



INDO-MARECLIM

INDO-EUROPEAN RESEARCH FACILITIES FOR STUDIES ON MARINE ECOSYSTEM AND CLIMATE IN INDIA

The programme envisages to strengthen research infrastructure of the host institution and to enhance the scientific co-operation between researchers from the Member States and Associated Countries and also those of the host country through the involvement of additional researchers in ongoing research activities as well as for the preparation of new joint projects through organising seminars, colloquia, summer schools and workshops.

Nansen Environmental Research Centre-India (NERCI) have entered MoU with pioneer institutions engaged in marine science research such as the Indian National Centre for Ocean Information Services (INCOIS), Anna University, Cochin University of Science and Technology (CUSAT), Kerala University of Fisheries and Ocean Studies (KUFOS), and ToCh Institute of Science and Technology (TIST).

NERCI along with the above institutions have associated with European partners in expanding their scientific cooperation and network building with Indian scientific community to address the contemporary challenges in monsoon, climate change, marine ecosystem and coastal zone management.

The objective is to develop NERCI as a joint research facility for scientific co-operation between India and the European Union member states and associated countries in the areas of monsoon climate variability, marine ecosystems and coastal zone management including their impact on society.

INDO-MARECLIM aims at analyzing and understanding some of the challenges of the Indian Ocean and the Indian subcontinent under past, present and future global change processes, by addressing three related and complementary scientific fields of research:

- (a) **Monsoon and ocean variability, climate change and sea level variations,**
- (b) **Marine ecosystem studies, including algae blooms**
- (c) **Coastal zone management and impact on society**

Funded by : European Commission

Type of project : EU-FP7 INCO-LAB

Grant agreement number : 295092

Project coordinator : Prof. (Dr). N. R. Menon

Steering Committee chairman :

Prof. Ola. M. Johannessen

Project website :

<http://www.indomareclim-nerci.in>

Project start date : 1 February 2012

Duration : 36 months



Overall Objective

To use and extend the Nansen Environmental Research Centre - India (NERCI) as a joint research facility for scientific co-operation between India and the European Union member states and associated countries in the areas of monsoon climate variability, marine ecosystems and coastal management including impact on society.

Important Events

Kick off Meeting

25- 26 April 2012

Participants from Partner institutions, India-EU delegation, KUFOS, Anna University, ToCh and CUSAT were present. The sessions

