Air Pollution


Precipitation samples were collected as wet-fall only and primarily on event basis in Delhi during the monsoon period. Concentrations of major anions and cations were determined. The pH of the rain water was found to be more than 5.6, showing alkality during the early phase of monsoon, but during the late phase of monsoon pH tendency was towards acidity due to lack of proper neutralization of acidic ions.


Lidar-derived aerosol vertical profiles obtained at Pune, have been used in the study to investigate the influence of horizontal winds on the aerosol characteristics in the lower atmosphere. The study shows that the short-and long-term increases in aerosol concentration/loading over the observation site are, to a large extent, influenced by horizontal winds in the surface layers and this in turn, can be attributed to the increasing human/urban activity around the lidar site over the years.


Indian large point sources (LPS) contribute to CO₂ and SO₂ emissions to a large extent (above 65%) and to CH₄, N₂O and NOₓ emissions to some extent (around 10%). The former emissions are primarily from fossil fuel combustion while the latter have agriculture sector dominance, explaining the drastic difference in LPS contributions to all India emissions. The present analysis would be useful for policy-making to mitigate these pollutants and their associated impacts.


An investigation is conducted to evaluate the impact on air environment due to opencast coal mining. Emission factor data are utilized for computation of dust generation due to different mining activities. Approach for the selection of work zone and ambient air monitoring stations are described. Work zone air quality, ambient air
quality, and seasonal variations are discussed, which shows high pollution potential due to SPM.


The Gaussian plume model (GPM) and two low wind models (LWM1 and LWM2) compute the hourly g.l.c.’s of SO$_2$ due to industrial and power sources. This evaluation has been performed at four receptors by using three different methods. On the basis of the results and discussion of above methods, it has been concluded that GPM is always overpredicting and LWM2 is consistently underpredicting the concentrations, whereas, LWM1 is performing better than GPM and LWM2.


A study of concentrations of sulphur dioxide (SO$_2$) and suspended particulate matter (SPM) has been performed in Delhi. The monthly and seasonal variations of concentrations and winds are analyzed. The monthly mean SO$_2$ concentrations were in the range of 16.15-34.44 mg m$^{-3}$ and showed regular seasonal variations with the highest concentrations in winter and lowest in monsoon season. On the other hand, the monthly mean SPM concentrations reached the highest (465.68 mg m$^{-3}$) in November and the lowest (150.07 mg m$^{-3}$) in August.


The data on deposition in NE India (in the countryside N of Bhubaneshwar) obtained with wet-only and bulk collectors show that the weighted mean concentrations (and wet deposition) of H$^+$ and HCO$_3^-$ are almost equal, with dustfall contributing a negligible amount of HCO$_3^-$ and the deposition of potential acidity, in the soil, could be as high as 40 mmol H$^+$ m$^{-2}$a$^{-1}$ corresponding to a pH of 4.3 in precipitation.


The usefulness of mathematical modeling and computational simulation techniques used to predict the horizontal and vertical pollutant concentrations of pollutants are explained. Finally a case study of an industrial area in Gujarat region is presented to arrive at setting up of air quality monitoring station for monitoring/management of regional air quality.

Carbon dioxide, the old refrigerant in its new form, appears to be a viable alternative refrigerant for the future in the context of CFC phase out and waste gas utilization. This paper is a state-of-the-art report concerning the various possible alternative refrigeration cycles based on carbon dioxide as a natural refrigerant in environmental protection.


Dry deposition of nitrate on marble was measured at Dayalbagh in a semi-arid region on India in the winter season. The dry deposition rate of nitrate was $2.1 \pm 1.3 \text{mg/m}^2/\text{d}$ with corresponding ambient concentrations of HNO$_3$ vapour and particulate NO$_3$ of $0.84 \pm 0.48 \mu\text{g/m}^3$ and $7.9 \pm 1.8 \mu\text{g/m}^3$, respectively.


