

OUTLINE FOR PROGRESS REPORT (May 2021 – April 2023) AND FUTURE WORKPLAN AND BUDGET (May 2023- April 2025)

Progress of IOC Regional Training and Research Center on Ocean Dynamics and Climate (ODC)

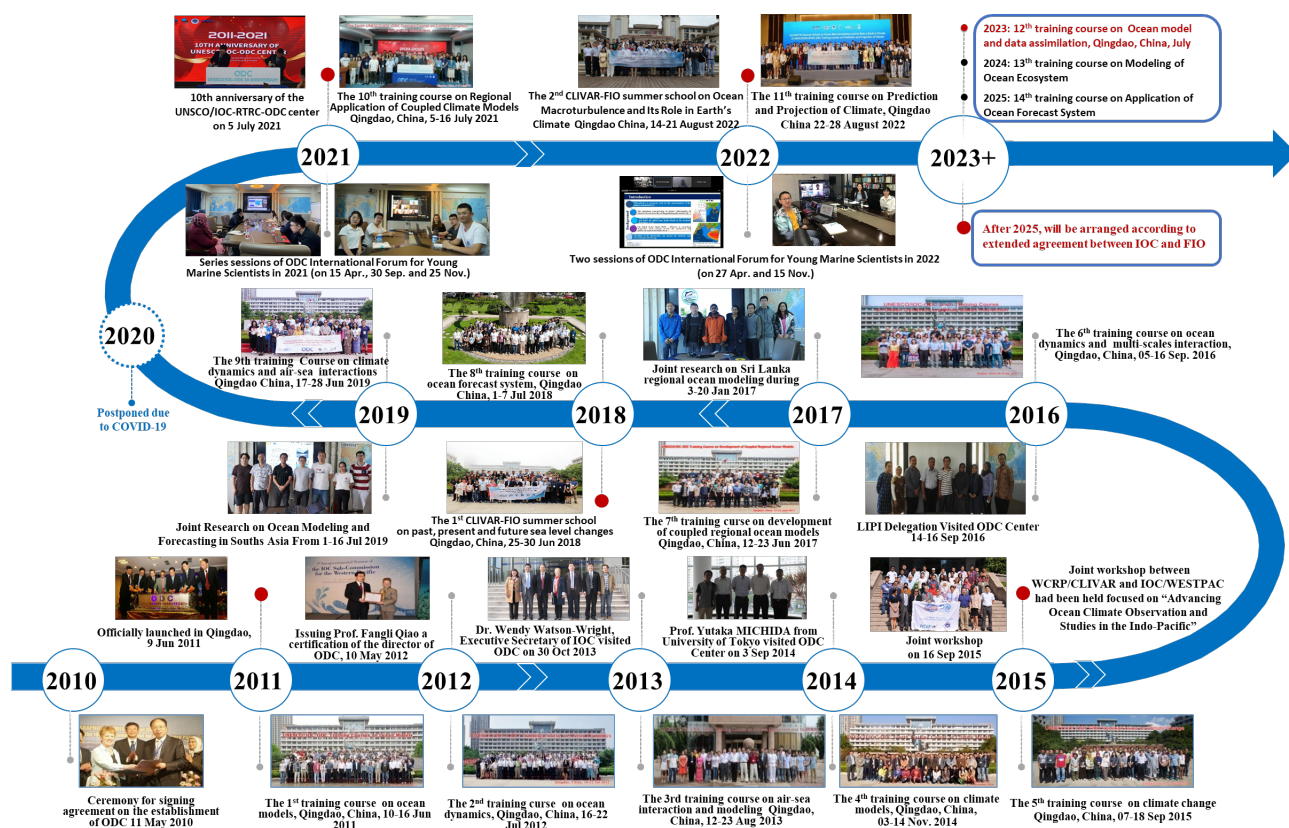
PI: Professor Dr. QIAO Fangli

The First Institute of Oceanography (FIO), Ministry of Natural Resources (MNR) of China

1. Introduction and justification

The UNESCO/IOC Regional Training and Research Center on Ocean Dynamics and Climate (hereafter referred to as “ODC Center”) was officially established through an agreement signed between the Intergovernmental Oceanographic Commission of UNESCO and the host institute, the First Institute of Oceanography, State Oceanic Administration of China (FIO), at the 8th Intergovernmental Session of UNESCO/IOC Sub-Commission for the Western Pacific (WESTPAC-VIII) in Bali, Indonesia on May 11, 2010. The ODC Center, based at the FIO, is the first Regional Training and Research Center (RTRC) of UNESCO/IOC, promoted and guided by IOC/WESTPAC. ODC was officially inaugurated on 9 June 2011 in Qingdao, China.

2. Timeframe and objectives



The timeframe of ODC

The objective of the ODC Center is to enhance the regional research capacity and capability in ocean dynamics, air-sea interaction, climate change and numerical modeling methods through the:

1) Provision for annual, tuition-free, English-language training courses for roughly 15-20 junior scientists and doctoral/master students. These students will be drawn primarily from the

developing member states in the Western Pacific region and beyond. These courses will invite experienced experts to serve as lecturers;

2) Organization and hosting of English-language workshops on pertinent topics to promote interactions between experienced practicing oceanographers and students;

3) Provision of a laboratory environment for testing open general circulation model theories and developing state-of-art wave-tide-circulation coupled ocean models;

4) Exchange of visiting scholars and doctoral education.