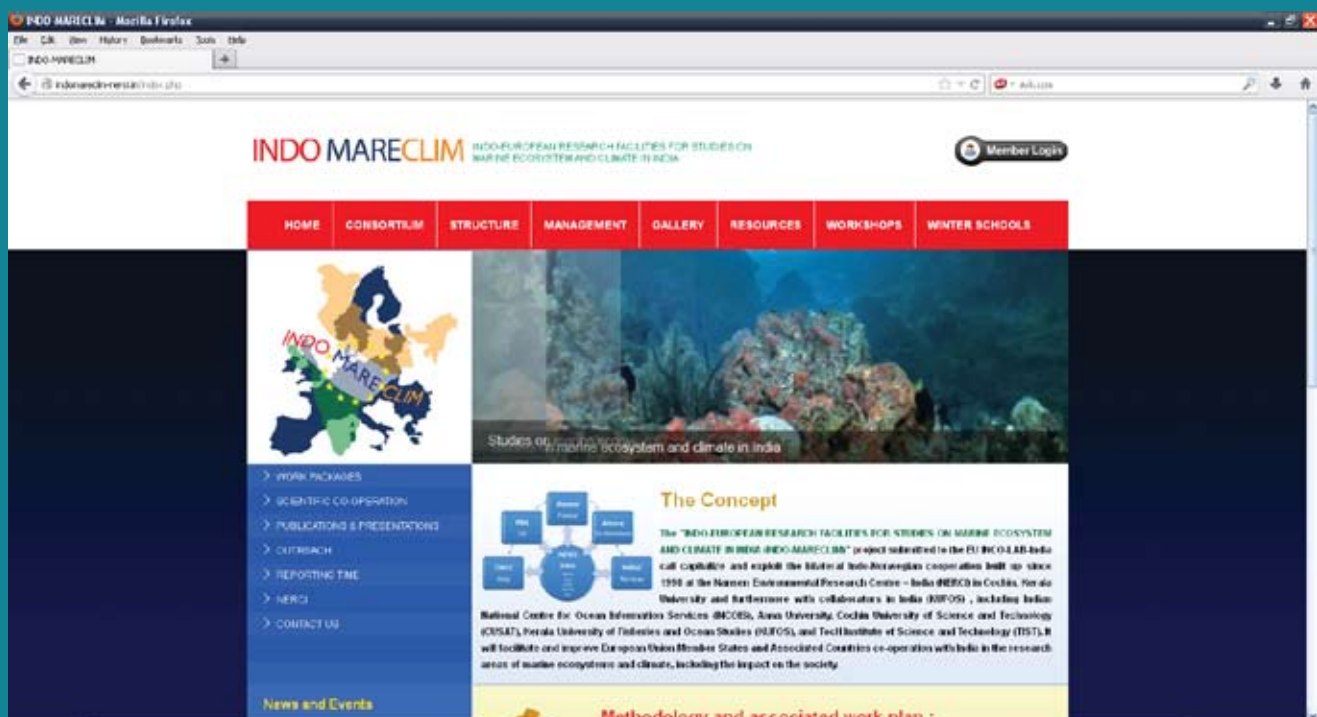
commenced with the presentations on the scientific topics and discussions on WPs concerned with management activities. Detailed implantation plans and core network of cooperation were defined for each project WP and within the three major research topics of INDO-MARECLIM.



Participants of the INDOMARECLIM project Kick off Meeting

Web Design & Implementation - June-October 2012

<http://indomareclim-nerci.in/index.php>



Project Review meeting

29 -31 October 2012

The partners gave scientific presentations of their contributions to each of the three research components of the INDO-MARECLIM project. Plans and clarifications of methodologies for their implantation and schedules for research exchange visits by the project partners were made. Further

planning of workshop and winter school on marine ecosystem and monsoon variability, exchange visits for NERCI project staff with other consortium partner institutions, suggestions for colloquia involving local educational institutions. Routines and schedule for project management and reporting were discussed and clarified.



Participants of the Project Meeting

INDO-MARECLIM Network Building

Pan Ocean Remote Sensing Conference (PORSEC) was conducted in Kochi, during 5-9 November 2012 gathering 544 International delegates from all over the world. INDO-MARECLIM has suggested and convened two sessions during PORSEC.

Session 7: Remote sensing Applications in Marine Ecosystem studies including algal bloom monitoring

Chaired by: Prof. N.R.Menon (India), Lasse Pettersson (Norway), Prof. Trevor Platt (UK), Dr. Shubha Satyendranath (UK)

The Session was the largest session during PORSEC 2012 including 42 papers with up to more than 100 scientists attending the session – distributed over two days. The papers were addressing the marine ecosystem dynamics from various scientific views based on mainly remote sensing data. Few speakers made a holistic and interdisciplinary approach especially with reference to complex pelagic ecosystem.

Several authors elaborated the importance of cyclones on the formation of phytoplankton blooms. The role of the Ekman layer in controlling primary production was delineated. yielded useful information in several waters world-wide, including Indian Ocean.

Session 13-Intra seasonal variability of Asian Summer Monsoon

Chaired by : Dr. P V Joseph (India) & Prof. Ola Johannessen (Norway)

A total of fourteen papers were presented in the session. Discussed various aspects viz: onset, advance and withdrawal of monsoon, active-brake cycles, variations on different time scales, forecasting techniques and different models used for monsoon studies.



