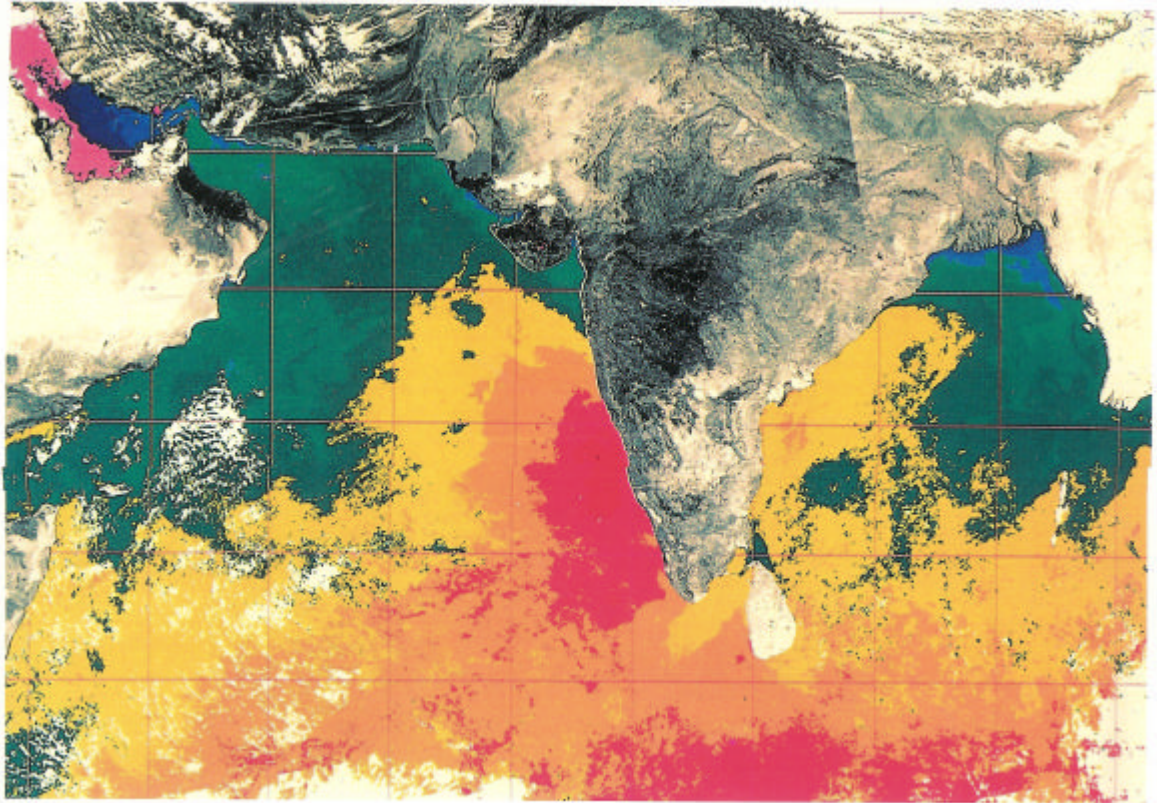


SECOND ANNUAL REPORT

1999-2000



**INDIAN NATIONAL CENTRE
FOR OCEAN INFORMATION SERVICES**
Department of Ocean Development
Government of India
HYDERABAD – 500 037.

SECOND ANNUAL REPORT

1999-2000

**INDIAN NATIONAL CENTRE
FOR OCEAN INFORMATION SERVICES**
Department of Ocean Development
Government of India
HYDERABAD – 500 037.

CONTENTS

1. Background	01
2. Roles and Responsibilities	02
3. Organisation	03
4. Major Events	05
5. Infrastructure and Facilities	06
6. Programme	06
6.1 Sea Surface Temperature	06
6.2 Potential Fishing Zone Advisories	08
6.3 IRS-P4 Utilisation	10
6.4 Marine Data Centres	11
6.5 Coastal Area Mapping	12
7. Information Bank	13
8. Potential Users	14

Appendix-1 (List of Acronyms)

1. Background

Knowledge and information on the ocean surrounding India are of paramount importance, as this realm is a potential source for food, energy and drugs, a driving force for monsoons, a powerful means of transport and strategic space. Recognizing the importance, the Department of Ocean Development initiated Marine Satellite Information Services (MARSIS) programme in June 1990, to address some aspects of remote sensing applications for coastal region and oceans. The ultimate goal of this national programme was to integrate remotely sensed information with the in-situ data collected by the conventional techniques towards generation of user-oriented data products for effective utilization of ocean resources. Besides, the programme envisaged development of thematic ocean information systems for use in ocean development.