Diurnal and seasonal variations in carbon dioxide and methane fluxes between Sundarban biosphere and atmosphere were measured using micrometeorological method. Study of the diurnal variations of the micrometeorological conditions in the atmosphere was found to be necessary to determine the duration of neutral stability when flux estimation was reliable. Considerable variations in mixing ratios of carbon dioxide and methane at the NE coast of Bay of Bengal were observed due to the seasonal variations of their fluxes from the biosphere to the atmosphere.


The application of diffusion model for prediction of ground concentrations from industrial sources has been described. Using power law profiles for wind speed and coefficient of turbulence, the diffusion equation has been solved which yields ground concentrations as a combination of series of Bessel functions. The important conclusions from the study are the efficacy of the theoretical model to predict industrial concentration for any metropolitan area.
Temporal variations in surface ozone at Thumba (8.6°N, 77°E)—a tropical coastal site in India. Atmospheric Env, 36(4) (2002), 603-610 [16 Ref].

Surface measurements of ozone and meteorological parameters are made at a tropical coastal site, Thumba. Ozone shows a diurnal variation with daytime higher levels and a sharp change in its values during evening time. The evening time change in ozone values with a secondary peak is found to be due to change in wind pattern from sea-breeze to land-breeze at this site. This secondary peak in ozone is weakest during monsoon period.

Atmospheric dust loads and elemental composition at a background site in India. Environ Monit Assess, 73(1) (2002), 1-6 [13 Ref].

Air particulate samples collected at a background site situated on the east coast of Thar Desert in Rajasthan State of India were analysed for atmospheric dust loads (SPM) and elemental composition. The values of SPM ranged from 9 mgM⁻³ to 97 mgM⁻³ with an average of 43 mgM⁻³ except a few episodic values, which were 3 to 5 times higher than the average during summer months.


Sulfate aerosols have been found to be the major contributors to precipitation acidity. Thus, in view of the long-term ecological repercussions they have on aquatic ecosystems and their acidity-potential, the present analysis focuses on a case study application of the layer-averaged aerosol-scavenging model for predicting values of the wet scavenging coefficient and sulfate concentrations in the precipitation samples on the basis of the information available for some selected Indian cities.


The city of Delhi was divided into three grids of 6, 12 and 18 km radii. Leaf samples from twelve important traffic zones were collected and microscopically analyzed for measuring relevant stomatal parameters. This data was subsequently used as the input for the EHER (Ecosystem-Health Exposure-Risk) Model for quantifying risks due to vehicular emissions. Future projections have been made for different categories of vehicles on the basis of models developed for them and calibrated with the help of available data.
Simultaneous measurements of ammonia and nitric acid in ambient air at Agra (27°10’N and 78°05’E) (India). Atmos Env, 35(34) (2001) 5979-5988 [55 Ref].

Simultaneous measurements of ammonia and nitric acid in ambient air were conducted at Dayalbagh, Agra using the mist chamber technique. Concentrations of HNO$_3$ are observed to increase during the daytime, consistent with its formation by photochemical reactions. Nitric acid and ammonia concentrations show a significant seasonal variation. Levels of HNO$_3$ are higher in winter but lower in monsoon, while ammonia shows a reverse trend with higher monsoon and lower winter values.

Impact of air pollutant emissions on the ecosystems in the vicinity of industrial areas of Indian subtropics. Water Air Soil Polln, 130(1-4) (2001), 843-848 [7 Ref].

An investigation to study the effect of emissions through various factories and thermal power plants on the quality of water in lakes, tanks, ponds, even well waters in relation to its use in the welfare of the society. The results showed that intensity of acidity (water pH) as well as concentration of various soluble salts and BOD and COD in the vicinity of an industrial area were very low. A substantially higher acidity and ion concentration were recorded up to 1 km away from industry, where the growth of aquatic plants, organisms and the production of fish were severely affected.


The CO monitor method was used to predict the CO level in Chidambaram town. From the study it is evident that the pollution level is closely related to the density of motor vehicles plying on the roads. With increase in number of motor vehicles, pollution level also increases which polluted the roadside environment severely in future.