INDO-MARECLIM exhibition booth at PORSEC-2012 venue



Dr. Abish B receiving memento from Dr. S.S.C. Shenoi, Director, INCOIS, for INDOMARECLIM at PORSEC Conference. At the right is Dr. Jim Gower, President PORSEC

EU-INDIA STI Cooperation Days

Thematic focus: Water related research
National Geophysical Research Institute,
Hyderabad, 8-9 November

The third edition of "EU- India Science Technology and Innovation Cooperation Days" was organised in Hyderabad in order to showcase the results of cooperation between Europe and India and to foster further STI cooperation. It is a joint event organised by the following projects and initiatives; New INDIGO and INDIA GATE, EURAXESS Links INDIA and India SI House in close cooperation with the National Geophysical Research Institute (NGRI).

The thematic focus was water-related research. Researchers working together in various types of projects (FP7, multilateral and bilateral) presented their achievements. The EU-India STI Days were composed of the following elements:

Scientific conference- presentation of joint projects in water related topics.

Networking & brokerage event – in addition to the networking friendly setting of the conference, a targeted brokerage event was also organised to assist future collaboration. Awareness raising activities about funding opportunities offered by the EU, India, bilateral programmes and by industry.

In this event, "EC-FP7" INDO-MARECLIM INCO-Lab project was represented by Dr Lasse H. Pettersson and Dr. K. Ajith Joseph.

MoU with KUFOS

March 15, 2013

A memorandum of understanding (MoU) was signed between Kerala University of Fisheries and Ocean Studies (KUFOS) and Nansen Environmental Research Centre India, Nansen Scientific Society, and Nansen Environmental and Remote Sensing Centre, Bergen, Norway.

The main objective of the MoU is to develop cooperative efforts in research and education in the areas including ocean studies, modelling, remote sensing and fisheries; socio-economics of fishery folks, climate variability and marine living resources. The MoU includes plans for exchange visits, joint supervision, short courses and workshops for PhD and master students, capacity building in physical oceanography and ocean modelling.

The MoU is effective for five years and was signed by Dr. Abraham Joseph, Registrar, KUFOS, Lasse H. Pettersson, Director of international cooperation, Director, NERSC, Norway, Prof. Ola M. Johannessen, President, Nansen Scientific Society, Prof. N. R. Menon, Chairman, Advisory Board, Nansen Environmental Research Centre (India) and Dr. K. Ajith Joseph, Executive Director, NERCI.



Poster presentation at EU-India STI workshop at NGRI, Hyderabad



From left-Prof. N.R. Menon (Co-Chairman, NERCI), Dr. K. Ajith Joseph (Director, NERCI), Prof. Ola M. Johannessen (Nansen Scientific Society), Prof. B. Madhusoodana Kurup (Vice Chancellor, KUFOS), Lasse H. Pettersson (Director, International Relations), Dr. Abraham Joseph, (Registrar, KUFOS).

India-EU Workshop on Marine Primary Production March 12 – 15, 2013

INDO-MARECLIM will enhance and build of institutional network and co-operation between research institutions and scientists the European Union Member States and Associated Countries and India. This will among other be achieved through hosting of international workshops and summer schools, involving scientists, post-docs and PhDs from Europe and India.

The INDIA-EU Workshop on Marine Primary Production was the first in a series of coordinated INDO-MARECLIM workshops in marine sciences. It was organized by NERCI at Kerala University of Fisheries and Ocean Studies at KUFOS, Cochin, India.



Dr. V. N. Sanjeevan, Director, CMLRE inaugurates the India-EU workshop on Marine primary production. From left - Lasse H. Pettersson (NERSC, Norway), Dr. K. Ajith Joseph (Director, NERCI), Prof. Ola M. Johannessen (Chairman, INDOMARECLIM, Norway), Prof. N. R. Menon (Coordinator, INDOMARECLIM), Prof. B. Madhusoodana Kurup (VC, KUFOS), Prof. C. Mohanakumaran Nair (PVC, KUFOS) and Prof. Trevor Platt (Executive Director, POGO, PML, UK)

A total of 80 participants (17 from 7 EU countries, 63 from India), from premier research institutions in India and Europe attended the workshop. Many scientific research groups and institutions in India are working on various aspects of marine primary production, including measurements, modelling, remote sensing and applications in ecosystem models. The workshop attempted to address some of the cardinal questions in this research area, like adding value to this work through enhanced collaboration and coordination, the insufficiently studied aspects of the topic, possibility of bringing in innovative thinking to understand the implications of variability in marine primary production for resources at higher trophic levels, including commercially-exploited fisheries and the need for standardising methods of measuring primary production, to facilitate comparison of results.

