ANNUAL REPORT 1998-99

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Indian National Centre for Ocean Information Services (Dept. of Ocean Development, Govt. of India) NRSA Campus, Balanagar Hyderabad-500 037, (A.P), India

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Introduction

The Department of Ocean Development (DOD), Government of India, have established Indian National Centre for Ocean Information Services – INCOIS at Hyderabad, Andhra Pradesh with the responsibility to provide the coastal and ocean information services, supporting developmental and operational sectors like ports, fisheries, shipping, meteorology, environment, off shore and coastal zone management in addition to promote advanced oceanographic research, in the country. INCOIS will generate and disseminate near real time information on Sea Surface Temperature (SST), chlorophyll, Potential Fishing Zones (PFZ) advisories, tracking of oil spills, forecast economical shipping routes, and upwelling zones along the Indian coast, utilizing both remotely sensed and conventionally observed data. The parameters envisaged for dissemination include wind, wave, current, mixed layer depth, heat budget and maps on coral reef, mangroves, shore line change and land use pattern. INCOIS is responsible for promoting application and marketing of data. INCOIS thus, is to support the Nation for sustainable development of the coastal and ocean sectors through ocean information services.

Background

In June 1990, national remote sensing Programme was initiated by the DOD for the study of various oceanic parameters/features/processes for exploration and exploitation of marine resources with active participation of National Remote Sensing Agency (NRSA), Space Applications Centre (SAC), National Institute Oceanography (NIO), Centre for Mathematical Modeling And Computer Simulation (C-MMACS), Central Marine Fisheries Research Institute (CMFRI), Orissa Remote Sensing Application Centre (ORSAC) and Institute of Ocean Management (IOM). This national programme, initially taken up for a period of 3 years (1990 -1993) was aimed at generation and demonstration of the remote sensing capabilities for obtaining information on various oceanic parameters/features/processes relevant to ocean development and operationally disseminating such information to the down stream users. The ultimate goal of this national programme was to integrate remotely sensed information with insitu data collected by conventional methods and thereby established Marine Satellite Information Services (MARSIS) to promote optimum utilization of ocean resources. After

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successful completion and achieving the goals, the project was continued in the second phase during 1993 – 1994 to 1996 – 1997. The national ocean remote – sensing programme, comprising of four specific projects was carried out by national research institutes, to address the following tasks.

- To study ocean related remote sensing applications and generate data on ocean parameters for dissemination on operational mode to the users, by NRSA, Hyderabad and SAC, Ahmedabad.
- ii. To collect sea-truth data required for remote sensing applications on the ocean and coastal zone by NIO, Goa.
- iii. To develop models for simulation and prediction of oceanic processes, by C-MMACS, Bangalore.
- iv. To develop information system on remote sensing application of marine environment, by NRSA, Hyderabad.

One of the objectives of this programme was to develop thematic information system for use in the coastal and ocean developmental activities. To give thrust to this activity, five centres were identified with the following theme.

- 1. National Remote Sensing Agency (NRSA): Remotely sensed information (SST) etc.
- 2. Institute if Ocean Management (IOM): Coastal zone information.
- 3. Orissa Remote Sensing Application Centre (ORSAC): Coastal zone information.
- 4. National Institute of Oceanography (NIO): Physical and chemical oceanographic information (sea truth).
- 5. Central Marine Fisheries Research Institute (CMFRI): Biological and fishery Oceanographic Information.

The broad goals of this project were to acquire, process, quality check, archive and disseminate data on above disciplines to end users on demand.

Genesis

The expert group of Indian Climate Research Programme (ICRP) expressed that generation of data from satellites, moored buoys, expandable bathythermograph etc. is essential for implementation of the programme. The group felt that data from both moored buoys and satellites would provide the most reliable and essential information for ocean state forecasts. It was strongly felt that there is a need to make operationally available some of the ocean information services like PFZ information and near real-time data on ocean parameters like wave, wind, temperature and coastal zone maps.

With this background, the DOD constituted a Working Group on Ocean and Atmospheric Climatology to develop a 5-10 Years perspective plan as inputs for 9th plan under the Chairmanship of Prof. R. Narasimha. The group met in February 1996 and discussed and recommenced the need for an Ocean Service Center and constituted a Working Group on Ocean Service Center under the Chairmanship of Prof. B.L. Deekshatulu with members from NIO, NRSA, SAC, SCI (Shipping Corporation of India), DOS (Department of Space), FSI (Fishery Survey of India) and IMD (Indian Meteorology Centre). The Working Group reviewed the status of ocean parameters, which can be retrieved from space borne sensors and possible generation of operational data products and modal-derived value-added products using satellite data, conventional data from ships, data buoys and others in-situ observations. The Working Group has recommended for setting up of a dedicated national centre to provide the ocean information services on operational basis.

