# ABSTRACTS

## 1. DECADAL VARIATION OF WEATHER IN ORISSA

**L.D.P.ROY**
**Metrological Centre**
**Bhubaneswar**

Meteorological Centre, Bhubaneswar was established in the year 1975. There are eighteen departmental /part time observatories under its control to record the weather in Orissa. Besides, there are 131 rain gauge stations in Orissa to record rainfall. To study the climatology of meteorological sub-divisions of Orissa, the state can be divided into four meteorological regions namely north coastal Orissa (undivided Balasore & Cuttack districts), north interior Orissa (Mayurbhanj, Sundargarh, Sambalpur, Keonjhar & Dhenkanal districts), south coastal Orissa (Ganjam & Puri districts) and south interior Orissa (Bolangir, Kalahandi, Phulbani & Koraput districts). In order to study the decadal changes in weather, one metrological station from each meteorological region is chosen for a detail study. Those are Balasore, Bhubaneswar, Gopalpur, Jharsuguda, Titlagarh & Phulbani. The decadal mean of maximum temperature of the day was studied from 1976 to 2000.It is oscillatory in nature. Similarly decadal mean of minimum temperature of a day was studied for the period. It does not show a definite trend & are not statistically significant. There is increase in rainfall over Bhubaneswar. The cyclones crossing the coast between Gopalpur & Balasore from 1981 to 2003 are studied. The cyclonic storm is increasing its intensity & severity at present.

## 2. METEOROLOGICAL DISASTERS AFFECTING ORISSA

**R.K.Rout**
**Meteorologist Gr. I**
**Meteorological Centre**
**Bhubaneswar**

Cyclone, Flood, drought, heat wave are major meteorological disasters in Orissa. Cyclonic-storm has been the most devastating natural phenomenon that has shattered state's economy and inflicted enormous suffering to the people.

Orissa being a maritime state in the east coast of India is cyclone prone and any storm formed in the Bay of Bengal mostly move towards east coast during the storm season (March, April, May) and (October, November, December). During the months of October-December & March-May the atmospheric pattern is favorable for movement of Cyclonic storm (CS) towards east coast of India. More number of CS has the tendency to cross Orissa during May & October-November in addition to monsoon months of June-September.

On analysis, it has been seen that during a period of 111 years from 1891 to 2002, 63 cyclones had crossed Orissa or moved very close to Orissa. Out of this 13 numbers have crossed during October-December (post monsoon season) and only one during March to May (Pre monsoon season)

Interestingly during the pre monsoon storm season only one cyclonic storm has crossed Orissa coast or very close to it in the month of May only and no storm crossed Orissa coast in March or April.

During monsoon months of June, July, August & September though more number of storm crossed Orissa coast they were of a less intensity.

During the 111 years, three super cyclones have crossed the East coast between $15^0$ North latitude to $22^0$ N, one each over Andhra Pradesh, Orissa and West Bengal and during the same period nearly 50% violent storms of 185 kilometer per hour wind affected Orissa coast.

## 3. MICROALGAL FLORA OF AQUATIC ECOSYSTEMS AS EARLY WARNING SYSTEMS FOR ASSESSMENT OF CLIMATE CHANGE AND THEIR MITIGATION

**Prof (Mrs) S.B.Padhi**
**Algal Research Laboratory**
**Dept. of Botany**
**Berhampur University**

Microalgal flora has been used to determine water condition and changes in mineral contents in lakes, rivers and ponds. Small changes of only a few degrees in average annual temperature may have dramatic effects on occurrence, growth, metabolic activities of microalgal organisms. They are affected by changes in the chemical, physical, biological environment and other climate factors. Since they make up the base of the food chain, any adverse effect on the microflora is a matter of urgent concern. Microalgal response to sudden unexpected surges of harmful materials into the environment usually caused by technological failures or human error can be used as an important tool as an early warning system to mitigate the adverse effects on the aquatic ecosystem.