The workshop was chaired by Prof. Trevor Platt and Dr. Shubha Satyendranath (PML, UK) along with Prof. N. R. Menon (NERCI, Cochin) and was hosted by Prof. B. Madhusoodana Kurup (VC, KUFOS, Cochin) at the Kerala University of Fisheries and Ocean Studies (KUFOS), Panangad, Cochin.

The workshop included a suite of tutorial lectures, a set of status presentations and a series of discussion groups.

A formal inaugural ceremony started the workshop. During the first two days, there were tutorial lectures by eminent scientists from Europe and India, on the following topics (see figure captions next page):



Participants of India-EU workshop on Marine Primary production



Participants listening to the lectures during Workshop

"MSY estimation from satellite based Chlorophyll estimates."



Dr. V. N. Sanjeevan, Director, Centre for Marine Living Resources & Ecology (CMLRE), Cochin "

"The sources of ocean colour data for Indian waters, and some applications."



Dr. K. H. Rao, Scientist, National Remote Sensing Centre, India

"Indian seas – an ecological approach"



Prof. N.R. Menon, Co-ordinator, INDO- MARECLIM "

"Modelling primary production and the need for data"



Dr. Anna Hickman, Univ. of Southampton

"Regional estimation of primary production"



Prof. Trevor Platt, PML, UK

"Community Structure and Primary Production"



Dr. Heather Bouman, Oxford University

"The bio-optical controls on primary production"



Dr. Shubha Sathyendranath, PML

On the third day of the workshop, four discussion groups were established to identify research captaincies and need for quantitative assessment of the marine primary production in Indian waters. The group leaders presented the outcomes of the discussions on the final day of the workshop. In the concluding session, a technical plan, which could be developed into a project proposal involving the relevant Indian and foreign institutions was sketched out.

Participation (at the 1st INDO-MARECLIM workshop)

From Europe- NERSC,-Norway, Plymouth Marine Laboratory (PML-UK), University of Southampton-UK, Oxford University-UK, Universidad de Vigo-SPAIN, Institute of Oceanography and Fisheries-Croatia, CMCC Italy, National Institute of Biology, Slovenia,IFREMER, France.

From India: NERCI, Indian National Centre for Ocean Information Services(INCOIS), Space Application Centre (SAC), National Remote Sensing Centre (NRSC), Centre for Marine Living Resources & Ecology (CMLRE), Cochin University of Science & Technology (CUSAT), National Institute of Oceanography (NIO), Central Marine Fisheries Research Institute (CMFRI), CAS in Marine Biology, Annamalai University, National Centre for Antarctic and Ocean Research(NCAOR), CSIR Fourth Paradigm Institute (Formerly C-MMACS).