Goals

INCOIS is established as an autonomous body organisation under the DOD with the following objectives.

- Undertake, aid, promote, guide and co-ordinate research in the field of Ocean Information Services.
- Establish and operate systems for data acquisition, analysis and interpretation.
- Archive ocean related data and disseminate value added products to users.
- Acquire information based on satellite technology and conventional data from ships, buoys etc. and generate data-products related to physical and biological processes at the sea and coastal zone for associated resources.
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- Provide user driven value-added products to ocean and atmospheric scientists/engineers, policy makers, Navy, Ports and fishing community.
- Undertake user requested projects for ocean and coastal zone related operations.

Organisation

Indian National Centre for Ocean Information Services (INCOIS) was registered on 3rd February 1999 as a society under the Andhra Pradesh (Telangana Area) Public Societies Registration Act 1350 Fasli at Hyderabad.

Following are the members of the society and the Governing Council of INCOIS.

INDIAN NATIOONAL CENTRE FOR OCEAN INFORMATION SERVICES SOCIETY MEMBERS					
Dr. A. E. Muthunayagam	Secretary, DOD	President			
Dr. D. P. Rao	Director, NRSA	Vice-President			
Dr. P. C. Pandey	Adviser, ASC, DOD	Member			
Dr. E. Desa	Director, NIO	Member			
Prof. M. Ravindran	Director, NIOT	Member			
Shri B.N. Krishnamurthy	Adviser, DOD	Member			
Dr. A. Narendra Nath	Director, DOD	General Secretary			
INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES GOVERNING COUNSIL MEMBERS					
Dr. A. E. Muthunayagam	Secretary, DOD	Chairman			
Dr. D. P. Rao	Director, NRSA	Vice-Chairman			
Shri A. Mishra	Joint Secretary, DOD	Member			
Shri S. Pandey	Jt. Secy. & Fin. Adv., DOD	Member			
Dr. A.K.S. Gopalan	Director, SAC	Member			
Dr. E. Desa	Director, NIO	Member			

Prof. M. Ravindran	Director, NIOT	Member
Shri S. Gopalan	Development Adviser, MoST	Member
Shri B.N. Krishnamurthy	Adviser, DOD	Member
Dr. P. C. Pandey	Adviser, ASC	Member
Shri V. Jayaraman	Director, EOS, DOS	Member
Dr. R. N. Singh	Head, C-MMACS, NAL	Member
Prof. V.K. Gaur	Emeritus Scientist, NAL	Member
Prof. B.L. Deekshatulu	Director, CSSTE-AP	Member
Dr. A. Narendra Nath	Director, DOD	Member Secretary

Organisational Concept



Facilities

- IINCOIS is located in the campus of NRSA, Hyderabad
- The computing facilities and systems created under MARSIS program of the DOD at NRSA, Hyderabad are available to INCOIS for carrying out immediate operations.
- The Government of Andhra Pradesh have allotted 50 acres 39 guntas of land for establishing INCOIS campus.

Ocean Information Services

Prior to establish of INCOIS, the program on providing SST and PFZ information was implemented through NRSA, Hyderabad. INCOIS undertook supervision of the program. The necessary measures and readiness plan have also been prepared. The physical parameters, data products and potential users are as follows.

Users Organisations

Physical Parameters	Users
SSTs, Winds, Waves, and	IMD, IITM, IITSc, Universities
Other derived parameters	organisations involved in ocean and
Colour of the sea, Chlorophyll	Atmospheric studies, Navy, Ports,
Sediments, Clouds, Water Quality	Industry and Modellers.
Coastal Zone and other GIS products	Govt. Departments, Decision makers, Environmentalists, Navy
	Coastal Guard, Ports, Voluntary
	Organisation and Industries.
Biological Parameters and fishery	Modellers, Fishery Research
Fishery Forecast Services	Organisations, State Govt. Fishery
	Organisations, Industry, Fishermen
	Associations and individual
	Fishermen.

Data Archives

INCOIS has a heritage and acquired the data created during different phases of DOD Projects as inheritance. Following are the important data holdings.

- a. SST archives for North Indian Ocean from 1992 onwards.
 - Daily, weekly and monthly images and grid data
 - NOAA-AVHRR raw data.
 - Brightness Temperatures
- b. PFZ information since 1992 onwards
 - Sector maps and PFZ information along the Indian coastline and Islands (twice weekly maps for non-monsoon months)
- c. Topography maps (of 0.5 meter contour intervals) from Nellore to Visakhapatnam along Andhra coast in 1:25,000 scales prepared by survey of India
- d. Moored and drifting Data Buoy information from NIOT and NIO, respectively.
- e. Wetland and coastal zone maps in 1:50,000 scales.
- f. Coral reef maps on Indian region.
- g. IRS LISS-II image data of entire AP coast and other regions.
- h. Landsat data and glacial morphology map covering Dakshin Gangotri, Antartica & environs (3° E to 21° E and 69° S to 75° S) of 1973 and 1995.
 - IRS-PAN data of Maitri region and AVHRR mosaic of the convinent.
 - Geological classification of Schirmacher and Wholthat mountains.



