INSTITUTE AT A GLANCE

Organization

The National Institute of Ocean Technology (NIOT) was established in November 1993 as an autonomous society under the Ministry of Earth Sciences, Government of India. NIOT is managed by a Governing Council and the Director is the head of the Institute.

The major aim of starting NIOT under the Ministry of Earth Sciences, is to develop reliable indigenous technology to solve the various engineering problems associated with harvesting of non-living and living resources of oceans.

Mission Statement

- To develop world class technologies and their applications for sustainable utilization of ocean resources.
- To develop a knowledge base and institutional capabilities in India for management of ocean resources and environment.
- To provide competitive, value added technical services and solutions to organizations working in the oceans.

MEMBERS OF THE GOVERNING COUNCIL AND THE GENERAL BODY OF NIOT (FROM APRIL 2011 T0 MARCH 2012)

Sl.No.	Name	Designation
1	**Dr. Shailesh Nayak** Secretary to Govt. of India Ministry of Earth Sciences	Chairman From August 2008
2	**Mr. R.Bhattacharya, IAS** Spl. Secretary & Financial Adviser Ministry of Earth Sciences	Member From January 2011
3	**Mr. D.P.Singh, IAS** Additional Secretary (Admn) Ministry of Earth Sciences	Member From April 2009
4	**Dr. S.K.Das** Adviser, Ministry of Earth Sciences	Member From June 2006 to February 2012 Permanent Invitee since March 2012
5	**Dr. T.K.Alex** Director ISAC/ISRO, Bangalore	Member From March 2012
6	**Dr. P.S.Nair** Chairman, Scientific Advisory Committee of NIOT	Member From June 2006
7	**Mr. U.V.Lakhan** Engineers India Ltd	Member From March 2012
8	**Mr. S.V.Rangarajan** Director, NSTL, Vizag	Member From September 2010
9	**Mr. Ananthanarayanan** Director, NPOL, Kochi	Member From March 2012
10	**Mr. A.K.Verma** Adviser, S&T, Planning Commission	Member From March 2008
11	**Prof. Baskar Ramamurthi** Director, IIT, Madras	Member From March 2012
12	**Dr. Nagesh R Iyer** Director, SERC, Chennai	Member From September 2010 to February 2012 Permanent Invitee since March 2012
13	**Dr. K.N.Shankara** Sathish Dhawan Professor, ISRO	Member From August 2005 to September 2011
14	**Prof. V.G.Idichandy** Professor, IIT, Madras	Member From June 2006 to September 2011
15	**Dr. M.A.Atmanand** Director, NIOT, Chennai	Member Secretary From October 2009

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MAJOR ACCOMPLISHMENTS DURING THE YEAR 2011-12

- Desalination plant at Minicoy was inaugurated by Hon'ble Union Minister for Science & Technology, Earth Sciences & Minister for Parliamentary affairs Mr. Pawan Kumar Bansal on 22nd April, 2011.
- Desalination plant at Agatti has been commissioned on July 25, 2011 producing fresh water for island community.
- Remotely Operable Subsea In-situ Soil tester was tested at 5462 m water depth in the Central Indian Ocean Basin (CIOB) at First Generation Mining (FGM) site in October 2011. Acoustic Positioning Systems using sub-sea transceivers at 5400 m depth and transmission of signals through cables have been done at CIOB. Communication of Subsea transceiver from 5400 m depth with sea floor transponders was established & retrieved successfully.
- Twelve buoy network was successfully maintained in Indian seas in which 5 were OMNI buoys having sub surface sensors.
- I-DAS, the indigenously developed met-ocean Data Acquisition System (DAS) was successfully tested, integrated in the buoy, deployed in the sea and measurements were validated.
- A Backward Bent Ducted Buoy (BBDB) with single point mooring system was deployed off Ennore port and it survived severe environmental conditions during 'Thane' cyclone crossing period. The data covering a wide range of wave climate were collected successfully and analysis is in progress to scale up for future applications.
- Demonstration of suction pile has been successfully carried out in shallow waters off Ratnagiri in the Westcoast.
- Testing of subsea solids pumping system was done at 616 m &1032 m depth off Narimanam coast (East coast) in November 2011
- The field observations and geophysical survey and data analysis for the Kalpasar project in Gulf of Cambay, Gujarat have been completed.
- Marine micro algal strain NIOT 74 has been identified by partial sequencing of 18s` rRNA.
- Parrot and milk fish reared in open sea cages at Rameswaram were harvested. Average growth achieved in parrot fish and milk fish was 200g and 480g, respectively.
- Autonomous noise measurement system along with a moored met-buoy has been operational in shallow waters off Visakhapatnam during Northeast monsoon. For the first time in Indian seas 48 days of time series noise data along with met-ocean parameters have been collected including the extreme event of "Thane Cyclone".
- Sea trials of the Drifter Buoy with INSAT communication were successfully conducted off Chennai.

FROM THE DIRECTOR'S DESK

Greetings from team NIOT. The year 2011-12 has been the last year of the 11th Five Year Plan. For NIOT it has been the year of introspection and planning. We took stock of what has been achieved in the last five years and made plans for the next five years. The major programmes have been continued with enhanced objectives and the new proposals have been submitted, opening new vistas.

In the past one year there have been many accomplishments that are detailed in this annual report. NIOT has tried hard to live upto its mandate of developing and demonstrating technologies and in the activities of Ocean development with the continued support of Ministry of Earth Sciences.

In the year 2011-12, NIOT has demonstrated its capability in continuously generating fresh water from sea. The water generated from the LTTD plant using condenser reject water in North Chennai Thermal Power Station (NCTPS) was used for the drinking and construction activities. Towards the extraction of energy from the Ocean, NIOT has demonstrated Backward Bent Ducted Buoy (BBDB) at Ennore Port. It survived severe environmental conditions and gave vital data. The design of ocean current turbine has been taken up.

The low temperature thermal desalination plant established at Kavaratti has been functioning continuously since its establishment in 2004. Two more similar plants have been successfully completed and made operational at Agatti and Minicoy Islands in the Union Territories of Lakshadweep. Desalination plant at Minicoy was inaugurated by Hon'ble Union Minister for Science & Technology, Earth Sciences & Minister for Parliamentary Affairs Mr. Pawan Kumar Bansal on 22nd April, 2011. The Offshore structure group has also successfully demonstrated the deployment of Suction Pile anchor in Shallow Waters off Ratnagiri.

The Coastal and Environmental Engineering group completed the field observations/geophysical survey and data analysis for the project 'Geophysical survey for revised dam corridor' for Kalpasar. Comprehensive Environmental Impact Assessment (CEIA) Studies were carried out for the development of marine coal handling facility by the Power Finance Corporation (PFC) off Cheyyur, south Tamil Nadu.

NIOT made rapid progress in the development of Technology for Ocean Mining by testing the subsea solids pumping system at 616 m &1032 m depth off Narimanam coast. Remotely Operable Subsea In-situ Soil tester was tested at 5462 m water depth in the Central Indian Ocean Basin (CIOB) at First Generation Mining (FGM) site in October 2011. Videos of polymetallic nodules were obtained through underwater digital camera.

The Autonomous Coring System (ACS) jointly developed with M/s.Wiiliamson and Associates, USA is ready for the final deep water trials at potential sites in Krishna Godavari Basin of Bay of Bengal. The hydraulic problem arose in the last trial was solved indigenously. The Remotely Operable Vehicle has been improved based on the deep water trials and the ROV is ready for Scientific Exploration Studies. It is heartening to note that NIOT team won the National Geo Science Award from the Ministry of Mines, Government of India, under Oil and Natural Gas category.

Several facilities like corrosion chamber, environmental chamber and shock and vibration chamber, have been successfully established as a part of the Electronic support facility.

Sea trials have been carried out with a multi mode digital sonar system with sub bottom profiler and the sub bottom data were collected as part of Buried Object Scanning Sonar project.

Underwater acoustics has been the strong point of NIOT. Under this programme Autonomous noise measurement system along with a moored met-buoy has been operational in shallow waters off Visakhapatnam during Northeast monsoon and for the first time in Indian seas 48 days of time series noise data along with met-ocean parameters have been collected which includes the extreme event "Thane Cyclone". The Acoustic Test Facility has been upgraded for calibration from 100 kHz to 500 kHz.

NIOT continues to support Ocean Research Community by maintaining a 12 buoy network in Indian Seas in which 6 are OMNI buoys (Ocean Moored buoy network for Northern Indian ocean) having sensors for subsurface measurements upto 500m depth apart from surface met-ocean parameters.

NIOT fulfills its mandate of supporting ocean observation programme by participating in the deployment of RAMA buoys and SAIC tsunami buoys as part of INCOIS programme. NIOT and IMD jointly conducted Brainstorming meet on the establishment of National Centre for Atmospheric Technology (NCAT) on 12th December 2011.

Realizing the importance of transmitting the vital data collected in the Indian waters, NIOT is striving hard to establish INSAT communication for in-house applications as the part of the programme. Sea trials of the Drifter buoy with INSAT communication were conducted during 24th to 31st August 2011, off Chennai. Met-ocean observatories of different kind were installed at Gulf of Khambhat for Kalpasar project and online data is received successfully.

Apart from the research activities, NIOT undertakes societal programmes. The Marine Biotechnology group has successfully deployed ten open sea cages at three locations viz. Olaikuda – Rameshwaram, Kothachathiram – Nellore and North Bay-Port Blair (A&N Islands). Parrot and milk fish reared in open sea cages at Rameswaram were harvested. Average growth achieved in parrot fish and milk fish was 200g and 480g, respectively.

Though it has been a pleasure to list the achievements of NIOT, the magnitude of the work that has been undertaken is also daunting. I am confident that NIOT will march ahead and will help the Nation in sustainable harvesting of resources from the ocean. We realize that we have fathoms to dive before we sleep.

TECHNOLOGY DEVELOPMENT - RENEWABLE ENERGY AND FRESH WATER FROM THE SEA

Backward Bent Ducted Buoy (BBDB)

Ø157 mm Gorlov turbine model made from Rapid prototype machine (3D printing)

Ø300 mm helical turbine made of steel reinforced blades

RENEWABLE ENERGY AND FRESH WATER FROM THE SEA

Introduction

The Group is committed to develop technologies for producing high quality drinking water and clean energy from the ocean. Technologies like Low Temperature Thermal Desalination (LTTD) using coolant water discharge from thermal power plant, wave energy using floating devices such as Backward Bent Ducted Buoy (BBDB), ocean current turbine development, solar desalination, heat exchangers for LTTD and ocean thermal energy conversion are the focal areas of research. Apart from the aspect of technology development, the group has taken initiative in transferring the LTTD technology to the society through industrial partnership.

Waste heat utilisation from power plants for LTTD applications

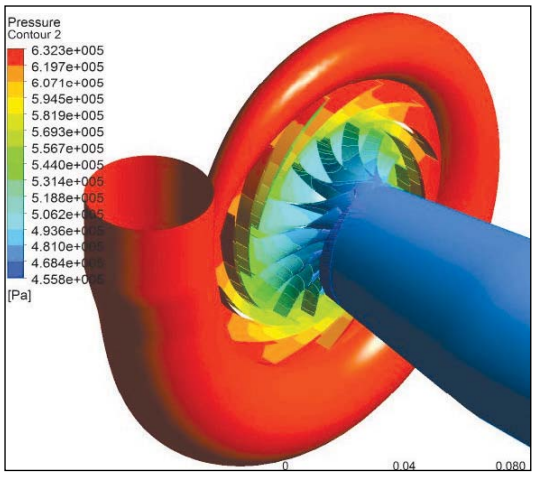
The LTTD plant was commissioned in North Chennai Thermal Power Station (NCTPS) in March 2009 and it was continuously generating 2-3 lakh litre per day a good quality potable water .The water generated from the plant was used for the drinking and construction activities. In order to further bring up the quality of freshwater to feed the chemical process for high pressure boilers of the power plant requirements, a wire mesh demister was procured. Presently, it is ready for installation in the existing flash chamber to obtain high quality freshwater from the LTTD plant.

During annual maintenance schedule of the power plant, the following activities were completed.

- All the warm and cold water steel headers were lined with fibre reinforced plastic to increase the durability of the life in seawater.
- A horizontal centrifugal pump was installed at the bottom of the plant structure in the existing warm water pipeline for easy servicing of the pump.

Studies on turbines

R134a Radial inflow turbine for 2 kW OTEC laboratory set up



Pressure contour across turbine assembly

It was decided that a small scale unit of closed cycle OTEC along with desalination would be set up in NIOT premises. The main capacity building from this set-up would be (a) turbine design and performance testing of various configurations, (b) working fluid handling system, (c) design of evaporator, separator and condenser, (d) power electronics for turbine control system, (e) integration with small scale desalination unit and (f) training for operation, maintenance and safety of future OTEC powered desalination plants. A 2 kW Radial inflow turbine has been designed to build a laboratory scale working plant for running an OTEC cycle in conjunction with LTTD plant. The turbine will operate on closed loop Rankine cycle principle with R134a as working fluid. The working fluid is selected after carrying out a detailed comparative study on different working fluids such

as Ammonia for this rated power output. The turbine is designed for inlet and exit temperatures of 24.5°C and 14°C respectively and mass flow rate of 0.354 kg/s with a pressure ratio of 1:4. One dimensional design of turbine was carried out to find geometry of the turbine. ANSYS Bladegen is used to generate 3D model of the rotor. Meshing is carried out in ANSYS Turbogrid. ANSYS CFX is used to carry out 3D simulation of flow inside the turbine and for predicting its performance at design and off-design conditions. The pressure variation across the turbine assembly is as shown in the above figure. Detailed design is being completed and the tender to fabricate the turbine initiated. Design and procurement of other required components for the laboratory set up is also under progress.

Ocean Current Turbines

Development of turbines was undertaken by the group in order to tap the vast kinetic energy resource of ocean water flowing by the virtue of the under-surface ocean currents. The experimental and computational methods are being used in the development of ocean current turbines. Laboratory scale models were tested in the towing tank facility in IIT-Chennai using a setup as shown in the figure. to measure torque and speed of the turbine. A turbine of 300 mm diameter and 600 mm length equipped with three helical blades of NACA 0015 profile was fabricated and tested for its performance. The turbine was also modelled and its performance was simulated using-ANSYS FLUENT. The results were validated using the data from experiments. Incident water velocity of 1.2 m/s and turbine operating speed of 60 rpm yielded a numerical predicted power output of 20 W as against 24 W. Further trials are in progress to improvise prediction.

Experimental setup

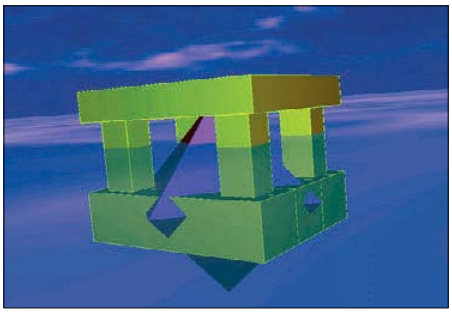
A turbine of diameter 325 mm and length 435 mm is also being developed in order to gain insight in to the development of straight bladed turbines. A series of models with different blade profiles, solidity ratio and number of blades are being made and tested in towing tank. The performance of these models is being simulated via a 2-D CFD approach. Also tests on different types of blades are being conducted in wind tunnel in order to study the most popular hydrofoils and in turn to develop a unique profile giving the desired drag-lift characteristics suitable for low current conditions mostly observed in Indian waters.

Floating type wave energy device – Backward Bent Ducted Buoy (BBDB)

Floating wave power device has been taken up to power loads or to meet the lighting requirements of small islands. The first phase of sea trials was conducted off Ennore port in April 2011 after fitting the unidirectional impulse turbine on the BBDB. The data was logged at 5 Hz and was sent to the base station situated on shore using radio frequency transmission. A wave rider buoy was also deployed near BBDB for real time recording of wave climate. After collection of suitable data, the BBDB and wave rider buoy were brought back safely to the shore at the end of sea trial. Data analysis revealed that instrumentation needs fine tuning for proper characterisation of the turbine and device as a whole.

The second and third phase of sea trials with improvised instrumentation were conducted in September and December 2011 respectively. The device was exposed to more vigorous wave climate during these months. The buoy was closely monitored and occasional in-situ trouble shooting was conducted. During the last sea trial, the buoy survived the ordeal successfully even for very high waves as cyclone Thane ravaged coastal Tamil Nadu and Puducherry. Highest significant wave height recorded was 12 m. The data was received continuously and was retrieved after the cyclone subsided. Analysis of the collected data during these sea trials throws significant light upon the floating wave energy device behaviour and also its effectiveness in energy conversion.

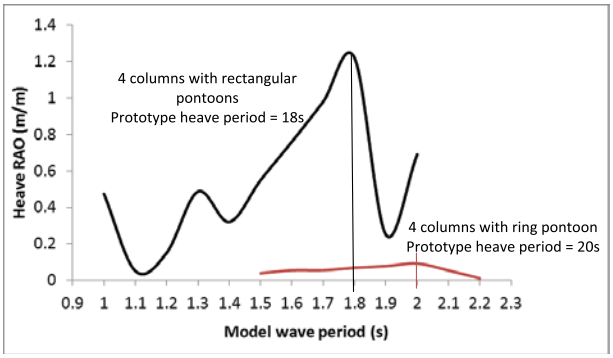
In order to separately analyse the pneumatic efficiency, an experimental investigation on a scaled down BBDB model in the wave flume at Anna University is in progress. It is concerned with the tuning of the duct dimensions to the incident waves and also with the sizing of the turbine for a given BBDB design. The outcome of these investigations and field trials will be used in future applications to cater to large power requirements both in main land and in islands.



Semi submersible with 4 column ring pontoon

Solar Desalination

The objective of this programme is to establish a 6 m^3/hr solar energy driven Multi Effect Distillation (MED) system at Ramanathapuram, Tamilnadu. The trial testing at Coimbatore using a bio mass boiler is completed. Sea water is drawn from the sea at 60 m^3/hr and steam at 40 bar is generated and supplied to the 6-effect MED system to generate freshwater at 6 m^3/hr. The product water quality was measured as 2 µS/s. The integration with solar field and testing of MED with steam generated from solar energy is under progress.



Heave response of Semi-submersible

Setting up of LTTD plants in coastal power plants and 10 MLD floating vessel mounted desalination plant

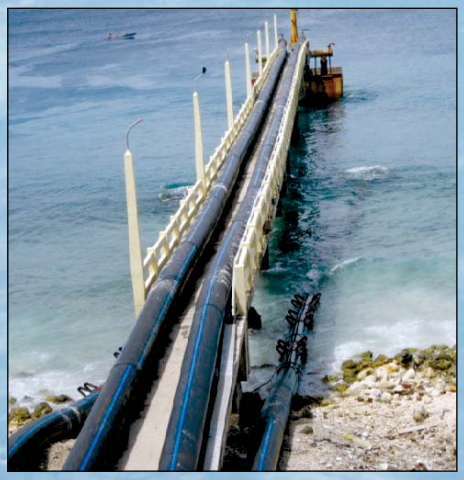
As part of establishing LTTD plants in coastal power plants and in offshore, an open tender for expression of interest was floated. After a detailed evaluation along with the Technical Evaluation Committee, the selection of the suitable parties is completed. Orders for the power plant desalination and the DPR preparation for the 10 MLD plant are in final stages of placement.

Physical model of Semi submersible with 4 column ring pontoon

As part of in-house studies, numerical studies on a 1:100 scale model of semi-submersible platform with ring pontoon were carried out in MOSES as shown below. The heave response as shown in the figure indicates that the ring pontoon model with 4 columns has the natural heave period of 2s (corresponding prototype period is 20s) which is more desirable compared to the previous models having 4 columns with 2 rectangular pontoons whose natural heave period is 1.8s (corresponding prototype period is 18s).It was also validated with physical model testing in the wave flume in Anna University as shown in the figure.

OFFSHORE STRUCTURES

Inauguration of Desalination Plant at Minicoy



Desalination Plant, Minicoy, Southernmost island of UT Lakshadweep

Desalination Plant, Agatti UT Lakshadweep

OFFSHORE STRUCTURES

NIOT has been developing several offshore components for various programmes like desalination, deep see mining, moored buoys etc. These include pipelines/risers, moorings in deepwater for small buoys as well as large vessels. The need for developing several offshore components has been felt for most of the projects handled by NIOT. The objective of the Offshore structures group is to provide innovative design solutions through continuous research to cater to the needs of the institute as well as industry in offshore installations. The following projects/programmes are being handled by group in XI plan.

- Establishing Desalination plants in islands of UT Lakshadweep.
- Development of Technologies for offshore structural components.
- Sea-link Pipeline between Rutland and South Andaman Islands.
- Demonstration of Shore Protection Measures through Pilot Projects.

Establishing LTTD based Desalination Plants in Lakshadweep Islands

The desalination plant at Minicoy was inaugurated by Honorable Minister for Earth Sciences, Mr. Pawan Kumar Bansal on April 22nd 2011. Since then plant has been supplying potable water to the 11000 people in the local island community. The plant is being maintained by NIOT for period of one year after commissioning and it will be handed over to Lakshadweep Administration by July, 2012. The desalination plant at Agatti was also commissioned on July 26, 2011 and potable water is supplied to local community.

Development of technologies components for offshore structures

Design, Development and Demonstration of Suction pile Anchor

The objective of the project is to develop and demonstrate suction pile anchor for floating mooring platforms. NIOT has indigenously developed all components of suction pile such as suction pump, electronics and pump skid required for field trial using expertise available within the institute from groups such as Gas Hydrates and Deep Sea Mining. Initially model tests were conducted in the test pond in a water depth of 1.5m and field trials were undertaken in Royapuram fisheries harbour in water depth of 5m. After checking the integrity of electronics and various components, offshore field tests were conducted off Dabhol coast (Maharashtra) in 20m water depth and results are encouraging, which is evident from the pull out test conducted in the field.

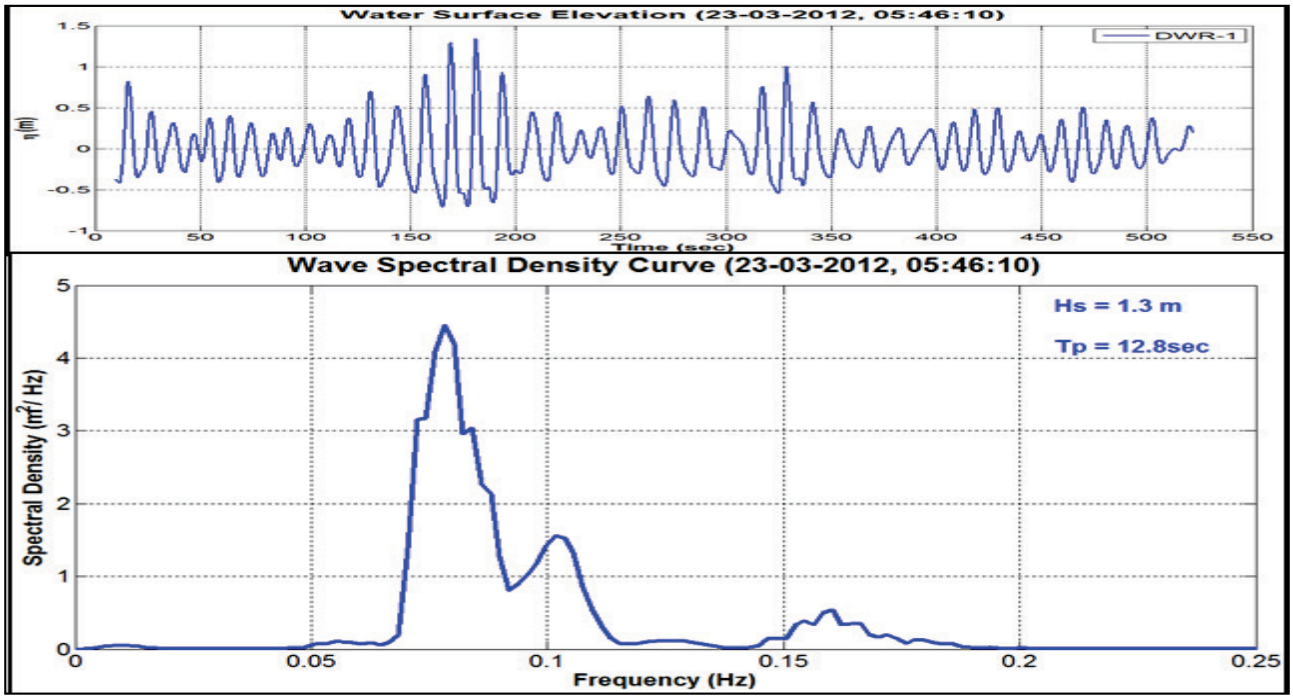
Suction Pile Demonstration

Suction Pile Demonstration

Wave structure interaction

The nonlinear wave impact forces on marine structures can lead to damage and collapse of the structures. The caisson/ sump of desalination plant located at Agatti, Lakshadweep Islands experienced high wave breaking forces resulting in the strengthening of the structure. When a wave breaks directly on the marine structure, the resulting wave force is severe and wave pressure distribution on the intake structure /sump depends on the nonlinear wave transformation over finite water depth. A clear understanding of these impact wave forces on the sump is required to optimize the design of similar marine structures in future. Hence, it is proposed to undertake full scale measurements in field and compare the field results with both theoretical and numerical methods. Wave pressures on vertical wall of sump were measured by mounting an array of pressure transducers on the sump. Simultaneously incident and reflected wave parameters were measured using the bottom mounted directional wave recorders deployed along direction of wave propagation in front of the sump.

Impact of Wave Forces



Impact of Wave Forces

The data was analyzed to estimate the total pressure acting on the sump for non-monsoon season. Further, continuous monitoring of wave parameters and the wave pressures will be continued to estimate the wave breaking wave force on the sump during the monsoon season. The experimental setup in field, location of pressure transducers, measured pressures and comparison of measured pressure versus theoretical methods is shown in the figure.

Material Studies for Cold Water Pipe for Desalination

The piping for marine projects such as desalination and renewable energy is usually made of High Density Poly-Ethylene (HDPE) or steel. Though NIOT gained experience in deploying the HDPE pipes into the deep sea, the task is still a challenging aspect, because of the weight of long HDPE pipe to be handled in deep sea and subsequently the heavy mooring for positioning the pipe. While HDPE is susceptible for actions such as abrasion in coral environment, steel is susceptible for corrosion in marine environment. In order to overcome this difficulty, it was proposed to identify an alternate material to cater the diverse requirements such as strength to handle the in-situ loads and other forces. Fibre Reinforced Plastics (FRP) was identified as alternative material and detailed dynamic analysis was conducted for prototype hydrodynamic loads for determining optimal ply configuration and the base and filament materials. Accordingly, a detailed specification and drawing of the FRP pipe was drawn and a tender was floated for supply of FRP pipes, which suits design requirement.

