from a minimum of 0.2 to a maximum value of 1.9, suggesting higher concentration of absorbing aerosols over the region during the last week of March. The higher AI values were observed in regions with high forest fires, a fact which is attributed to the contribution of biomass-burning aerosols from forest fires over the region. The higher values of MODIS AOD are in accordance

with high fire counts derived from DMSP-OLS nighttime data suggests the contribution of forest fires to atmospheric aerosol loading over the region. The analysis of DMSP-OLS and MODIS derived fire locations and high resolution data sets from IRS-P6 AWiFS data over Mizoram State suggested that multi-satellite mission data provides an opportunity to understand the fire dynamics over large regions. Mizoram state has 87 percent forest area with 51 per cent dominated by Melocanna baccifera bamboo species. The bamboo species had flowering in the current year, i.e., 2006. The bamboo species die after flowering and there was extensive clearing and burning resulting in higher incidence of forest fires as observed in satellite data. The results of our analysis suggested good correlation ($R^2$ = 0.90 and 0.87) between DMSP-OLS derived nighttime forest fire events v/s MODIS aerosol optical depth (AOD) at 550 nm and TOMS-OMI AI.
***Key words****: Atmosphere, Climate, Active, Forest fire, Satellite, IRS, Analysis*