Detection and Monitoring of Jaipur Industrial Fire Smoke Plume based on satellite data of OCEANSAT-2 OCM and INSAT-3A-CCD measurements

NIVEDITA SANWLANI[1] and PRAKASH CHAUHAN[1]

[1]*Space Applications Centre, (ISRO), Ahmedabad-380015, Gujarat, India.*

Fire at Indian Oil Corporation (IOC) depot in south of Jaipur spewed toxic smoke across major portion of the eastern Rajasthan for more than 10 days. Almost 60,000 kilolitres of mineral oil in 11 storage tanks went up in flames on the evening of October, 29 2009 and the blaze continue to rage till November 6, 2009 till entire oil in the tanks got exhausted. Optical properties of, Jaipur Indian Oil Corporation (IOC) depot, fire aerosols were investigated by remote sensing techniques during November 28, 2009 to December 1, 2009. Carbonaceous aerosols are very complicated in respect of their chemical and optical properties, but are commonly associated with strongly absorbing aerosol with the inclusion of soot particles. Such large sized aerosol particles significantly absorb shortwave radiation. Identification of strongly absorbing aerosols of this occurrence was done using the multispectral Ocean colour monitor (OCM) measured radiances from visible to infrared at the infrared (IR) regions. Rayleigh corrected radiances were observed to be continuously decreasing towards shorter wavelength region of electromagnetic spectrum. A sharp decrease of the order of ~51% in the rayleigh corrected radiances was observed over the fire affected regions. This clearly indicated presence of carbonaceous aerosols released due to bio-mass burning. Multi-temporal INSAT-3A-CCD data was also used on an hourly basis to monitor and characterize such a massive fire event. Maximum diurnal variations were noticed during dust storm, which registered ~500% increase from morning to noon and 34% fall from afternoon to evening. An index for such aerosols namely Normalised Absorbing Aerosol Index (NAAI) based on near infra red and visible channel has also been evaluated. Simple temporal band ratio algorithm has been evolved to demonstrate for identification and detection of the extent of absorbing aerosol.

This study demonstrate the synergetic use of high spectral and spatial resolution data of OCM-2 and high temporal resolution data of INSAT-3A CCD for air quality monitoring during industrial disasters.

Keywords: Fire smoke aerosols; OCM; INSAT-3A-CCD; remote sensing