Offshore wind turbine

Offshore wind energy is gaining importance because of consistent offshore winds and utilization of land based wind energy to its maximum potential. The offshore wind energy can be viable only when the substructure cost is optimized, for which there is need to develop economical design and construction methods for installation of substructure for wind turbine. Ministry of Renewable Energy has proposal to develop offshore wind energy in India and there is need

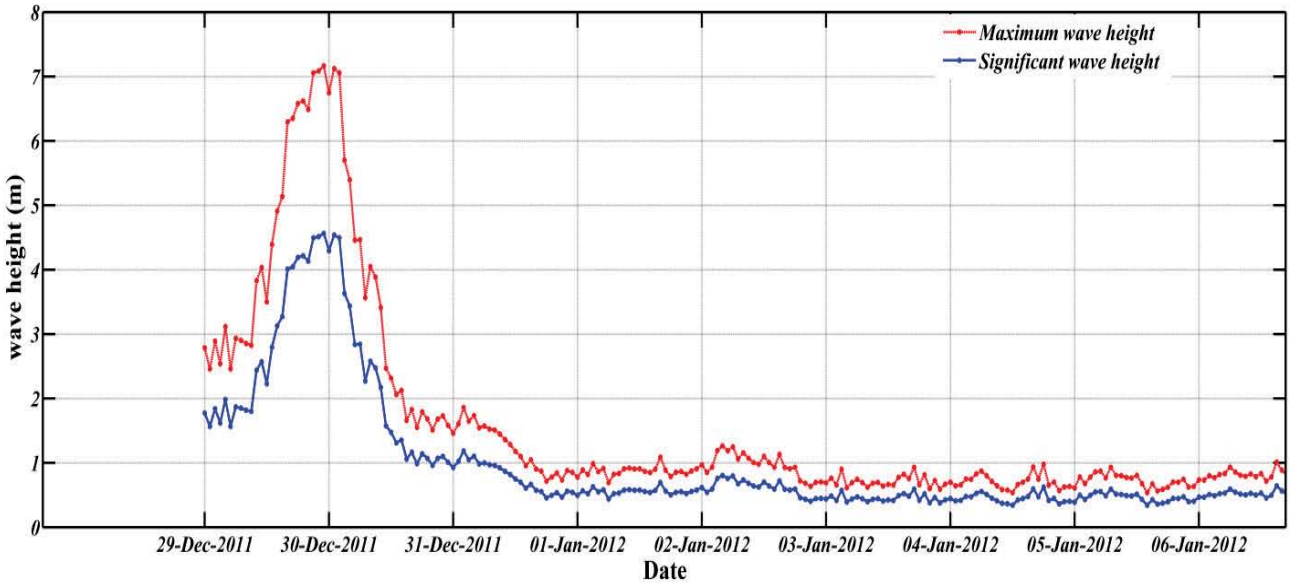
to develop substructure for wind turbine for setting up a pilot plant in Rameswaram, Tamilnadu. Studies have been initiated to develop substructure for offshore wind energy projects.

Sea-Link Pipeline between Rutland and South Andaman Islands

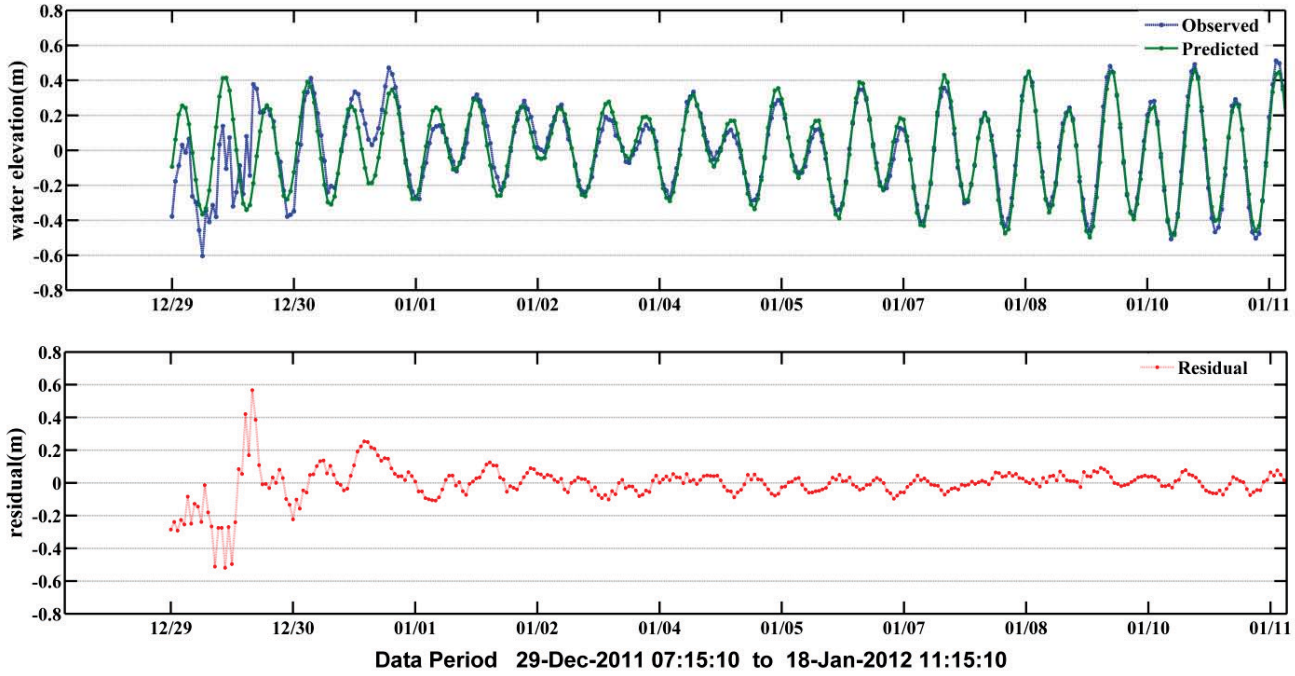
Port Blair, which is located in the South Andaman Island, faces a deficit in potable water supply during the summer months. Considering the natural water sources in the uninhabited, Rutland Island that is separated from the South Andaman Island by a narrow channel, the solution of diversion of water from the Rutland Island to Port Blair has been envisaged by the administration to augment the summer fresh water supply by laying submarine pipeline. NIOT is providing technical services to A&N Administration for the project and feasibility report with various technical option was submitted.

Demonstration of Shore Protection Measures through Pilot Projects

Studies are undergoing at two coastal sites viz., Pondicherry and Kondurupalem based on the request from corresponding local bodies that have been potentially facing the erosion and siltation problems. The current studies aim in developing environmentally friendly shoreline stabilization measures using field measurements and numerical modeling. The near shore circulation pattern of Kondurupalem inlet was studied during SW and NE monsoon periods using the observed data on waves, tides and currents, whereas the same was studied along Pondicherry coast during NE monsoon. Coastal morphology and sediment characteristics were analyzed for both the areas. The long term and short term trends in shoreline changes were studied from satellite imagery archives and maps. Shoreline change and impact models are constructed to study functional and structural performance of structures. Geo-textile based training jetties are being designed and tested at the laboratory scale for its demonstration at field. The recent observations made at Pondicherry could detect the surge height during Thane cyclone, when it was crossing the coast.



Observed Wave Height and Storm Surge at Pondicherry during Thane Cyclone



Observed Wave Height and Storm Surge at Pondicherry during Thane Cyclone

DEEP - SEA TECHNOLOGIES AND OCEAN MINING

Launching of Sub - sea Solids Pump System (1032 m depth)

Remotely Operable In - situ Soil Tester (ROSIS)

Launching of ROSIS from Sagar Nidhi and view of nodules from 5462 m depth

Universal sub - sea latching system

Sub - sea transformer

Portable In - situ Soil Tester (POIST)

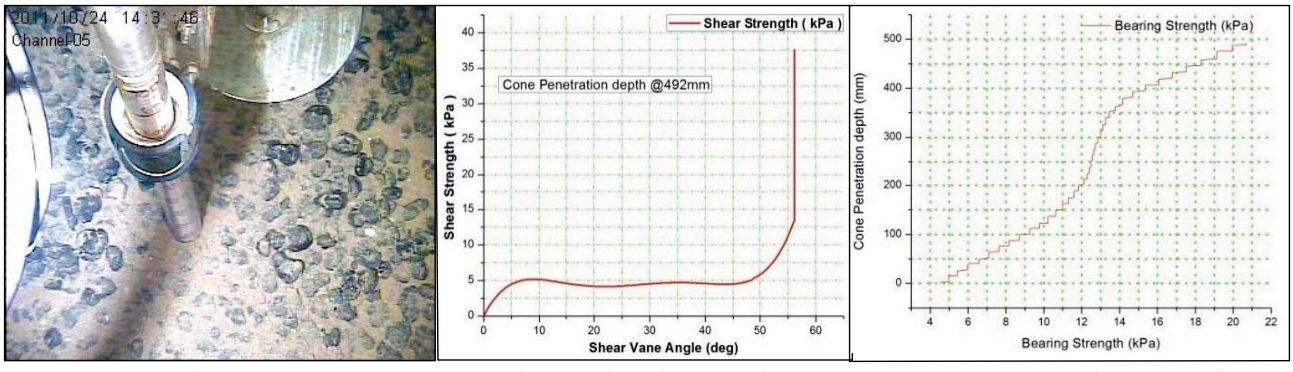
DEEP-SEA TECHNOLOGIES AND OCEAN MINING

Introduction

Polymetallic nodules have economically valuable metals such as Copper, Cobalt, Nickel and Manganese in them and are viewed as potential resources to take care of the depleting land resources and increasing demand of these metals. There are 380 million tons of nodules in the retained Indian Pioneer area. However development of deep subsea technology for mining these resources is a major challenge considering the ultra high pressure environment, very soft soils and other factors. NIOT has been working on a mining concept where a crawler based mining machine collects, crushes and pumps nodules to the mother ship using a positive displacement pump through a flexible riser system. It is expected that multiple mining machines will cover the mining field during large scale commercial mining operations. With this perspective, the integrated mining system is under development for demonstration of deep-sea mining of polymetallic nodules.

ROSIS (Remotely Operable Subsea In-situ Soil tester) tests at 5462 m depth

The optimum design of an integrated deep sea mining system is mainly dictated by the soil properties of sea bed. Hence for proper design of the mining machine the bearing and shear strength of the soil is to be measured accurately in-situ. This is to avoid sinking of crawler in soft soil during locomotion, which affects the maneuverability of the crawler during mining operation. Design and development of Remotely Operable Subsea In-situ Soil Tester (ROSIS) was done such that the machine can be operated safely and efficiently in soft sea floor in order to obtain reliable soil strength values. NIOT had developed and tested a fully electrical Remotely Operable Subsea In-situ Soil Tester at 5462 m water depth in the Central Indian Ocean Basin (CIOB) in October 2011. The test was done in the proposed First Generation Mine Site for assessment of soil properties in-situ to facilitate safe deployment of deep subsea mining machines. Cone and Shear Vane testing was done on the sea floor to ascertain the extent of bearing area required for crawler tracks for operation with minimum machine sinkage.



In - situ Soil testing in progress | *Shear strength Vs. Shear Vane angle* | *Cone penetration Vs. Soil Bearing strength*

Subsea Solids Pumping System Tests at 1032 m depth

The subsea positive displacement solids handling pump of the underwater mining machine, used during sea trials in 2010 at 512 m depth was provided with pressure compensated actuators and tested at 1032 m water depth. The

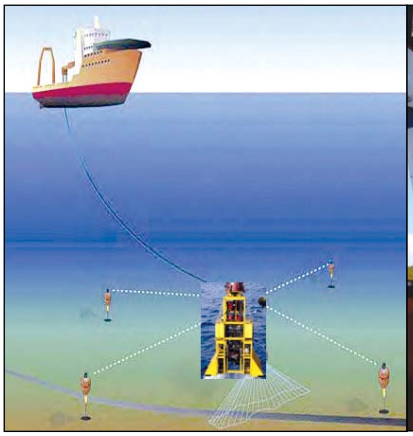
Water being pumped from 616 m depth

Observation of solids pump performance

trials were done onboard ORV Sagar Nidhi off Narimanam coast during the return voyage of In-situ soil tester trials in November 2011. The system was kept in suspended condition and detailed tests were initially done at 616 m depth for various flow rates of 10, 20, 30 and 45 m3/h for clear water pumping. The pump was tested for delivery pressures up to 18 bar. Subsequently the hose was attached with umbilical cable and the pump was lowered to 1032 m depth. Other major components like Transformers, Sensors like Altimeter, Motion Reference Unit (MRU), Temperature, Depth Sensors, Underwater Illumination, Vision cameras, Data Acquisition and Control Systems, Terminations and Connectors were also qualified in these tests. These components will be tested and used further in the development of Integrated Mining System for 6000 m depth operation.

Acoustic Underwater Positioning System Test at 5400 m

Acoustic POsitioning System (APOS) is an essential system to navigate the underwater mining machine for effective mining operations. A subsea transceiver capable of operating at 6000 m depths, communicating with transponders from 50-60 m from the sea floor and transmitting the signal through an umbilical cable has been used for developmental

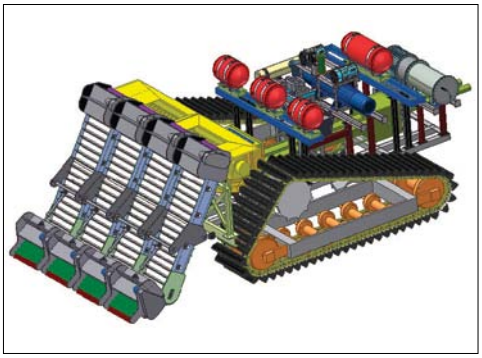


Acoustic Positioning System

APOS integrated with ROSIS

Retrieval of Transponders released by Subsea Transceiver

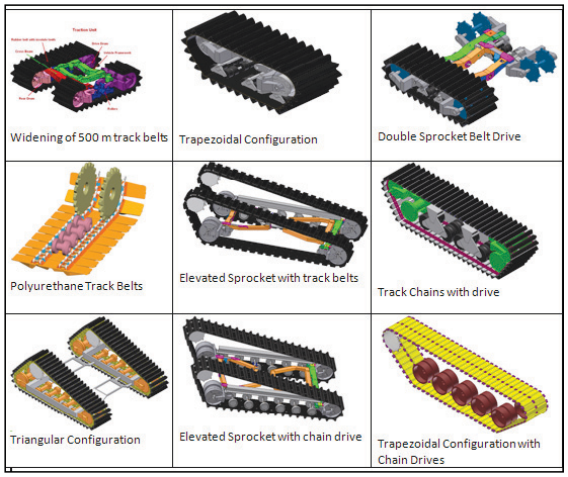
work. The APOS operates in two modes Super Short Base Line (SSBL) mode and Long Base Line (LBL). A subsea transceiver was integrated with ROSIS system and tests were carried out at CIOB at 5400 m depth. The transceiver could communicate with subsea transponders, establish position relative to seafloor transponder and also release it.



Solid Model of Deep-sea Mining Machine for 6000 m

Integrated Deep Sea Mining System for mining of polymetallic nodules upto 6000m depth

System configuration design, preliminary design and detailed design of various subsystems like undercarriage systems, mechanical collector and pick up device, cleated belt conveyor, crusher, solids pumping system, hydraulic systems, electrical, electronics, sensors, data acquisition, instrumentation and control systems have been completed. The configuration of the mining machine that is proposed to be developed without buoyancy packs and with all the main subsystems as shown in the figure.



Undercarriage Design Studies

Pull out tests of undercarriage

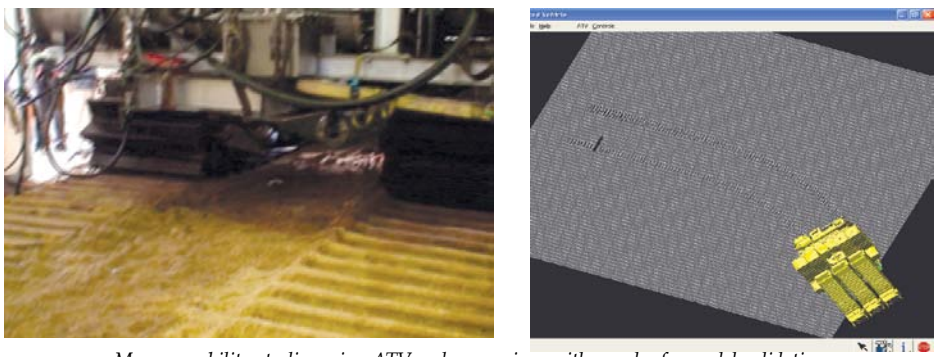
Undercarriage Development

Based on the experience gained from 500 m tests, two undercarriage configurations were selected, one having involute tooth profile. Detailed design has been done for double sprockets elevated triangular configuration system.

Experimental sinkage studies and Pull out tests

Pull out tests of the crawler undercarriage has been done in a bentonite tank with the available track belt developed for the earlier 500 m depth tests.

Similarly simulation for maneuverability is being done using Adams Tracked Vehicle (ATV) and SIMULINK for



Maneuverability studies using ATV and comparison with crawler for model validation

the mining machine for 6000 m operations. Initially the model developed has been validated using the results from mining machine developed for 500 m. Detailed slip control studies have also been undertaken.

Configuration finalization of the solids pump based on results from the tests at 500 m depth has been done. The pump will be modified suitably for increased pressure and tested at Hydrotransport test facility at IIT Madras and further tested in the deep oceans at various depths. Procurement of the pump is in progress.

Inter-institutional R&D Activities

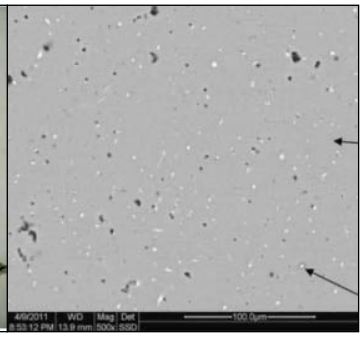
Soil-Machine Interaction Studies on Deep Sea-bed Poly-metallic Nodule Mining Systems

A major laboratory facility is being developed at Anna University under inter-institutional R&D. As the facility is being realised initial studies are being carried out in NIOT in the pick up device test facility.

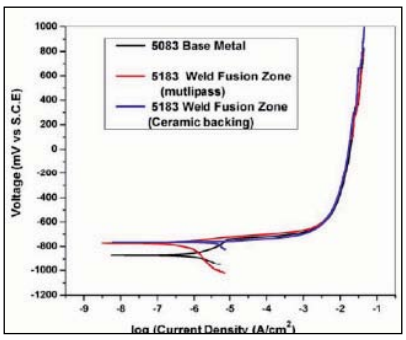
Aluminium structures for Deep-sea Mining Machine

Micro-structural characterization and mechanical testing of TIG welds in alloy 5083-H116 made with 5183 fillers and 6061 T6 with 4346 filler was done. Fatigue testing of TIG and MIG welds was completed. Tests like Corrosion, Bend, and Tensile, Vickers micro-hardness, impact test were also completed. It was concluded that 5083-H116 weld with 5183 fillers was suitable for 6000m mining applications. Test and analysis result report preparation is in progress.

Bent specimen (5083 multi - pass weld)



SEM micrograph, weld fusion zone



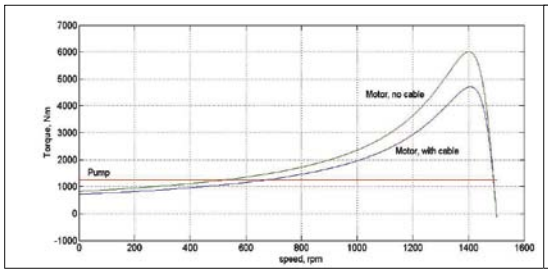
Potentiodynamic polarization curves

ER5183 filler of alloy 5083

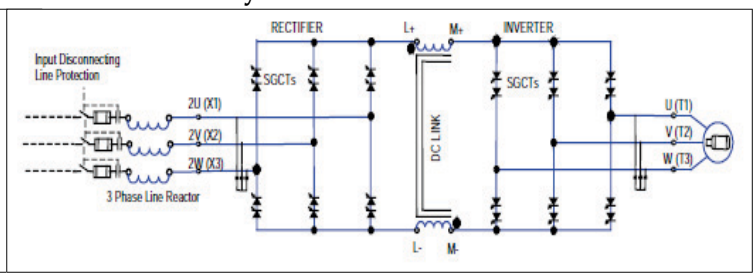
Modeling and Analysis of Sub Sea drive systems

Analysis of sub sea drives have been completed and it was concluded that Current Source Inverter based (CSI) drive is most suitable with the squirrel cage Induction Motor for subsea applications. Procurement of material and necessary hardware to build the prototype model for 2kW system is in progress. Schematic of the proposed drive system is as shown in the figure.

Schematic of Sub-sea Drive System



Comparison of speed - torque curves for motor and positive displacement pump



Current Source Inverter (CSI) with Active front end rectifier control

Studies on Hydraulic Lifting and Plugging of Large solids In Hoses (with Specific Reference to Manganese Nodule Mining using Flexible Riser Concept).

Slurry Pump was re-installed at test setup at IIT after subsea pumping test at higher depth of 616 m & 1032 m. Preliminary plugging studies for various combination of bend angles in slurry hose have been completed. Final set of experiments and slurry flow studies is in progress along with further studies on plugging of large solids.

SUBMERSIBLES AND GAS HYDRATES

Autonomous coring system being launched from the vessel

SUBMERSIBLES AND GAS HYDRATES

The objective of the Submersibles & Gas Hydrates group is to develop technological tools for deep ocean resource exploration such as Poly-metallic Manganese Nodules, Gas hydrates and offshore applications such as seabed imaging, pipeline and submarine cable inspections and well head activities.

Deep-Water Remotely Operable Submersible (ROSUB-6000)

The ROSUB-6000 is a work class under water Remotely Operated Vehicle (ROV) with a depth rating of 6000m. System is intended for exploration activities of Poly-metallic Manganese Nodules and Gas Hydrates.

Based on the experiences gained from successful ROSUB 6000 trials at Poly Metallic Nodule site in Central Indian Ocean Basin at a depth of 5289 m during April 2010, modifications and improvements are incorporated in the systems. They include:

a. Incorporation of isolated firing circuit control in the subsea converter power electronics in the Tether management system.

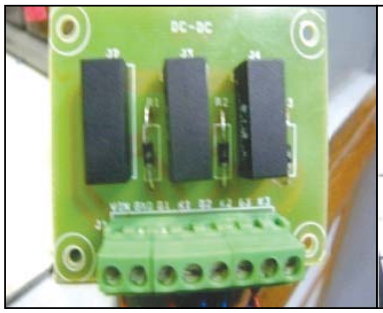
b. Incorporation of underwater still camera in the ROV and interfacing it with the system telemetry.

c. New Fiber Optic Rotary Joint changed in Tether Management System (TMS) slip ring to enhance the duration of underwater operation

d. Additional LED type lamps included in the system for better illumination.

e. Subsea pressure case collectors in the ROV and TMS are anodised and installed back.

f. Electro-optic umbilical cable re-terminated in the TMS end.



Modified firing circuit in TMS subsea power converter

New slip ring being installed in TMS

Electro-optic umbilical cable being re- terminated in TMS

Anodized cable collectors re-installed inTMS pressure case

From the deep water trials, it is identified that the optical performance of the electro-optic slip ring is affected at lower temperatures (< 4 °C). The slip ring is of pressure compensated type and the oil used for pressure compensation also has to offer required optical index matching characteristics at the required pressure and low temperature conditions. In-house experiments conducted on the compensating oil indicated variation in the optical performance of the oil at lower temperatures. Hence the TMS slip ring is filled with a suitably identified oil having required optical index matching properties.

Development of Deep-Water Autonomous Coring System (ACS)

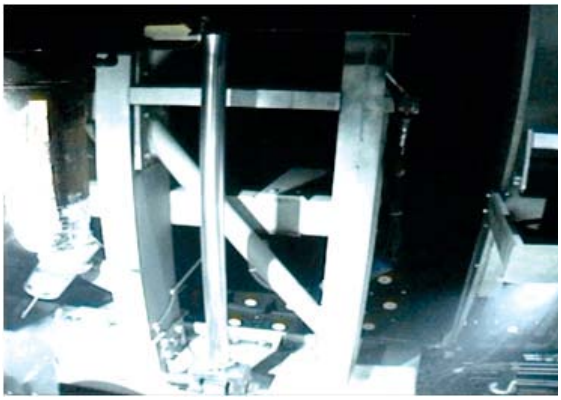
Autonomous Coring System (ACS) has been developed by NIOT in joint collaboration with M/s Williamson & Associates, Seattle, USA. The system which has been designed for ground truth validation of gas hydrate occurrence in Indian continental margins is capable of collecting 100m long core from ocean basins at a maximum water depth of 3000 m. First time in the world, ACS employs state-of-the-art wire-line drilling technology for 3000m water depth to recover 100m long core.

- Deep sea winch in ORV Sagar Nidhi is upgraded in the presence of Kley France engineers to handle the ACS system weighing 32 tons up to 3000 m water depth with 3500 m of 39 mm electro-optical steel armoured umbilical cable. Traction winch, Umbilical Storage winch, Sheave systems, bearings, shafts and electric motors have been modified and the control logics tuned to meet ACS operating conditions.
- Sea trials were conducted off Chennai in 350 m water depth during the period from 27th August 2011 to 7th September 2011 to qualify the upgraded deep sea winch for level winding, cable pay-out and pay-in functions with a dummy load of 3.2 tons. The system is tested for 18 tons on the deck.

Umbilical cable winding in modified LEBUS of winch in initial stage

Winch testing with dummy load

- Sea trials were conducted off Chennai coast in 3000 m water depth during the period from 9th to 13th September 2011 for testing the umbilical cable along with the termination, retrieval and coring system operation. Dummy weight was lowered till a depth 2150 m and the system qualified for line pull of 21 tons. Subsequently coring system was lowered upto 1500 m water depth and the coring systems electrical and optical functions were tested for 4 hours.



Sea trials of ACS

OCEAN ACOUSTICS

Data acquisition system testing at ATF

Ambient noise system along with data buoy off Vizag

Ambient noise system with data communication to surface

OCEAN ACOUSTICS

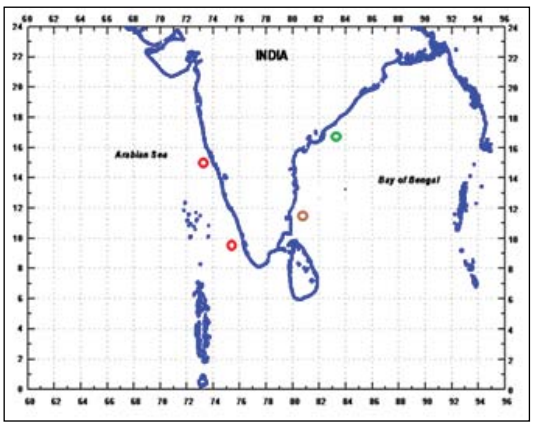
The Ocean Acoustics group was formed in the 11th plan period with the aim to focus on research and development in underwater acoustics as most of the applications in the oceans rely on acoustics. Research and Development activities in the following key areas have been taken up.

- Development of acoustic measurement systems
- Testing and Calibration of transducers
- Ocean ambient noise measurements, analysis and characterization
- Sound propagation modeling
- Underwater signal processing techniques
- Seabed characterization and classification
- Underwater Acoustic Communication

Three major in-house projects and few inter institutional projects are in progress. A fully automated ambient noise measurement system developed by the group is being utilized for collecting time series measurements in Indian shallow waters. The group also maintains an NABL (National Accreditation Board for Testing and Calibration Laboratories) accredited Acoustic Test Facility for testing and calibration of underwater acoustic transducers that caters to the needs of internal groups and external institutions/organizations.

Measurement & characterization of ocean ambient noise in shallow waters

The main focus of the project is time series measurements spanning seasonal scale and complete characterization of the noise field at specific shallow water locations. The autonomous noise measurement system consisting of a vertical linear array of hydrophones integrated with data acquisition modules enclosed in a pressure casing, along with sub surface floats, battery pack and acoustic pinger for monitoring was deployed at two strategically important sites, off Goa and off Vizag. Some of the main characteristics of the noise field such as space-time variations of the noise level, noise intensity, noise influencing sources, space-time coherence and vertical directionality are investigated. Noise field provides information with which study of the propagation in the ocean is carried out. The complex nature of sound propagation is used to derive information about the ocean environment.



Deployment locations

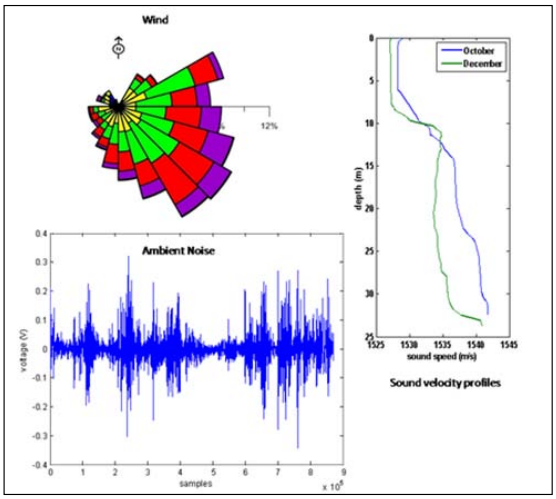
Ambient noise system deployment

- The autonomous noise measurement system along with a data buoy (for surface meteorological parameters of interest for ambient noise studies) was deployed in shallow waters off Visakhapatnam, for time series measurements during winter monsoon and data for 48 days were acquired.