# 4. CLIMATIC AND PHYSIOGRAPHIC CONTRIBUTION TO THE HERPETOFAUNAL NOVELTY IN THE ESTERN GHAT RANGES OF ORISSA

**Pratyush P. Mohapatra, Siba P.Parida and S.K. Dutta**
**P.G. Department of Zoology**
**Utkal University**
**Bhubaneswar-751004**
**Orissa, India**

The herpetofauna of Orissa is represented by 22 species of lizards, 3 species of crocodilians, more than 45 species of snakes and 12 species of fresh water turtles and tortoises. This excludes the sea turtles and sea snakes. However detailed field studies, specifically in the unexplored forest areas reveals several species of frogs, snakes, lizards and turtles new to sciences or were not recorded earlier. Some of these taxa includes lizards: Ophisops sp, Hemidactylus subtriedrus, Geckoella sp, Calodactylodes aureus; frogs; Philautus similipalenissi, Fejerverya orissaensis, Fejerverya sp, Rana malabaricus, Microhyla sp, Polypedates teraiersis and Chirixalus sp; snakes:Boiga forsteni, Boiga orchracea, Oligodon affinis, Sybnophis sagittarus, Lycodon striatus, Lycodon sp, Elepha helna monticolaries, Trimmeresurus gramineus, Ahetulla pulverunlentus.

Several of these species are found either in the Western Ghat ranges or in North East India. Furthermore, these species live in the semi-evergreen rain forests or wet-evergreen forests of the above regions. Their presence and discovery in the Eastern Ghat forest indicate that similar climatic and habitat features are also found in some areas of Orissa. However, such habitats are fragmented and these species have been found in areas similar to Western Ghat and North East habitats. Hence we consider these as indicator species of both climatic and physiographic factors. It is suspected that additional survey in Orissa will yield more such species, which will add new dimension to the existing knowledge on the herpetofauna of India.

## 5. CLIMATIC EFFECTS AND IMPACT ASSESSMENT OF NUTRIENT FLUXES TO BHITARAKANIKA ESTUARINE WATERS

**A.Swain, T.K. Das, P.R. Biswal and S.P.Rath.**
**P.G.Department of Botany, Utkal University, Bhubaneswar,**
**S.V.M, College, Jagatsinghpur**

Environmental perturbations have strained watershed properties intensely. Anthropogenic activities and watershed properties govern nutrient loads to the estuaries. The pristine watersheds receive most of the nutrients from catchments and up streams. In relation to carbon, Nitrogen, Silicon and Phosphorous Nitrogen (N) retention has shown large variability in surface waters. There are signs of increased area-specific runoff rates. Similarly, exports of phosphorous (P) have shown large variability among catchments. It has been seen that N:P ratios in different catchments have shown different variable properties in relation to vegetation distribution. The flux of silicon (Si) to estuaries has been shown in decreasing trend. The retention of P has been most efficient in the basin waters. It is predicted that even short term climatic changes have impacted nutrient export to estuaries. The 'N' occurrence has been well marked during late winter in relation to mild winters than cold and normal winters. More N export has been observed in winter. Climatic shifts in relation to precipitation and temperature are considered as dynamic variables, which have reflected increased inorganic N concentration in comparison to the normal years. Climatic warming is very significant in relation to the decrease N:P ratio. The export of P, N and Si to the estuaries is found decreased with warming and reduced precipitation .Probably, the increased $CO_2$ concentration has resulted in an increase in N concentration in water.

Key words:-Bhitarakanika Estuary, Impact Assessment, Nutrient fluxes, wetlands, water dynamics.

## 6. PILOT ACTION FOR CLIMATE CHANGE

**N.K.DAS, Assets Orissa, Bhubaneswar**
**S.R.MANIA, Research & Analysis Consultants, Bhubaneswar**

Global action for impact of climate change initiated at RIO in 1992 and by creation of "United Nations Frame Work Convention on Climate Change" is implemented through annual Conference of parties. Besides mitigation, adaptation has been identified as focal area. Delhi declaration emphasize need to contain and further reduce green house gas concentration to 5.2% below 1990 level by the year 2012. Inter governmental panel on climate change stressed vulnerability of developing countries. Emphasis has been laid on tackling human induced in climate change. A clean development mechanism has been devised as a process of cooperation by developed and developing nations and carbon emission reduction credit is an effective tool for technology and resource transfer. Capacity building from local to national level has been the acknowledged pathway.