ODC will be a long-term project, and the objectives till 2025 include: Three annual training courses in 2023, 2024 and 2025, respectively.

3. Major activities, outputs & outcomes over the last intersessional period (May 2021-April 2023)

1. The Tenth Training Course on Regional Application of Coupled Climate Models

During July 5-16, 2021, the UNESCO/IOC-ODC (UNESCO/IOC Regional Training and Research Center on Ocean Dynamics and Climate) Tenth Training Course on Regional Application of Coupled Climate Models was successfully conducted in Qingdao, China. And the Tenth Anniversary of ODC center was held at the First Institute of Oceanography, Ministry of Natural Resources, China. This training course was in hybrids mode of online and onsite participation. Nine famous experts from United States, Australia, Japan, Malaysia and China were invited to give lectures for 127 trainees from 24 countries during the training course.



Group photo of the tenth training course in 2021 (Onsite only)

(1) Opening Ceremony

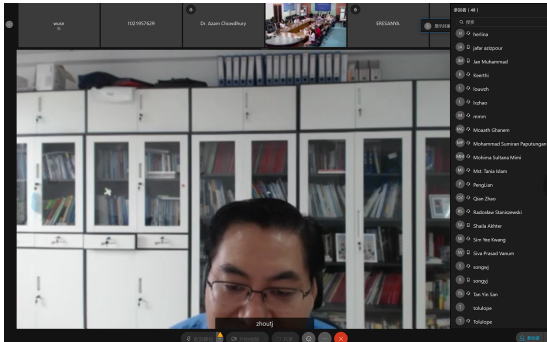
The opening ceremony of the 10th UNESCO/IOC-ODC Training Course and the 10th anniversary of the center were held in the afternoon of 5 July, 2021 at the First Institute of Oceanography (FIO), Ministry of Natural Resources (MNR) of China in Qingdao. The ceremony, chaired by Mr. Yafeng Yang from Department of International Cooperation of FIO, was attended by Mr. Shengzhi Sun, Deputy Inspector of Department of International Cooperation, Ministry of Natural Resources, Dr. Vladimir Ryabinin, Assistant Director General of UNESCO and Executive Secretary of IOC, Prof. Kentaro Ando, Co-chair of IOC Sub-Commission for the Western Pacific (IOC/WESTPAC), and Dr. Wenxi Zhu, head of IOC/WESTPAC Secretariat. In their welcome and congratulation speeches, the great achievements of the ODC center were heavily recognized.

(2) Training Lectures

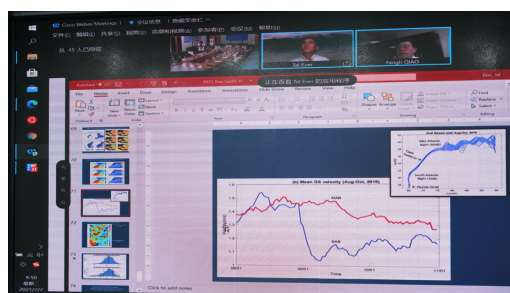
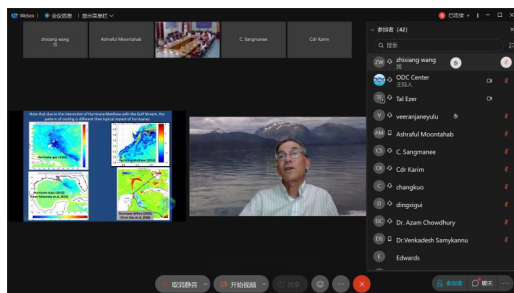
After 10th anniversary and opening ceremony of the ODC center, the two-weeks training course started. Due to the challenging global situation of COVID-19, only applicants based in China participated in the onsite training in person, while online training through webex.

Restricted distribution

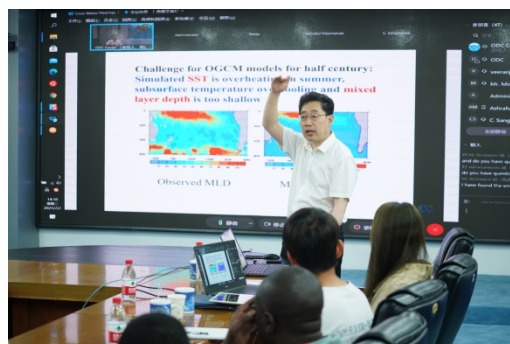
On 6 July, 2021, Prof. Tianjun Zhou gave lectures on the East Asian climate response to natural and anthropogenic forcing. He presented the reasons behind the strengthening and weakening tendencies of the East Asia Monsoon and the observed drying trend in global land monsoon precipitation's attribution to anthropogenic forcing.



On 7 July, 2021, Prof. Tal Ezer gave lectures on the air-sea interaction for hurricane modeling and global/regional sea level rise in the morning session. He presented that the air-sea coupled model could provide a better prediction on the intensity of hurricane. He also mentioned about the impact of the Gulf Stream of Mexico on the sea level rise near the American shore. Prof. Tal Ezer stated that the coupled model of POM and WRF actually underestimated the storm surge compared with just using the POM model. On 8 July, Prof. Tal Ezer continued his lecture on the air-sea interaction for hurricane modeling and global/regional sea level rise. Prof. Tal Ezer stated the importance of predicting future sea level rise through listing some hazardous effects it brought to us. He discussed about the challenges facing in the process of predicting future sea level rise. Prof. Tal Ezer's lecture focused on the sea level rise aspect from climate change and its impacts from local examples to global variability.