  The system withstood the extreme weather conditions during the "Thane cyclone" period from 25th to 30th, December 2011 and captured noise data.

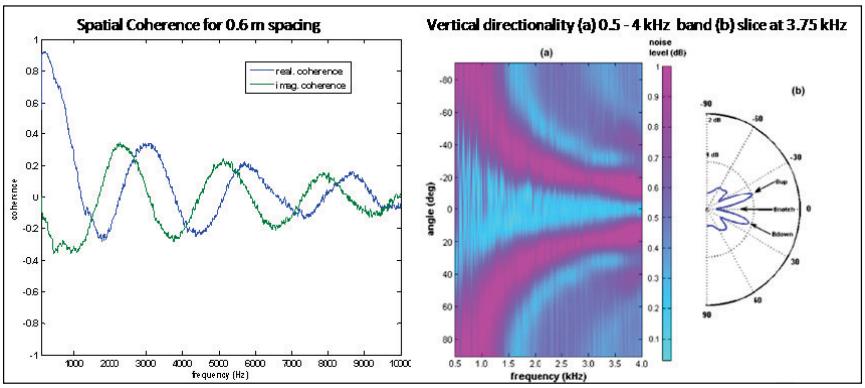
- In-order to enable high frequency data transfer from subsurface data acquisition system to surface buoy, the system has been improved by incorporating underwater ethernet cable and field testing of improved system was successfully carried out in shallow waters off Chennai.

- In addition to acoustic data, wind speed & direction, sound velocity profiles, rainfall data, sediment grab samples and bathymetry have been collected at the site to aid in understanding the acoustic field. The figure shows the sound velocity profiles during different periods off Vizag, wind vectors during October and the raw data of noise amplitudes in volts.



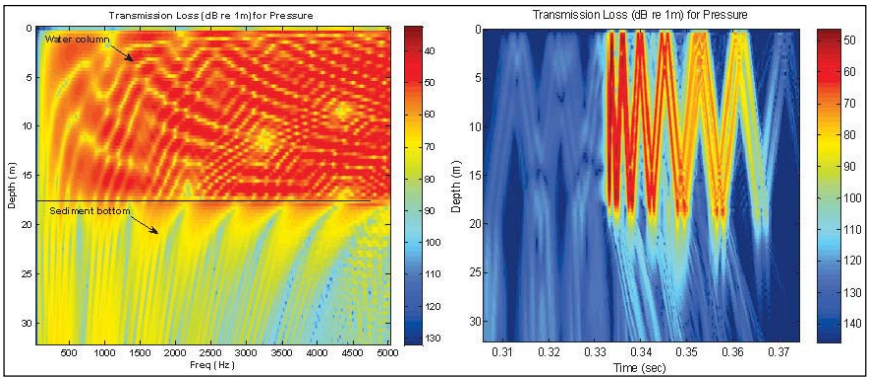
Ambient noise, sound velocity profiles and wind

- Noise characterization from observations: The figure shows the real and imaginary spatial coherence for the frequency band upto 10 kHz. It shows secondary and tertiary peaks illustrating surface wind noise. The directivity pattern for surface wind noise depicts presence of notch in the horizontal.



Data Analysis

- Noise propagation studies: Propagation loss models are being employed to interpret field data with respect to site characteristics. The simulation results indicate the transmission loss in the water column as well as sediment and the noise arrival structure.



Sound propagation model simulation

Development of Vector Sensors and array for underwater acoustic source localization and signal estimation. (Jointly with M/s Keltron Ceremics, Kerala)

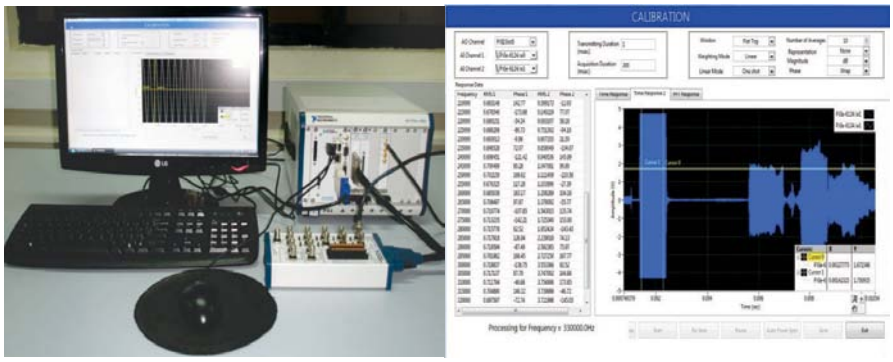
Vector sensors have the ability to detect the noise emitted from discrete interfering noise sources and the ability to localize, track, and range targets. It is proposed to develop vector sensor in collaboration with M/s. KELTRON, Kerala for shallow water applications. Further sensors are proposed to be aligned in array to enhance detection capability.

A sample Vector sensor VHS-100 (20 Hz – 4 kHz) has been procured from M/s. SUASIS, Turkey. Initial study and testing of the sensor in air and in water was completed with pseudo noise sources. The test data was analyzed and found to give satisfactory results. This data is to be used in the development of signal processing algorithm. It has been decided to use a multi channel data acquisition system to test the vector sensor array.

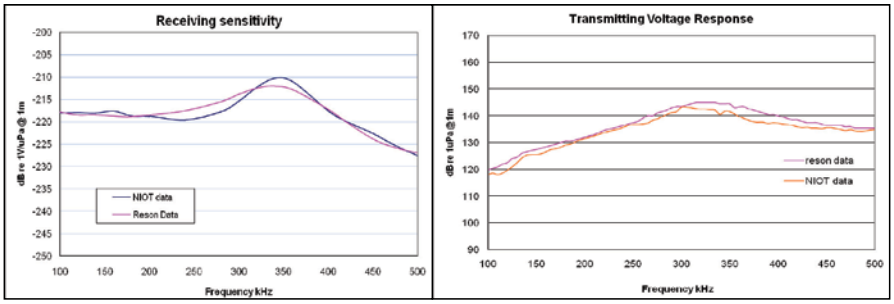
Upgradation of existing NABL accredited facility and establishing a new setup for low frequency calibration of transducers as a peripheral facility to ATF

Upgradation of ATF

Augmentation of the facility to high frequency from 100 kHz to 500 kHz is taken up to perform any underwater acoustic measurement as well as underwater transducer calibration till 500 kHz as high frequency measurements are important for imaging applications. Hardware and software implemented for underwater transducer calibration using different methods like Reciprocity calibration, Comparison calibration, Directivity measurement & general purpose signal acquisition and TC 4014 hydrophones are characterized at ATF for high frequency measurement. Receiving sensitivity, transmitting responses impedance measurements are carried out as per IEC 60565 standard. The frequency used for this measurement is 100 kHz to 500 kHz using comparison calibration and the results are compared with manufacturer data.



High frequency calibration setup



Measurement validation

Low frequency calibration set up

The vibrating water column based method proposed for low frequency calibration. The structural analysis and harmonic analysis has been completed for each mechanical subcomponent with different materials. Work order was

issued to Bruel & Kjear, Denmark to execute the work. Feasibility study have been completed and submitted to NIOT for vibrating column based calibration setup.

NABL accreditation

The calibration facility at ATF has been accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) as per international standard ISO/IEC 17025. Measurements are performed in accordance with IEC 60565-1977 and ANSIS1.20-1988 for the frequency range between 3 kHz and 100 kHz. Desktop surveillance audit was conducted by NABL during November 2011. As a part of accreditation program, round robin / inter laboratory comparison test with the similar kind of laboratory in foreign National Metrological Institute (NMI) have been explored to check the equivalency of standard in hydrophone calibration.

Utilization of Acoustic Test Facility

ATF has been extensively utilized by internal as well as by external users for all types of underwater acoustic transducer calibration and other system performance test. Internal usage such as BPR testing by OOS group, positioning system test by Deep sea mining group, transducer calibration by marine sensors and technology group, Electronics and mechanical test by Ocean Electronics group etc. have utilized the facility. External organizations such as Bharath Electronics Limited, Bangalore, Defence Research & Development Organization (DRDO), Pune, and Naval Science & Technological Laboratory, Vizag have used the facility for transducer calibration and acoustic panel testing.

Inter-institutional projects

Vector hydrophone array processing algorithm for source localization (IISc., Bangalore)

Passive detection techniques for acoustic vector sensor arrays have been developed. Performance analysis of bearing estimation techniques in ocean using known methods such as SIM and R-MUSIC have been applied to arrays of Acoustic Pressure Sensor (APS) and Acoustic Vector Sensor (AVS) respectively. Three new techniques, viz. Subspace Detector (SD), Truncated Subspace Detector (TSD), and Approximate Signal Form Detector (ASFD) have been developed. In order to test the algorithms low frequency transmission experiments in the shallow waters off Chennai were carried out and the field data are being analysed. The studies being carried out aim to achieve high resolution bearing estimation using shorter arrays.

Acoustic characterization of sea floor and other related habitat studies using high frequency systems-Application and model and model free techniques (NIO, Goa)

The focus is on characterizing the sea bed using single beam and multi beam echo sounder data, through efficient data processing and signal correction algorithms using Hilbert, moving average filters, echo alignment and noise removal. Benthic fauna at the study locations off Goa have been characterized from the data collected. Artificial neural network technique based algorithm for multi-beam backscatter data has been developed. Acquisition of underwater seafloor photographic data to strengthen the ground truth aspects is underway.

Participated in multi-Institutional shallow water experiment (GulfEx11) off Panama City, Florida, in Gulf of Mexico lead by APL, University of Washington, USA. Carried out data acquisition of sub bottom profiler, multi beam and sediment samples and participated in detailed mapping survey.

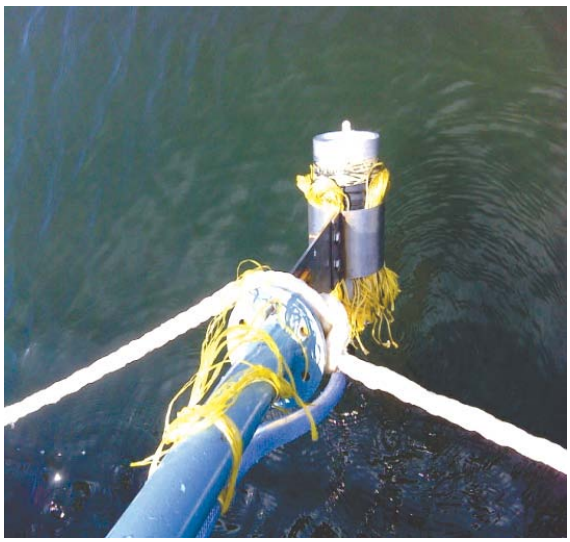
Investigation of TRM and MIMO-OFDM methods for underwater acoustic communication (IIT, Delhi)

Time Reversal Mirror (TRM) takes advantage of the reciprocity of the medium to compress acoustic energy both in time and space. The temporal compression recombines the multi-path interferences and the spatial focusing mitigates the effect of channel fading. This ability of the time reversal to reduce dispersion makes ideal for underwater acoustic communications. MISO (2x1) configuration has been successfully implemented and integrated. Alamouti Space Time Block Coding has been used as a form of orthogonal coding. The code has been tested with channel profiles of the underwater tank at Naval Physical and Oceanographic Laboratory (NPOL) at pass band. The trials were conducted with different channel lengths and have been found to work satisfactorily. Trials with two transmitters and one receiver have also been conducted at the underwater tank at Centre for Applied Research in Electronics, IIT Delhi.

Development of Acoustic Equipment for Object Detection for Divers (NPL, Delhi)

The objective of the project to develop an acoustic device that may be worn by diver as headgear or goggles and suitable to produce audible sound if there is any object in front of diver. The transmitter and receiver circuits were designed and the 1st prototype system was tested at ATF, NIOT. The transmitter was converted to directional and the separate receiver hydrophone was used for long range operation. The field testing was carried out off Chennai.

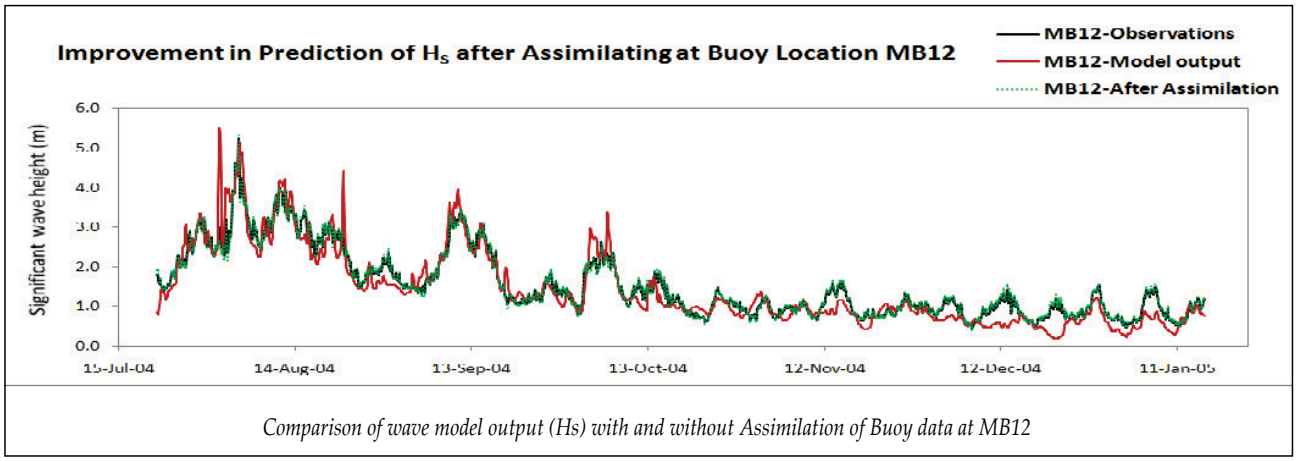
Acoustic equipment



Field testing

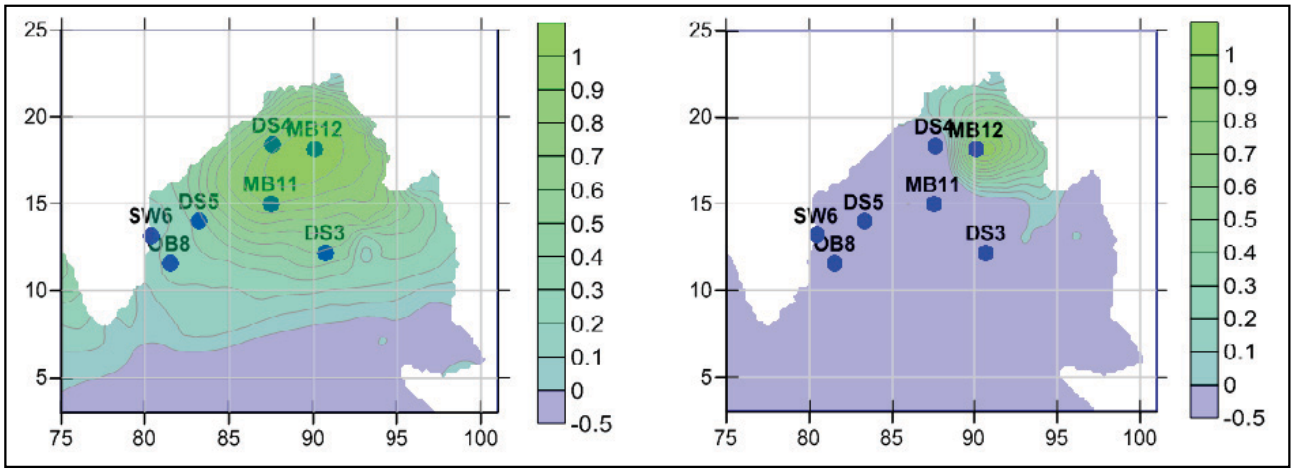
MODELING OF OCEAN PROCESSES

Data Assimilation (DA) proves to be a powerful tool in improving the ocean state prediction and in Indian seas in order to improve the wave prediction, data assimilation in the model domain with buoy observations has been studied. DA not only improves the prediction at the location where data is available but also influences its neighbouring area with respect to time and space due to its dynamic nature. Optimum interpolation scheme has been applied for assimilating significant wave height from buoy data and it is found that it captures the model physics while predicting the weight factors for the deviations in the model output with respect to the observations which are incorporated into a gain matrix. The figure shows more than 90% improvement in the significant wave height after assimilation at the buoy location.



Comparison of wave model output (Hs) with and without Assimilation of Buoy data at MB12

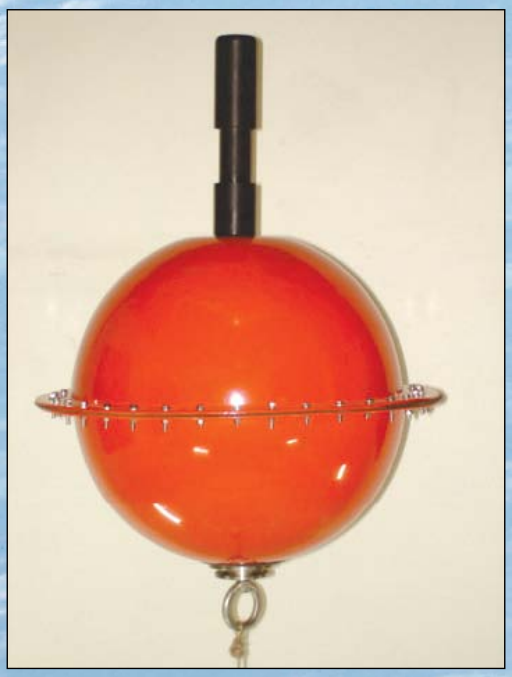
The gain contours define the distribution of the correction in the model domain. It is maximum at the location of observation and generally decreases with increasing distance from the observation location, depending on the season, wave intensity and the wave (wind) direction as well as on the characteristics of the site(deep/shallow waters, islands etc).



(a & b) Buoy Influence Area (MB12) without and with Filtera

The long term analysis of the gain distribution at the buoy location off Visakhapatnam (MB12) has been studied for one month and 6 months observation period. It showed regular pattern with increasing time span. It also emphasizes the need to filter out the spurious combinations which are not practical to arrive at a realistic estimation. A criteria has been developed to filter out the spurious combinations based on the covariance structure. The above figure clearly depicts the efficient way in which the actual influence area of a particular buoy (MB12) has been segregated using this technique for a 2 month simulation period during the South West Monsoon season.

OCEAN ELECTRONICS

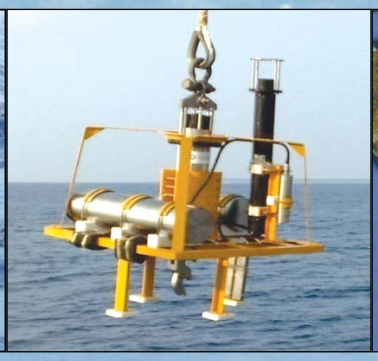


Pradyu - II

Autonomous Underwater Profiling Drifter (AUPD)

Kalpasar Observatory Network

Pradyu - I



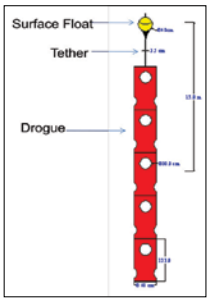
Tsunarec

Kalpasar Observatories Locations

OCEAN ELECTRONICS

Ocean Electronics group has a mandate to develop ocean observation systems and demonstrate for applications in the ocean. The group is involved in the development of Deep Ocean Bottom Pressure Recorder (DOPR) & surface buoy data logger for Tsunami Early Warning Systems, Autonomous Underwater Profiling Drifter (AUPD), Drifter and technologies for data communication using INSAT satellites.

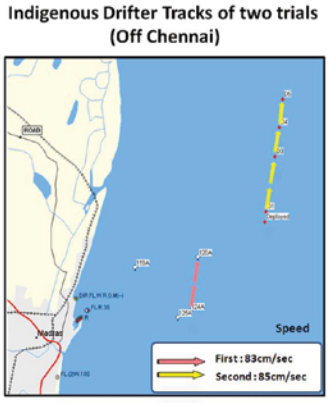
Pradyu: Drifter Buoy system is a floating device deployed in sea, which is used to collect process and transmit the Meteorological/Oceanographic information like Sea Surface Temperature, Barometric Pressure via satellite. It is designed to follow the path of ocean currents depending on the drogue length. The key elements of Drifters are Surface Float, Drogue and a connecting tether wire. The Surface Float contains the data acquisition modules, Sensors, Battery pack, Magnetic Reed On/Off switch and INSAT transmitting modem. Drifter position is obtained by GPS receiver.

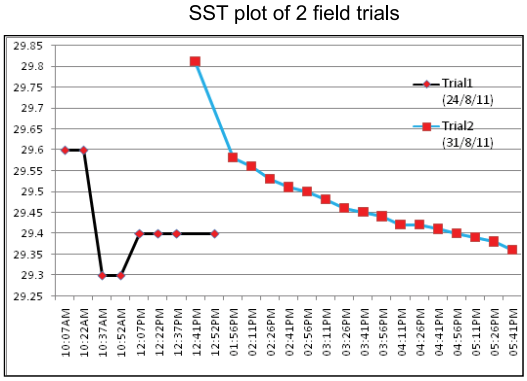


Drifter buoy system


Pradyu - I *Drouge*

Drifter Buoy prototype system PRADYU has been developed and demonstrated using with INSAT modem for data transmission. The Pradyu-I was developed using FRP material and the two day field trials are conducted off Chennai on 24th and 31st August 2011 by deploying and recovering system.





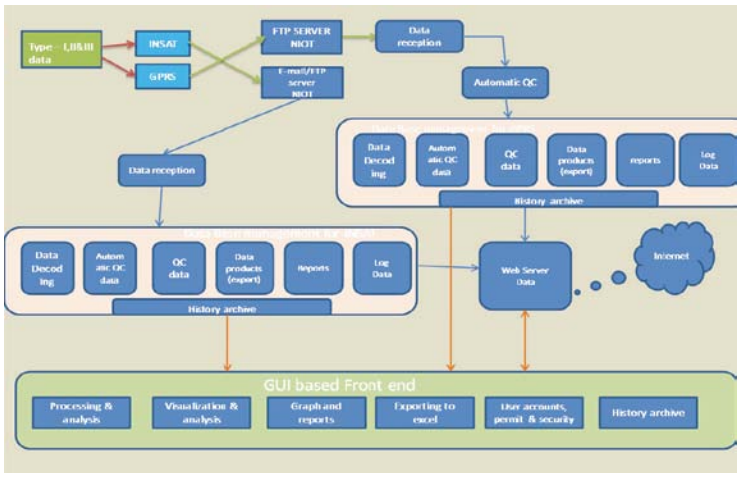
Kalpasar Project: The group has set up Met-Ocean Observatory network at Gulf of Khambhat, as a part of the Kalpasar Project being carried out by NIOT. The requirement is time series measurements of tide, current, water quality and meteorological parameters.

The Met-ocean observatory has been classified into 4 types. Type-I and II are current meters moored at 10m and 25m, and Type III with Radar tide gauge and met-station installed on existing structures, and Type IV with pressure tide gauges.

The data logger and supporting hardware are developed in the Institute and the real time communication from these platforms is through GPRS and INSAT satellites. The network is programmed to report the data on hourly basis and store all the time series information in the internal hard disk. All the observatories are powered by solar panels and batteries to support for more than a week's backup. The platform is also incorporated with a marker lamp for navigation.

A dedicated software application KALSOFT has been developed to handle the data reception through INSAT & GPRS. It decodes and updates the data in the database. Various views, reports and alerts can be automatically generated by the application.

Presently 20 TYPE III stations and 17 pedestals with current meters are deployed.

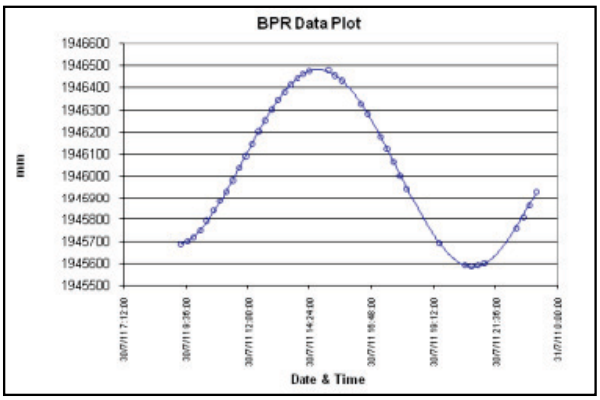


Kalpasar Observatory Network - Overview

Installation of Type-I, Type-II & Type-III observatories of Kalpasar Project

Tsunami detection and reporting system

Tsunarec: The indigenously developed Deep Ocean Pressure Recorder (DOPR) was deployed at 2000m depth off Chennai during July, 2011. The system could not report data for longer duration and the DOPR could not be retrieved. A revised system with deep ocean acoustic modem is under test at Laboratory.



Tsunami Test Rig: Laboratory testing of tsunami detection system at deployed conditions is a cumbersome task. It needs 400 bar static pressure and 0.1 bar dynamic pressure variation with more than 0.01m bar accuracy. In order to test the dynamic performance of the tsunami detection systems, an automated tsunami test rig has been developed at NIOT. The test rig is capable of simulating tsunami wave superimposed on 1000mm tide.

Tsunarec

Tsunami Test Rig

Tsunami Surface Buoy Data Logger: A new version of data logging/reporting system for tsunami surface buoy was developed and the performance of the system has been proved in Bay of Bengal. The Data Logger was used in the tsunami systems deployed during July 2010

to November 2011. The 2-way communication incorporated in the data logger was used to diagnose the BPRs (Bottom Pressure Recorder) at sea bed at locations TB05 & TB10 in Bay of Bengal from the land station. To enhance the endurance of the surface buoy, a low power data logger based on ARM 32 bit processor was developed with INSAT communication and tested for continuous operation.

Tsunami Surface Buoy Data Logger

Autonomous Underwater Profiling Drifter:

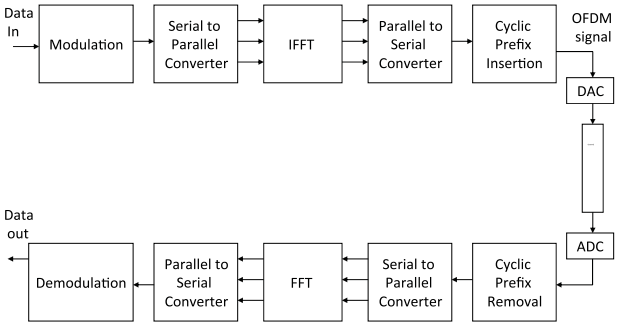
NIOT has successfully developed a proto type AUPD which was deployed in Arabian Sea during January 2008. Trial production of AUPDs with the help of private industry is in progress. The progress made during 2011-12 is as given below.

- Fabrication and procurement of all the major sub-components / parts were completed.
- Data Transmission test through ARGOS satellite was completed with control electronics and PTT & Antenna.
- Pressure testing of enclosure with rubber bladder assembly, CTD sensor, Antenna was carried out successfully at 200 bar pressure.
- Buoyancy engine performance / PMDC motor power consumption studies are being carried out with different operating pressure.

Patent has been filed for the AUPD technology.