One of the major accomplishments of MARSIS programme was successful demonstration of generation and experimental dissemination of potential fishing zone (PFZ) information to the end users. Similarly, several programmes were launched by the Department and other agencies, towards acquisition of a variety of coastal and ocean data. These programmes received a good response from the user community.

In 1996, an expert group on Indian Climate Research Programme (ICRP) expressed that generation of data from satellites, moored buoys, expandable bathythermographic etc is essential and provide the most reliable and essential information for forecasting of ocean state. It was strongly felt that the ocean information services like providing potential fishing zone information, and other ocean parameters like waves, winds, Temperatures and coastal zone would need to be made available operational basis.

Towards effective delivery of data products and other services, the Department of Ocean Development (DOD) established, an autonomous institution, Indian National Centre for Ocean Information Services (INCOIS) and registered it as a Society under the Andhra Pradesh (Telangana Area) Public Societies Registration Act 1350 Fasli at Hyderabad on February 3, 1999.

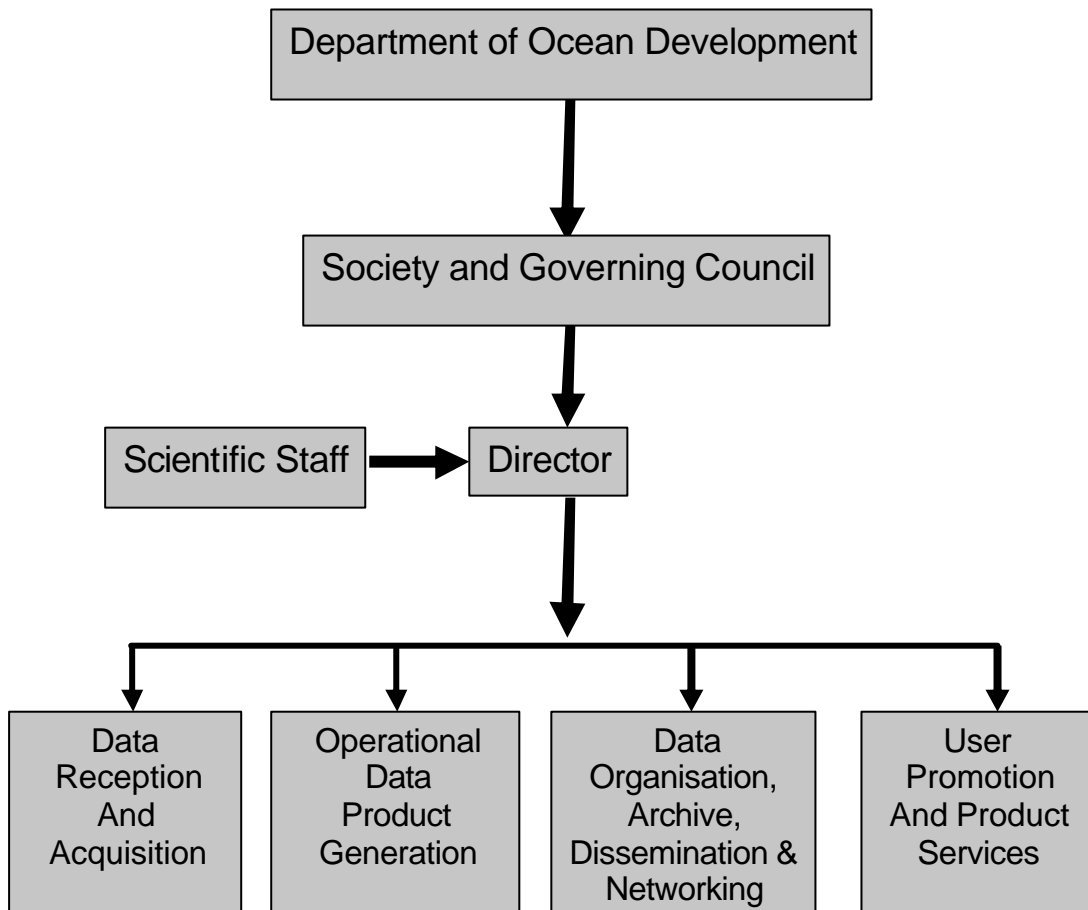
2. Roles and Responsibilities

The mandate of INCOIS is to synthesize, generate, promote, provide, coordinate the various endeavors in the field of Ocean Observations, Information and Services particularly with respect to seas around India, towards sustainable development of ocean resources, improving forecasting of weather and planning of coastal developmental activities.