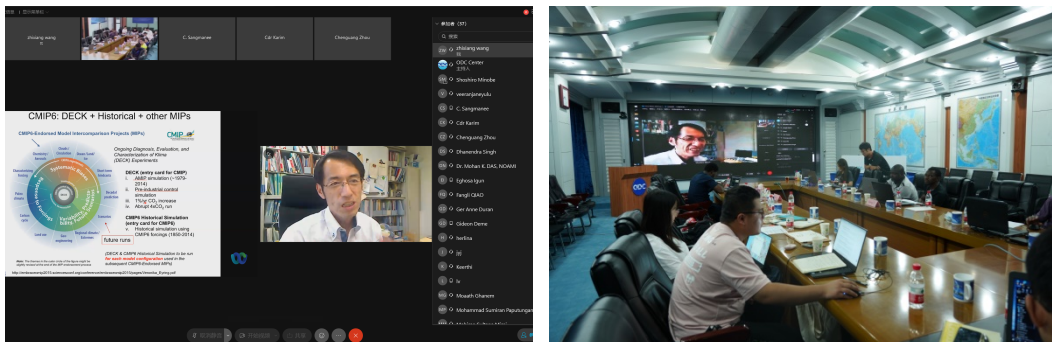


On the afternoon of 7, July, 2021. Prof. Fangli Qiao gave lectures on the development of Ocean Forecasting System (OFS) and its applications. Prof. Fangli Qiao pointed out two high uncertainties for ocean general circulation models: ocean mixing and air-sea fluxes. Wave effect was introduced into the model to produce better results. There are three physical processes related to ocean waves: nonbreaking surface wave-induced vertical mixing, Stokes drift and sea spray. Prof. Fangli Qiao introduced the Ocean Forecasting System, and by incorporating the three wave-related processes into the model, and the coupled model provided much better prediction results for high intensity typhoon.

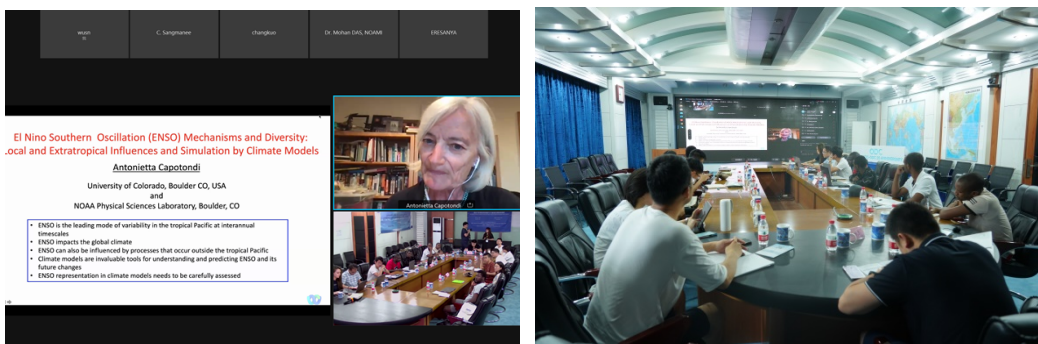


Restricted distribution

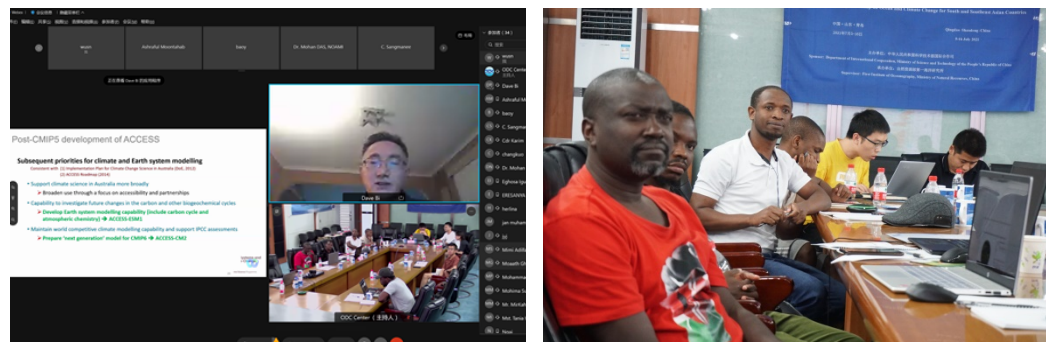
On 9 July, 2021, Prof. Shoshiro Minobe gave lecture on the introduction to CMIP multi-model analyses. In the morning session, Prof. Shoshiro Minobe discussed about the coupled CMIP models and the CMIP forcing. He provided a detailed introduction for the CMIP6 models and the use of scenarios in CMIP. In the afternoon session, Prof. Shoshiro Minobe shared some of his research results including the applications of CMIP6 models, sea level rise in western boundary regions, relation between ocean interior sea level rise and western boundary sea level rise and etc. In the last part, Prof. Shoshiro Minobe demonstrated some implementations of the Python scripts for CMIP6 data.