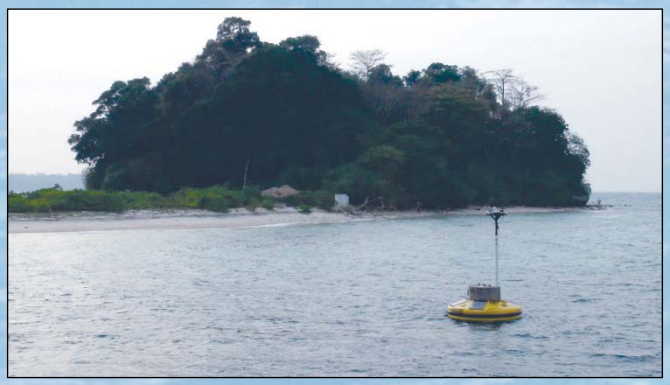
Acoustic Modem: Acoustic modem finds wide applications in underwater communication for various applications. The group is involved in developing acoustic modem for 2000m depth of operation. The modems employ DSP/FPGAs whose high performance to implement complex signal processing algorithms makes it possible to overcome the channel limitations and attain higher baud rates. Orthogonal Frequency Division Multiplexing(OFDM) modulation technique is adopted and the modulation scheme was simulated and tested using MATLAB.

Orthogonal Frerquency Division Multiplexing System

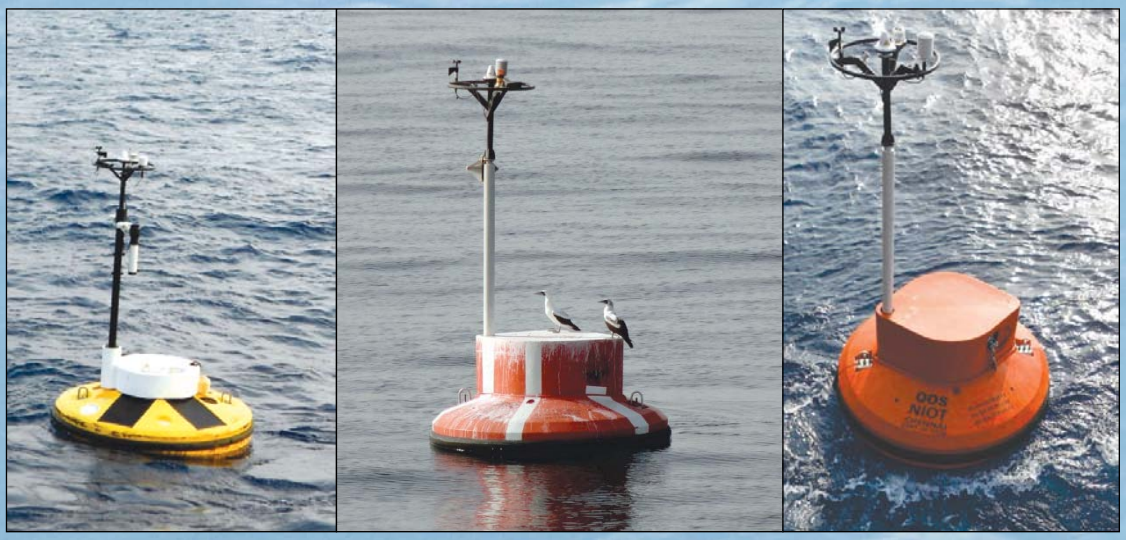


Block Diagram of Basic OFDM System

OCEAN OBSERVATION SYSTEMS



Coastal Buoy Deployment at Andaman



OMNI, Met Ocean Buoys at Deep Sea Locations

Retrieval of Deep Sea Buoys

OCEAN OBSERVATION SYSTEMS

Ocean observations have immense societal value through various climate and weather applications, including forecasts of droughts, tropical cyclones and associated storm surges, and projections of decadal to multidecadal climate variability and change. These observations provide information vital to the management of ocean ecosystems and human adaptation activities in response to climate variability and change. Time series observations are vital to improve the understanding of ocean dynamics and its variability.

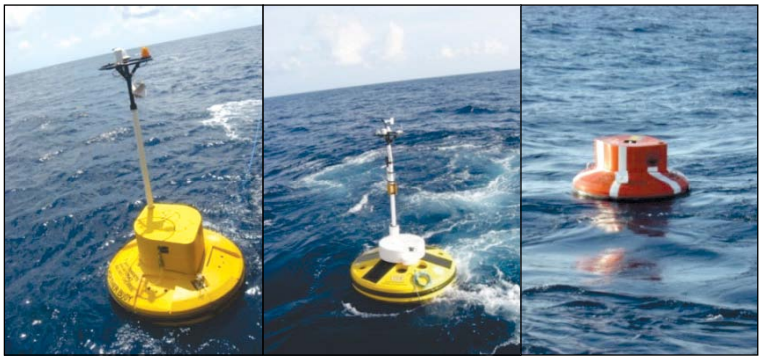
The Ocean Observation Systems (OOS) group of NIOT is engaged in the establishment and maintenance of Data Buoy Network for measurement of met-ocean parameters in Indian Seas to monitor the Marine Environment and to improve weather and Ocean Forecasts. Considering the importance of continuous measurements, reliable and high quality data, MoES had constituted a National Expert Committee to evolve optimal number of buoys required for the programme and to identify strategic locations in Bay of Bengal and Arabian Sea. On the recommendations of this committee, considering the importance of Upper Ocean data, the next generation buoy system called Ocean Moored buoy network for Northern Indian Ocean (OMNI) was evolved. Further, a Technical Evaluation Committee finalized the specification of the system and these moorings routinely measure ocean temperature, surface air temperature, humidity and wind at many locations. This data serves as a platform for salinity, currents, carbon dioxide, surface radiation, atmospheric pressure, and rainfall sensor.

As challenges arise in the form of natural disasters such as Tsunamis in the Indian Ocean, in spite of their infrequent occurrence, could be very devastating and can occur anytime without a notice. Though such disasters cannot be prevented, their impact can be mitigated with prior and proper planning. With this in view, OOS team has developed, tested and has established Tsunami Buoy system with Bottom Pressure Recorder (BPR) in Indian Seas. These moored surface buoys, each with a surface communication relay and a Bottom Pressure Recorder (BPR) measures water pressure on the sea floor to calculate the height of the water column above it. The BPR is capable of detecting subtle water level fluctuations that might indicate passage of energy due to a tsunami and through the acoustic link between the BPR and surface buoy; it provides reports transmitted to land via the INMARSAT communication system. INSAT communication system is also tested and would be systematically implemented into these buoy systems.

Objectives

To collect marine meteorological and oceanographic data using moored Met-Ocean buoy systems and disseminate data to INCOIS (Indian National Centre for Ocean Information Services).

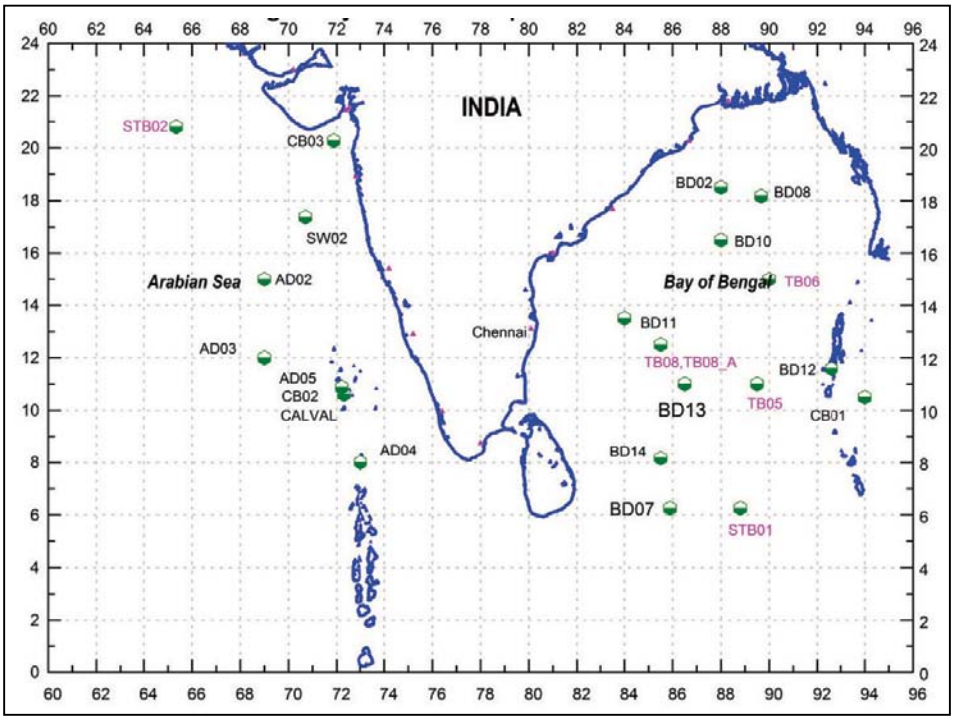
To collect deep sea water level data using Bottom Pressure Recorder and disseminate data to INCOIS for Tsunami Early Warning System.



Different types of buoy systems

Moored Data Buoy Programme

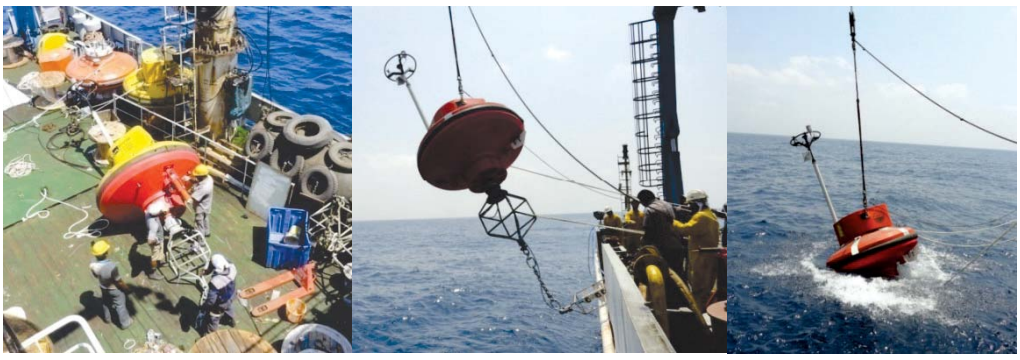
Moored Met Ocean Buoys : The 12 Buoy Network performed successfully during April 2011 to March 2012 and provided valuable data. The 12 buoy network was maintained, out of which six were OMNI buoys and six were Met-Ocean buoys. During this period, OOS has carried out 13 cruises involving 110 operations at Sea, 5200 man days and sailed to distance of
32568 nm (~60316 Km) in Bay of Bengal and Arabian Sea.



Moored Buoy Network

Sagar Manjusha cruise

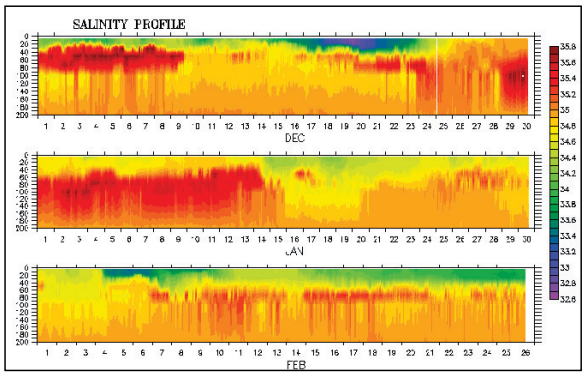
During 20-02-2012 to 11-03-2012 met-ocean buoys were serviced by Sagar Manjusha in Arabian sea. Deep sea and shallow water moorings were deployed in fair weather conditions. The deck operation on deployment of met-ocean buoys is as shown below.



Buoy deployment / retrieval operation onboard Sagar Manjusha

OMNI Buoy network in Bay of Bengal (Ocean Moored buoy network for Northern Indian ocean)

These next generation buoy systems were deployed in two phases, initially with 2 OMNI buoys and subsequently 4 OMNI buoys were deployed and performance evaluation was completed. The Performance Evaluation Committee appreciated the successful completion of 30 day and 90 day evaluation period. Since these buoys were established before the onset of North-East Monsoon, BD13 and BD14 buoy could capture THANE cyclone during December 2011. The buoy network provided useful information for operation agencies during summer and winter monsoons. Freshening of the Northern bay by High River discharges during the South West Monsoon (SWM) and Barrier Layer formation in the Bay of Bengal as observed during North East Monsoon (NEM) 2011 were captured/retrieved and analyzed from the observations. The figure shows that the high sub surface salinity favours formation of barrier layer during the North East Monsoon period which is evident from the salinity profiles obtained from the OMNI buoys in the month of December and January.

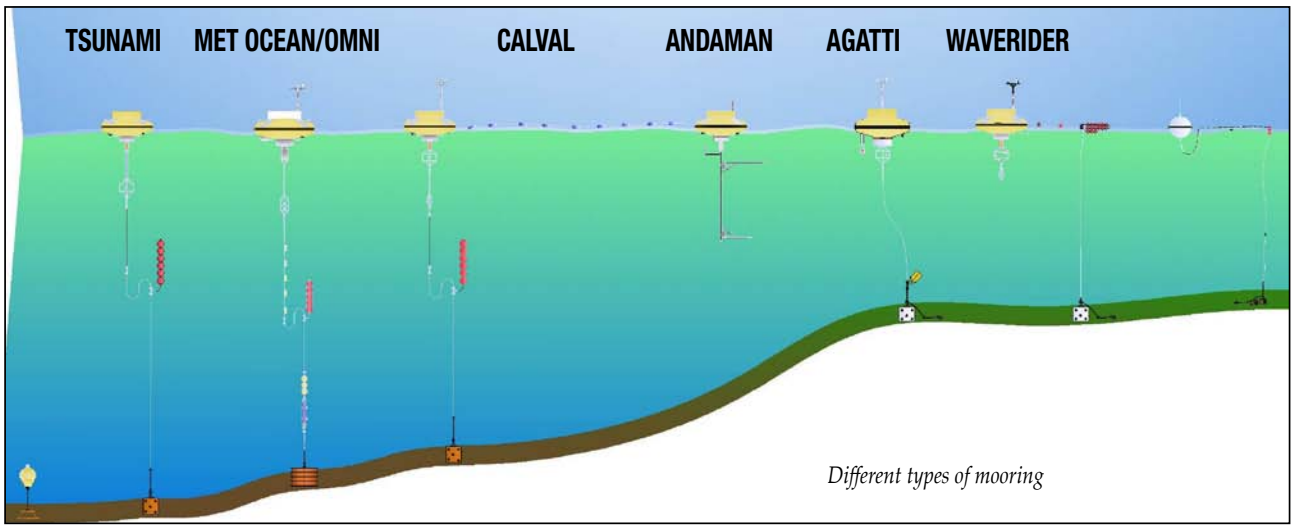


Cyclone Genesis and Oceanic Impact

Observation from OMNI buoy

CALVAL Kavaratti

In collaboration with SAC, Ahmedabad, a moored data buoy and an optical buoy were designed, tested and deployed successfully off Kavaratti under CALVAL Phase II project during December 2011 onboard Sagar Nidhi. A new optical



Different types of mooring

under water frame was designed and fabricated for this application. A systematic study was carried out to ensure foolproof safety and functioning of the system.

While designing the frame structure, many aspects have been considered and provided with possible solutions such as deployment and retrieval from Ship or boat; from a jetty with less depth; towing of the frame with or without the buoy; prevention of damage to the instrument frame; offsetting the effects of shadow on the observation; and the best way to connect the two buoys during deployment. The system was found to be working satisfactorily.

NIOT Data Reception Centre

The Data reception Centre is functioning satisfactorily 24x7. It is upgraded with Blade Servers, UPS etc. New Software is also being developed for automatic data quality check, inventory, metadata and reports sensors status and buoy status etc.

Weather through SMS

A Reference Weather Station has been installed at OOS and functional from 15th August 2011 to provide meteorological data such as Air temperature, Relative humidity, wind speed, wind direction, Atmospheric pressure and precipitation. On request through SMS the data transmission module will transmit to user by means of a global system for mobile communication (GSM) or a general packet radio service (GPRS) network. The OOS Data Reception Centre can display the real-time data through a graphical user interface (GUI) implemented in Lab View software. The real-time data can be viewed 24 X 7 from anywhere on request through SMS.

Indigenous Buoy Data Acquisition System

NIOT has successfully developed the IDAS (Indigenous Buoy Data Acquisition System) for Met-Ocean Buoy, Wave Buoy and Tsunami Buoy. These systems are already deployed and working satisfactorily. The technology was transferred to an industry to meet further requirements.

As suggested by the Technical Expert Committee, necessary steps were initiated to upgrade the existing indigenous buoy system to measure all the parameters similar to OMNI buoy system.

Coastal Buoy at Andaman

A coastal buoy was successfully re-deployed at Mahatma Gandhi Marine National park, Andaman, and data is being provided to Andaman and Nicobar Island administration through INCOIS. The observation showed soft Coral growth on the bottom of buoy hull which is reported for the first time during February 2011 to March 2012.

The marine fouling organisms like Lamellodysidaeherbacea Tubastraeasp, Antipatharianetc were identified by Zoological Survey of India. However, further systematic scientific study need to be conducted with periodical sampling at site.

Anti vandalism measures

All the buoys are expensive and their set-up in the sea is a time-consuming exercise. Therefore, any loss of the buoys hampers global climate research, and meteorological forecasts considerably. Anti vandalism measures such as conical hood, mounting of antenna inside the hood and usage of special tools for opening the lid locks have been attempted.

Conical Hood

Inter comparison of wave rider buoy with Data Buoy

As advised by MoES, one wave rider buoy was successfully deployed during April 2011 Off Agatti and local UHF reception setup was installed at shore to receive the real time data from the buoy. The operation was carried out for the Inter Calibration Project of data buoy and wave rider buoy and good correlation was observed using the wave parameters.

Extended Technical Support

Ocean Observation Systems (OOS) provides various types of technical support in the form of Inter-institutional and Intra-Institutional training programmes during deployment / retrieval time.

Inter-institutional

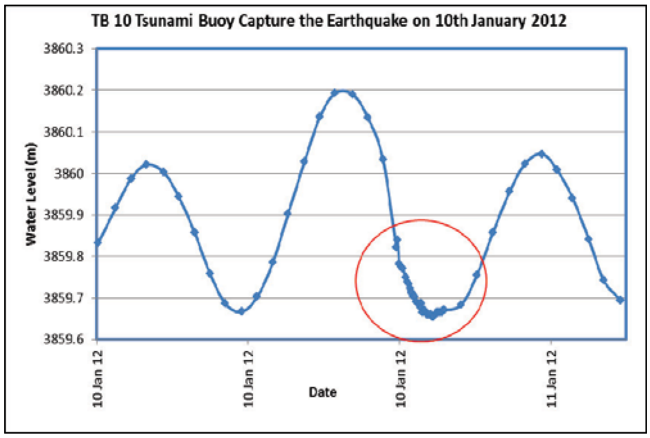
INCOIS	Supported during a joint cruise in their projects on RAMA, SAIC Tsunami buoy, Drifters, ARGO, etc
INDO-US PARTNERSHIP (MoES-NOAA MoU) Collaboration	NIOT is associated with INCOIS on deployment of RAMA buoys
IITM Pune	Associated with the project on climate measurements under FLUXNET programme.

Tsunami Buoy Programme

Tsunami buoys were deployed and maintained in Bay of Bengal and Arabian Sea.

The Tsunami system TB10 deployed at this location successfully captured two events.

Tsunami Buoy Deployment



Capturing of Earth quake at TB Location

MARINE SENSOR SYSTEMS

Tow body during Buoyancy Test

Linear Hydrophone Arrays

Effective usage of Facilities

MARINE SENSOR SYSTEMS

The focus of Marine Sensor Systems programme is

- To establish a facility of excellence to provide electronic support to various activities and projects of NIOT.
- To create infrastructure for reducing the development time and facilitate rapid prototyping.
- To develop sophisticated underwater sensor technology for marine applications.
- To develop expertise in Marine electronics related issues.

Project-wise progress

Underwater Electronics Support Facility

The objective is to establish underwater electronic support facility of excellence to cater the needs of various project related activities of NIOT. Apart from the facilities which are established already, a Humidity and Temperature calibrator has been added to the facilities list. The following new softwares have been added to the electronic support facilities:

- ✦ Altium Designer release 10 for the PCB designing and FPGA projects.
- ✦ PSIM-Power electronic simulator.
- ✦ Proteus VSM-Microcontroller simulator.
- ✦ Pads-PCB designing software.

- For the purpose of Buried Object Scanning Sonar development, a Data Acquisition System-16-bit, 250ks/s, Multifunction DAQ Device having 8 simultaneous analog inputs along with software has been procured.
- All the established facilities like Helium-Leak detector, Shock and Vibration Test Facility, Corrosion Testing Chamber, Environmental Chamber and Humidity Calibrator have been under effective use by different groups of NIOT.

Development of Underwater Components

The main objectives are development of underwater components such as, underwater electrical slip ring, underwater BLDC (Brush Less DC) motor in association with industries, and establishment of underwater engineering laboratory and a marine electronics laboratory.

Preliminary design of the underwater slip ring to sustain / withstand / designed for pressures rated 600 bar has been completed and its fabrication has started. Moulding of the Ring assembly has been completed and tested for temperature and vibration as per MIL (Military) standards. Identification of Industrial partner for the joint development of underwater BLDC motor is under progress.

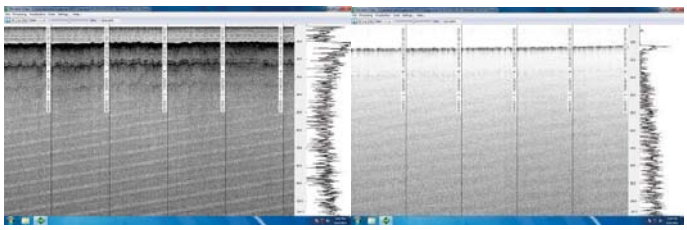
Marine Sensors and Technology Development

The main objectives are:

- To develop new shallow water sub bottom profiler transducers and to interface it with off the shelf hardware using the technology developed by NIOT.
- Development of sensor technologies to detect, classify and identify objects buried under seabed using Acoustic and Magnetic Detection Techniques for shallow water and deepwater applications.
- To develop acoustic sensors in collaboration with M/s BEL for projects of mutual interest
- To develop user based bio-sensors and sensors for oceanographic applications pertaining to the project of NIOT.

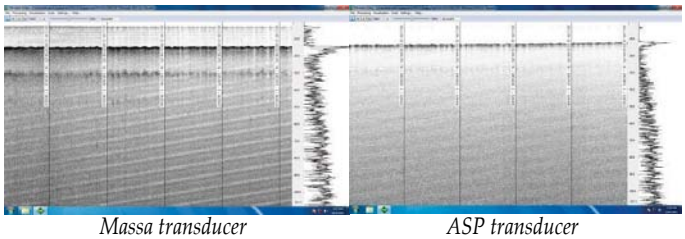
The progress made in the above activities are the following:

- ASP (Acoustic Sub bottom Profiler) transducer developed by NIOT has been interfaced with COT (Commercial Off the shelf Technology) user friendly Multimode Digital Sonar System (MDSS) and tested off Chennai port on 25/05/11. The transducer has been tested in two frequency ranges, 2-9 kHz and 2-24 kHz and as expected images with higher degree of resolution have been obtained in the second range as expected of frequency. The high resolution sub bottom profiles obtained by ASP transducer, when compared with that of standard transducer (Massa), clearly underlines ASP transducer's ability to perform as an efficient transducer for sub bottom profiling.
- An algorithm has been developed for sub bottom profiling and profiles have been generated from the data collected from Chennai port during May 2011.



Massa transducer (a) *ASP transducer (b)*

Comparison of Sub bottom profile using standard transducer (Massa) (a) and indigenously developed ASP transducer (b).



Massa transducer *ASP transducer*

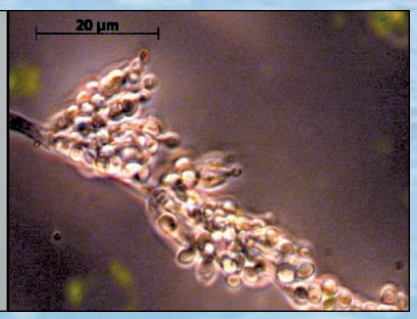
Comparison of sub bottom profiles using indigenously developed ASP transducer in two frequency ranges.

- A prototype cymbal hydrophone array with in-built pre-amplifier for each element has been developed and lab tests have been carried out in NIOT's Acoustic Test Facility (ATF).
- The design of prototype linear towed array with cymbal transducer has been optimized based on the analytical and experimental results and its fabrication is under progress.
- Both analog and digital linear array which have been given to industrial partners for fabrication have been delivered to NIOT for testing and calibration.
- As per the amended MoU with BEL, Bangalore, the projects of Mutual interest such as development of Wide Band Transducer Array, Conformal Array, etc. have been updated and technical discussions are underway.
- Development of an optical biosensor kit for the water quality analysis with the help of metalloproteins like Haemoglobin and Myoglobin is under progress. The hardware design of the prototype optical biosensor has been completed and the manufacturing and testing is also under progress.

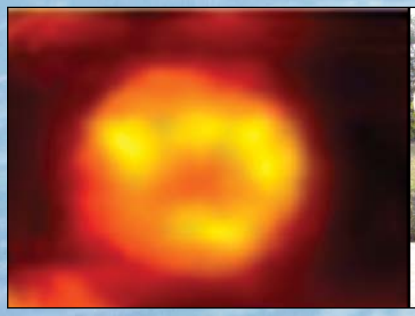
MARINE BIOTECHNOLOGY

High pressure serial dilution and fermentor systems

Extraction and Purification of Lutein

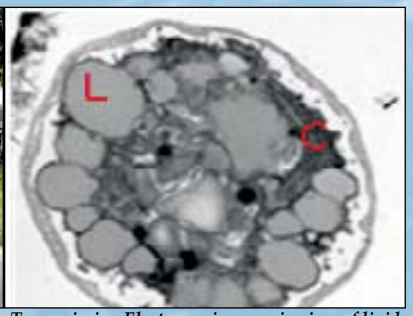


Deep sea filamentous fungus Paecilomyces sp.



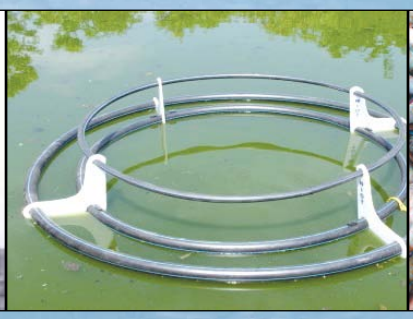
Light microscopic view of lipid droplet in Chlorella vulgaris

Tubular Photobioreactor with process controller



Transmission Electron microscopic view of lipid droplet in Chlorella vulgaris

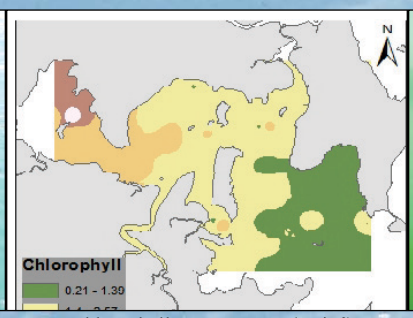
Sea weed Caulerpa sp.



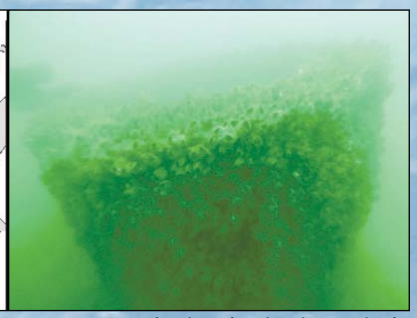
Nursery Cage (2 m Ø HDPE)

Milk fish harvested at Olaikuda

SCUBA diving training at Port Blair



Chlorophyll concentration (mg/m³) in Port Blair Bay



Dome type Artificial Reef with rich growth of marine organisms

AREAS OF ACTIVITY IN MARINE BIOTECHNOLOGY

MARINE BIOTECHNOLOGY

Marine Biotechnology programme includes five major activities, namely, Open Sea Cage Culture, Marine Micro Algal Biotechnology, Marine Microbial Biotechnology, Materials for Marine Applications and Island Resource Information System. Three multi-institutional projects, viz., Developments of Potential Drugs from Ocean (DPDO) and Coastal Ocean Monitoring and Prediction System (COMAPS) and Biofuel from Marine Microalgae are also being carried out under this programme. Societal activities such as design, fabrication and deployment of Artificial Reefs and Fish Aggregating Devices (FADs) for the enhancement and effective utilization of fishery resources were successfully implemented with the financial support from the Department of Fisheries, Government of Odisha and Andaman & Nicobar and Lakshadweep Administration, respectively.