INCOIS is designed to meet the user demands of data, data products and other consultancy in the coastal Ocean realm with specific responsibilities as stated below:

- a) Synthesize ocean and coastal remote sensing data with observed and measured data, generate and disseminate coastal and ocean data and data products in the form of sea surface temperature (SST), potential fishing zone (PFZ) advisories and other ocean features like waves, up welling zones, oceanic eddy information, chlorophyll and suspended sediment loads etc.,
- b) Provide ocean information consultancy services to the State and Central Government agencies and Private sector.
- c) Manage Marine Data Centres set up under National Ocean Information System (NOIS) and Marine Satellite Information Service (MARSIS).
- d) Collect sea truth data and undertake and organize validation campaigns for Ocean Satellite Sensors.
- e) Organise User Interactions both Private and Government Sectors.
- f) Undertake Surveys and assess User demands, Specifications of the Ocean Information Services, costing, Marketing and Marketing strategies, and
- g) Undertake experimental Ocean State Forecast.

3. Organisation



The composition of the Society and the Governing Council is given below:

COMPOSITION OF SOCIETY

Dr. A. E. Muthunayagam, Secretary, DOD	President
Dr. D. P. Rao, Director, NRSA	Vice-President
Dr. P. C. Pandey, Director, NCAOR, 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

COMPOSITION OF SOCIETY

Dr. A. E. Muthunayagam, Secretary, DOD	Chairman
Dr. D. P. Rao, Director, NRSA	Vice-Chairman
Prof. V. K. Guar, Emeritus Scientist, IIA	Member
Prof B. L. Deekshatulu, Director, CSSTE-AP	Member
Shri C. S. Rao, A. S. & Financial Adviser, DOD	Member
Shri Anil Misra, Joint. Secretary, DOD	Member
Principal Adviser (S&T), Planning Commission	Member
	(From Nov. 1999)
Shri A. K. S. Gopalan, Director, SAC	Member
Dr. E. Desa, Director, NIO	Member
Prof. M. Ravindran, Director, NIOT	Member
Shri S. Gopalan, Development Adviser (Ports), MOST	Member
Shri B. N. Krishnamurthy, Adviser, DOD	Member
Dr. P. C. Pandey, Director, NCAOR, DOD	Member
Shri V. Jayaraman, Director, EOS, DOS	Member
Dr. R. N. Singh, Head, CMMACS	Member
Dr. A. Narendra Nath, Director, DOD	General Secretary

4. Major Events

- ◇ On February 3, 1999. INCOIS started functioning formally from its premises located at the campus of National Remote Sensing Agency, Hyderabad. During the year, three officers of the Department of Ocean Development were posted at INCOIS to provide support for the Centre Director in setting up of facilities at INCOIS.
- ◇ On May 26, 1999, India launched Indian Remote Sensing Satellite (IRSP4), designed specifically for oceanographic studies in India. INCOIS would extensively make use of the data available from the IRS-P4.
- ◇ Director, INCOIS participated in the Fourth Session of the IOC-WMO-UNEP Committee for Global Ocean Observing System, held at Paris during June 23-25 1999, organized by Intergovernmental Oceanographic Commission (IOC), UNESCO. A national report highlighting the envisaged activities under INCOIS was presented in this session.
- ◇ Under Indo-Myanmar Co-operation for Ocean Science & Services, a two-member delegation from Myanmar visited INCOIS during October 18-19, 1999, for identifying the areas for cooperation in the field of Ocean Science.
- ◇ The Second and Third Governing Council meetings of INCOIS were held on November 9, 1999 to review the progress of the INCOIS to provide advice and accord approvals on various proposals relating to implementation of the programme and to amend the Byelaws. The First meeting of the Society was held on November 9, 1999 and adopted the Annual Report and Accounts of INCOIS for the years 1998-1999.
- ◇ A 10-day hands-on-training programme for three Scientists from Sri Lanka was organized by INCOIS, during January 17-27, 2000 on the generation and dissemination of Potential Fishing Zone information under the Indo-Sri Lanka Sub Commission of Science and Technology.