Exchange programs

Person-Institute	Activity	Work Package	Period
Trevor Platt & Shubha Sathyendranath, PML	Preliminary discussion on INDOMARECLIM Project	WP2	February 2012
Lasse H. Pettersson, Ola M. Johannessen, NERSC	CORDEX monsoon conference in Pune and monsoon studies at NERCI	WP2	February - March 2012
Annette Samuelsen, Lasse H. Pettersson Ola M. Johannessen, NERSC	GOTM model set up/training at NERCI. Project planning and coordination.	WP2 + 1	April 2012
Lea Svendsen, NERSC	CORDEX monsoon workshop in Pune. Studies on monsoon variability (PhD).	WP2	October –November 2012
Yongqi Gao, NERSC	CORDEX monsoon workshop in Pune.	WP3	October 2012
Trevor Platt & Shubha Sathyendranath, PML	INDOMARECLIM sessions on Remote sensing applications chaired during PORSEC 2012	WP2,3	November 2012
Lasse H. Pettersson, Ola M. Johannessen, NERSC	EU-INDIA cooperation Days in Hyderabad WP training at NERCI and PORSEC 2012	WP 2 + 3	October -November 2012
Morten W. Hansen Natalia Ivanova, NERSC	WP training at NERCI and PORSEC 2012	WP2	November, 2012
Stefane Saux Picart, PML	Primary Production(PP) model was set up at NERCI & training given to Smitha & Syam	WP2	November 2012
Annemarie Groot, ALTERRA	Field study for evaluation of economic status of fisher folk.	WP2	November 2012
Ola M. Johannessen, Lasse H. Pettersson, NERSC	Indo-MARECLIM Marine primary production workshop, Project networking and management	WP2, & 1	March, 2013
Stefane Saux Picart, PML	Planning of joint publication on PP model. Indo-MARECLIM Marine primary production workshop	WP2	March 2013
Annette Samuelsen, NERSC	GOTM model training at NERCI.	WP2	March 2013
Trevor Platt & Shubha Sathyendranath, PML	Indo-MARECLIM Marine primary production workshop A Paper using PPmodel Smitha during POGO SCOR fellowship work plan.	WP2, WP3	March 2013
Stephano Ciavatta, PML	GOTM ERSEM model training given to Nandini, Syam & Smitha	WP2	March 2013
Anton Korosov, NERSC	BOREALI algorithm was set up NERCI and training given to NERCI staff	WP2	May 2013
Syam Sankar, NERCI	At NERSC to use GOTEM ERSEM Model.	WP2	May –July 2013
Ajith Joseph, K, NERCI	NERSC INDO-MARECLIM scientific and financial reporting	WP1, WP2	July, 2013
Eddy Moors, Obbe Tuinenberg, Kirsten van Riel, ALTERRA	Socio-economics of climate change. Evaluation of economic status of fisher folk during different seasons	WP2	March -May 2013

INDOMARECLIM-Infrastructure Facility at NERCI

Hardware

HP High-end server

HP server is installed in NERCI for the following applications in the Indomareclim project:

1. BOREAL algorithm to estimate the chlorophyll, total suspended matter and dissolved organic carbon from remote sensing reflectance bands.
2. Estimation of daily water column production from satellite data (PP model).
3. The coupled GOTM-ERSEM marine ecosystem model is used to estimate ecological parameters such as nutrients, chlorophyll-a and dissolved oxygen in the Arabian Sea.
4. Principal Component Analysis (PCA) for zoning Northern Arabian Sea and to study the characteristics of each zone.
5. The Weather Research and Forecasting Model (WRF) to be installed in the server in order to study the Indian monsoon and ocean variability.

The Highend server has the specifications- HP PROLIANT DL580 G7 E7520 2P P410i/512 FBWC 8 SFF 1200W RPS Base server/ (2) Intel Xeon E7520 (1.86 GHz/4-core/18MB/95W) Processors/12 MB Level 3 cache / (2) memory boards is capable to run the above applications for the INDO-MARECLIM.

Software Packages

ArcGIS

ArcGis 10.1 runs natively on 64-bit Windows and Linux operating systems, providing users with high-performance web editing and map caching, on-the-fly analyses, and imagery exploitation capabilities. This software is used for spatial representation of climate and ecosystem variables from the INDO-MARECLIM.

MATLAB

MATLAB is a commercial package which provides a user friendly interactive programming environment. It is well adapted to numerical experiments which can be modelled easily on the MATLAB platform. Many matrix operations that need heavy computing can be easily accomplished using matrix operations in MATLAB.

Recently, a MATLAB version R2012a is introduced in NERCI by MATHWORKS. MATLAB consists of many tools from which some of the tools are chosen. These are curve fitting toolbox (CFALL), parallel computing toolbox (DMALL), Global Optimization Toolbox (GDALL), Image Processing Toolbox (IPALL), Mapping Toolbox (MGALL), Neural Network Toolbox (NNALL), Optimization Toolbox (OPALL) and Statistics Toolbox (STALL).