On 12 and 13 July, 2021, Prof. Antonietta Capotondi gave lectures on ENSO mechanisms and diversity: local and extratropical influences and simulations by climate models. She introduced the key ENSO characteristics and their representation in models. She discussed about the tropical ENSO dynamics including the evolution of equatorial heat content and wind forcing. She also talked about the ENSO diversity and the precursors of ENSO diversity.



In the afternoon of 13 and 14, July, 2021. Prof. Dave Bi gave lectures on the new generation Australian community climate and earth system simulator coupled model. He provided further information on the ACCESS system. He presented future developments of ACCESS and shared experimental results regarding SST and its critical influence on ENSO variability.



On 14 July, 2021, Prof. Yajuan Song from First Institute of Oceanography, MNR, China gave lectures on seasonal climate prediction of Northwest Pacific based on FIO-ESM model. She discussed about the earth system climate, climate change and climate variability. She provided some predictable patterns of climate in ENSO and monsoon by using the FIO-ESM model.

Restricted distribution



In the afternoon session, Prof. Fredolin Tangang from National University of Malaysia, Malaysia gave lectures on the coordinated regional climate downscaling experiment in the Southeast Asia. He shared some key findings on climate change and mentioned the importance of regional climate downscaling. He introduced the coordinated regional climate downscaling experiment (CORDEX) framework and its implementation and the simulation findings in Southeast Asia.



On 15 July, 2021, Prof. Hong-li Ren gave lectures on ENSO diversity: feature, mechanism, monitoring and prediction. He discussed about the feature and mechanism of the two ENSO types: the canonical or eastern Pacific (EP)-type and Modoki or central Pacific (CP) type. He also talked about the dynamical and statistical model predictability and the ENSO monitoring. In the afternoon session, he provided an introduction of MJO by including some key features and representative indices such as RMM. He then discussed about the MJO's impacts and its operation in Beijing Climate Center (BCC) models.



(3) Forum for Early Careers Scientists

Besides the lectures and practical exercises, Forum for Early Career Scientists was carried out to deepen understanding and promote cooperation during these two weeks, which included some activities such as trainee reports, group discussion and group reports.

1) Trainee Reports

During the training course, due to hybrids mode of online and onsite, we collected videos and share them online, 3 trainee reports were held. 31 trainees provided a video and ppt to introduce their research work related to the topic of this training course, their research area, academic

Restricted distribution

achievements and preliminary idea for cooperation with other countries in the region. After the reports, trainees could ask their questions. Through interaction, trainees have better known each other and found some common interests. The activities also promoted the understanding of each other and increased the trainee's enthusiasm to grasp new knowledge from the training course.



2) Group discussion and reports

During the training course, all the trainees were divided into 10 groups, onsite were divided into 3 groups and online were into 7 groups. Trainees in each group completed the exercises, carried out group discussions, and prepared group reports. In addition, each group was required to make PPT together to introduce their group members, cooperation and new knowledge gained from the training course, results of their assignments and suggestions for future cooperation. The group discussion and reports provided more chance for the trainees to perform a first attempt to work together and some prospective cooperation in future research.

Through heated group discussion and lots of activities, group report was held on the morning of 16, July. During the final group report, and one group's representative reported at 4:00 am local time. One group missed the report time due to network problems, but still insisted on doing report in the late time, also have recorded and shared it with all trainees. Each group expressed sincere gratitude for the Lectures and training, and looked forward to ODC center's continuous innovation and greater achievements.



Restricted distribution



(4) Farewell ceremony

The farewell ceremony was held in the afternoon of 16 July, 2021. Prof. Fangli Qiao, Prof. Hong-li Ren, Dr. Yajuan Song, Dr. Xunqiang Yin and all trainees attended the ceremony. Certifications were issued to those trainees who had completed all the courses. Group leaders, group secretaries and volunteers were issued a certification for their great contribution in this training course. Nine trainees (Mr. Augustine Onyango, Mr. Tolulope Emmanuel Oginni, Ms. Hui Ren, Mr. Emmanuel Eresanya, Mr. Eghosa Igun, Mr. Chalermrat Sangmanee, Mr. Yee Kwang Sim, Mr. Jan Muhammad and Mr. Mohan Kumar Das) were awarded as the best trainees based on their performance during these 2 weeks training. Special certifications had been issued to them by Prof. Fangli Qiao, Prof. Hong-li Ren and Dr. Yajuan Song during the ceremony. Online trainees also expressed their gratitude virtually. It is worth mentioning that one online trainee expressed her sincere gratitude to ODC Center and expert lecturers on the chat board even though it was already 2:00 am in their local time.

Restricted distribution



2. Eleventh ODC Training Course on Prediction and Projection of Climate.

During August 14-28, the UNESCO/IOC-ODC (UNESCO/IOC Regional Training and Research Center on Ocean Dynamics and Climate) Eleventh Training Course on Prediction and Projection of Climate (22-28 August 2022), back to back with the second CLIVAR-FIO joint summer school (14-22 August 2022), was successfully accomplished in Qingdao. This training course was in hybrid mode with online and onsite participation. Eight famous experts from United States, Germany, Japan, Malaysia, Indonesia and China were invited to give lectures to 148 trainees from 33 countries. The summer school covered Ocean Macro-turbulence and Its Role in Earth's Climate. While the ODC training course was designed to comprehensively

introduce the dynamics of climate variability, prediction and projection of climate, evaluation of climate models and new findings from the CMP6 assessment reports (AR6) of the United Nations.