5. Infrastructure and Facilities

INCOIS is currently operating from the campus of National Remote Sensing Agency (NSRA), Hyderabad. During the year INCOIS entered into a Memorandum of Understanding with NRSA for providing administrative, scientific and technical support to INCOIS in the recruitment of personnel, setting up of office, procurement of systems, software and accessories for operationalisation of the actives of INCOIS as well as utilization of the facilities set up at NRSA under the MARSIS programme.

6. Programmes

6.1 Sea Surface Temperature (SST)

Sea Surface Temperature is retrieved regularly from NOAA-AVHRRR data. The SST data is used for delineation of thermal features of the surface ocean, which is useful for understanding ocean dynamics, productivity and ocean-atmospheric interaction. These are important to generate potential fishing zone information. Further, the time-series information on SST are required to understand the surface advection, mixing, circulation and genesis of tropical cyclones. SST averages of 15° to 5° latitude/longitude grids and their anomalies with reference to climatic 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 for understanding the dynamics of Asian monsoon.

During the year, over 250 daily composites of SST were generated for the northern Indian Ocean and provided to users groups. The details of daily grid averages of SST generated for each month during the current year are as shown in Figure-1.

Besides, quarterly SST for three years i.e., 1995-96 to 1997-98 for the Arabian Sea were generated, compiled and analyzed to study the seasonal and inter-annual variations of SST. The satellite-based SST images were compared with the in-situ data collected during the Indian component of Joint Global Ocean Flux Study to address the

changes in biological productivity relating to upper ocean dynamics. A typical SST Composite generated using NOAA-AVHRR data is given in Figure-2.