All these tools are currently used by INDO-MARECLIM scientists for in situ as well as modelled data processing and analysis.

Equipments

UV Spectrophotometer



Shimadzu UV (Model : UV 2700) (Ultraviolet Visible Spectrophotometer overcomes many difficulties and provides excellent resolution with high speed sensitivity for analysis of compounds like inorganic, organic substances in environmental research.

The instrument will provide absorbance spectrum of the sample which is related with the concentration of the compounds present in a given solution.

Applications:

To record spectrum of chemical substances that can absorb UV and visible light such as CDOM, D O C, Pheopigment and Chlorophyll-a

Software:

Software called UV-probe Software is 32 bit windows based and is coming with data acquisition Mode like Spectrum, Photometric (Quantiaation) and Kinetics measurement.

Radiometer

The installation of the Radiometer (Ocean ProfilerII) was conducted at NERCI, in June 2013. The whole instrument was assembled inside the NERCI lab by the engineer from Electrotek, the Indian agency of Satlantic. The instrument was connected via a data cable to a 200m long hauling wire to the power supply through the power supply convertor. The data can be read in the computer connected to the power converter unit (MDU-200) via a serial port driver unit of the computer. Sat-View software installed in the PC is used for the manipulation of the onboard sensor data. Each sensor in the instrument has different calibration files, which can be seen individually and in Zipped format.



Preparation and deployment of Radiometer

Upcoming events

INDO-MARECLIM Winter School on Climate Change and Variability, Marine Ecosystems and Coastal Zone Management, 2nd to 7th November 2013, Cochin, India.

The INDO-MARECLIM project host a one-week winter school at Bolgatty Palace and Island Resort, Kochi (India) from 2 – 7 November 2013. An interdisciplinary training program is scheduled with a select group of instructors from India and Europe providing lectures and practical training on recent advancements in the understanding of marine ecosystems, climate change and their socio-economic impacts.

<http://indomareclim-nerci.in/winterschools.php>

India-EU workshop-II: Monsoon and ocean variability, climate change and sea level variations, 11th to 13th November 2013, Cochin, India.

Nansen Environmental Research Centre India (NERCI) is organizing a workshop as part of the Indo-European Research Facilities for studies on marine ecosystems and climate in India (INDO-MARECLIM), project of European Union FP-7, to discuss the current status of scientific work on monsoon and ocean variability in the context of global warming and climate change and to explore possibilities for enhanced Indo-European collaboration in the future. Link to the Workshop is:

<http://indomareclim-nerci.in/workshops.php>

Scientific Publications :

- Joseph P.V., Bindu G., Archana Nair and Shinu S. W., 2013. Variability of Summer Monsoon Rainfall of India on Inter-annual and Decadal time scales. *Atmospheric and Oceanic Science Letters*, Vol. 6 (5): 398-403, doi:10.3878/j.issn.1674-2834.13.0044.
- Abish, B., Joseph, P.V. and. Johannessen, O.M., 2013. Weakening Trend of the Tropical Easterly Jetstream of the Boreal Summer Monsoon season 1950 - 2009, *Journal of Climate* (JCLI-D-13-00440). (Accepted)
- Arunmozhi, P. Ajith Joseph, K. and Ramalingam, M., 2013. Identification of river plumes of Ganga-Brahmaputra-Meghna (GBM) river basin in the Bay of Bengal using Satellite Altimetry, Poster presentation at IAPSO General Assembly, Gotheborg, Sweden.
- Ajith Joseph, K., Smitha, A. and Balchand. A.N., 2012. Synergistic use of Altimeter and Ocean colour data to study the role of geostrophic currents in modulating surface chlorophyll distribution along the SW coast of India. Poster presentation at the PORSEC 2012 Conference, Kochi, India.

The INDO-MARECLIM Partners:



Plymouth
Marine Laboratory