A local forum for climate change has been formed at ASSETS ORISSA to address the issue of voluntary participation and scientific support for network action on climate change. The climate change mitigation segmental activity in Orissa has been nucleated which centers around small sized green field industries where during the last few year carbon emission hazard has been noticed .A large number of small sized coal based Sponge Iron plants have come up. The entrepreneurs have been addressed for awareness of their obligations and scientific support for appropriately controlling the emission as well as recovering waste heat co-generation. Majority of such unit have now installed control equipment and a few have already progressed in harnessing waste gas energy. A CDM proposal is under negotiation through the UNDP project "UNDP/GEF Assisted project" under Ministry of Steel. An assessment of the cumulative carbon reduction benefit is being attempted. An UNDP small grant project has been under implementation by Research & Analysis Consultants, Bhubaneswar with the central theme of Industry-Community -Cooperation in the periphery of a sponge iron plant in Keonjhar. The coal char, which is the Industry's waste product will be recycled and converted to smokeless fuel briquette for use of the households in the neighborhood to replace customary firewood. Low cost improved cook stove will be provided. This will be a step forward to save the housewives from health hazards as well as to check the degradation of forest resources, which eventually contributes to climate change

For capacity building in the model project area village institutions for youth, women, and farmers activity with environment education and motivation has been taken up. Short season cultivation has been facilitated as an alternative

farming system and for augmenting household income. Drinking water, health, plantation and community services have also been taken up as a holistic measure with environmental amelioration in focus.

Socio economic base line survey has been conducted. Acquisition on climatic data from the surrounding observation stations for last 10 years and generation of local, seasonal data will be undertaken for analysis, monitoring and forecasting. Land cover changes will be monitored to assess forest carbon sink. Besides balanced water use management, bio-energy and alternative agro-system implementation, self-help based income generation and other innovative capacity enhancement activities are being implemented.

## 7. CHANGES IN COASTAL CLIMATE-POSSIBLE CAUSE AND EFFECTS

**S.N.Das, Ruby Das and Y.V. Swamy**
**Regional Research Laboratory, Bhubaneswar 751013**

Vladimir Vernadsky first introduced the concept of 'Biosphere' and stated "there are no stronger chemical forces at the earth surface than living organisms taken in their totality".Svante Arrhenius calculated that a doubling of $CO_2$ level in atmosphere would warm the planet by $5^0C$. Since then our scientific studies have established that there is a distinct warming trend in atmospheric temperatures in spite of increasing reflectivity due to higher quantum of aerosols in our atmosphere.

The warming is due to human interference in the form of burning of fossil fuels , agriculture, deforestation, biomass burning etc resulting in increased inflow of green house gases like $CO_2$ , $CH_4$, $N_2O$ and CFCs.

The effects of this rise in temperature has been felt in various ways, such as

- Gradual shifting of warmer zones pole wards
- Higher than normal temperatures over prolonged periods
- Higher precipitation both in dry and wet forms
- Adverse climatic conditions like heat waves, floods, cyclones
- Adverse effects on human health

Large-scale climate disturbances like super cyclone, recurring flood or heat wave conditions may appear unconnected and discrete in a smaller scale say decades. But when viewed in a larger scale, they present a disturbing picture. For example, if we analyze the highest temperatures recorded on both land and ocean over the last decade of the $20^{th}$ century, we will find , it has risen continuously. This is directly proportional to the unusual climatic conditions as shown in table-1. Spread of vector-bone and water-borne diseases like malaria, typhoid as well as lungs and heart complication due to increased levels of pollution in lower atmosphere (suspended particulate matter, ozone, respirable dust) are some of the manifestations of global warming effects.

Similarly, the emission of green house gases has been going up calling for restraints through international Geo-sphere and Bio-sphere Programme (IGBP) and Conference of Parties (COPs). Signatories to the United Nations Framework Convention on Climate Change (UNFCCC) have submitted their initial National Communications quantifying the emission scenario taking 1994 as the base year. The Kyoto protocol also calls for restricting it. Trading in greenhouse gases has

been introduced to solve the problem of higher emission from certain sectors to be balanced against emission in certain others due to introduction of better and greener technology.