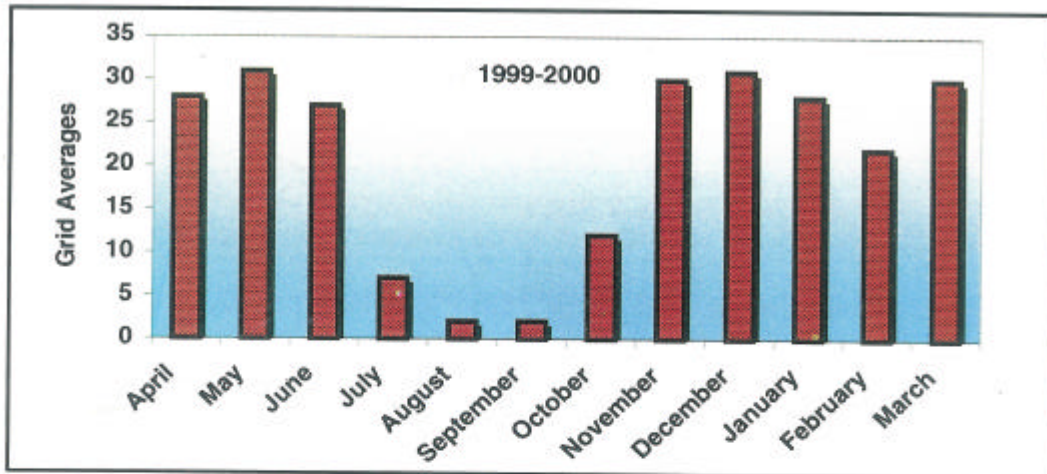


Figure 1. Daily Averages of SST generated during the year 1999-2000

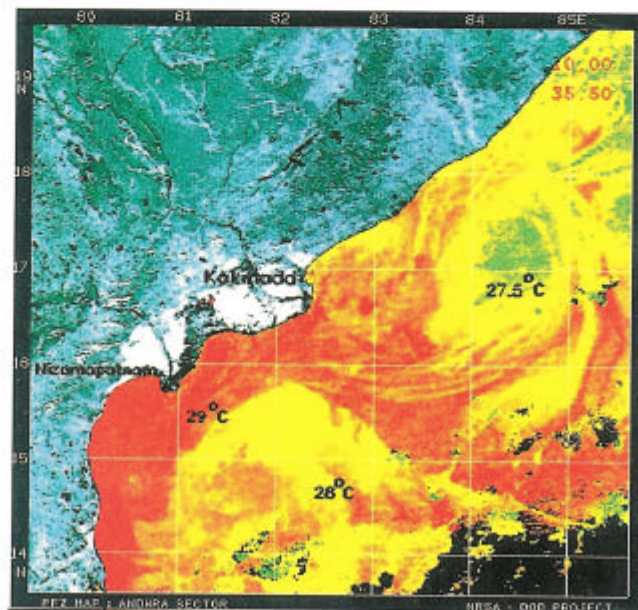


Figure 2. A typical SST Composite of Andhra Coast generated using NOAA-AVHRR Data

From the SST images, a 3-days composite of SST would be generated for delineating the upper ocean processes such as gyres, eddies, thermal fronts, advection, mixing and surface circulation which would be of relevance to surface biological processes.

6.2 Potential Fishing Zone (PFZ) Advisories

The ability to forecast catch or seasonal abundance of stocks in different areas requires a great of understanding on various aspects of physical, biological and chemical processes of the sea. This involves basic knowledge of currents, upwelling areas, eddies, gyres and thermal fronts over space and time. Remote sensing observations can provide a significant part of information needed to asses the potential fishery zones. A wide spatial coverage with repetivi at short intervals provides additional advantage to utilize the satellite technology for the forecast of PFZ information.

Sea Surface Temperature (SST) over the Arabian Sea and Bay of Bengal, retrieved from thermal infrared channels of NOAA-AVHRR are used for identifying Potential Fishing Zones along the Indian coastline and island regimes. Thermal features in high spatial resolution SST represent the upper ocean dynamics relating to biological processes. Thermal gradient information is transferred to a standard map for identifying surface dynamic features, which represent the areas of fish aggregation Indian coastline is divided into 9 Sectors viz., Gujarat, Maharastra, Karnataka & Goa, Kerala, Tamilnadu, Andhra Pradesh, Orissa & West Bengal, Lakshadweep and Andaman & Nicobar Islands for sector-wise processing of SST/PFZ.

The text containing the above PFZ information and maps are transmitted to fisherman community through fax, telephones, telegrams and telex, News Media etc. During the year, PFZ advisories were sent, twice a week (i.e. Monday and Thursday), to various nodes from the Maritime States of India as given in Figure -3 and Figure -4.

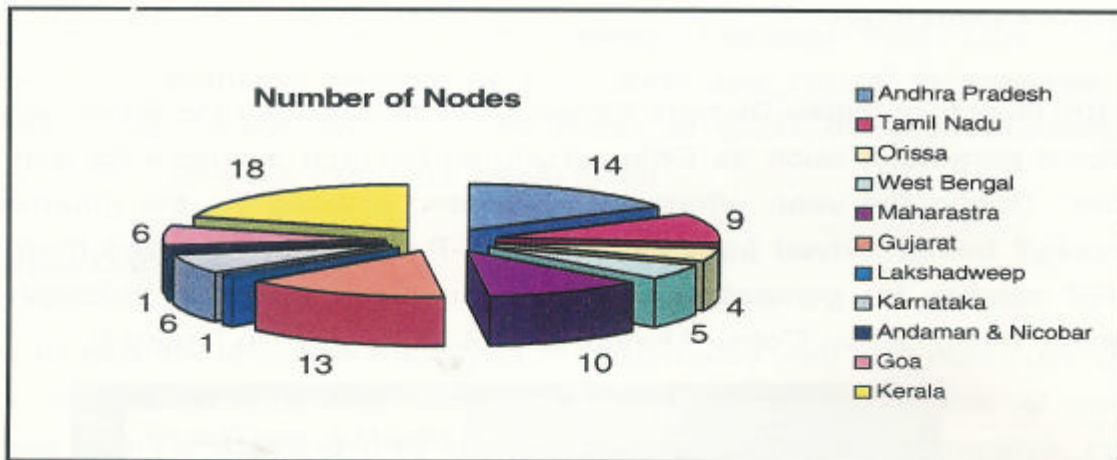


Figure 3. Dissemination Centres (Nodes) for PFZ Advisory.