Open Sea Cage Culture: Experimental scale culture of marine fin fishes was carried out with hatchery reared sea bass fingerlings (obtained from Rajiv Gandhi Centre for Aquaculture & Central Institute of Brackish water Aquaculture), wild collected milk fish fingerlings and juvenile parrot fishes at Kothachatram (off Kavali, Andhra Pradesh) and Olaikuda (off Rameswaram, Tamil Nadu), between July and October 2011. An average growth rate of 263g (2.26g/day) was achieved in sea bass on the 110th day with 776g being the maximum weight from its 14g mean stocking weight at Kothachathram. The milk fishes stocked in sea cages at Olaikuda showed an excellent growth rate up to 800g (average 489g) from its mean stocking weight of 18g with 50% survival in 110 days. In the absence of large scale nursery rearing facility for rearing the fish fingerlings to a stocking size, an indigenously designed open sea nursery (2 m Ø HDPE) cage with 4mm nylon knotless net was developed and tested successfully.

Sea bass in open sea cage at Kothachatram

Nursery Cage (2 m Ø HDPE)

In an effort to breed late maturing commercial fin fishes, development of fast maturing surrogates is being attempted using Amphiprion seabae as an experimental model. A seabae treated with 17β-estradiol recorded a precocious ovarian development in ovotestis in 16 days. Partial cloning of kisspeptin and its receptor involved in puberty was completed and temporal expression studies in wild population revealed a gradual increase of kisspeptin level during the gonadal

Milk fish harvested at Olaikuda

transition period. Studies on the effect of heterologous myostatin antigen on the muscle growth of seabass are under progress.

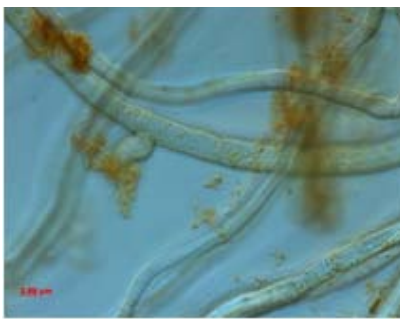
Marine Micro Algal Biotechnology: Continuous flow bubble column photobioreactor of 1500L capacity with a flow rate of 300L/hr using airlift mechanism was designed and developed. Chlorella vulgaris (NIOT-74/POSA), identified as one of the potential strain for the production of biolipid, was cultured with a custom designed media. A maximum cell density of 3.05 x 106 cells/mL and 0.3g/L dry biomass on the third day of the culture with a specific growth rate of 0.17 g/L per day was recorded. A maximum lutein production of 9.23 and 9.44mg/L was obtained in mixotrophic culture of C.vulgaris. To minimize the electrical energy dependence and efficient utilization of energy, a solar powered DC motor system with ON/OFF control system for continuous and intermittent operation of paddle wheel in raceway culture system has been designed and developed for mass culture of marine micro algae. Direct Current (DC) powered electro flocculation system has been developed and tested by using aluminium and titanium electrodes and standardized for 98% efficient electro flocculation in 300L tank within 5 minutes.

Tubular PBR with control system

Raceway with solar powered paddle wheel

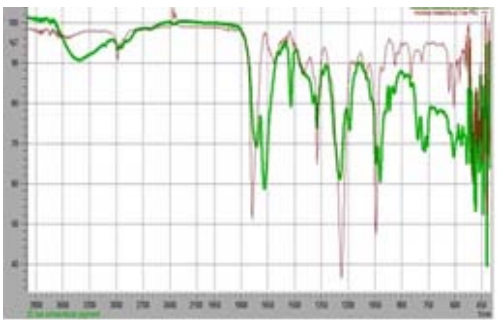
Continuous flow bubble column PBR

Deep-sea microbiology: High pressure and low temperature serial dilution system and fermentor system with a working pressure of 350 bar were designed and developed for deep sea microbial culture. A peizotolerant marine filamentous fungus which was isolated by NIOT from a depth of 800 m at Arabian Sea was identified as Nigrospora sp. by partial sequencing of 18s rRNA and Internal transcribed spacers. The fungus was initially tested in high pressure fermentor at a pressure of 25 bar and significant changes in the secondary metabolites are recorded. Further attempts are being made to examine the system at higher pressure employing deep sea microbes. Marine bacteria producing polyhydroxyalkoanates (PHAs) were isolated from 1020m depth and purification and characterization of the PHAs were successfully completed. Phylogenetic identification of 9 deep sea bacteria and 16 deep sea fungi was completed



1 bar pressure

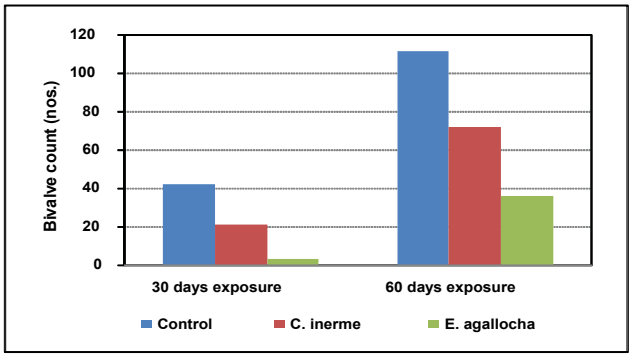
25 bar pressure



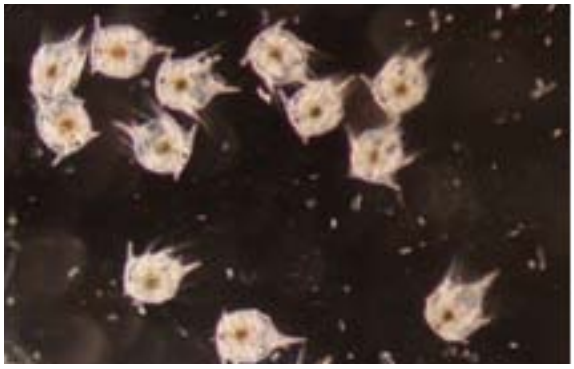
FTIR spectrum of metabolites

by amplification and partial sequencing of 16s rRNA and 18s rRNA sequences. Design and development of deep sea water sampler is in progress.

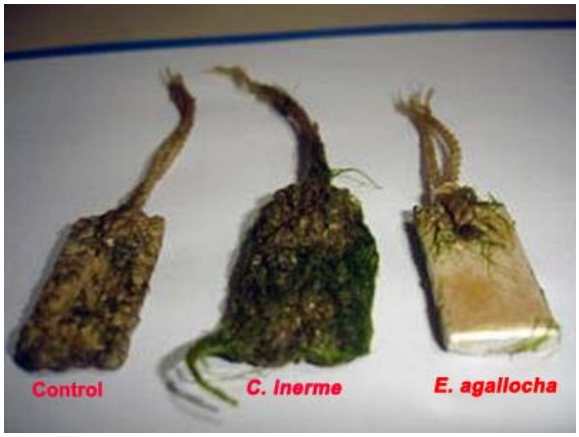
Materials for Marine Applications and Antifouling Measures: Antifouling extracts from mangroves Clerodendroninerme (21.59 µg/ml) and Excoecariaagallocha (30.97 µg/ml) showed higher efficacy in barnacle bioassay conducted with Tetraclitaporosanauplii. E. agallocha extract coated test coupon showed significant biofouling control in open sea immersion test up to a period of 30 days.



Bivalve settlement assay



Tetraclita porosa nauplii



30 days exposed test panels

Island Resource Information System: Geo-database of water quality parameters was developed based on the grid method for Chidiyatappu and Aerial Bay. The coral resource for an extent of 355.56 hectare area along the Aerial Bay coast was studied using digitally classified images. The Digital Elevation Model (DEM) was developed for Long Island using Survey of India topo sheets of 10m contour intervals. The DEM was used for risk assessment and disaster management planning and Rapid Environmental Assessment (REIA) projects for A&N Islands.

Development and deployment of Artificial Reefs and Fish Aggregating Devices: The post deployment survey of artificial reef structures in Penthakota, Chandrabhaga and Balinolchia along Orissa coast was carried out. Large congregation of groupers and other reef fishes was recorded in the vicinity of artificial reef structures. Twenty kilogram of fish catch per unit effort of one hour was recorded in Balinolchia using gillnet. Ten FADs were successfully deployed off Diglipur, Rangat, Mayabandar, Havelock, Chidiatapu, Hut Bay, South Sentinel, Car Nicobar, Kamorta and

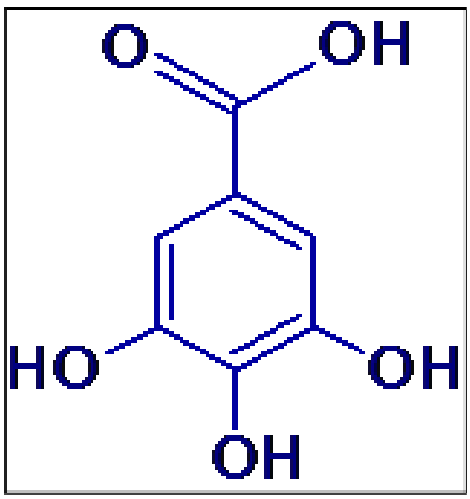
Congregation of grouper in Triangle type AR

Congregation of grouper in Square type AR

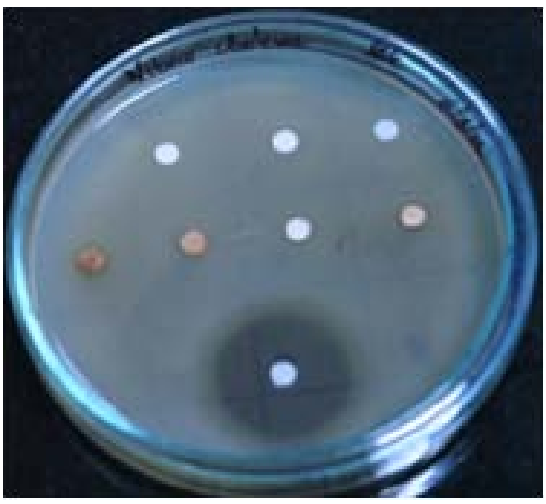
Cambell Bay in Andaman & Nicobar Islands. Repair and redeployment of 9 FADs off Kavaratti, Agatti, Kalpeni, Amini, Chetlat, Bitra, Kadmat, Kiltan and Androth in Lakshadweep Islands were completed.

Stylissa sp. from Neil Island

Development of Potential Drugs from Ocean (DPDO): A total of 97 marine organisms (55 flora and 42 fauna) were collected from 16 locations covering north, middle and south Andaman. Forty three samples were submitted to Central Drug Research Institute, Lucknow, for various pharmacological screenings. Three samples exhibited promising anti-hyperglycaemic activity. A purified fraction from a mangrove with antibacterial property was identified as 3, 4, 5-Trihydroxy benzoic acid. Thirty eight crude extracts and six fractions were submitted for anticancer activity analysis at Advanced Centre for Treatment, Research and Education in Cancer, Mumbai. Thirty eight samples were submitted for anti-HIV screening at



3,4,5-Trihydroxy benzoic acid



NIT-567 Antibacterial assay

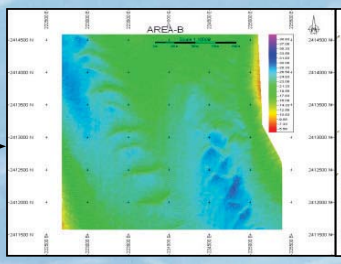
Dr. A. L. M. Post Graduate Institute of Basic Medical Sciences, Chennai. Six samples showed promising anti-HIV activity. Hundred and sixty one samples and 12 fractions were examined for in-house anti-bacterial activity and two fractions were found to be active. One hundred and eighty eight samples were received from various collaborating institutions for antibacterial activity testing and 15 were found with promising activity during the bioactivity testing.

Coastal Ocean Monitoring and Prediction System (COMAPS): Physicochemical and biological samplings for the year 2011-12 were carried at 7 stations of Port Blair Bay and at Wandoor, both low and high tide periods, during May, August and November 2011. Physicochemical and biological parameters of seawater samples were analyzed and the report was submitted to ICMAM. One year report for Mahatma Gandhi Marine National Park station was prepared and submitted to the Department of Environment and Forest, Andaman and Nicobar Administration, Port Blair.

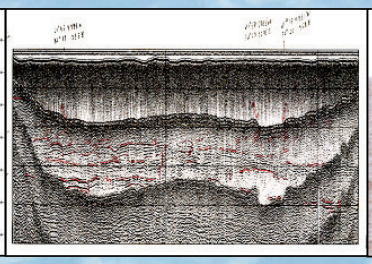
Biofuel from marine microalgae: Effect of Ultra Violet (UV) light on microalgal lipid accumulation and its ultra structure has been investigated. UV-mutated culture showed increased lipid content. The major fatty acid methyl esters found include C16:0 (Palmitoleic acid) and C18:1 (Oliec acid) C18:2 (Linoleic acid) and C18:3 (Linolenic acid) methyl esters. The percentage of fatty acid suitable for biodiesel i.e. C16:0 and C18:1 were comparatively higherin 30 second UV exposed and 60 second UV exposed when compared to non UV exposed. B-10 biodiesel was prepared from the lipid extracted fromC. vulgaris. FTIR spectra of B-10 blended biodiesel and the transesterified micro algal lipid were similar to those of the petroleum based diesel.

COASTAL AND ENVIRONMENTAL ENGINEERING

Kalpasar Project



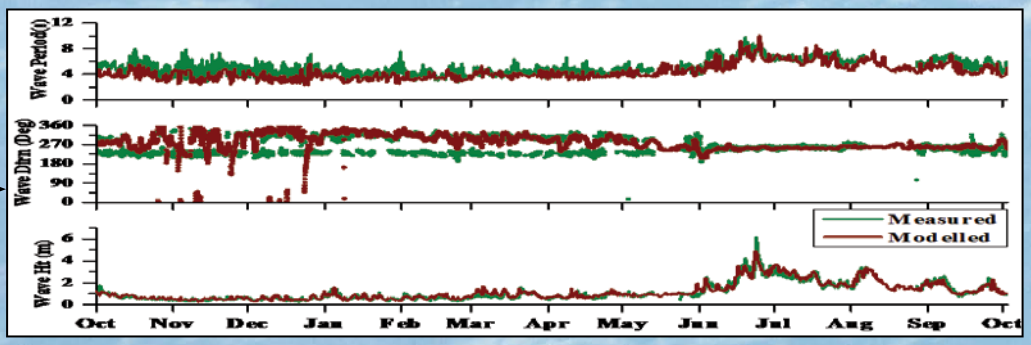
Digital elevation model of survey site



Shallow seismic profile

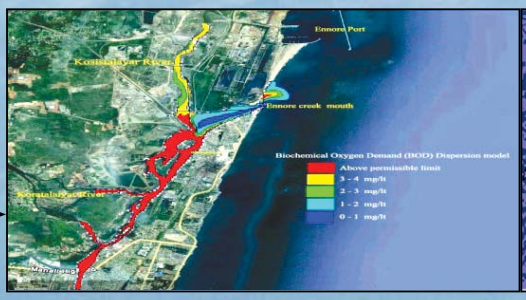
The Catamaran with Met Sensors

Technical Criteria Atlas

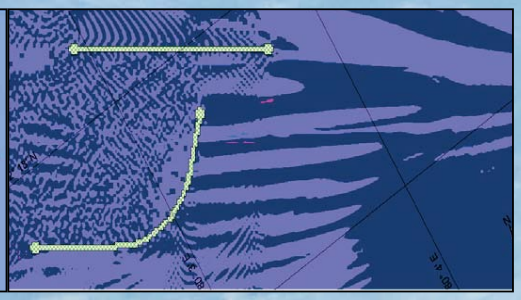


Validation of Wave parameters off Vijayadurg

Sustainable Shoreline Management

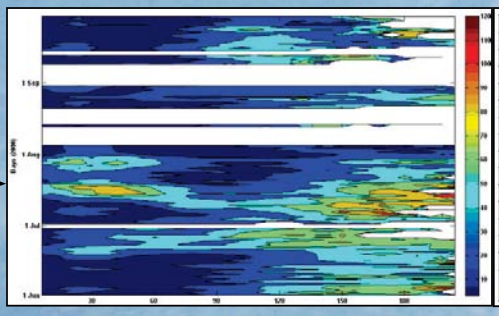


Biochemical Oxygen Demand dispersion model for Ennore Creek



Simulation of Sediment deposition rate off Cuddalore

HF Radar



Seasonal Variation of Surface Currents off Tamil Nadu coast

SITE	CUDA	KALP	MACH	YANM	WASI	JGRI	GOPA	PURI	PTDL	HTBY
2011 Jan	77	100	92	52	94	100	94	93	88	98
2011 Feb	94	100	69	76	95	89	83	93	94	100
2011 Mar	97	100	98	82	43	100	91	92	59	77
2011 Apr	95	98	100	46	59	97	91	88	80	98
2011 May	72	78	95	54	75	97	85	73	90	98
2011 Jun	57	76	91	66	53	80	40	75	55	55
2011 Jul	88	100	98	25	67	15	3	81	54	88
2011 Aug	100	100	70	70	66	100	64	73	79	96
2011 Sep	98	100	99	72	90	54	90	91	50	98
2011 Oct	95	100	99	70	78	85	95	97	70	59
2011 Nov	99	74	95	66	95	53	96	77	59	75
2011 Dec	88	78	75	93	94	83	81	93	75	76
2012 Jan	0	100	100	96	95	88	84	93	72	96
2012 Feb	0	75	75	19*	96	100	78	93	55	85
Since Installation	75	96	78	42	65	91	64	82	75	85

Monthly Data Reception from HF Radar

COASTAL AND ENVIRONMENTAL ENGINEERING

Coastal and Environmental Engineering (CEE) programme aims to bring the state of the art technology in coastal infrastructure development through field observation, numerical modeling and engineering application. The programme handles four major projects along with an industry sponsored project. The major projects handled by CEE are as follows:

- Engineering Investigations for the 'Kalpasar' Project of Government of Gujarat
- Demonstration of Shore Protection Measures through Pilot Projects
- Technical Criteria Atlas
- Establishment of Coastal HF Radar Network under tsunami Early Warning System

Engineering Investigations for the 'Kalpasar' Project of Government of Gujarat

The Kalpasar project envisages installation of a dam across gulf of Khambhat – connecting Bhavnagar on west to Dahej on east coast. The engineering investigations related to dam site selection and the after-effects of the dam on sedimentation pattern in the gulf has been entrusted to NIOT by Kalpasar department, Govt. of Gujarat. NIOT started the studies in October 2010 and it is expected to complete all the scope of investigations by mid 2013. The study has been divided into following four components:

1 Engineering seabed investigations in the Dam Corridor

2 Bathymetric survey in northern gulf and met-ocean observations

3 Bathymetric survey in southern gulf

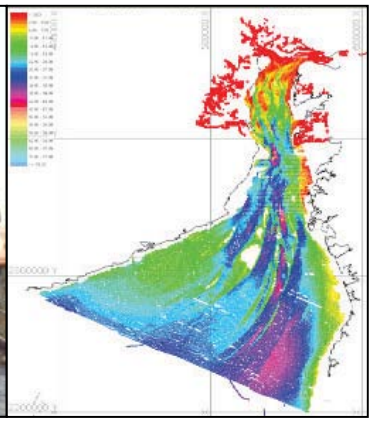
4 Numerical simulation studies for hydrodynamics and sedimentation pattern in the gulf with related field measurements.

Among the four components, the projects 1, 2, and 3 have commenced from October 2010 with field surveys and installations, which are nearing completion now. The data processing for 1 and 3 are in progress. The field observation scheme of 2nd (met-ocean observations) is scheduled for one year duration upto April 2013. The scope of work for 4th component was refined and the agreement signed on 28th May 2012 at Gandhinagar by NIOT and Kalpasar department.

The purpose of the study of the project is

a. To ascertain the physical setting of the project site

Pedestal and tower deployment



Measured Bathymetry at Gulf of Khambhat

in terms of bathymetry, geological and geophysical characteristics and enable selection of a suitable alignment for Kalpasar dam.

b. To obtain bathymetry and elevation data through various surveys and integrate them to produce a seamless digital terrain model covering the model domain as an input for setting up a numerical model for hydrodynamic and sedimentation studies.

c. To carry out numerical simulation study to characterize the hydrodynamic and sedimentation pattern in the gulf before and after installation of dam, produce engineering input to dam design and construction activities.

The following are the salient achievement of work:

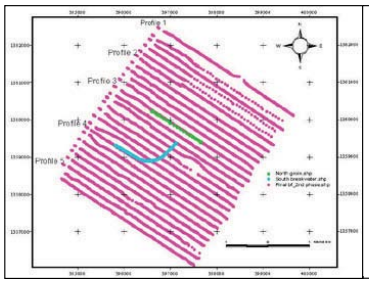
- Installed 19 met-ocean and tidal observatories along Gulf of Khambhat and established online data reception at NIOT.
- First phase of satellite imageries were processed with respect to tide to arrive DTM of intertidal region of Gulf of Khambhat.
- The topographic and bathymetric survey for dam corridor, Northern gulf and Southern gulf has been finished. Geotechnical investigations using Cone Penetration test and vibro corer in dam corridor (15 locations) and surface sampling (166 no.) has been finished successfully.
- The geophysical investigations included shallow seismic (750 km), side scan sonar (750 km), magnetic survey (300 km) has been completed.

Sustainable Shoreline Management (SSM)

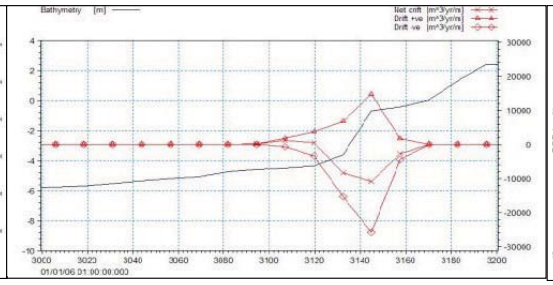
The objective of the project is to provide sustainable, environment-friendly solutions for stabilizing the shorelines undergoing erosion or accretion, as well as to provide solutions for improvement of the environmental quality.

Sediment Transport

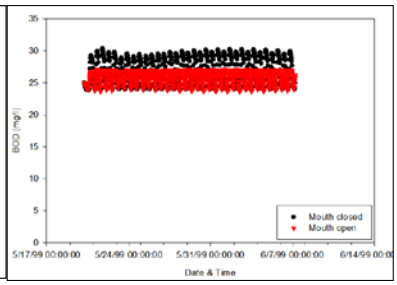
The sediment transport estimation and shoreline evolution was carried out along Panaiyur coast using the numerical model Mike21-HD and Mike21-LITPACK. The net annual sediment transport at all transects exhibited the dominance of northerly drift over southerly drift along the Panaiyur coast. It is also observed that the detached structures do not block the net long shore sediment transport and results only in minor shoreline changes.



Profile locations for sediment transport study



Contribution of northerly and southerly sediment drift and net annual transport



BOD variation at upstream end of Ennore Creek

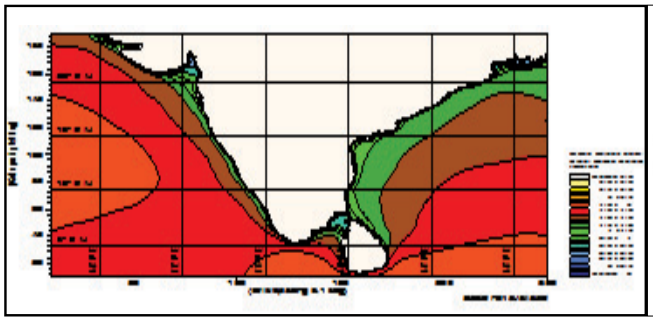
Creek and Estuarine Dynamics

Hydrodynamic model has been setup with the objective to assess the flushing of pollutants by sea water through opening of Ennore creek mouth or opening of Kosisthalayer connection to open sea situated along the northern arm of the Ennore creek. The effect of mouth opening on water quality in terms of pollutant load Biochemical Oxygen Demand (BOD) at three locations representing near to mouth, middle and upstream stretch of the creek were tested. Three scenarios viz., (i) widening the mouth by 120m from existing 30m, (ii) deepening of the mouth by 3 m from existing 1.0m and (iii) creating a trench with a width of 30m (3m depth) from mouth to middle of the creek were simulated.

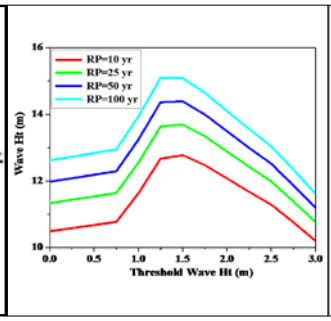
The output indicates flushing 50% of pollutant (BOD) from the middle and 1% at upstream end of the creek. No change in pollutant (BOD) concentration at mouth segment of the creek indicates that while in the process of flushing pollutant may not create any undue changes in water quality along the subsequent segments of the creek system. This scenario of mouth widening and providing trench at the middle of the creek envisage some encouragement towards flushing of pollutant load by incursion of sea water into the creek system.

Technical Criteria Atlas

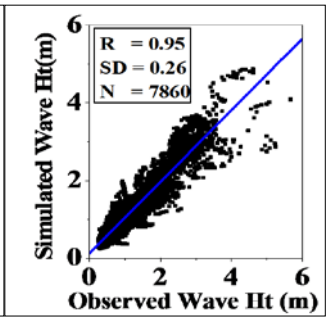
The objective of the plan project 'Technical criteria Atlas' is to provide ready reference for parameters like tide, wave and water level in terms of return period/ extreme values along the Indian coast. The plan project 'Technical Criteria Atlas' is envisaged under three components (Wave, Tide and Storm Surge), of which the Wave Atlas is nearing completion. The model setup is finalized after sensitivity analysis and preliminary validation. The various computations required to estimate the parameters in wave atlas are finalized and the corresponding coding is also carried out.



Significant Wave Height - Annual Average



Design Wave height Using Peak Over Threshold Method



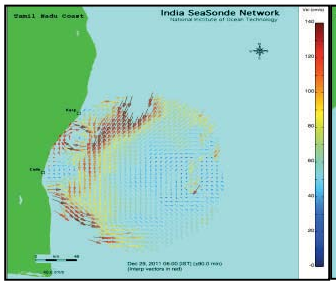
Correlation between simulated and observed Wave Height

- The secondary data sets for validating the wave model results are collected from various sources such as NIOT - Chennai, NIO - Goa and INCOIS - Hyderabad. The available spectral wave data is processed using wave steepness method for separating sea and swell components. The validation is carried out at various depths and for various parameters including sea and swell components.
- The weibull distribution found to be better for extreme wave analysis and is opted for preparing the wave Atlas. The extreme wave analysis is further refined with Peak Over Threshold (POT) method. The critical threshold value is estimated at average wave height.

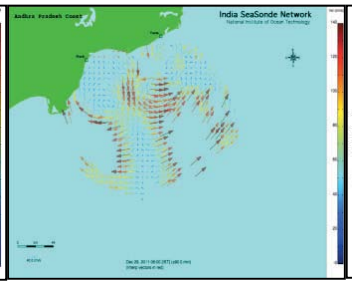
- The coding for wave data analysis to compute the single parameter distribution, joint occurrence tables, exceedance, return period, persistence etc. are carried out. Coding for computation of return periods using Peak Over Threshold (POT) method is also carried out.
- Completed the product run using NCEP/QSCAT blended winds for 9 years and the data base is prepared. The development of web application for wave atlas is in progress.