Group photo of the Eleventh training course together with the second CLIVAR-FIO joint summer school in 2022 (Onsite only)

(4) Training Lectures

Due to the global situation of COVID-19, only approved applicants in China participated in the training in person this year, and online trainees joined through zoom. On 22 August, 2022, Prof. Fangli Qiao introduced New Generation of Earth System Model (FIO-ESM v2.0) for Climate Prediction, he talked about the difference between ESM and Climate Model, and discussed how to distinguish prediction, forecast and projection, what are climate change and climate variability. Prof. Yajuan Song presented what climate change and climate variability was, and she also talked about decadal climate prediction system FIO-CPS V1.0 and V2.0.



On 23 August, 2022, Prof. Tianjun Zhou gave lectures on Climate Change and Extreme Events and Projection of Climate Change at Global Warming Levels of Paris Agreement. He also discussed projection of climate change at global warming levels. In the afternoon, Prof. FredolinTangang introduced regional downscaling methods for climate change projection including dynamical downscaling method and statistical downscaling method, and he discussed CORDEX regional climate downscaling activities. On 24 August 2022, Prof. Shoshiro Minobe from Department of Earth and Planetary Sciences, Hokkaido University of Japan, gave lectures on Climate Change and its Costal Impacts in the Pacific Ocean. He gave lectures from three questions on the sea level rise(SLR) in the western boundary regions. Then he taught students how to use Python to do analysis on climate change and did exercises.

Restricted distribution



On the 25 August, 2022, Prof. Zhaohua Wu from Florida State University of USA gave lecture on the application of Python in Climate Dynamics. And Prof. Nelly Florida Riama from Center for Research and Development, Agency for Meteorology, Climatology, and Geophysics of Indonesia, gave lecture on applications of using climate predictions for services. In the afternoon, Prof. Nelly Florida Riama introduced the applications of using climate predictions for services. She talked the climate system and climate prediction. Then she introduced climate information and climate change impact for special sector. Finally, she discussed the climate literacy.



On 26 August, 2022, Prof. Zhaohua Wu introduced annual cycle of the surface air temperature and the physical origin of surface air temperature. He discussed the basics of heating the earth by the sun. In the afternoon, Prof. Gerrit Lohmann, Alfred Wegener Institute of Germany, gave the lecture on: What our climate history can tell us about the future? He discussed the glacial climate, orbital theory, ice ages and abrupt climate change.



(2) Forum for Early Careers Scientists

During the training course, due to hybrids mode of online and onsite, we collected all self-introduction and share them online, 4 trainee reports were held. 72 trainees provided a video and PPT to introduce their research work related to the topic of this training course, their research area, academic achievements and preliminary idea for future cooperation. After the reports, other trainees asked questions. Through interaction, trainees have better known each other and found some common interests in research for discussion.

Restricted distribution



(3) Group discussion and reports

During the training course, all the trainees were divided into 8 groups, onsite were divided into 3 groups, and online were into 5 groups. Trainees in each group completed the exercises, carried out group discussions, and prepared group reports. In addition, each group was required to make PPT together to introduce their group members and new knowledge gained from the training course, results of their assignments and suggestions for future cooperation. The group discussion and reports provided more chance for the trainees to perform a first attempt to work together and some prospective cooperation in future research among them become more possible.



ONLINE GROUP-1

COME WITH FEW OR ZERO

OCEANOLOGY, CLIMATE PREDICTION, MATLAB, PYTHON BY THEORY, PRACTICE, EXERCISE

GOAL
To gain the skills and, finish the course with good research proposal

THEORY
Oceanic Mesoscale Eddies, Mesoscale air-sea interaction, Dynamical upwelling of eddy, important of ocean mix layer depth, Role of ocean macroturbulence in climate simulation and prediction, Physical/biogeochemical processes & interactions, Sea level rise, Coastal impacts of Climate Change, Extremes Climate Change Events, Climate Projection, Dynamical downscaling methods of regional climate, Glacial Climate, Orbital Theory

PROGRAMMING
Ocean Models, LICOM Forecast System (LFS), FIO-CPS v2.0, Earth System Model, Climate Model Intercomparison Project, Energy Balance Model, Python in Climate Projection, MATLAB in Eddies Analysis

GROUP WORK
"INTERACTIONS OF SOUTH EAST ASIA WINTER RAINFALL WITH THE OCEANS SURFACE TEMPERATURE AND MIX LAYER DEPTH"

- defined subject and study area
- formulate research questions
- identify and observe variables
- formulate hypotheses
- make observations
- use case-studies
- conduct experimentation
- use measurements
- strive for good communication

GROUP

Principal Investigator Kyan Tian Ou	Co-Investigator Gandy Rosales	DATA Coordinator Ziyang Xuan
Regulatory Coordinator Ranui Firdaus	DATA Coordinator Kaini Li	Research Coordinator Yiji Zhang