Acidifying trend of atmosphere is more marked now than ever before. It was noticed in North America and Europe in 1980s causing greater concern and awareness. The emission of acidifying gases like $SO_X$ & $NO_X$ from the developing world have increased. Though economic and population pressure in these parts of the world are the forcing factors, attempts should be made to adopt better technology. Our observations over the last 15 years at a remote site monitoring rainwater and aerosol chemistry show an increasing trend of acidification. The trajectory studies have established migration of acidifying gases from the west coast during monsoon as well as non-monsoon periods and the sources are established to be continental in origin. Presence of largely alkaline ions like Ca2+ and $NH_4$ + as well as macro soil particles is not able to neutralize these emissions. Thus the eco-system is under stress and may result in irreversible changes .This will add to deforestation problems in the Eastern-Ghats compounding the adverse effects observed in the form of extreme climatic conditions in the coastal districts of Orissa and Andhra Pradesh.

# 8. LANDUSE/LAND COVER MAPPING AND OBSERVATIONS ON ATMOSPHERIC SUSPENDED PARTICULATE MATTER ALONG WITH METEOROLOGICAL PARAMETERS IN ANGUL-TALCHER AREA

N.D. Mohanty, K.S.Pattanaik & G.Behera
Orissa Remote Sensing Application Centre, Bhubaneswar

The study area in Angul-Talcher is situated between $20^0$ 45' to 21' N and $85^0$ to $85^0$15'E. This area has developed into an industrialised area. The change of topography due to industrialization leads to an accumulation of trace substances and affect hydrometeorogical parameters including temperature and wind speed. Keeping in view Air Pollution problems of Angul-Talcher area, Orissa Remote Sensing Application Centre, a Research and Development Organization under the Department of Science and Technology, Govt of Orissa undertook the study of land use/land cover practices using IRC-IC data and concentration of suspended particulate matter at different stations along with wind speed, wind direction and relative humidity. Moreover, an attempt has been made to study the existence of type heat-islands. Land use/land cover mapping have been classified into different categories viz. built-up-lands, forests, wastelands, water bodies and mines. For convenience, suspended particulate matter concentration estimated over 27 stations in January'97 have been divided into 4 subgroups i.e > 500 ug/$m^3$, 500 to 200 mg/$m^3$, 100 to 200 ug/$m^3$ < 100ug/$m^3$. The study on wind speed and direction reveals that wind direction is dominantly about NW and wind speed is almost calm to moderate in the study area in the same month. It has been observed from morning temperature measurements data in and around Angul-Talcher that there are broadly three heat-island. The study further indicates that the heat-islands are well correlated with land use/land cover practices. It is concluded that Angul-Talcher has been seriously affected due to present land use/ land cover practices which need immediate attention to reduce the burden of pollutants at different stations.

# 9. SEA SURFACE TEMPERATURE (SST) VARIATIONS IN THE BAY OF BENGAL ADJACENT TO ORISSA COAST AND ITS IMPACT ON THE AIR TEMPERATURE IN THE SURROUNDING INLAND

**N.D.MOHANTY & G.BEHERA**
**Orissa Remote Sensing Application Centre, Bhubaneswar**

Orissa state, particularly its coastal districts are subjected to severe spells of hot weather during summer. Severe heat wave conditions for a longer duration are causing a threat to human lives. Data collected by IMD reveals that the average annual loss of human life due to heat wave over India is 153.In the year 1998, when it killed many persons much exceeding the same average, it became a thrust area of research. Orissa Remote Sensing Application Centre made an attempt to study variations of air temperatures at Bhubaneswar, Paradeep, Puri & Gopalpur along with that of the sea surface Temperature (SST) in Bay of Bengal from mid winter to peak summer months for the years 1994 to 1999. The area of study is between $18^0$ to $21^0$N lat. And $84^0$ to $88^0$ E long. The study indicates that monthly average air temperature (Average of maximum & minimum temperature) during May , 1998 was very high and the corresponding SST was $28.8^0$C at $20^0$ N lat. And $87^0$ E long. Though monthly average SST during the month of April & May , 1998 was almost same , average air temperature at Bhubaneswar during April was $2.90^0$C less than that of May 1998