Establishment of Coastal HF Radar network under Tsunami Early Warning System (TEWS)

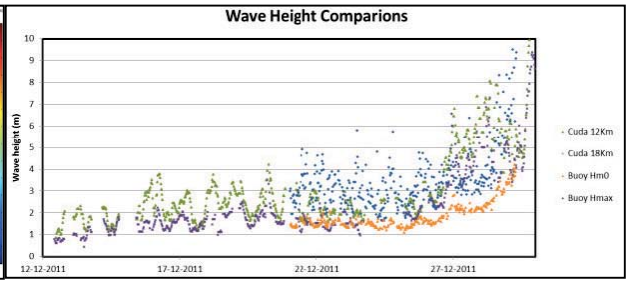
As part of the NIOT TEWS project, ten remote HF Radar sites and two central sites viz. in Chennai and Hyderabad are installed and are working continuously since 2010. Various incidents of cyclones, seasonal currents and high wave activity were captured by various radars and the detailed analysis is in progress. The surface current and wave signatures of cyclone Thane, which made its landfall near Cuddalore, was well captured by the two radars in the Tamil Nadu coast viz. Cuddalore and Kalpakkam.



Surface currents during the cyclone Thane off Tamil Nadu coast



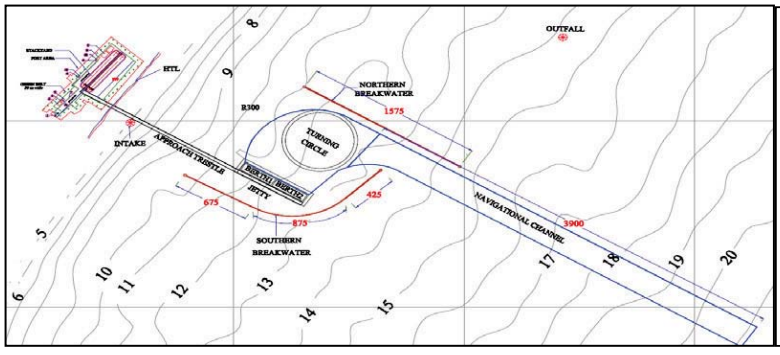
Surface currents during the cyclone Thane off Andhra coast.



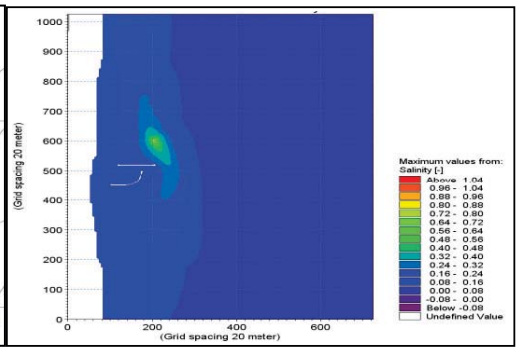
Comparison high wave activity measured by buoy and HF radar off Cuddalore

Industry Sponsored Project

Comprehensive Environmental Impact Assessment (CEIA) Studies were carried out for the development of marine coal handling facility by the Power Finance Corporation (PFC) off Cheyyur, Tamil Nadu. The detailed engineering feasibility study for the port location, harbour layout planning and costing was also carried out by NIOT. Based on NIOT's CEIA studies, the Tamil Nadu Coastal Zone Management Authority accorded 'No Objection' to the project. The CEIA studies included dredge dispersion, thermal dispersion and sediment transport modeling.

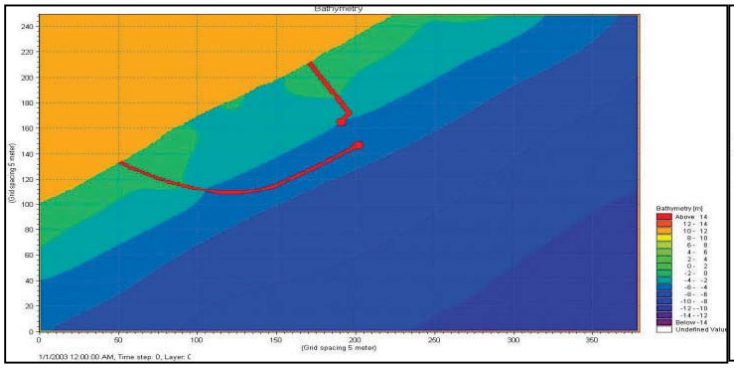


Proposed layout of Harbour

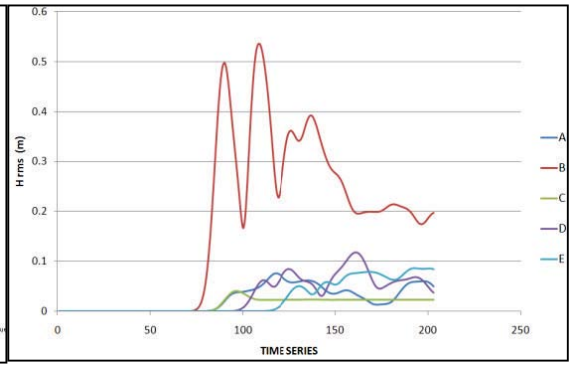


Thermal plume dispersion from cooling water discharge

Wave tranquility studies and breakwater cross section design was carried out for development of fishery harbour at Poompuhar along the Tamil Nadu coast for Tamil Nadu Fisheries Department. Based on NIOT design, physical model tests were carried out successfully on a typical breakwater cross section for the design wave height at the Institute of Hydraulics (IHH) Poondi.



Bathymetry along with proposed breakwater layout for Poompuhar fishery harbour



Significant wave height at chosen locations within the proposed harbour

VESSEL MANAGEMENT CELL

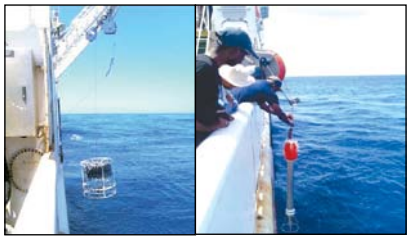
Technology Demonstration Vessel Sagar Nidhi

VESSEL MANAGEMENT CELL

The main function of Vessel Management Cell (VMC) is the Operation, Maintenance and Management of vessels such as Costal Research Vessels (CRV) Sagar Purvi and Sagar Paschimi, Buoy Tendering Vessel (BTV) Sagar Manjusha and Oceanographic Research Vessel (ORV) Sagar Nidhi. . Procurement of onboard equipments and spares, dry-dock and other ship repairs, preparation for all cruises including Southern Ocean Expedition and coordination with the team till end of cruise through offshore and onshore support for both scientific and ship team, are other major activities of VMC.

The Vessel Management Cell is providing research vessels to the user research institutes and organizations under MoES for the successful implementation of Ocean related programmes. The two coastal research vessels 'Sagar Purvi' and 'Paschimi' are used for the implementation of the Coastal Ocean Monitoring and Prediction System (COMAPS) and Integrated Coastal and Marine Area Management (ICMAM) programmes of the Ministry of Earth Sciences and to provide services to the other agencies like Universities and Research Institutes for surveys and data collection. The Buoy Tender Vessel 'Sagar Manjusha' is involved in the ocean observation programme and other projects of the NIOT and other institutes. The Technology Demonstration Vessel 'Sagar Nidhi' is catering to the ongoing and the new programmes of the MoES such as the Deep Sea Mining, Remotely Operable Vehicle, Autonomous Underwater Vehicle supporting the Underwater Observations Systems and Instruments, surveys to support the Technology Demonstration Programmes and to act as support platform for the various research activities planned by the Ministry.

Upgradation of deep sea winch on board Sagar Nidhi



Southern Ocean Expedition 2011-12

Cruise preparation for Southern Ocean Expedition has been a major activity and for the third time the Southern Ocean expedition was carried out by Sagar Nidhi successfully.

The performance of Sagar Nidhi's Dynamic Positioning (DP) system is done through reliability assessment and recommendation is given to improve DP system reliability.

Swathe Bathymetry Survey of the Exclusive Economic Zone of India (EEZ)

The objective is to prepare a comprehensive Bathymetric Map of Exclusive Economic Zone of India across the Eastern coast between 10m water depth and 500m water depth. The Bathymetry Map will serve as a base map for Oceanographic Researchers, communication purpose, defence, and Navigation Sectors etc.

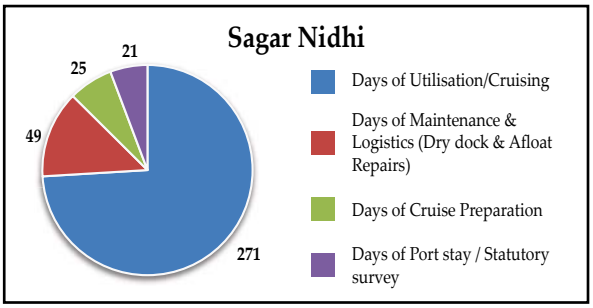
- Total Area of Survey conducted from April 2011 to March 2012 is 2187 sq.km.
- Total area surveyed till date is 13547.15 sq.km.

- Successfully installed, calibrated and tested-7101 Multibeam system in Sagar Purvi and 7111 Multibeam system in Sagar Manjusha.
- CTD database was prepared from 2002 to till date and will be handed over to INCOIS.

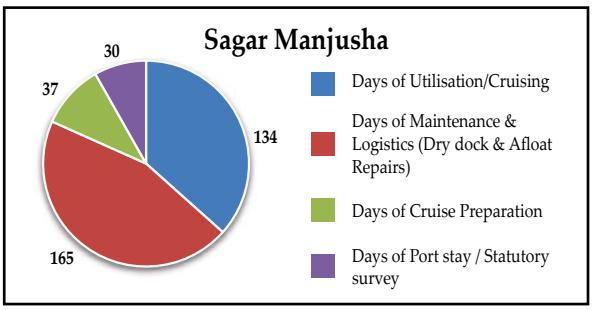
Vessel Utilisation Report

Utilization [April 2011 to March 2012 = 366 days]

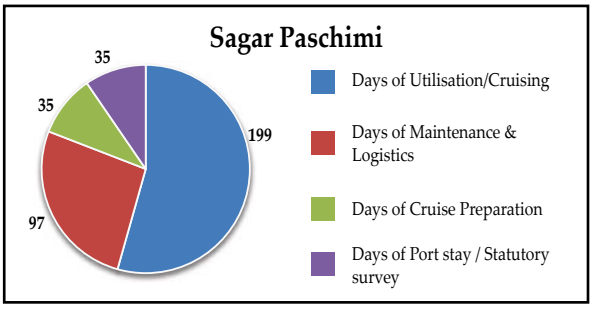
Sagar Nidhi	No. of Days
Utilisation/Cruising	271
Maintenance & Logistics (Dry dock & Afloat Repairs)	49
Cruise Preparation	25
Port stay / Statutory survey	21
Total days	**366**



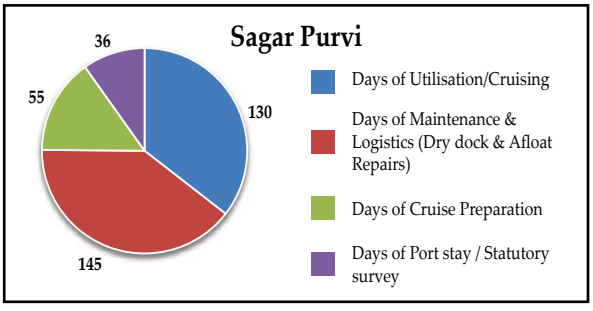
Sagar Manjusha	No. of Days
Utilisation/Cruising	134
Maintenance & Logistics (Dry dock & Afloat Repairs)	165
Cruise Preparation	37
Port stay / Statutory survey	30
Total days	**366**



Sagar Paschimi	No. of Days
Utilisation/Cruising	199
Maintenance & Logistics	97
Cruise Preparation	35
Port stay / Statutory survey	35
Total days	**366**



Sagar Purvi	No. of Days
Utilisation/Cruising	130
Maintenance & Logistics (Dry dock & Afloat Repairs)	145
Cruise Preparation	55
Port stay / Statutory survey	36
Total days	**366**



COMPUTER MAINTENANCE CELL

Computer Maintenance Cell (CMC) of the National Institute of Ocean Technology, Chennai was established in the year 1997, with the objective of providing computational infrastructure facilities for the research community of the Institute. CMC administers, manages and supports the needs of different projects/ departments within the institute, apart from in-house software development and maintenance.

Common resources at CMC

CMC serves the campus-wide single mode Optical Fiber Cable Local Area Network catering to about 350 users across the campus with an aggregate bandwidth of 1 Gbps between different Switches. Three leased lines of 4 Mbps, 15 Mbps and 1 Gbps capacity from different Internet Service Providers ensure uninterrupted service to the user community. National Knowledge Network is also established through National Informatics Center.

The CMC core infrastructure facilities include an 80 core SGI Altix, 4700 HPC and several high end servers with wide variety of operating systems like Windows, Unix, Linux, Centralized OS for intranet portal, web and mail services, FTP Storage and Application servers running key applications on 24 x 7 basis. Storage facilities include EMC 20 TB and HP 4 TB to support large volume of data.

EMC Storage Facility

CMC maintains the in-house built, online software applications for Stores & Purchase and Finance & Accounts with which indenting, approvals, payroll and accounting applications are performed online.

Change over from legacy mailing system (Rain Mail) to a state of art Lotus Notes mailing system with additional programmability and functionality enhances the available infrastructure in this area providing tools to manage the ever-growing inboxes effectively, with the options for full-text search, mail filtering and sorting, conversation views and flags.

CMC also maintains the video conference and tele-presence facilities of the campus, provides support for computational, presentation and Wi-Fi needs for seminars, conferences and workshops.

Major Accomplishments during the year

- Revamped S&P and F&A application with new and improved functionalities.
- Implementation of improved online recruitment process for receipt and screening of applications.
- Internet leased line was upgraded from 4 Mbps to 15 Mbps.
- Improvisation of antivirus software

Tele-presence facility for Meetings

- Introduced Blade servers, compact versions of traditional rack mounted servers with a modular design.

Following are some of the major softwares that are used by various departments and supported by CMC

Drafting and Modelling	Analysis	General Purpose Software's	Project Monitoring / Administrative
AutoCAD Surfer	Ansys	MathCAD	Primavera
Solid Works Grapher	Orcaflex	Lab View	Micro Soft Project
Pro-E	CFD-Fluent	Matlab	Oracle
Mike C Map	Surface Modelling Simulation X	Code Vision	SAP-2000
AEGIS	Mike 21	Conrad	
ITI Simulation	Plaxis		
	STAAD Pro		
	Arc-GIS		
	HTRI		
	LMS Sysnoise		

CAMPUS DEVELOPMENT

Common facilities

A two wheeler parking shed has been constructed adjacent to the main gate with a total parking area of 300 sq.m, with a capacity of accommodating 150 vehicles. The existing canteen area has been extended by 56 sq.m to provide larger work space for the kitchen. As an additional measure of protecting environment, a herbal garden with variety of herbal plants (40 varieties) has been established and 400 trees were planted in the different places at NIOT. Tree plantation activity has also been the regular practice of NIOT to preserve nature in addition to honoring VIPs during their visits.

Two wheeler Parking Facility

Extension of Canteen

Herbal Garden

Tree plantation

Activities for the group

Passenger lift (with a capacity of 5 persons) has been erected at NDBP building. The DSM electronics lab area of 46 sq.m has been modified to cater to the needs of the group. CCTV cameras have been installed at vantage points in the campus for enhancing security measures. Two fuel consumption monitors have been installed in the utility building – I and II for the diesel generators.

Renovated DSM Electronics Lab

Newly Installed CCTV Camera

Renewable/Eco Friendly Energy Projects

Solar street lights of 20 numbers have been installed around the compound wall for security measures. Solar water heater has been installed in the Guest House, which provides hot water to all the rooms. LED lights have been installed in the campus at different places (integrated bay area, NDBP rear side and two wheeler parking shed) replacing

Newly installed solar lights near the compound wall

View of Solar Water Heater Installation in rooftop of guest house

the conventional electrical lights. The above mentioned renewable energy measures have resulted in conservation of electricity, thus saving substantial amount which leads to the savings of about Rs. 2 Lakhs of Electricity charges per year after 3 to 4 years of installation.

Gymnasium

An indoor gymnasium has been maintained with professional coach to promote and nurture health & fitness of the staff members. As a first step towards green energy promotion, fitness cycle has been modified as fitness cum energy generating cycle, accommodating new electronic circuit to charge the batteries to power tiny electronic gadgets such as mobile charger, music player and tiny LED lights.

Library

NIOT Scientific Information Center plays a vital role in acquisition, organization, and dissemination of knowledge in frontier areas of Ocean Engineering and Sciences. It has an impressive collection of both print and electronic resources including books, journals, technical reports, standards publications and other material. Knowledge-based services such as Reference, Bibliography, Document Delivery Service, Reprography, CD-ROM Databases, Internet browsing and e-services are provided by the library for its users. The Online Public Access Catalogue (OPAC) is being used to help users in utilizing the resources efficiently. All the library functions are well automated. The Library is a part of consortium agreement for e-journal access for Ministry of Earth Sciences.

Book Stacks

The library is housing a collection of 4,800 volumes of reading material in various branches of Science and Technology. The annual subscription for 20 printed Indian and international journals and 117 online Journals also augment the strength of document collection. NIOT Library participated in the ISO 9001-2008 certification process along with other units of the Institute. TÜV SÜD South Asia Pvt. Ltd., awarded the certificate for maintaining quality systems and procedures. Library is actively serving the Scientists and technical staff members, who have been working in cutting edge technology development and periodically participating and presenting technical research papers in several National and International Conferences, Seminars and workshops.

These research papers are available in NIOT Intranet (Samudra) and NIOT website. Totally 186 research papers are preserved and disseminated in digital format under the Ministry Open Access Digital Repository Service. Users from NIOT can also access other libraries such as British Council, IIT Chennai, and Anna University libraries for their reference. In additional to all general services, the Library provides various value added services including GFR, Accounts reference books, Management books, Self development books, Dictionaries, News papers and Magazines in English, Hindi and Tamil.

OTHER ACTIVITIES

Implementation of Official Language at NIOT

As per the provisions of the Official Language Act 1963, every effort has been made to fulfill the provisions of the Official Language Act for use of Hindi in day office work at NIOT. During the year 2011-12, four meetings of the Hindi Implementation Committee were held under the Chairmanship of Director of the Institute.

Training in Hindi

In accordance with the directions of the Government of India, Hindi classes were organized and conducted regularly to both technical and administrative staff members in Hindi. In 2011-12, the following 34 staff members have qualified in Hindi courses as indicated against their names during the period under report.

SL. NO.	NAME	DESIGNATION	COURSE
1	M.Sankar	Scientist-D	PRABODH
2	G. Venkatesan	Scientist-D	PRAVEEN
3	J. Rajkumar	Scientist-C	PRABODH
4	Arul Muthiah	Scientist-C	PRAVEEN
5	S.B. Pranesh	Scientist-B	PRABODH
6	K. Mullaivendan	Scientist-B	PRABODH
7	S. SundarJesuraj	Scientific Assistant-Gr. B	PRABODH
8	C. Muthukumar	Scientific Assistant-Gr. B	PRABODH
9	R. Suresh	Scientific Assistant-Gr. B	PRABODH
10	A. MeenatchiSundaram	Scientific Assistant-Gr. B	PRABODH
11	ShijoZacharia	Scientific Assistant-Gr. B	PRABODH
12	A. Karthikeyan	Scientific Assistant-Gr. B	PRAVEEN
13	J. Santhana Kumar	Scientific Assistant-Gr. A	PRABODH
14	K. Venkatesan	Scientific Assistant-Gr. A	PRABODH
15	R. Sridharan	Scientific Assistant-Gr. A	PRAVEEN
16	P.M. Rajeswari	Scientific Assistant-Gr. A	PRAVEEN
17	M. Saravanan	Scientific Assistant-Gr. A	PRAVEEN
18	A. Thirunavukkarasu	Scientific Assistant-Gr. A	PRAVEEN
19	T. Thamarai	Scientific Assistant-Gr. A	PRAVEEN
20	G. Raguraman	Scientific Assistant-Gr. A	PRAVEEN
21	V. Chandran	Scientific Assistant-Gr. A	PRAVEEN
22	E. Chandrasekaran	Scientific Assistant-Gr. A	PRAVEEN
23	S. Elangovan	Scientific Assistant-Gr. A	PRAVEEN
24	K. Jayanthi	Scientific Assistant-Gr. A	PRAVEEN
25	V. Pandurangan	Scientific Assistant-Gr. A	PRAVEEN
26	V. Sundaramoorthi	Scientific Assistant-Gr. A	PRAVEEN
27	R. Sundar	Scientific Assistant-Gr. A	PRAVEEN
28	S. Charles Sathish Kumar	Technician-Gr. B	PRAVEEN
29	C. Jothi	Technician-Gr. A	PRAVEEN

30	V.S. Suresh	Technician-Gr. A	PRAVEEN
31	Ashok Kumar K	Technician-Gr. A	PRAVEEN
32	VatchalaKupparaman	Executive	PRAVEEN
33	P. SalomanRaj	Multitasking Staff	PRABODH
34	L. ArokiaPrabhu	Multitasking Staff	PRAVEEN

Hindi Fortnight Celebration

Every year, the Institute celebrates Hindi Fortnight celebration. During the year 2011-2012 Hindi Fortnight Celebration were organized at NIOT from 01.09.2011 to 14.09.2011 and also published an article about NIOT in the Daily Milab towards Hindi Day Celebration. Various competitions were organized in Hindi for the staff members of NIOT and prizes and Cash Awards were distributed to the winners of the programs.

The following NIOT staff were awarded prizes for paper presentation in Hindi in the National Scientific Hindi Seminar conducted by MoES, New Delhi on 21st December 2011.

Sl. No.	Name	Title of the paper	Prize awarded
1	VijayaRavichandran, Jena B.K.	Assessment of ocean properties for engineering feasibility and EIA studies for a proposed marine facility off Cheyyur	First Prize
2	NidhiVarshney	Deep sea Mining of Polymetallic Nodules-Status of Technology development	Third prize

NIOT scientists Mrs. VijayaRavichandran and Mrs. Nidhi Varshney receiving prize from Secretary, MoES for presenting technical abstracts in Hindi

Conferences / Workshops organized

NOAA NDBC-Capacity Building on **"Moored Buoy Data Management and Quality Control"** offered by two experts Mr. Walter Henry McCall and Mr. Micheal Nolan Huguet from National Data Buoy Centre (NDBC) – NOAA, USA was successfully completed during 18th to 29th April 2011. Participants from NIOT, INCOIS & IITM interacted with the experts and gained more insight on data management.

Regional Workshop on **"Establishing a Cooperative Mechanism for Protection of Met-ocean Data and Tsunami Buoys in the Northern Indian Ocean Region"** organized by the National Institute of Ocean Technology (NIOT) and the Bay of Bengal Programme – Inter Governmental Organization (BOBP-IGO) at NIOT Campus, Chennai from 6th & 7th May 2011. A total of 84 delegates representing 53 Organization participated in the Regional Workshop. Strategies were discussed and arrived at for protection of buoys from vandalism.

One day Workshop on **"Recent Advances in Proteomics"** was held on 21st December, 2011 at NIOT Chennai. One hundred and forty one students from various colleges and research institutions participated in the workshop and had an opportunity to know the recent advances and meet the experts. The Best Poster Awards were presented to the winners who participated in the workshop.

Workshop on **Multi-Objective Ocean Thermal Energy Conversion (MOOTEC)** was conducted with M/s Lockheed Martin, USA to discuss about various spin-offs from OTEC cycle such as aquaculture, agriculture, air-conditioning and uranium or lithium extraction including desalination on 11th & 12th January 2012 at NIOT Campus. The workshop also paved the way towards possible future cooperation between NIOT and M/s Lockheed Martin, USA.

Trainings / Meetings Organized

NIOT obtained ISO 9001:2008 certification for administrative functionalities. A training on"Internal Auditing for Quality Management System Based on ISO 9001:2008" was organized by NIOT and conducted by TÜV SÜD South Asia Pvt. Ltd., 16-17, February 2012. 13 NIOT staff successfully completed the training and qualified as the Internal Auditors for ISO.

A joint meeting with Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Japan for mutual collaboration opportunities was held on 27th January 2012 at NIOT.

Conducted training programme on "Capacity building programme on Coral Reef and Sea Grass Monitoring Techniques through SCUBA Diving" from 18th to 24th January 2012 for the Department of Forest, Andaman and Nicobar Island. Twelve members of forest department staff and 5 members of Central Agriculture Research Institute were trained for open water diver level certification.

Confined Water Classes

Coral Reef Monitoring Classes

A training on "Time Management" was organized by NIOT and conducted by British Council on 28th June 2011.

Training was imparted to students from Goa University, NIO Goa, ICMR, Jaipur and NCAOR staff on Arctic mooring to collect environmental and meteorological data by cruise on-board Sagar Kanya during May 2011.

Staff Recreation Club

The NIOT staff recreation club was formed under the chairmanship of Director and the office bearers were elected. To promote harmonious relations amongst NIOT employees and to coordinate the various activities such as Cultural, Literature, Sports etc. representatives are selected apart from group of executive committee members to deal with the overall activities. The office bearers of NIOT staff recreation club are listed below:

President	:	**Dr. M.A.Atmanand, Director**	**Executive Committee Members**
Vice President	:	Dr. B.K.Jena	Mr. C.R.Deepak
General Secretary	:	Mr. S.Krishnamohan	Mr. D.Sathyanarayanan
Joint Secretaries	:	Dr. G.Latha (Cultural)	Mr. S.M.Gopalakrishnan
		Mr.K.Murthi (Picnic)	Mrs. K.R.Anuradha
		Dr. K.Jossia Joseph (Literary)	Mr. G.Dandis Ananda Kumar
		Mr. S.Sasikumar (Sports)	Mr. L.Arokia Prabhu
Auditors	:	Mr. T.P.Rangamaran	Treasurer : Mrs. R.Rathi Kumari
		Mr. Guruprasad Rao	

The activities of Staff Recreation Club commenced with the friendly cricket match between NIOT and Cognizant team. The NIOT team won the match held in June 2011. The club also organized musical programmes and games during independence day and republic day celebrations.

Independence Day Celebration

The Independence day was celebrated on 15th August 2011. NIOT staff participated in sports events such as cricket, throw ball and weightlifting and children participated in competitions like drawing, painting and short run . Prizes were distributed to the winners.

Republic Day Celebration

The Republic day was celebrated on 26th January 2012. The staff of NIOT and their families were invited and children participated in the games and won the prizes.

NIOT Foundation Day

Dr.R.Chidambaram, Principal Scientific Adviser to the Govt. of India & Chairman, Scientific Advisory Committee to the Cabinet was invited as the chief guest for the celebration of 18th Foundation Day of NIOT on 4th November 2011. Open day was declared for school children and many students visited the laboratory and facilities at NIOT to know and understand the various programmes being carried out by NIOT.

Women's Day Celebration

Women's day was celebrated on 8th March 2012 to rejuvenate the other interests and skills of women at NIOT. The events like cooking, collage, music and quiz contests were conducted and many staff of NIOT participated. Prizes were distributed to the winners.

Student Autonomous Underwater Vehicle (SAVe)

National Institute of Technology (NIOT), under Ministry of Earth Sciences, announced a competition for students pursuing engineering degree to visualize and design an autonomous underwater vehicle. The conceptual basis for Student Autonomous underwater Vehicle (SAVe), is a highly mobile autonomous underwater vehicle (AUV) to be built based on engineering principles. The main focus of this competition is to involve students on the new frontier areas of ocean technology and kindle their innovative thinking in this unexplored ea of ocean environment and observation. Overwhelming response was shown by the students on this initiative and last year Indian Institute of Technology Kharagpur, West Bengal team won the competition and participated in the International AUV competition on 17th July 2011 at San Diego, USA.