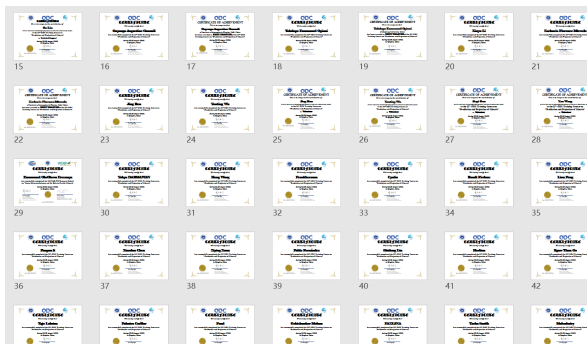
Video call participants: 乔安彦 (Kyan Than Oo), Qian Zhao, CLIVAR..., Fangli QIAO-China

(4) Farewell ceremony

The farewell ceremony was held in the afternoon of 27 August, 2022. All the trainees, Prof. Fangli Qiao, Dr. Wei Zheng and Dr. Xunqiang Yin attended the ceremony. Certifications were issued to those trainees who had completed all the courses. Group speakers and volunteers were issued certificate for their great contribution in this training course. 4 trainees (Mr.

Restricted distribution

Changlong Liu, Mr. Dickson Mbigi, Mr. Kyaw Than Oo and Tojo Lalaina) were awarded as the best trainees based on their performance during the training course. Special certifications had been issued to them by Dr. Wei Zheng and Dr. Xunqiang Yin during completion ceremony. The lectures, exercises and Forum for Early Career Scientists in training course have helped the trainees improve their understanding of the Prediction and Projection of Climate, and strengthen the personal friendships among participants.



4. Development of the Forum for Young Marine Scientists (FYMS)

Through the provision of annual training courses, workshops and joint researches, the ODC center has witnessed increasingly active exchanges, steadily expanded cooperation, and deepened international friendship among participants in the past years. It has been instrumental in developing an early career professional network with the attendance of previous trainees. In the context of global epidemic in the past two years of 2021-2022, there has been an increasing demand for enhancing international exchanges among them. Therefore, the ODC center started to establish the International Forum for Young Marine Scientists (FYMS). In 2021 mainly through online meetings.

(1) FYMS on 15 April 2021

The first FYMS meeting focusing on Advanced Tools Used in the Research of Ocean and Climate was held on 15 April 2021. This forum attracted 34 participants, mainly from Indonesia, Bangladesh, Ethiopia, Poland and China. The topics of this forum covered the Static and Dynamic Visualization of Oceanography Data, Oceanic Data Visualization Works with Python, and Prediction of Droughts in Ethiopia using ANN.



(2) FYMS on 30 September 2021

The second FYMS meeting during the 10th ODC training course which is a part of the Forum for Early Careers Scientists. And the third FYMS was held on 30 September 2021. The topics of this forum covered “Structure of the Pacific Walker circulation (PWC) Depicted by the Reanalysis and CMIP6”, “Impacts of Extreme Hot Climate on Covid19 Spread in India”, ENSO Cold Phase on Equatorial East Africa Seasonal Drought, the Science Diplomacy for our Marine Systems Governance.



(3) FYMS on 25 November 2021

On the occasion of the meeting “Decade Action Incubator of United Nations Decade of Ocean Sciences for Sustainable Development”, the topics are the common interests of the ODC trainees. Therefore, the ODC center has invited the previous trainees to attend this meeting and this activity was carried out as one section of the FYMS. During this meeting, 2 previous trainees, such as Dr. Sheng Chen and Dr. Azam provided talks and the other previous trainees attended with heavy discussion. We were very glad to notice that previous trainees had growth quickly in attending variety of international meetings.

Restricted distribution



The vision of Seamless Ocean Forecasting and Service System (SOS) is to develop new generation seamless ocean and climate forecast systems, and provide high quality services to public for integrated ocean management, reduction and prevention of the impacts of ocean and climate natural hazards, protection of marine ecosystem, mitigation and adaptation to climate change and variabilities, and scientific research community.

SOS will promote multidisciplinary, solution-oriented approaches including low-cost new observational buoys and high efficient platforms, algorithms of air-sea fluxes especially under extreme weather conditions, coupled models and new assimilation techniques, multi-hazard early warning systems, and coordination mechanisms aiming for raising the public engagement into the UN Ocean Decade. All related stakeholders who are interested in SOS are highly welcome to attend this Decade Action Incubator to catalyze partnerships, strengthen dialogue, initiate co-designing processes, and facilitate the development of SOS UN Decade program.

Speakers



Mohd Fadzil Akhir
Universiti Malaysia Terengganu



Liew Juneng
Universiti Kebangsaan Malaysia



K. M. Azam Chowdhury
Dept. of Oceanography, University of Dhaka, Bangladesh



Sheng Chen
First Institute of Oceanography
Ministry of Natural Resources, China



Byoung-Ju Choi
Chonnam National University
Republic of Korea



Chalermrat Sangmanee
Phuket Marine Biological Center, Thailand

Date & Time

25 November 2021
1530-1730
(UTC+7, Bangkok time)

Registration

Incubator Program

Conveners



Fangli Qiao
First Institute of Oceanography
Ministry of Natural Resources, China



Fredolin Tangang
Universiti Kebangsaan Malaysia



Botao Xie
China National Offshore Oil Corporation, China

(4) FYMS on 27 April 2022

The 4th FYMS was successfully accomplished in the afternoon of 27 April 2022. The topics of this forum covered inter-annual variation of chlorophyll-a and its relationship with physics-chemical parameters, Indian Ocean Dipole in the northern Bay of Bengal, Ocean Response to super typhoon Haiyan based on Multi-Platform Datasets. In the last but also a new part, we talked about the 10th ODC training course, and trainees expressed their hope to have more time for practice, group discussion, and extracurricular activities during the following training courses.