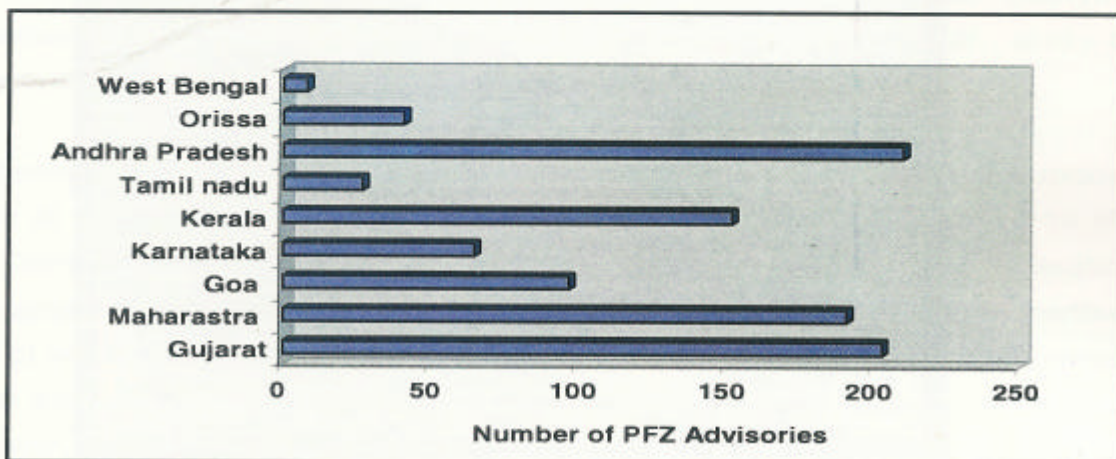


Figure 4. Dissemination of PFZ Advisories during 1999-2000

Over the years, the technology for generation of PFZ information has undergone changes considerably in light of launch of new satellites and results from continuous validation experiments. Efforts are underway for refinement/enrichment of PFZ advisories to their ensure effective delivery to the Target Groups and to make it part Value chain. Over 300 fish landing centres located along the Indian coast, including Andaman & Nicobar and Lakshadweep islands were contacted for feedback on the utility and effective dissemination and utilization and utilization of PFZ information.

6.3 IRS-P4 Utilisation

With the launch of Indian Remote Sensing Satellite series (IRS-P4) in May 1999, additional parameter such as Chlorophyll has become available for use of PFZ forecast. During the year, efforts were initiated to integrate the information on Chlorophyll being derived from OCM of IRS-P4 with SST derived from NOAA-AVHRR satellite for generation of PFZ information. A Typical chlorophyll map generated using Ocean Colour of IRS-P4 is given in Figure-5.

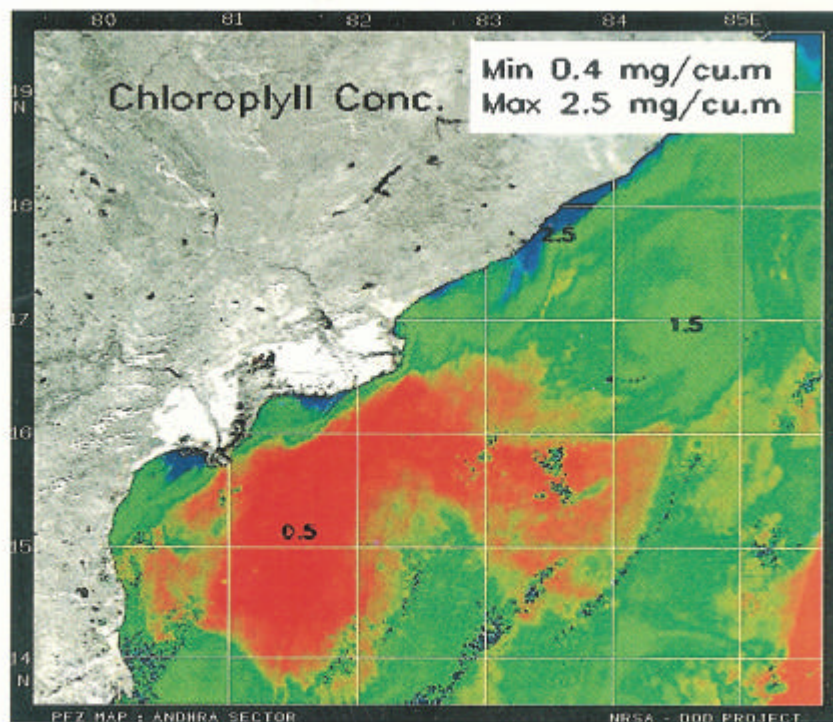


Figure 5. A typical chlorophyll map of Andhra Coast generated using Ocean Colour Monitor of IRS-P4