Data Products

Sea Surface Temperature is regularly derived from NOAA-AVHRR data using daytime multi-channel SST algorithms. Although the project started during 1990-91, a reasonably database had become available from 1996 onwards. Prior to 1996, database needs improvement in their bias and accuracy. Efforts are afoot to develop regional algorithms with sea truth data from the buoys in the Indian Ocean. Reprocessing of the entire AVHRR data sets is planned to create a better SST database with higher accuracy.



Thermal features in high special resolution maps are used for understanding ocean dynamics, productivity and ocean atmosphere interaction. These products have various applications in the field of ocean dynamics, particularly identifying thermal fronts, which are known for their usefulness in PFZ forecast. Time series information on SSTs are useful in understanding advection, mixing, circulation of the different water masses, genesis of cyclones and primary productivity at the sea.

SST products generated as averages of 15° to 5° latitude/longitude grids and their anomalies with reference to climate data sets have several applications in studying weather and climatic studies of local and global significance. In context to Indian sub-

continent, long term analysis of such information is expected to be useful fo understanding dynamics of the Asian monsoon.



Estimates of wave climate, such as monthly height or of the 50 year wave height, are needed for designing offshore structures, ship routing and establishing of a coastal industry. The amphibious activities of army and navy require real-time as well as 50 to 100 year statistics on wave climate of the coastal waters.

Erosion and accretion along the coast under the impact of wave induced stress and eventual surges associated with local tides and currents are of significant importance in view of the coastal zone management. In

this regard, the wave pattern observed by optical sensors on board Indian Remote

Sensing (IRS) satellite as seen off Andhra coast and Mangalore coast are quite significant.

Indian coast, particular west coast is expose to heavy ship traffic and oil pollution as most of the gulf oil is being exposed to Far East through the Arabian Sea. Accidental oil spills cause damage to ocean environment. In this regard, satellites provide a better scope for monitoring oil spill at the sea. One of the major spills Is seen with IRS-1B data off



Mangalore coast. With the availability of data form IRS-1c and IRS-1D, the scope for monitoring has been extended further.

IRS-P4, with Ocean Colour Monitor (OCM) and Multi-frequency Scanning Microwave Radiometer (MSMR) having repeatiivity of two days and covering a swath as much as 1400 KMs is expected to provided valuable information on the ocean and the atmosphere around Indian subcontinent. The required software and data analysis capabilities are being developed for retrieval of ocean parameters. This will facilitate the users in their respective studies of marine resource management. Monitoring of oil and naturals spills and ship traffic is expected to the users of fishing and shipping industry. Satellite data provide depth signatures in clear water conditions. Efforts are being made to establish relationship with depth in the coastal waters. This may help ship navigation in uncharted waters.

The development efforts will be made to estimate chlorophyll concentration from the OCM data around the Indian Coast. This is expected to improve the PFZ forecast. Subsequently, methods/techniques will be developed to integrate information extracted from SST with those of OCM derived chlorophyll to improve the PFZ along the Indian Coast. Besides, the improvement of fore cast techniques and dissemination modes are also planned. In future, such information will be converted into electronic form for providing through Web pages over internet.

Potential Fishing Zone (PFZ) Information

Fish is a dynamic aquatic resource. Ability to forecast the catch or their variation in seasonal abundance of stocks in different areas assumes great importance in development and management o fisheries. Marine fish forecast is based on various aspects of Physical, Biological and Chemical processes at the sea. This involves basic understanding of currents, upwelling areas, eddies, gyres and thermal fronts over space

over space and time. Remote sensing observations can provide a significant part of

information needed to assess and improve potential yield at the fishing grounds. A wide special coverage and repeatiivit at short interval provide additional advantage to utilize the satellite technology in the forecast of PFZ Information.

SST over the Arabian sea and Bay of Bengal are retrieved fror thermal infrared radiation using NOAA-AVHRR channels for Identifying PFZ along the Indiar Coastline and Island regimes. The coastline of India divided Into 11 sectors covering



maritime states viz. Gujarat, Maharastra, Karnataka, Goa, Kerala, Tamilnadu, Kanyakumari, Andhra Pradesh, Orissa, West Bengal, Lakshadeep, Andaman & Nicobar

Islands. Thermal gradient information is transferred to a standard map for identifying

surface dynamic features which represent the areas of fish aggregation. The text PFZ information containing and maps are transmitted to fishermen community through fax, telephones, telegrams, telex, news media, etc. Based on Feedback received from the fishermen and concerned organisations, validation experiments have been conducted for PFZ forecast. The results are found to be encouraging.