(5) FYMS on 15 November 2022

The 5th ODC International Forum for Young Marine Scientists was successfully accomplished in the afternoon of 15 November, 2022. The topics of this forum covered the analysis of interannual relationship between Myanmar Southwest Monsoon (MSwM) and the Oceans, Ocean Acidification monitoring programme in the DMCR, and Ocean to climate Seamless Forecasting system (OSF)

Restricted distribution

Programme, Fate of the Embayed Beaches on the Muddy and Sandy Coast in China, Global Distribution of Wind Stress by Considering Wave-induced Stress.

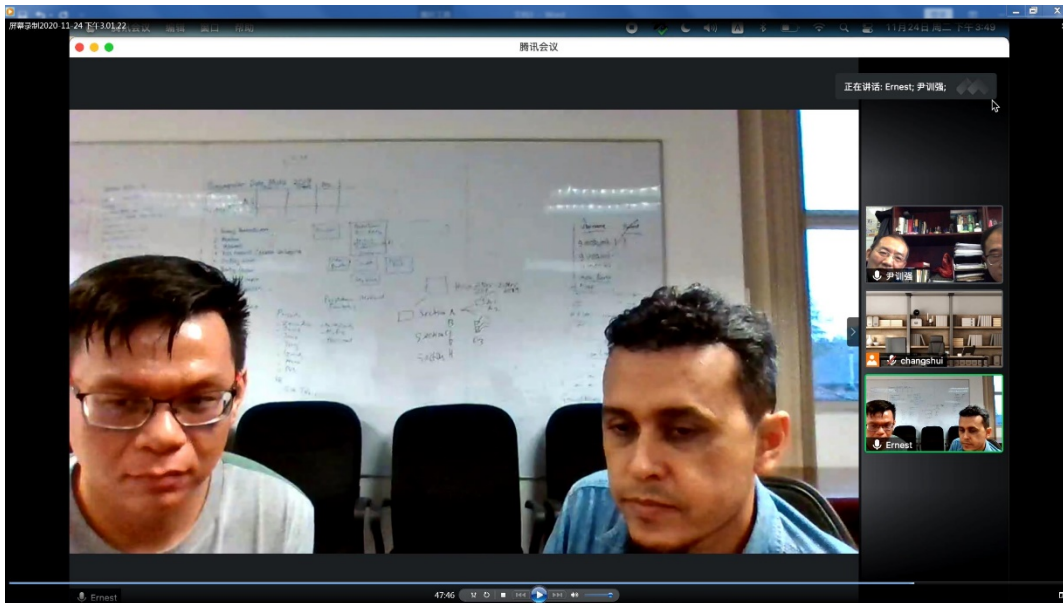


4. Joint research, workshop and emergency events

(1) Developing the Malaysian Ocean Forecasting System (MyOFS)

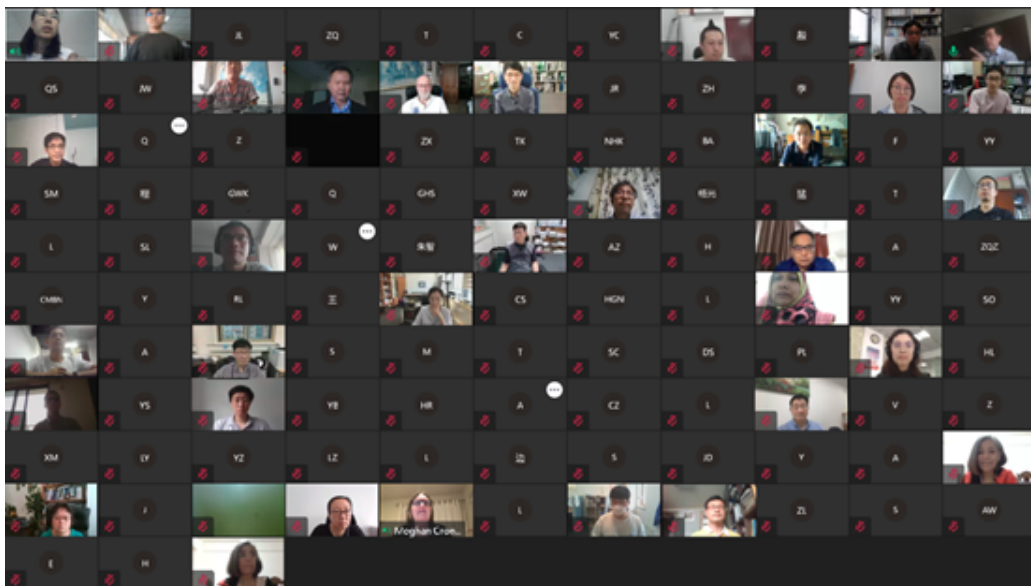
The MyOFS is developed as a supplementary product of the Ocean Forecasting System (OFS), which is one of the SEAGOOS Pilot Projects under the auspices of the IOC Sub-Commission for the Western Pacific (IOC/WESTPAC). It is the 1st OFS in Malaysia to have high-resolution forecast data for the marine environment protection through the successful collaboration between FIO of China and UMT of Malaysia. The annually ODC training courses have supported this system by training lectures and hands-on experience to early career professionals. On 24 November 2020, an online meeting was held for discussion the recent progresses of MyOFS and the problems faced during its development. Dr. Xuanqiang Yin and Dr. Changshui Xia from FIO, Dr. Mohd Fadzil Mohd Akhir, Director of the Institute of Oceanography and Environment, and PhD Candidate Kok Poh Heng from the University Malaysia Terengganu (UMT) attended for discussion.