INCOIS plays a major role, in conjunction with SAC and NRSA in the operationalisation, promotion and marketing of the Value-added products generated from IRS-P4 (OCM & MSMR) data. Regional Specific algorithms are being generated for retrieval of Chlorophyll and atmospheric parameters from OCM and MSMR, respectively, towards improvement of forecasting Potential Fishing Zone information, respectively, towards improvement of forecasting Potential Fishing Zone information. Presently, efforts are being made to estimate chlorophyll concentration from the OCM data around the Indian Coast. This is expected to improve the PFZ forecast. Validation for selected areas along

the Andhra Coast is in progress. Subsequently, methods/techniques will be developed with technical assistance from SAC and NRSA to integrate SST information from NOAA-AVHRR with those of OCM derived chlorophyll to improve the PFZ forecast along the Indian Coast.

6.4 Marine Data Centres

In order to exploit the ocean resources in sustainable way and make use of the benefits effectively, it is important to understand the dynamics of oceans processes and its coupling with atmosphere. It is important to receive, collate and archive historical data relating to coastal and oceans of India. In addition, most of marine research studies are multi-disciplinary in nature, which require a wide range of data sets such as surface meteorological, tidal, bathymetry, sedimentary, geophysical, physical, chemical and biological and other parameters etc.,

Considering the importance, the Department of Ocean Development supported a number of national laboratories and organisation to establish a set of 14 Marine Data Centres (MDC's) with a view to foster exchange and Utilisation of oceanographic data through their networking. Depending upon the expertise and nature of work of each MDC is entrusted with a task of collection, quality checking, archival and dissemination of a specific oceanographic or surface meteorological parameter.

DOD has made INCOIS responsible to manage the MDC's and also extend minimum financial support to the institutes to maintain MDC's. Each MDC is also responsible to make information available to INCOIS for dissemination to other national and international scientific community for greater utility of the data and developing value added data products.

The details of parameters being generated by each MDC are given in Table-1.

Table-1 Marine Data Centres and Data holdings

No	Location of Marine Data Centre	Data Holdings
1	Indian Meteorological Department, Pune	Ocean Surface Meteorology
2	Geological Survey of India, Calcutta	Marine Geology
3	KD Malavia Institute of Petroleum Exploration, Dehradun	Magnetic, Seismic and Gravity data
4	Survey of India, Dehradun	Tide Level
5	Naval Hydrographic Office, Dehradun	Bathymetry
6	Central Salt and Marine Chemicals Research Institute, Bhavnagar	Marine Algal resources
7	Regional Centre, National Institute of Oceanography, Mumbai	Marine Pollution
8	Fishery Survey of India, Mumbai	Offshore Fisheries
9	National Institute of Oceanography, Goa	Physical, Chemical and Biological Oceanography
10	Central Marine Fisheries Research Institute, Kochi	Coastal Fisheries
11	Institute for Ocean Management, Chennai	Coastal Geomorphology
12	Central Drug Research Institute, Lucknow	Bio-active substances in the sea
13	National Remote Sensing Agency, Hyderabad	Sea-truth Data PFZ Validation, SST Grid Averages,
14	Orissa Remote Sensing Centre, Bhubaneswar	PFZ Validation

6.5 Coastal Area Mapping

Recognizing the importance of Coastal maps for development activities in the coastal zone and preparation of contingency plan particularly ecological sensitive areas, a programme was launched by the Department for preparation of the coastal area maps on the scale of 1:25.000 with 0.5m contour interval, by survey of India, Dehradun. The Project envisaged generation a set of required coastal area maps for the entire east

coast of India stretching from Nellore to Bangladesh boarder, which is a cyclone prone area. Generation of Coastal Zone Maps and creation of Coastal Zone Information System on an operational basis need to be pursued further, consolidating the Maps, Digital Data Bases and Information Systems generated under MARSIS, SATCORE and ICMAM Programmes and with active participation from SAC, NRSA, RRSSC of DOS, ICMAM/DOD and InfoTech industry. The Coastal Area Maps Stretching from Nellore to Orissa Boarder and database has been prepared.