Students of IIT Kharapur in the International AUV Competion at USA

In the next competition, 57 registrations were made and 17 teams had submitted their Preliminary Design Reports (PDR). The scrutinizing committee verified the PDR documents received based on the concept, Literature Review, Design Method, Simulation, Theory Design, Block Diagram, Project Document, Theory Modeling, Method of Operation and other requirements. The detailed Conceptual Design Report and oral presentation by the selected 17 teams was held at NIOT on 30th January 2012.

Visit of Distinguished Scientists

Technology Day Celebration

National Technology Day was celebrated at NIOT on 11th May 2011. Dr. Mylswamy Annadurai, Program Director-IRS, ISRO honored the occasion as the chief guest and delivered a lecture. Various technical competitions were arranged for NIOT scientists.

Visit of Dr. Mylswamy Annadurai , Program Director - IRS, ISRO during Technology Day Celebration

Visit of Dr. J. Narayanadas, Chief Controller R&D (CCR&D) Naval Systems & Material (NS&M)

Dr. J. Narayanadas, (CCR&D) (NS&M) visited NIOT and interacted with the scientists. He visited the labs and facilities and discussed about the possible further collaborative work.

Patents Filed

Author Name	Title		
Tata Sudhakar, Shijo Zacharia, T.Thamarai, V.Gowthaman, M.A.Atmanand	Automated Tsunami Test Rig	2805/ CHE/2011	17.8.2011
Tata Sudhakar, Shijo Zacharia, T.Thamarai, V.Gowthaman, G.A.Ramadass, M.A.Atmanand	Tsunami Detection System "TSUNAREC"	2806/ CHE/2011	17.8.2011
R.Venkatesan, M.A.Atmanand, G.Vengatesan, S.Sundar Jesuraj, M.Arul Muthiah	An Apparatus and the Functioning of Integrated Marine Surveillance System	873/ CHE/2012	8.3.2012

Awards Won

Best exhibitor award being received by NIOT

- Best exhibitor award to NIOT at the 26th Indian Engineering congress held at Bangalore in December 2011.
- The following Scientists from NIOT have been honoured with the prestigious **National Geoscience Award** of Ministry of Mines for the year 2010 under 'Oil and Natural Gas ' and 'Disaster Management Categories'. The award was conferred by the Hon'ble Speaker of Lok Sabha **Smt.Meira Kumar** in the presence of Hon'ble **Mr. Dinsha J Patel,** Union Minister of State (independent charge) for Mines, at Vigyan Bhavan, New Delhi on 16th February 2012.

NIOT Scientists being awarded the National Geoscience Award from Smt Meira Kumar, Hon'ble Speaker of Lok Sabha

Sl. No.	Name	Field
1.	Dr. M. A. Atmanand	Oil & Natural Gas Exploration
2.	Dr. G.A. Ramadass	Oil & Natural Gas Exploration
3.	Dr. S. Ramesh	Oil & Natural Gas Exploration
4.	Mr. A.N. Subramanian	Oil & Natural Gas Exploration
5.	Dr. D. Sathianarayanan	Oil & Natural Gas Exploration
6.	Mr. R. Ramesh	Oil & Natural Gas Exploration
7.	Mr. G. Harikrishnan	Oil & Natural Gas Exploration
8.	Dr. M. V. Ramanamurthy	Disaster Management
9.	Mr. Tata Sudhakar	Disaster Management

- The paper by Swaminathan Palanisami, Magesh Peter D, Dhinesh Kumar D, Mary Leema Thilagam J, Dharani G, R. Kirubagaran, on "Microalgal isozyme as a biomarker for Rare Earth Element detection", has received the **Best Student Paper award** in the 2nd International Conference on challenges in Biotechnology and Food Technology (ICBF-2012), January 9-10, 2012.

- The paper by Ashokan M, Muthuraman S, Edwards Durai P, Nithyanandam K, on "Application of Wavelets for analysing ship noise from shallow water ambient noise measurements", has received the **Best Student Paper award** in the conference OSICON'11 conducted at NIOT during 13-15, July 2011.
- The paper by D.Rajasekhar, N.Ravi, Anantha Krishna Rao, D.Narendra Kumar, titled "An analysis of reliability-Dynamic Positioning System" has been awarded the **Annual Maritime Award** for 2011.

MoES Award

The following staff of NIOT have received the MoES awards during MoES Foundation Day, held on July 27, 2011 at New Delhi.

- Mr. R.Saravanan, Scientist – D, Young Scientist Award in the field of Ocean Science and Technology for his performance in the Island Desalination project.
- The Best Employee Award for the staff given below:
  - ✦ Mr. T.P.Rangamaran, Assistant Manager
  - ✦ Mr. S.M.Gopalakrishnaa, Co-ordinator Grade III
  - ✦ Mr. S.Charles Satish Kumar, Technician-Grade 'B'
  - ✦ Mr. P.Saloman Raj, Multitasking staff

Publications in Journals

International Journals

- Lakshmi K, Muthukumar T, Doble M, Vedaprakash L, Kruparathnam, Dineshram R, Jayaraj K, Venkatesan R, *"Influence of surface characteristics on biofouling formed on polymers exposed to coastal sea waters of India"* **Colloids Surf B Biointerface**, Vol.1;91:205-11. Epub, November 7, 2011.
- D.Rajasekhar, N.Ravi, Anantha Krishna Rao, D.Narendrakumar, *"A Finite Element Approach to Renew underwater shell plate of a dumb barge sans dry docking: an innovative and cost effective model"*, **Journal of Ships & Offshore Structure-Taylor and Francis Group**, Vol. 7, No. 2, 215-222, June 2011.
- Pradipta Muduli R, Vinithkumar N.V, Mehmuna Begum, Robin R.S, Vishnu Vardhan K, Venkatesan R and R. Kirubagaran, *"Spatial Variation of Hydrochemical Characteristics in and Around Port Blair Bay Andaman and Nicobar Islands, India"*, **World Appl. Sci.** J. 13; 564-571, 2011.

National Journals

- Marimuthu N, Dharani G, Vinithkumar N.V, Vijayakumaran M and R. Kirubagaran, *"Recovery status of sea-anemones from bleaching event of 2010 in the Andaman waters"*, **Current Science**, 101(6): 734-736, 2011.
- Abdul Nazar A. K, Dharani G, Rao D.V, Santhanakumar J and N. Saravanane, *"A new record of pearl fish Onuxodonmargaritiferae (Rendahl, 1921) from Andaman Islands"*. **Indian J. Fish**, 58(2): 141-143, 2011.

Papers Presented in Conferences

International Conferences

- Swaminathan Palanisami, Magesh Peter D, Dhinesh Kumar D, Mary LeemaThilagam J, Dharani G and R. Kirubagaran, *"Microalgalisozyme as a biomarker for Rare Earth Element detection"*, presented in **2nd International Conference on challenges in Biotechnology and Food Technology** – ICBF, 2012.
- Sanjana M C, Latha G, Gopu R Potty, *"Vertical coherence of ambient noise in shallow waters"*, presented at the **International Symposium on Ocean Electronics 'SYMPOL-2011'** Kochi, November 19-21, 2011.
- P.M.Rajeshwari, C.Kannan, R.Dhilsha, M.A.Atmanand, *"Development of Hydrophone for Passive Sonar Applications"*, **Proc. of International Symposium on Ocean Electronics**, CUSAT, Kochi, SYMPOL-2011, November 16-18, 2011.
- C. Kannan, PM Rajeshwari, Shibu Jacob, A. Malarkodi, R. Dhilsha, M.A. Atmanand, *"Effect of manufacturing procedure on the miniaturized Flextensional Transducers (Cymbals) and Hydrophone array performance"*, **OCEANS'11, Santander,** Spain, June 6-9, 2011.
- R.Srinivasan, Shijo Zacharia, T.Thamarai, Tata Sudhakar, M.A.Atmanand *"Design and Performance of Low Power Moored Data Buoy Systems"*, **OCEANS'11, Santander,** Spain INSPEC Accession Number: 12207350 (Page No.1-6) June 6-9, 2011.

- Shijo Zacharia, R.Srinivasan, T.Thamarai, G.A.Ramadass, M.A.Atmanand *"Design of an Advanced Acoustic Tide Gauge for Tsunami Monitoring"*, **OCEANS'11, Santander,** Spain INSPEC Accession Number: 12207353 (Page No.1-5) June 6-9, 2011.
- S. Rajesh, A.A. Gnanaraj, A. Velmurugan, R. Ramesh, P. Muthuvel, M.K. Babu, N.R. Ramesh, C.R. Deepak, M.A. Atmanand, *"Qualification tests on Underwater Mining System with Manganese Nodule Collection and Crushing Systems"*, accepted for publication in the **Ninth ISOPE Ocean Mining Symposium**, Hawai, June 2011.
- Prasad Dudhgaonkar, Kedarnath S, BirenPattanaik, PurnimaJalihal, Jayashankar, *"Performance analysis of a floating power plant with a unidirectional turbine based power module"*, **World Renewable Energy Congress**, Sweeden, 2011.

National Conferences

- Raju Abraham, A. Mani, L.S.S Prakash Kumar, *"CFD studies on falling film modes in tube bundles in multi-effect distillation (MED) System"*, **National Conference on Water Purification Technologies and Management**, Indian Desalination Association, Mumbai, February 8-9, 2012.
- Shinu M Varghese, Raju Abraham, Hariprasad E P, Sureshkumar C, *"Design and performance analysis of solar assisted multi effect desalination system for coastal regions"*, **National Conference on Water Purification Technologies and Management**, Indian Desalination Association, Mumbai, February 8-9, 2012.
- G.Venkatesan and PurnimaJalihal, *"Experiences in demonstration of 1000 m^3 / day capacity offshore thermo cline driven desalination plant"*, **National Conference on Water Purification Technologies and Management**, Indian Desalination Association, Mumbai, February 8-9, 2012.
- G.Venkatesan, S.Iniyan and RancoGoic, *"A new desalination system from condenser reject heat to enhance sustainability and reduce environmental pollution"*, **National Conference on Water Purification Technologies and Management,** Indian Desalination Association, Mumbai, February 8-9, 2012.
- Rasheeda M.K, Sendhil Kumar R, Thirunavukkarasu A.R, Santhanakumar J, Saravanan N, Rajaprabhu G, Dharani G and R. Kirubagaran, *"Myostatin mRNA expression during larval growth in Asian SeabassLatescalcarifer"*, **Presented in the National Conference on New Vistas in Indian Aquaculture** in commemoration of Silver Jubilee celebrations of CIBA, 2012.
- K. Jossia Joseph, K. M. Sivakholundu, B. K. Jena, *"Intra-annual variability of wave spectral characteristics at a near shore location in west coast of India"*, **National Conference of Ocean Society of India**, OSICON, NIOT, Chennai, July 13-15, 2011.
- Manu P. John, RajnishAntala, Sisir K. Patra, B. K. Jena, *"Coastal wave measurement using HF Radar"*, **National Conference of Ocean Society of India**, OSICON'11, NIOT, Chennai, July13-15, 2011.
- RajnishAntala, Manu P John, B. K. Jena, *"Effects of Atmospheric Interferences on Coastal HF Radar Measurements"*, **National Conference of Ocean Society of India**, OSICON'11, NIOT, Chennai, July 13-15, 2011.
- Simi Mathew, G.Latha, R. Venkatesan, *"Barrier layer formation in the Bay of Bengal as observed by OMNI buoys during northeast monsoon"*, **National Conference of Ocean Society of India**, OSICON'11, NIOT, Chennai, July 13-15, 2011.

- Vimala J, G. Latha, *"Wave Hindcasting using Artificial Neural Network with varying input Parameter"*, **National Conference of Ocean Society of India,** OSICON'11, NIOT, Chennai, July 13-15, 2011.
- Ramesh, K, Arulmuthiah M, P. Murugesh, *"Analysis of Antenna placement on Data Buoy Systems for INMARSAT Satellite Communication"*, **National Conference of Ocean Society of India**, OSICON'11, NIOT, Chennai, July13-15, 2011.
- Arulmuthiah M, R. Sundar, A. Tamil Mugilan, R. Venketesan, *"Analysis on Under Water Seismic Event"*, on June 12, 2010 recorded by **Indigenous Tsunami Early Warning Buoy Data Processing System**, National Conference of Ocean Society of India, OSICON'11, NIOT, Chennai, July 13-15, 2011.
- Sanjana M C, Latha G, Thirunavukkarasu A, Raguraman G, *"Acoustic propagation induced by environmental parameters in coastal waters"*, **National Conference of Ocean Society of India,** OSICON'11, July 13-15, 2011.
- Malarkodi A, Dhanalakshmi M, Satheesh S, *"Reverberation measurements of Acoustic Tank"*, *National Conference of Ocean Society of India, National Conference of Ocean Society of India*, OSICON'11, July 13-15, 2011.
- Ashokan M, Muthuraman S, Edwards Durai P, Nithyanandam K, *"Application of wavelets for analysing ship noise from shallow water ambient noise measurements"*, **National Conference of Ocean Society of India**, OSICON'11, July 13-15, 2011.
- Vijaya Ravichandran, R.Ramesh, J.Manecius Selvakumar, Muthukrishna Babu, G.A.Ramadass, M.V. Ramanamoorthy, *"Development and testing of model suction piles in the NIOT test pond"*, **National Conference of Ocean Society of India** (OSICON-11), NIOT, Chennai, June 22-24, 2011.
- Apurba Kumar Das, Vinithkumar N.V, Dilip Kumar Jha, Biraja Kumar Sahu and R. Kirubagaran, *"Distribution of mangrove in relation to water quality parameters of Minnie bay, Lalaji bay and Aerial bay of Andaman Islands"*, Presented in a workshop on **Mangroves: An Integral Component of Coastal Ecosystem - Conservation Strategies and Management Practices**, 2011.
- Santhanakumar J, Sendhil Kumar R, Dharani G, Vijayakumaran M and R. Kirubagaran, *"Blue Barred Parrot fish (ScarusghobbanForsskal, 1775) Culture in sea cages at Olaikuda, Southeast coast of India"*, Presented in **9th Indian Fisheries Forum**, 2011.
- Sendhil Kumar R, Santhanakumar J, Anand C, Saravanan N, Rajaprabu G, Dharani G, Vijayakumaran M, R. Kirubagaran, *"Development of Sea cage systems for finfish farming activities in Indian Seas"*, Presented in **9th Indian Fisheries Forum**, 2011.

Articles published in Book

- Dharani G, Abdul Nazar A.K, Saravanane N, Vinithkumar N.V, Santhanakumar J, Krupa Ratnam, Dilip Kumar Jha, Magesh Peter D, Venkateshwaran P, Kumar T.S, R. Kirubagaran, *"On the recurrence of coral bleaching and recovery in North Bay, Port Blair"*, In K. Venkataraman et al. (eds.), **Ecology of Faunal Communities on the Andaman and Nicobar Islands,** DOI 10.1007/978-3-642-28335-2_5, Springer-Verlag Berlin Heidelberg 2012.
- Mehmuna Begum, Vinithkumar N.V, Mohan, P.M, Dhivya P, R. Kirubagaran, *"Spatial distribution pattern of Phytoplankton in relation to nutrients availability in the offshore waters of Andaman Sea, India"*. In **Recent Advances in Biodiversity of Indian subcontinent**. Zoological Survey of India Publication, 2012.

- Vinithkumar N.V, Mehmuna Begum, Dharani G, Anushrita Biswas, Abdul Nazar A.K, Venkatesan R, Kirubagaran R and S. Kathiroli, *"Distribution and Biodiversity of Phytoplankton in the Coastal Seawaters of Andaman and Nicobar Islands, India"*, **National Symposium on Recent Advances in Biodiversity of Indian subcontinent,** Zoological Survey of India Publication, 2012.
- Mary Leema J.T, Vinithkumar N.V, Magesh Peter D, Abdul Nazar A.K, R, Krubagaran and S. Kathiroli, *"Seasonal variation in diversity, spatial distribution and species scuccession of phytoplankton in Port Blair, India"*, In **Recent Advances in Biodiversity of Indian subcontinent**, Zoological Survey of India Publication, 2012.

Gene sequences received accession number and published in National Centre for Biotechnology Information GenBank, USA

Sl. No.	Author	No. of gene sequences
1	Ganesh Kumar A, Senthil Kumar S, Kirubagaran R	15
2	Anburajan L, Vinithkumar N.V, Dharani G, Kirubagaran R	11
3	Magesh Peter D, Dharani G, Kirubagaran R, Mary Leema Thilakam J	1

Protein sequence received accession number and published in National Centre for Biotechnology Information GenBank, USA

Sl. No.	Author	No. of protein sequence
1	Rasheeda M.K, Kagawa H, Kirubagaran R, Dutta-Gupta A, Senthil kumaran B	1

Deputation Abroad

S. No	Name	Designation	Purpose and Place of visit	Period
1.	Dr. M.A.Atmanand	Director	To attend the Meeting of India-Russia Working Group on S & T at Moscow	16th – 24th November 2011
2.	Dr R Venkatesan	Scientist – G	To attend the 27th session of the joint WMO-IOC Data Buoy Cooperation Panel (UK) in Geneva, Switzerland.	26th September – 5th October 2011
3.	Dr R Venkatesan	Scientist – G	To attend the meeting on Role of the Bay of Bengal in the Prediction of the Indian Monsoon held at the Woods Hole Oceaznographic Institution, USA	16th – 18th November 2011
4.	Dr. M.V. Ramanamurthy	Scientist – F	To participate in the meetings of IBSA at Rio and Sao Paulo, Brazil & Germany for structural inspection of New Antarctica station (Bharati)	5th – 14th March 2012
5.	Dr.Dhilsha Rajapan	Scientist – F	To attend the International Conference IEEE OCEAN'S/MTS during at Santander, Spain.	6th – 9th June 2011
6.	Dr.Dhilsha Rajapan Mrs. A.Malarkodi	Scientist – F Scientist – C	To participate in the International workshop on JCOMM Marine Instrumentation for ASIA Pacific Region", held at Tianjin, China.	11th – 13th July 2011
7.	Mr. Tata Sudhakar Mr. V. Gowthaman	Scientist – E, Scientific Assistant 'B'	To acquire knowledge on Operation, data collection and processing of Ocean Gliders, School of Environmental Systems Engineering, "The University of Western Australia, Perth, Western Australia.	14th – 20th November 2011
8.	Mr. M. Sankar	Scientist – E	To witness the testing of UBV (Unmanned bathymetry Vehicle) at M/s Sea Robotics Corp., Jupiter, FL-33478, USA	12th – 16th September 2011
9.	Mr. R.Saravanan	Scientist – D	To present a paper at "Annual International Conference, on Ocean, Offshore and Arctic Engineering, OMAE-2011", Rotterdam, Netherlands & a visit to MARIN for carrying out hydrodynamic & offshore testing facility.	19th to 24th June 2011
10.	Mr. N.R.Ramesh	Scientist – D	Technical discussion for development of high pressure retainable water sampler system, at the Royal Netherlands Institute of Sea Research (NIOZ), The Netherlands .	12th – 16th September 2011
11.	Dr. D.Sathianarayanan	Scientist – D	To attend Scientific Technology Panel (STP) meeting of International Ocean Drilling Program (IODP), Kochi, Japan.	19th – 22th March 2012

12.	Mr V. Suseentharan	Scientist – D	To attend HF Radar training course and discussions with CODAR, USA officials on data usage and analysis, validation etc. at San Francisco USA.	1st – 15th October 2011
13.	Mr. N.Ravi	Scientist – C	To facilitate logistics transfer of containers, samples and other major activities related to Southern Ocean Expedition - 2011-12, Mauritius.	4th – 10th February 2012
14.	Mr.M. Arul Muthiah	Scientist – C	To attend the Eighth session of the ICG/IOTWS at Melbourne, Australia	3rd – 6th May 2011
15.	Mr. D.Narendra Kumar	SRF	To participate as a team member in 6th Southern Ocean Expedition - 2011-12, Mauritius	25th December 2011
16.	Mr. K.Ramesh Mr. C.Muthukumar	Scientific Asst, Scientific Asst	To attend the capacity building exercise at NOAA PMEL, USA. During this they were on testing, calibration of Oceanographic & Meteorological Sensors, Tsunami Buoy BPR development, mooring analysis, selection of components for the mooring system and buoy design.	4th – 11th September 2011

Membership in Committees

Dr. M.A.Atmanand

- Senior Member, Institution of Electrical & Electronics Engineering (IEEE), USA
- Executive Committee Member, IEEE Oceanic Engineering Society, India Chapter
- Life Fellow of the Institution of Engineers (India)
- Member of Academic Council, Anna University, Chennai
- Member of American Society of Mechanical Engineers (ASME)
- Member, INSA National Committee.
- Member of Management Board of OASTC at IIT, Kharagpur
- Member, Governing Council of Indian National Centre for Ocean Information Services (INCOIS), Hyderabad.
- Member, Project Advisory Board for project on "A Centre for Fuel Cell Technology (CFCT) – Phase – II
- Member, Board of School of Maritime Design & Research of Indian Maritime University (IMU).
- Member on the first court of the Indian Maritime University, Chennai
- Member, Naval Research Board
- Member, Governing Council of Jerusalem College of Engineering
- Executive Committee Member, Science City, Dept. of Higher Education, Govt. of Tamilnadu
- Executive Committee Member, Centre for Technology Development and Transfer, Anna University
- Life Member, Ocean Society of India (OSI)

Dr. Purnima Jalihal

- Member, Project Review and Monitoring Committee for project on Performance Modelling of Free Floating Wave Energy Converter, Office of Principal Scientific Advisor, Govt of India
- Member, Project Advisory and Monitoring Committee on Sea water intrusion and farming under WAR programme, DST.
- Chairman, Sexual Harassment Committee – C-WET

Dr R Venkatesan

- Vice Chairman,Asia and DBCP Capacity Building Action Group member.
- Member, International Buoy Programme for the Indian Ocean (IBPIO). Chairman of working committee on Buoy Vandalism constituted by DBCP
- Member , International Maritime Organization Biofouling Correspondence Group BLG16
- Member, Confederation of Indian Industry CII-Corrosion Management Committee

Dr. G.A. Ramadass

- Member, IEEE Oceanic Engineering Society.

Dr. K. M. Sivakholundu

- Member, Local Organising Committee for the Eighth International Conference on Coastal and Port Engineering in Developing Countries (VIII PIANC-COPEDEC) held at IIT-Chennai during 20-24, February 2012.

Dr. R. Kirubagaran

- Member, National Task Force, The Bay of Bengal Large Marine Ecosystem
- Member, Project Review Board, Naval Materials Research Laboratory, Ambarnath
- Member, Board of studies for M.Sc., Marine Biology, Pondicherry University
- Member, Board of studies for M.Sc. Microbiology and M.Phil. Marine Biotechnology, Bharathidasan University
- Member and Research Supervisor Doctoral Committee, Sathyabama University
- Life Member, Indian Science Congress Association
- Life Member, Society for Reproductive Biology and Comparative Endocrinology
- Life Member, Association for DNA finger printing and related technologies

Mr.D.Rajasekhar

- Expert Member, Ship acquisition-GSI.
- Member Secretary – Joint Scientific and Technical Advisory Committee.
- An Expert Member for acquisition of Polar Research Vessel for NCAOR.

Dr.Dhilsha Rajapan

- Member, Acoustic Society of America
- Member, IEEE/Oceanic Engineering Society.
- Member, IEEE/UFFC Society
- Life Member, Acoustic Society of India
- Life Member, Magnetic Society of India
- Member, Research & Consultancy Promotion Council of Anna University, Chennai

Dr. G. Latha

- Member, Institution of Electrical and Electronics Engineering (IEEE)
- Member, Acoustic Society of America
- Member, India Meteorological Society
- Member, Subject Expert Committee on Earth and Atmospheric Sciences, Women Scientist Scheme, DST
- Member, Doctoral Committee, Anna University, Chennai

Mr. Tata Sudhakar

- Contributed to the document prepared by DST, Delhi on Technology Vision 2035: Brainstorming meeting on Global Change Issues held on 31st January, 2012 at TIFAC, New Delhi
- Member, Board of studies RGM COLLEGE OF ENGG&TECH, NANDYAL-518501.

Dr. B. K. Jena

- Chairman, Local Organising Committee for National Conference of Ocean Society of India, (OSICON-11), held at NIOT-Chennai during 13-15 July 2011.
- Member, The State committee for technical project evaluation board of Integrated Coastal Zone Management Project (ICZMP), Odisha.
- Member, Technical evaluation committee for INCOIS, Hyderabad.
- Member, Procurement and contamination committee of ICMAM, Chennai.

Mr. C.R.Deepak

- Member & Treasurer, IEEE Oceanic Engg., Society, India chapter.

Mr. Raju Abraham

- Member, Technical review committee for "WAR for Water" programme, Department for Science and Technology, since May 2010.
- Member, Indian Desalination Association (InDA)

Dr. S. Ramesh

- Member, IEEE Oceanic Engineering Society.
- Life Member, Ocean Society of India.
- Member, Indian Initiatives in the Integrated Ocean Drilling Program (IODP) of NCAOR, under Ministry of Earth Sciences.

Mr. N. Vedachalam

- Member, IEEE Oceanic Engineering Society.
- Member, International Society of Offshore and Polar Engineering (ISOPE) and Society for Under Water Technology (SUT), UK.

Mr.N.R.Ramesh

- Member, IEEE Oceanic engineering society, India chapter

Dr. G. Dharani

- Member, Professional Association of Diving Instructors
- Member, Doctoral Committee, SRM University.
- Member, Doctoral Committee, Anna University.

Dr. N.V. Vinith Kumar

- Member, Multidisciplinary committee to prepare state level action plan for A& N Island in line with the national action plan for climate change
- Member, Selection committee UGC fellowship in meritorious student programme, Pondicherry University
- Life Member, Ocean Society of India

Mr.G.Venkatesan

- Member, Institution of Electrical and Electronics Engineering (IEEE).

Mr. S.Muthukumaravel

- Member, ISA

Mr. AN. Subramanian

- Member, IEEE Oceanic Engineering Society.

Dr. D. Sathianarayanan

- Member, IEEE Oceanic Engineering Society.
- Scientific Technology Panel Member of Integrated Ocean Drilling Program (IODP).

Mr. P. Muthuvel

- Member, IEEE Oceanic Engineering Society, India chapter

Smt.K.Chithra

- Member, Institution of Electrical and Electronics Engineering (IEEE)

Membership in Ocean Society of India

- 23 regular scientists of NIOT are life members of Ocean Society of India

Invited talks

Dr.M.A.Atmanand

- 'Smarter and Greener flow measurement control' in the IV Global Conference and Exhibition – Flotek.g. organised by FCRI, Palghat on 20th January 2012.
- 'Ocean Technology for Climate Change' in the Workshop on 'CO2-Storage Options in Ocean' organized by NTPC, Delhi on 27th September 2011.
- 'Strides in Deep Sea Technologies – Indian Experience' in the Conference on OSICON-2011 held at NIOT, Chennai on 13th July 2011.
- 'Ocean Technology for Environmental Protection' in 1-Day 'Enviro Camp' organized by M.S.S.R.F in association with Loyola Institute of Frontier Energy (LIFE), MSSRF, Taramani, Chennai on 4th June 2011.
- Keynote on "Status of Ocean Mining in India" was delivered in absentia in the 21st International Society of Offshore and Polar Engineers, Maui, Hawaii, USA during June 2011.

Dr. Purnima Jalihal

- "Energy and Desalination" at Indian Maritime University, Visakhapatnam, 16th February 2012.
- "New Initiatives in Ocean Energy and Desalination" at IIT, Chennai, 23rd September 2011.

Dr.R.Venkatesan

- "Current and Future Ocean Observation Systems" at International meet organized by NCMRWF, MoES, New Delhi on 19th March 2012.
- "Materials for marine and ocean technology applications" in the Workshop at IISc, Bangalore on 24th January 2012.
- Colloquiums of 26th Indian Engineering Congress at "The Institution of Engineers (India), Karnataka State Centre, Bangalore on 17th December 2011.
- "Strategic Insight into the growth and technological advancement of the Indian Maritime Sector" in the 25th National Convention of Marine Engineers & National Seminar during 5-6 August 2011 at Chennai.

