

Paper Number: 4399

Seasonal Variability of Polycyclic Aromatic Hydrocarbons on Surficial Soils in South-West India

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This study focuses on the seasonal variation and the potential sources of polycyclic aromatic hydrocarbons (PAHs) in the surficial soils surrounding a coal-based thermal plant (Udupi Power Corporation Limited- UPCL in 8 KM Radius) in southwest coast of India. The study area lies in the close proximity of the National highway (NH 66) and different State Highways (SH 67, SH 1 and SH 70). Seasonal (pre-monsoon, early-monsoon, monsoon and post-monsoon period) surficial soil sample were collected at 12 stations from January 2012 to January 2013. Gas chromatograph-mass spectrometer was used to analyze PAHs compounds.

The results of average PAHs concentrations in surficial soil, ranges from 1.48 - 22.67 ng/g in different seasons. The monsoon season's samples showed decreasing concentration of PAHs with increasing distance from the thermal power plant. However, pre-monsoon, early-monsoon and post-monsoon PAH concentrations in soil do not show this trend. This could be because of the wind movement patterns and absence of strong winds during this period, Srimurali et al. [1]. This is confirmed by 7 days backward trajectory analysis collected from NOAA HYSPLIT MODEL, Hegde et al. [2]. During pre-monsoon and post-monsoon seasons, wind travels a long distance from the east-northeast direction to the west-southwest direction, which presumes the lowering of the PAH concentrations, due to the absence of strong wind. Whereas during the early-monsoon and the monsoon seasons, wind blows from, west-southwest to the east-northeast direction, i.e. from arid regions (surrounding the Arabian Sea) with high wind speed, presumed to enhance the PAH concentrations in the study area. The surficial soil samples shows high concentration of 4 ringed (55%) and 6 ringed (17%) aromatic compounds. These factors are significantly contributing to the total PAHs concentration. The high concentration of 6 ringed Indeno[1,2,3-cd]pyrene in surficial soil, which is carcinogenic, indicates that the soil is contaminated, Ma et al [3]. The thematic maps and principal component analysis reveals that the PAHs compounds in surficial soil were more influenced by the emission of fly ash, diesel from the thermal power plant, Vehicle moments on NH 66, SH 67, SH 1 and SH 70 and also due to the burning of biomass from agricultural land. As per our knowledge this is the first attempt to provide information on the seasonal variability of PAHs compounds on surficial soils in south-west coast of India.

References:

- [1] Srimurali et al. (2015) Environmental Forensics 16: 76-87
- [2] Hegde et al. [2007] Atmospheric Environment 41: 7751-7766
- [3] Ma et al. (2009) Arch Environ Toxicol 57: 670-678