Diurnal and seasonal variations of suspended particulate matter in air of Ranigang-Asansol area Nature Env Polln Techno, 1(2) (2002), 221-222.

Paper deals with the variations in diurnal, average monthly and seasonal levels of suspended particulate matter at four sites in Raniganj-Asansol area. The data indicate that the SPM level remain higher during winters as compared to other periods. Diurnally, the SPM remain highest during the time between 14:00 and 22:00 hours.

Air quality of Kalyani township (Nadia, West Bengal) and its

In Kalyani township a study was undertaken to determine the extent of air pollution and its impact on some dominant local flora by studying their anatomico-biochemical features of leaves in a comparative manner. The total chlorophyll content, epidermal thickness, stomatal length and breadth of the leaves were found to decrease while the leaf thickness, stomatal frequency were found to increase in case of pollution stress plants with respect to control plant population of non polluted habitat.


A comprehensive, spatially resolved (1.25°’0.25°) fossil fuel consumption database and emissions inventory was constructed for India. Emissions of sulphur dioxide and aerosol chemical constituents were estimated for and extrapolated to the Indian Ocean Experiment (INDOEX) study period. Emission factors for various pollutants were derived using India specific fuel characteristics and information on combustion/air pollution control technologies for the power and industrial sectors.


A spatially resolved biomass burning data set, and related emissions of sulphur dioxide and aerosol chemical constituents was constructed for India, and extrapolated to the INDOEX period. The national average biofuel mix was 56 : 21 : 23% of fuelwood, crop waste and dung-cake, respectively. Compared to fossil fuels, biomass combustion was a minor source of SO$_2$ (7% of total), with higher emissions from dung-cake because of its higher sulphur content. Northern and the east-coast India had high densities of biomass consumption and related emissions.


An experiment with *Phaseolus mungo* Var. Radiatus Linn. (variety Jerman-9) was conducted to study the effect of sulphur dioxide on total free amino acids, proteins and growth parameters. Treatments were given to 20-day old plants for 30 days. Results were noted for 35, 50, 65-day old plants. Growth parameters, total free amino acids and proteins were found to be adversely affected under SO$_2$ exposure of 1.00 ppm.
Dry deposition of aerosol particles was determined at Rampur located about 75 km south-east of Agra. The observed flux varied between 1.0±0.9 and 5.4±2.1 mg/m²/d. The calculated dry deposition flux was found to vary between 0.20±0.20 and 3.5±6.4 mg/m²/d for various ions. Deposition flux showed a seasonal variation with maximum rates during the winter followed by summer, and a minimum during the monsoon.

A detailed survey of vehicular pollution in the city of Chennai has been undertaken to assess pollution contribution from transport sector. Methodology adopted in arriving at the vehicular pollution load is discussed. The traffic density of typical Indian categories of vehicle along with respective emission factors has been used for generating emission scenarios. The available information about mobile source emission factors has been compiled from different sources and used for emission estimation from transport sector in the city of Chennai.

Attempt has been made to establish dose-response relationship of Ambient Air Quality Index and human health, based on time spent by an individual in different microenvironments during one day. Economic valuation of morbidity and mortality has been attempted through lost salary approach. The results show that the avoidance cost is 29% of the total health damage cost.

Paper reports the size and chemical characteristics of surface aerosols measured at Mumbai during the Indian Ocean Experiment-Intensive Field Phase (INDOEX-IFP), January-March 1999. Carbonaceous (30%) and ionic (20%) constituents contributed significantly to aerosol mass. High black carbon concentrations and a low organic to black carbon ratio implied the predominance of primary carbonaceous aerosol, while a high non-sea salt-sulphate contribution in the fine mode, suggested a probable anthropogenic origin.

Ground level concentration and sky-shine dose due to radioactive emissions from a nuclear power plant at a coastal site have been estimated using the standard Gaussian Plume Model (GPM) and the modified GPM which incorporates fumigation effect under sea breeze condition. The difference in results between these two models is analysed in order to understand their significance and errors that would occur if proper choice were not made.