Research Paper Environment

Changes in Environment and Their Effects on Meteorology

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ABSTRACT

Our Environment is changing gradually. Many environmental changes have effects on Meteorology. An analytical study is made in this regard and some conclusive remedial principles are proposed herein to ensure a healthy Earth.

KEYWORDS Global Warming, Acid Rain, Brown Cloud, Evapotranspiration, Electric Field.

Introduction:- Environment changes are remarked on large scale. Some changes are global and some changes are zonal. Environment has intimate relationship with Meteorology. Accordingly, meteorological changes are being noticed. Many meteorological changes put adverse effects on life and society. Hence it has become necessary to protect our environment for the welfare of mankind. Environmental changes may be classified as : (i) Pollution related changes and (ii) Other changes. Pollution related changes are either global or wide spread. Other changes are generally zonal.

Pollution related changes:- Industrialisation has brought the problem of environmental pollution. Different pollutants are: Suspended Particulate Matter, Respirable Particulate Matter, Sulphur Dioxide, Oxides of Nitrogen, Lead, Oxides of Carbon etc. Meteorological parameters related to pollutant dispersal are : Wind, Lapse rate and Inversion. Sources of pollution are classified as follows: single continuous source, multiple sources, a line source.

Let us now discuss the major pollution related environmental changes and their effects on Meteorology.

(i) Global Warming refers to rise in the average temperature of the Earth's climate system. Most of the additional energy stored in the climate system has resulted ocean warming. The rest has melted ice, warmed the continents and atmosphere. Scientists are nearly certain that Global Warming is mainly caused by increasing concentration of Greenhouse Gases and other human activities. Global Warming is a matter of common concern now a days. Many measures have also been adopted to reduce and control the causes of Global Warming. Rise in ocean water level will put the coastal areas in danger.

According to some sources, Global average temperature rise in recent past was insignificant. According to some Scientists, a precipitous rise in average Global temperature in the 1990s is result of cyclical variations in ocean conditions only. During the period from 1999 to succeeding ten years,Global average temperature rise was only 0.1˚F

(ii) Acid Rain is a rain (or precipitation) which is unusually acidic in chemical nature. It possesses raised level of hydrogen ions (low pH). It can harm plants, animals, infrastructure etc. It is caused by reaction of emitted Sulphur Dioxide and Oxides of Nitrogen with water molecules. Oxides of Nitrogen may also be produced by lightning strokes and Sulphur Dioxide by volcanic eruptions.

(iii) Asian Brown Cloud is a layer of air pollutants which recurrently covers different parts of South Asia. Now reference is made to the undermentioned research papers:

(a) Methodology to Monitor Effective Optical strength of Brown Cloud Layer, published in PARIPEX – Indian Journal of Research, August 2013 issue,
(b) A Study on Variation of Bright Sunshine Hours in Kolkata and Port Blair, published in PARIPEX – Indian Journal of Research, February 2015 issue.

Asian Brown Cloud can cause delay in commencement of Asian monsoon and can change in associated rainfall / precipitation pattern, as well as can affect relevant zones. It can displace the Thermal Equator in southward direction. Brown Cloud over other parts of the Globe can act similarly. In general, Brown Clouds have masked a significant percent of Greenhouse Gas. Brown Cloud causes increased solar heating of atmosphere and lowering down of Earth's surface temperature. It can reduce the amount of incoming solar radiation reaching Earth's surface. Weather change can take place due to hampering of heat balance.

Other changes:- Let us now discuss the other environmental changes and their effects on meteorology.

(i) Evapotranspiration is the aggregate of evaporation and transpiration (Plants). A very important factor which influences the rate of evaporation is surface area of the water body. Filling of waterbodies by soil and deforestation / de-plantation reduce zonal evapotranspiration. Evapotranspiration is the source of atmospheric moisture. Now, reduction of zonal evapotranspiration is very significant when advection of moisture is less. In this way, such reduction of zonal evapotranspiration can affect pre-monsoon thunderstorm type in south Bengal.

(ii) Another important thing is increase in Electric Field caused by increased wireless communication, detection and ranging as well as remote sensing. Now, reference is made to the undermentioned research paper:-

A Study on the Pre-monsoon Thunderstorm Spells over Kolkata, published in PARIPEX – Indian Journal of Research, August, 2014 issue.

The effect can promote electrostatic discharge in / through the atmosphere. Accordingly there is increase in Pre-monsoon thunderstorms spells in south Bengal.

Conclusion:-

Tables are given at the end of the paper. The tables in respect of Bright Sunshine Hour and Potential Evapotranspiration (especially during prior to the decade of 1980 and the last decade of the previous century) are very significant. Meteorology has great dependence on changing environment. Meteorological phenomena result from interaction of different elemental properties of atmosphere. Influences of changing environment have been analytically analysed in this paper. Some environmental changes do not directly influence Meteorology, but can influence indirectly. Bank line erosion of rivers takes place due to shifting of course of rivers and also due to certain meteorological cause as well as deforestation/ de-plantation. Now, reference is made to the undermentioned research paper:-

A Study on the Discharge Rate of the Ganga at Farakka, published in PARIPEX – Indian Journal of Research, May, 2014 issue.

However bank line erosion can adversely affect supply of water through canals connected to rivers spoiling vegetation, and ultimately reducing zonal evapotranspiration.

It is not only required that environment is to be protected against pollution. Controlled urbanisation and controlled modernisation are also required to restrict certain environmental changes which have adverse effects on Meteorology.

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Table I

Percentage of month wise bright sunshine hours (PS) with respect to normal is tabulated below:-

	PS Jan,2015	PS Feb, 2015	PS Mar, 2015	PS Apr, 2015
Alipore	074	078	096	071
Port Blair	082	086	091	093

(Referred relevant research paper may be consulted for values of PS during earlier months / years.)

Table II

Potential Evapotranspiration (PET) in mm/day is tabulated below:-

	PET averaged during 1901-1950	PET averaged during 1951-1960	PET averaged during 1961-1970	PET averaged during 1971-1980	PET averaged during 1981-1990	PET averaged during 1991-2000
March	6.29	6.43	6.44	6.37	6.07	6.15
April	6.92	7.01	7.06	6.94	6.77	6.92
May	6.81	6.85	6.96	6.88	6.75	6.82

(Data have been collected from the free and open access site www.indiawaterportal.org/met_data/)

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