Restricted distribution



(2) East Asian Workshop on A Predicted Ocean was held successfully online

The East Asian Workshop on A Predicted Ocean, as one of the important satellite activities of the second UN Ocean Decade Laboratory, was successfully held online on 17 September. It is co-sponsored by the First Institute of Oceanography (FIO), Ministry of Natural Resources of China, V.I.Ill'ichev Pacific Oceanological Institute of Russian Academy of Sciences (POI) and Chonnam National University of Korea (CNU), and technically supported by ODC center. A lot of up-to-date modeling and prediction studies from short to long time scales were presented during the workshop. During the workshop, 12 invited speakers gave talks around three topics: development and applications of ocean models in the East Asia countries, prediction on key processes, and prediction on extreme air-sea interaction. This 4-hour meeting attracted more than 120 participants from all over the world, especially those from East Asia.



4. A summary of key achievements since its establishment

Though past 12 years, 670 trainees from 54 countries, including Bangladesh, Brazil, Cameroon, China, Congo, India, Indonesia, Iran, Kenya, Malaysia, Mexico, Mozambique, Nigeria, Pakistan, Philippines, Poland, Russian Federation, South Africa, Sri Lanka, Sweden, Thailand, Yemen, Morocco, had been trained at ODC center through 11 training courses. They had learnt not only the advanced knowledge of the Ocean Dynamics and Climate especially on ocean and climate model development and applications, but also became familiar with the ocean and climate model research fronts.

Through the trainee reports, group discussion and reports, the ODC center provided serious FYMS for early career scientists. The trainees exchanged ideas on their research or study activities linked to the topic of the training course and cooperations started by working together during especially after the training course.

The ODC center had carried out much joint research in 2021 and 2022. For example, Dr. Mohd Fadzil Mohd Akhir from Malaysia Institute of Oceanography and Environment led the joint research on the recent progress of the Malaysia Ocean Forecasting System. FIO team of emergency forecasting provide kernel support for rescuing during the shipwreck in Cambodia. Through these activities, the ODC center expanded the cooperation with young scientists all over the world, and provided the training supports for some international cooperation projects of IOC/WESTPAC, such as the OFS (Ocean Forecast Systems).

5. Self-assessment on implementation against objectives

ODC center has carried out and successfully held relevant activities as planned, playing a solid platform role in providing training and collaborative research for young generation climate and ocean scientists, especially young marine scientists from developing countries. Although the training under the epidemic is quite challenging to carry out, the enthusiasm of online trainees has been so high. These made the training to run smoothly.

6. Problems encountered and recommended actions

Given the heavy influence of COVID-19, both the 10th and 11th training courses and FYMS were conducted through the hybrid mode of online and onsite. In 2023, we are planning to turn back to the offline training mode. Since the training course may held during the tourist season in Qingdao, the budget for the training is high, we will work hard to control costs and try to apply additional funding.

7. Objectives to be achieved, if applicable, over the next intersessional period (May 2023- April 2025)

ODC will continually carry out the annual training courses and the FYMS. More efforts will be taken to continuously improve the performance of these activities and establish Committee for FYMS.

8. Planned activities for May 2023- April 2025

- 1) 12th ODC Training Course on Ocean model and data assimilation
- 2) 13th ODC Training Course on Modeling of ocean ecosystem
- 3) Regular FYMS Activities related to ocean dynamics and climate

[provide, in tabular form, the action items that should be included in the work plan and budget]

Program	Activities	Objectives	Expected outputs/outcomes	Date and place	Funding Required		Remark
					IOC	Other sources (i.e., from national or international)	
IOC Regional Training and Research Center on Ocean Dynamics and Climate	1. 12 th ODC Training Course	Ocean model and data assimilation	Understanding the simulation of ocean dynamic processes, new generation ocean models, basic theory and principles of data assimilation, data assimilation method and systems for operational ocean forecast system	2023 Qingdao	US\$20K expected	US\$60K (China) US\$20K (local host)	Annual Training Course
	2. 13 th ODC Training Course	Modeling of ocean ecosystem	Understand Basic dynamics of ocean circulation, surface wave, tide and mesoscale eddies in the open ocean and shelf regions, multi-processes coupling in ocean models, and numerical models of marine ecosystems.	2024 Qingdao	US\$20K expected	US\$60K (China) US\$20K (local host)	Annual Training Course
	3.Regular FYMS Activities	Related to Ocean dynamics and climate	Improve the exchange of knowledge scholars from different countries.	2023-2024 Qingdao		US\$10K(local host)	Annual FYMS