7. Information Bank

Information Bank is the backbone of INCOIS. INCOIS has been acquiring and archiving data/information created as part of various programmes of DOD. Following are the important data/information in the information Bank.

1. NOAA-AVHRR data and Sea Surface Temperature archives for North Indian Ocean from 1992 onwards, including:
 - i. Daily, Weekly and monthly images and grid data.
 - ii. Brightness Temperatures
2. Potential Fishing Zone information since 1992 onwards: Sector maps and PFZ information along the Indian coastline and Islands (twice weekly maps for non-monsoon months)
3. IRS LISS-II data of the entire AP coast.
4. Landsat Data and Glacial morphology map covering Dakshin Gangotri and environs (3° E to 21° E to 69° S to 75°S) of 1973 and 1975.
5. IRS-PAN data of Maitri region and AVHRR mosaic of the Continent.
6. Moored and Drifting Data Buoy information from NIO and NIOT for 1999-2000.
7. Topography maps(of 0.5 meter contour intervals) of the coast from Nellore to Orissa border in the scale 1:25,000 prepared by Survey of India for Department of Ocean Development.
8. Wetland and coastal zone maps in 1:50,000 scale
9. Coral reef maps of Indian region.
10. Geological classification of Schirmacher and Wholthat Mountains.

8. Potential Users

Information / Services	Potential Users
SST, Winds, Waves, Sea level, Surface Currents, Mixed – layer depth and other derived parameters, Colour of the sea, Chlorophyll, Sediments, Clouds, Water Quality.	IMD, IITM, IITs, IISc, Universities and organisations involved in Ocean and Atmospheric studies, Navy, Ports, Industry and Modellers.
Coastal Zone and other GIS products	Govt. Departments, Decision Makers, Environments, Navy, Coast Guard, Ports, Voluntary Organisations, Industry
Biological Parameters and Fishery Forecast services	Modellers, Fishery Research organisations, State Govt. Fishery Organisations, Industry, Fisherman Associations and Individual fisherman

APPENDIX-1: LIST OF ACRONYMS

AVHRR	Advanced Very High Resolution Radiometer
CIFT	Central Institute of Fishery Technology
CMFRI	Central Marine Fisheries Research Institute, Cochin
CMMACS	Centre for Mathematical Modeling and Computer Simulation
CSMCRI	Central Salt and Marine Chemical Research Institute, Bhavnagar.
CSSTE -AP	Centre for Space Science and Technology and Education in Asia And Pacific
DOD	Department of Ocean Development
EOS	Earth Observing System
FSI	Fishery Survey of India
GOOS	Global Ocean Observing System
ICMAM	India Centre for Marine Area Management
ICRP	Indian Climate Research Programme
IISc	Indian Institute of Science
IITM	Indian Institute of Tropical Meteorology
IIT	Indian Institute of Technology
IMD	Indian Meteorological Department
INCOIS	Indian National Centre for Ocean Information Services
IOC	Intergovernmental Oceanography Commission
IOM, AU	Institute of Ocean Management, Anna University, Chennai
IRS	Indian Remote Sensing Satellite
JGOFS	Joint Global Ocean Flux Study
LISS	Land Imaging Self – Scanning Sensor
MARSIS	Marine Satellite Information Services
MDC	Marine Data Centre
MoST	Ministry of Surface Transport
MSMR	Multi-frequency Scanning Microwave Radiometer
NAL	National Aeronautical Laboratory
NCAOR	National Centre for Antarctic Ocean Research
NIO	National Institute of Oceanography

NIOT	National Institute of Ocean Technology
NOAA	National Oceanographic and Atmospheric Administration
NOIS	National Ocean Information System
NRSA	National Remote Sensing Agency
OCM	Ocean Colour Monitor
ORSAC	Ocean Remote Sensing Application Center, Bhubaneswar
PFZ	Potential Fishing Zone
RRSSC	Regional Remote Sensing Service Centre
SAC	Space Application Centre
SATCORE	Satellite Coastal Oceanographic Research
SSC	Sagar Sampada Cell
SST	Sea Surface Temperature
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WMO	World Meteorological Organisation
XBT	Expandable Bathythermograph