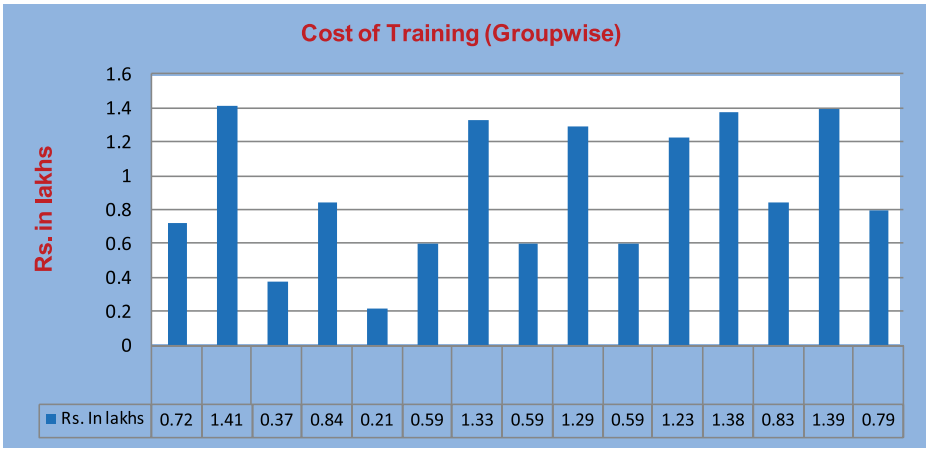
Bilateral / International Collaboration-Continuing

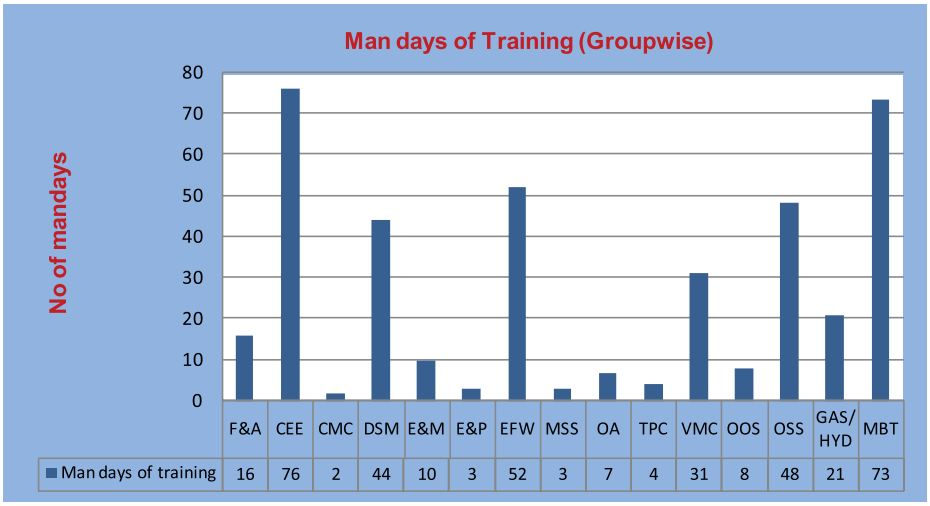
- Experimental Design Bureau of Oceanological Engineering (EDBOE), Moscow, Russia for the development of ROSUB 6000.
- M/s. Williamson and Associates Inc, Seattle, USA for the development of Autonomous Coring System.

Human Resource Development

HRD Co-ordinates the activities of training of staff members of NIOT in areas such as Project Management, Engineering, Software, Personality development etc. Extra Mural Lectures were delivered by eminent personalities in the field of music, medicine, education etc. NIOT staff members were trained for about 398 man days in total. Nearly 86 students carried out their project works in various departments of NIOT. Short term internships (27 Nos.) were also arranged during the summer and winter vacation.

The details of the training in group wise and the total cost as well total number of man days in the calendar year is given below:-





Extramural lectures

- An Extra Mural Lecture by Dr. Mrs. Soumya Swaminathan on Climate Changes and Emerging Diseases held on 13th March 2012, at NIOT, Chennai.
- A talk on "Music Therapy" was delivered by Madurai Dr.G.S.Mani on 9th May 2011 at NIOT, Chennai.

Extra Mural Lecture by Dr. Mrs. Soumya Swaminathan

Technical Lectures

- A talk on "Inference based Robotic Exploration of the Coastal Ocean" delivered by Mr. Kanna Rajan, Principal Researcher for Autonomy at Monterey Bay Aquarium Research Institute (MBARI), on 27th March 2012, at NIOT, Chennai.
- A lecture on "The protection, exploitation and restoration of blue mussel beds in the Dutch Wadden Sea" delivered by Dr. Jeroen Jensen, Faculty, Institute of Marine Resources and Ecosystem Studies (IMARES), The Netherlands, on 10th January 2012, at NIOT, Chennai.
- A talk on "Status of Coastal Ocean Observation Activities in USA" delivered by Dr. Vembu Subramanian of University of South Carolina USA, on 22nd December 2011, at NIOT, Chennai.

Training Undergone by NIOT Scientists and Technical Staff

Sl. No	Name of the Staff	Training Programme	Conducted by	Duration
1	Mr. S. Krishna Mohan	Letters of Credit Plus New INCO Terms 2010 & Exclusive coverage on UCP – 600	Indian Academy of Management, Mumbai	19th – 20th April 2011
2	Mr. J. Manecius Selvakumar	AI Planning and Execution with emphasis on T-REX (Teleo-Reactive Executive) System	DRDO's Centre for AI Robotics, Bangalore	9th – 20th May 2011
3	Mr. S. A Sheik Meeran Mohideen	Supervisory Programme	Foremen Training Institute (FTI), Bangalore	6th – 17th June 2011
4	Dr. A. Ganesh Kumar Mr. B. Baskar	Techniques in Animal Cell Culture & In Vitro Toxicology	Mahatma Gandhi-Doerenkamp Center, Bharathidasan University, Tiruchirappalli	4th – 13th June 2011
5	Mr. V. Gowthaman	ANSYS Fluent, ANSYS Design Modeler & ANSYS Meshing	ANSYS Software Pvt Ltd, Bangalore	20th – 24th June 2011
6	Mr. Anantha Krishna Mrs. K. Amudha	Heat Treatment of Industrial Component	IC&SR, IIT Madras	29th – 30th June 2011
7	Mr. Anantha Krishna Mr. D. Narendra Kumar	Design of Experiments	Arohan Management Services Pvt Ltd, Pune.	11th – 12th July 2011
8	Ms. D. Sudha Mr. AshwaniVishwanath	Offshore Engineering	Indian Maritime University, Visakhapatnam	5th – 16th September 2011
9	Dr. N. V. Vinithkumar Mr. Dilip Kumar Jha Mr. Apurba Kumar Das	An Integral Component of Coastal Ecosystem-Conservation Strategies and Management Practices in Department of Environment & Forests	Port Blair	12th – 14th October 2011
10	Mr. KrupaRathnam	NABL Supported Training ISO- 17025 Internal Audit	Bangalore	14th – 17th November 2011
11	Ms. Sucheta Sadhu	NABL Supported Training ISO- 17025 Internal Audit	Bangalore	14th – 17th November 2011

12	Mr. J. SanthanaKumar	Advanced Shrimp Pathology	in Rajiv Gandhi Centre for Aquaculture, Sirgali, Tamilnadu	14th – 19th November 2011
13.	Ms. D. Sudha Ms.M. ThayaPraba Mr. D. Antony Johnson Mr. M. SakthiRajan Mr. K.S. Sajeev	Repair and Rehabilitation of Marine structures	Dept. of Ocean Engineering, IIT Madras	28th November 2011
14.	Mr. N. Ravi Alias Gurusamy	Hydrodynamics in Ship Design	Ocean Engg. Dept, IIT Madras	12th – 16th December 2011
15.	Mr. P. Venkateshwaran	COMAPS Training Program on Microbiology in NIO	NIO, Goa	14th – 16th December 2011
16.	Mrs. A. AngelinPonmalar	COMAPS Training Program on Microbiology in NIO	NIO, Goa	14th – 16th December 2011
17.	Mr. V. Samson Packiaraj Raphael Mr. S. SrinivasaRao Mr. D. Balaji	HTRI, Advanced Xace Workshop & Vibration Analysis Workshop. Advanced Xist Workshop	HTRI Software, New Delhi	15th – 16th December 2011
18.	Mr. T.P. Rangamaran Mrs. R. Rathikumari Mrs. VatchalaKuppuraman Mr. M. Vadivelu	Advance Tax, Tax Deduction at Source and possible impact of Direct Tax Code on the non-profit organization	C-WET, Chennai	19th December 2011
19	Mr. S.A Sheik MeeranMohideen Mr. G. Nagarajan Mr. S. Charles Satish Kumar	Ships at Sea in Department of Ocean Engineering & Naval Architecture	Dept. of Ocean Engg & Dept of Naval Architecture at IIT, Kharagpur	19th – 21st December 2011
20	Mr. G. Dhinesh	11th National Training course on Wind Energy Technology	C-WET, Chennai	28th – 30th December 2011
21	Mr. A. A Gnanaraj Mr. V. Sundaramoorthi Mr. K. Ashok Kumar	Welding Technology, Inspection & Remedies	Dept. of Metallurgical Engineering, IIT Madras	6th – 7th January 2012
22	Mr. V. Kiran	Multibeam course for Hydrographic surveyors	IIC Academy, Vizag	6th – 10th February 2012
23	Mr. K. Mullaivendhan	Health assessment of structures using innovative technologies	CSIR-SERC, Chennai	8th – 9th February 2012
24	Mr. H. Junaid Ahmed	Total Cost Management Along Supply Chain Levers, Opportunities & Challenges (Spectrum 2012)	Indian Institute of Materials Management, Chennai	17th – 18th February 2012

25	Mr. C. R. Deepak Mr. V. Chandran	Ship Structural Design Concepts	DNV Academy India & Ocean Engineering Department, Indian Institute of Technology Madras, Chennai	27th – 29th February 2012
26.	Mr. J. Prince Prakash Jeba Kumar Mr. S. Sundararajan	Environmental Management System Auditor/Lead Auditor Training Course	Det Norske Veritas (DNV), Chennai	27th February – 2nd March 2012
27.	Mrs. K. Jossia Joseph	Coastal process and modeling	Dept. of Civil Engg, IIT Mumbai	19th – 23rd March 2012

Conference / Workshop attended by NIOT Scientists and Technical Staff

Sl. No	Name of the Staff	Training Programme	Conducted by	Duration
1.	Mr. N. Ravi	Workshop on Distortion Control, Fatigue & Ultimate Strength in Ship Structures Design	ASRANET, Chennai	20th – 22nd July 2011
2.	Mr. Surya Pratap Singh	Workshop on Biophysical & Biotechnological Research Techniques	AU-KBC Research Centre, Chennai	25th – 27th July 2011
3.	Mr. J. Sriganesh, Mr. K.A Krishnan Mr. S. ParameswaraPandian Mr. D. Antony Johnson Mr. M. Manikandan Mr. Ravinder Mr. T. Karthikeyan Mr. A. Balakumar	Hypack Conference & Hemisphere GPS	ASB Systems, Goa	22nd – 25th August 2011
4.	Mr. D, Rajasekhar	Oil spill India 2011 International Conference & Exhibition	iTEN Media Pvt Ltd, New Delhi	29th September 2011- 1st October 2011
5.	Dr. N. Marimuthu	Workshop on Marine Corrosion and Surface Engineering at Centre of Advanced Study	Marine Biology, Annamalai University, Parangipettai	24th – 26th November 2011
6.	Mr. P. Murugesh	Pre-Conference Workshop on Residual Life Assessment of Boilers and Turbines	Chennai Convention Centre (CTC), Chennai	6th – 7th December 2011
7.	Mr. D. Mahesh Peter Mr. P. Swaminathan	2nd International Conference on Challenges in biotechnology and food technology (ICBF 2012)	Annamalai University, Chidambaram	9th – 10th January 2012
8.	Mr. Raju Abraham Mr. G. Venkatesan	Conference on Water Purification technologies	InDACON, Mumbai	8th – 9th February 2012
9.	Mr. Sisir Kumar Patra	Second International Conference Indian Ocean Tropical Cyclones and Climate Change	Indian Meteorological Society, New Delhi	14th – 17th February 2012
10.	Dr. R. Kirubagaran	Workshop on Right to Information Act, 2005: Obligations & Strategies	Industrial Management Academy, New Delhi	23rd – 25th February 2012
11.	Dr.M.Kalyani	Workshop cum training programme on "Ocean Initialization for Coupled Models"	NCMRWF, New Delhi	22nd – 24th March 2012

Training organized by NIOT, Chennai for the scientists and administrative staff of NIOT

Sl. No.	Training Programme	Duration
1.	STAAD Pro Training	1st – 9th June 2011
2.	Time Management (by British Council)	28th June 2011
3.	Managing Meeting (by British Council)	25th – 26th July 2011
4.	Fluidyne Software Training	14th – 16th December 2011
5.	Import & Export Procedures	16th December 2011
6.	Report Writing (by British Council)	21st December 2011
7.	Safety at Sea (by Indian Maritime University)	31st January 2012 – 3rd February 2012

SCIENTIFIC CRUISE PROGRAMS

Scientific Cruises undertaken by the below mentioned vessels during 1st April 2011 to 31st March 2012

Sagar Nidhi

S. No.	From	To	Program / Institute	Area of Operation
1.	01/04/2011	07/04/2011	OOS, NIOT	CIOB
2.	20/05/2011	22/06/2011	INCOIS, NOAA	Bay of Bengal
3.	10/07/2011	17/07/2011	CMERI-AUV deployment	Bay of Bengal
4.	29/07/2011	31/07/2011	OE-NIOT	Bay of Bengal
5.	03/08/2011	24/08/2011	OOS-NIOT	Bay of Bengal
6.	12/09/2011	30/09/2011	ROSUB, NIOT – ACS Trials	Bay of Bengal
7.	07/10/2011	04/11/2011	DSM-NIOT	CIOB
8.	15/11/2011	05/12/2011	OOS-NIOT	Arabian Sea
9.	06/12/2011	21/12/2011	OOS-NIOT / INCOIS	Arabian Sea
10.	25/12/2011	06/02/2012	SOE, NCAOR	Southern Ocean
11.	27/02/2012	31/03/2012	Dry-dock & Afloat repairs at Singapore	

Sagar Manjusha

S.No.	From	To	Program / Institute	Area of Operation
1.	01/04/2011	23/04/2011	Desalination, NIOT	Arabian Sea
2.	27/04/2011	05/05/2011	MBT-NIOT	Arabian Sea
3.	18/05/2011	31/10/2011	Dry-dock & Afloat repairs at Paradip	
4.	06/12/2011	14/12/2011	OOS-NIOT	Arabian Sea
5.	16/12/2011	20/12/2011	CESS-Trivandrum	Arabian Sea
6.	25/12/2011	11/01/2012	MBT-NIOT	Arabian Sea
7.	13/01/2012	19/01/2012	VMC-NIOT, EEZ Survey	Bay of Bengal
8.	24/01/2012	13/02/2012	MBT-NIOT	Arabian Sea
9.	21/02/2012	29/02/2012	OOS-NIOT	Arabian Sea
10.	01/03/2012	31/03/2012	CEE-NIOT	Arabian Sea

Sagar Paschimi

S.No.	From	To	Program / Institute	Area of Operation
1.	01/04/2011	08/04/2011	ICMAM	Bay of Bengal
2.	10/04/2011	22/04/2011	IMMT	Bay of Bengal
3.	27/04/2011	03/05/2011	Andhra University	Bay of Bengal
4.	10/05/2011	11/05/2011	ICMAM	Bay of Bengal
5.	15/05/2011	16/05/2011	IGCAR / Anna University	Bay of Bengal
6.	18/05/2011	20/05/2011	IGCAR / Anna University / CAS Annamalai University	Bay of Bengal
7.	23/05/2011	24/05/2011	MSS-NIOT	Bay of Bengal
8.	25/05/2011	31/05/2011	Annamalai University	Bay of Bengal
9.	02/06/2011	08/06/2011	VMC-NIOT-EEZ Survey	Bay of Bengal
10.	10/06/2011	13/06/2011	IIT-Madras	Bay of Bengal
11.	16/06/2011	21/06/2011	Annamalai University / Madras University	Bay of Bengal
12.	29/06/2011	30/06/2011	Andhra University	Bay of Bengal
13.	08/07/2011	17/07/2011	IMMT	Bay of Bengal
14.	29/07/2011	31/07/2011	Annamalai University / Andhra University	Bay of Bengal
15.	04/08/2011	16/08/2011	VMC-NIOT-EEZ Survey	Bay of Bengal
16.	18/08/2011	26/08/2011	Madras University	Bay of Bengal
17.	28/08/2011	31/08/2011	CAS Annamalai University	Bay of Bengal
18.	20/09/2011	24/09/2011	NIO-Goa	Arabian Sea
19.	28/09/2011	07/10/2011	Desalination-NIOT	Arabian Sea
20.	08/10/2011	11/10/2011	NIO Goa / COMAPS	Arabian Sea
21.	15/10/2011	20/10/2011	Desalination	Arabian Sea
22.	21/10/2011	21/02/2012	Dry-dock & Afloat repairs at Cochin	
23.	27/02/2012	15/03/2012	CEE-NIOT	Arabian Sea
24.	17/03/2012	31/03/2012	CESS-Trivandrum	Arabian Sea

Sagar Purvi

S.No.	From	To	Program / Institute	Area of Operation
1.	01/04/2011	30/08/2011	Dry-dock & Afloat repairs at Chennai	
2.	31/08/2011	02/09/2011	OE-NIOT	Bay of Bengal
3.	05/09/2011	17/09/2011	VMC-NIOT-EEZ Survey	Bay of Bengal
4.	20/09/2011	21/09/2011	MSS-NIOT	Bay of Bengal
5.	22/09/2011	26/09/2011	CAS Annamalai University	Bay of Bengal
6.	01/10/2011	2/10/2011	Andhra University	Bay of Bengal
7.	04/10/2011	06/10/2011	Andhra University / INCOIS	Bay of Bengal
8.	15/10/2011	25/10/2011	IMMT	Bay of Bengal
9.	03/11/2011	04/11/2011	CEE-NIOT	Bay of Bengal
10.	14/11/2011	15/11/2011	CAS Annamalai University	Bay of Bengal
11.	17/11/2011	18/11/2011	OE-NIOT	Bay of Bengal
12.	20/11/2011	27/11/2011	CAS Annamalai University / INCOIS	Bay of Bengal
13.	28/11/2011	01/12/2011	CAS Annamalai University	Bay of Bengal
14.	13/12/2011	17/12/2011	NIO-Goa – SIBER	Arabian Sea
15.	25/12/2011	27/12/2011	OOS-NIOT	Arabian Sea
16.	01/01/2012	31/03/2012	Major overhauling of engines & Class survey at Cochin	

ADMINISTRATION

Following are the details of the manpower position during the period from 1.4.2011 to 31.3.2012 at NIOT.

(a) Staff Strength

NIOT has a total strength of 166 staff members, the details of which are furnished here under:

Sl.No.	Category	No. of Posts Sanctioned	No. of Posts Filled	No. of Posts Vacant
1.	Scientific	88 *	85	NIL
2.	Technical	54	52	2
3.	Administrative	18	18	NIL
4.	Multi Tasking Staff	6	6	Nil
	Total	166	161	2

* Three Scientifc posts have been newly created for NIOT by Ministry of Earth Sciences vide Order No.ESSO-1(15)/2012-Sectt. Dated 4th April, 2012 for Global and Regional Climate Change (GRCC).

(b) Appointments

Sl.No	Name	Post	Date of Appointment
1.	Vedachalam N	Scientist-E	16.03.2012
2.	Sanjana M.C	Scientist-C	13.12.2011
3.	Ramasundaram S	Scientist-C	09.02.2012
4.	Bolem Srinivas	Scientist-C	09.02.2012
5.	Sreedev D S	Scientist-C	10.02.2012
6.	Janarthanan C	Scientist-C	16.02.2012
7.	Ashwani Vishwanath	Scientist-C	17.02.2012
8.	Prasad Dudhgaonkar	Scientist-C	20.02.2012
9.	Sridhar Muddada	Scientist-C	24.02.2012
10.	Tamshuk Chowdhury	Scientist-C	07.03.2012
11.	Balanaga Jyothi V	Scientist-C	27.03.2012
12.	Kiran A S	Scientist-C	28.03.2012
13.	Anburajan L	Scientist-B	18.01.2012
14.	Umapathy A	Scientist-B	09.02.2012
15.	Sundar R	Scientist-B	09.02.2012
16.	Shyamala Varthini D	Scientist-B	17.02.2012
17.	Rekha L	Scientist-B	17.02.2012
18.	Kesava Kumar B	Scientist-B	24.02.2012
19.	Sarojani Maurya	Scientist-B	02.03.2012
20.	Prabhakaran K	Scientist-B	05.03.2012
21.	Reshma K V	Scientist-B	09.03.2012
22.	Vijayasankar A	Scientist-B	14.03.2012
23.	Naveen A	Scientific Asst A	07.03.2012

(c) Promotions under Modified Flexible Complementing Scheme

Sl.No	Name	Post	With effect from
1.	Dr Purnima Jalihal	Scientist – G	01.07.2011
2.	Dr R. Venkatesan	Scientist – G	01.07.2011
3.	Mr. D. Rajasekhar	Scientist – F	01.07.2011
4.	Dr Dhilsha Rajapan	Scientist – F	01.01.2012
5.	Mr. M. Sankar	Scientist – E	01.07.2011
6.	Mr. R Srinivasan	Scientist – D	01.07.2011
7.	Mr. V Suseentharan	Scientist – D	01.07.2011
8.	Smt K Chithra	Scientist – D	01.07.2011
9.	Mr. A.N. Subramanian	Scientist – D	01.01.2012
10.	Mr. P. Murugesh	Scientist – C	01.01.2012

(d) Promotion under Career Progression Path

Sl.No	Name	Post	With effect from
1.	Mr. D Magesh Peter	Scientific Asst `B'	01.01.2012
2.	Smt Mary Leema Thilakam	Scientific Asst `B'	01.01.2012
3.	Mr. J. Santhana Kumar	Scientific Asst `B'	01.01.2012
4.	Mr. Kantipuli Sudarsan	Scientific Asst `B'	01.01.2012
5.	Mr. A. Thirunavukkarasu	Scientific Asst `B'	01.01.2012
6.	Mr. S. Elangovan	Scientific Asst `B'	01.01.2012
7.	Mr. C. Muthukumar	Scientific Asst `B'	01.01.2012
8.	Mr. V. Pandurangan	Scientific Asst `B'	01.01.2012

(e) Financial Upgradation under MACP Scheme

Sl.No	Name	Post	With effect from
1	Mr. K. Anandan	Multitasking Staff	01.09.2008
2	Mr. M. Vinodh Kumar	Multitasking Staff	01.09.2008
3	Mr. P. Saloman Raj	Multitasking Staff	20.12.2011

(f) Resignations

Sl.No	Name	Post	Date of Resignation
1	Mr. J. Manecius Selvakumar	Scientist – D	30.11.2011
2	Mr. A. Umapathy	Technical Assistant	08.02.2012 (Technical Resignation)
3	Mr. R. Sundar	Technical Assistant	08.02.2012 (Technical Resignation)

(g) Retirements - **NiI**

Right to Information

The Right to Information Act 2005 came into force for its enactment from 12th October 2005 to promote transparency and accountability in the working of every public authority in India.

RTI Annual Return

Right to Information Annual Return 2011-2012

Ministry / Department / Organization : National Institute of Ocean Technology, Chennai
: Ministry of Earth Sciences

Year : 2011-2012 (Upto March 2012)

			Progress in 2011-12			
	Opening Balance as on 01.04.2011	**No.of applications received as transfer from other Pas u/s**	**Received during the Year (including cases transferred to other Public Authority)**	**No. of cases transferred to other Public Authorities 6(3)**	**Decisions where requests / appeals rejected**	**Decisions where requests / appeals accepted**
Requests	0	6	7	0	0	13
First Appeals	0	0	1	0	0	1

No. of Cases where disciplinary action taken against any Officer		0
No. of CAPIOs designated	**No. of CPIOs designated**	**No. of AAS designated**
0	1	1

No. of times various provisions were invoked while rejecting requests													
Relevant Section of RTI Act 2005													
Section 8 (1)										Sections			
a	b	c	d	e	f	g	h	i	j	9	11	24	Others
0	0	0	0	0	0	0	0	0	0	0	0	0	0

Amount of Charges Collected (in Rs.)		
Registration Fee Amount	Additional Fee & Any other charges	Penalties Amount
60/-	1080/-	0

LIST OF ACRONYMS

CAS	:	Centre of Advanced Study
CEE	:	Coastal & Environmental Engineering
CESS	:	Centre for Earth Science Studies
CMC	:	Computer Maintenance Cell
CMERI	:	Central Mechanical Engineering Research Institute
DSM	:	Deep Sea Mining
E&M	:	Estate & Maintenance
E&P	:	Establishment & Personnel
EFW	:	Energy & Fresh Water
F&A	:	Finance & Accounts
GAS/ HYD	:	Gas Hydrates
ICMAM	:	Integrated Coastal & Marine Area Management
IGCAR	:	Indira Gandhi Centre for Atomic Research
IMMT	:	Institute of Minerals & Materials Technology
INCOIS	:	Indian National Centre for Ocean Information Services
MBT	:	Marine Biotechnology
MSS	:	Marine Sensor Systems
NCAOR	:	National Centre for Antarctic and Ocean Research
NCMRWF	:	National Centre for Medium Range Weather Forecasting
NIO	:	National Institute of Oceanography
OA	:	Ocean Acoustics
OE	:	Ocean Electronics
OOS	:	Ocean Observation Systems
OSS	:	Offshore Structures
TPC	:	Transport Cell
VMC	:	Vessel Management Cell

AUDITORS REPORT

To
The Chairman & Members
Governing Body of National Institute of Ocean Technology, Chennai

We have audited the attached Balance Sheet of National Institute of Ocean Technology, NIOT Campus, Velachery-Tambaram Main Road, Pallikaranai, Chennai 600 100 as at 31st March 2012 and also the Income and Expenditure Account for the year ended on that date and Receipts and Payments account for the year ended on that date annexed thereto. These financial statements are the responsibility of the management of National Institute of Ocean Technology. Our responsibility is to express on opinion on these financial statements based on our audit.

We conducted our audit in accordance with auditing standards generally accepted in India. These standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatements. An audit includes examining, on test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

We report that:

a. We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purpose of our audit.

b. In our opinion, proper books of accounts as required by the law have been kept by National Institute of Ocean Technology so for as it appears from our examination of the books.

c. The Balance Sheet and Income & Expenditure account dealt with by this report are in agreement with the books of accounts.

d. In our opinion the Balance Sheet and Income & Expenditure account dealt with by this report is prepared in accordance with the applicable Accounting Standards issued by the Institute of Chartered Accountants of India.

e. In our opinion and to the best our information and according to the explanations given to us the Financial Statements, together with the schedules and notes forming part of Accounts give a true and fair view of the state of affairs of the Institute and are in conformity with the accounting principles generally accepted in India subject to:

The accounting of terminal benefits of employees is on cash basis as against accrual basis as prescribed in Accounting Standard 15 (Revised) issued by the Institute of Chartered Accountants of India. The impact of the same could not be quantified in the absence of actuarial valuation of retirement benefits.

- In the case of the Balance Sheet of the state of affairs of the institute as on 31st March 2012.
- In case of Income and Expenditure account, of the excess of income over the expenditure for the year ended on that date.

For Gopalaiyer and Subramanian
Chartered Accountants
FRN: 000960S

K.K.A.RAMANUJAN
Partner
M.No. 209498

Place: Chennai
Dated: 30th August 2012