## 10. IMPACT OF CLIMATE CHANGE ON AGRICULTURE:ROLE OF CULTIVATION PADDY

**T.K.Adhya,D.R.Nayak, Y.J.Babu and A. Dutta**
**Division of Soil Science & Microbiolology, Central Rice Research institute**
**Cuttack-753006**

Climate Change is now a reality and assessing the impact of climate change on agriculture is a vital task for scientists in the field f agro-environmental research. In both developed and developing countries, the influence of climate on crops and livestock persists despite irrigation, improved plant and animal hybrids and intensive crop production technologies. Projected changes in the global climate including rise in mean ambient temperature, unpredicted rainfall pattern, high CO2 and rise in pests and diseases are all anticipated to adversely affect the crop productivity. This is more relevant in marginal agriculture practiced in fragile ecologies like coastal environment of the tropics. Use of global circulation models to predict climatic behavior and crop growth modes for extrapolating growth patterns of crop plants in a changed climate, helps in evaluating the complex interaction between the environmental variables influencing crop growth and yield. While crop plants have enough genetic plasticity to withstand climatic interference, efforts should be made to develop friendly technologies for sustaining crop productivity. Growth and productivity of rice, the major cereal crop of tropical India, is likely to be adversely affected by all the parameters of climate change. Alternately, the major effects of rice cultivation on global climate change are due to emission of relatively important trace gases including $CH_4$ and N2O.Studies conducted at Central Rice Research Institute, Cuttack indicate that the emission of these green house gases from India paddy cultivation was far below the predicted levels. However, intensification of rice cultivation to meet the increasing demand of this important crop is likely to reverse the trend. Studies indicate the scope of reducing green house gas emission by employing common agronomic practices without significantly affecting the grain out put.

# 11. CLIMATE CHANGE AND WETLANDS: IMPACTS, ADAPTATION, AND MITIGATION

**Dr A. K.PATTNAIK,IFS**
**Chief Executive**
**Chilika Development Authority**

Wetlands are one of the most productive ecosystems of the world. Wetlands, in all their forms, provide unique services to human societies and human well-being. Wetlands play a key role in the global hydrological cycle; supply water for the survival of biological diversity, human consumption, agricultural production and recreation; supply food (especially fish and rice and other natural products) and are centres of economic development focused around industry, transport, food production and tourism; and are places rich in biodiversity. Conservation and wise use this unique ecosystem is essential to sustain this life supporting system, notably in relation to poverty eradication and food and water security. Climate change may substantially affect the ecological character of wetlands and their sustainable use.

The impacts of climate change, including changing and more extreme patterns of drought, storms and flooding; rise in sea temperature and sea level; thawing of permafrost and glaciers; are likely to adversely affect the ecological integrity of the wetlands. Persistent drought in many regions of the world is already seriously affecting the ecological character of wetlands and that climate change, along with other land use and land management activities, is projected to adversely affect their potential for supplying economic benefits. The Intergovernmental Panel on Climate Change (IPCC) in their Third Assessment Report (TAR), have expressed concern about the likely adverse impact of climate change on some sensitive ecosystem like reefs, atolls, mangroves, sea grass beds tropical and boreal forests, and arctic (including permafrost) and alpine ecosystems, because of their limited adaptive capacity, and may undergo significant and irreversible change. UN Framework Convention on Climate Change (UNFCCC) and its subsidiary bodies have recommended that education, training and public awareness are vital tools in addressing issues of climate change. It is further felt that developing cooperation among multilateral environmental agreements and their subsidiary bodies on matters of common interest on climate change is necessary, as the issue is global in nature. The Scientific and Technical Research Panel (STRP) of Ramseur Bureau are of the opinion that there are key gaps in current knowledge and information on the possible impacts of climate change upon wetlands, and on wetland adaptation, and on the ways in which wetlands can mitigate climate change impacts. This need to be bridged through appropriate modeling and the findings of the model

study need to be incorporated in to the management planning; so as to increase their resilience to climate change and extreme climatic events, and to reduce the risk of flooding and drought in vulnerable sites by promoting wetland and watershed protection and restoration.