CIC NEWSLETTER No.17 2019

Center for International Collaboration
Atmosphere and Ocean Research Institute
The University of Tokyo

Regional Planning Workshop of the UN Decade of Ocean Science for the North Pacific and Western Pacific Marginal Seas

Participants of the regional workshop for the UN Decade of Ocean Science held in Tokyo

Yutaka Michida
Professor, Center for International Collaboration

In preparation for the UN Decade of Ocean Science for Sustainable Development (2021–2030), a regional planning workshop was held on July 31 to August 2, 2019, at Iino Hall Conference Center in Tokyo. It was one of the series of regional consultative and planning workshops to identify regional needs and requirements for the UN Decade of Ocean Science, organized jointly by the IOC Sub-Commission for the Western Pacific (IOC/WESTPAC) and the North Pacific Marine Science Organization (PICES) with financial support from the Ministry of Education, Cultural, Sports, Science, and Technology of the Japanese government. JAMSTEC and CIC jointly contributed to the workshop as partner organizations of the host country.

Over 160 attendees gathered from 18 countries, mainly of the North and Western Pacific region. The participants were from a variety of sectors including universities, academic institutions, NGO/NPO, private companies, governmental agencies, and international organizations. The workshop started with opening remarks by key organizations including, Ms. Mami Oyama, Secretary General for Japanese National Commission for UNESCO, Dr. Vo Si Tuan, Chairperson of IOC/WESTPAC, Mr. Takashi Hamada, Cabinet Counsellor of the Japanese Cabinet Office, Dr. Chul Park, Chairperson of PICES, Mr. Shigeru Aoyagi, Director of UNESCO Bangkok, and Dr. Vladimir Ryabinin, Executive Secretary of IOC (via video messaging). Four members of the Executive Planning Group (EPG) also joined the discussions. Having had a keynote presentation by

Prof. Michida (center) suggesting possible solutions on the data sharing policy at the breakout session on "transparent and accessible ocean" convened by Dr. Leinen (right)

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Prof. Uematsu leading the discussion at the breakout session on "clean ocean"

Dr. Julian Barbiere of IOC and plenary talks by EPG members, there were organized breakout sessions for six thematic areas relevant to the six societal outcomes of the UN Decade of Oceans Science co-convened by a couple of leading scientists for each theme.

Prof. Mitsuo Uematsu, professor emeritus of the University of Tokyo, the former Director of CIC, gave a plenary talk on one of the desired societal outcomes "clean ocean" and led the discussion at its breakout session. Prof. Hiroaki Saito led the discussion at the breakout session on "sustainably harvested ocean" as a co-convener of the session. Prof. Yutaka Michida, the Director of CIC, contributed to the breakout session on "transparent and accessible ocean" co-convened by Dr. Margaret Leinen (Director of Scripps Institution of Oceanography, USA), Dr. Somkiat Khokiattiwong (the former Chairperson of WESTPAC), and Dr. Kim Juniper (Chief Scientist of Ocean Networks, Canada). "Transparent and Accessible Ocean" covers a wide range of cross-cutting issues, such as data and information sharing, capacity development, ocean literacy, and public awareness of the ocean, among others, which should provide fundamental infrastructure for the successful implementation of the UN Decade of Ocean Science.

The results of the workshop will be presented at the forthcoming EPG meeting in January 2020 and at the 2nd Global Planning Meeting in March 2020 for further discussion toward finalizing the Implementation Plan of the UN Decade of Ocean Science.

Layout of plans to prepare the UN Decade of Ocean Science by EPG members

Mitsuo Uematsu
Emeritus Professor, AORI, the University of Tokyo

The first meeting of the Executive Planning Group (EPG) of the United Nations Decade of Ocean Science for Sustainable Development (2021-2030) was held at UNESCO from December 17-19. Nineteen experts were selected and met from diverse fields in ocean science, technology, policy, management, and advocacy to brainstorm on scientific, governance, communications, and engagement elements of the decade ahead of a first Global Planning Meeting and a series of regional consultations to channel stakeholder input into the preparatory process.

The Decade of Ocean Science is set to begin officially in 2021. The EPG members have been working in coordination with the IOC Secretariat to process into a draft Implementation Plan for the Decade the many stakeholder inputs coming from various global and regional consultations. From Asian countries, Dr. Fangli Qiao from First Institute of Oceanography in China, Dr. Youn-Ho Lee from Korea Institute of Ocean Science and Technology, Republic of Korea and I have been serving as the EPG members.

Within the road map, research and development priority areas include creating a comprehensive digital atlas of the ocean, implementing a comprehensive ocean observing system, developing a quantitative understanding of ocean ecosystems and their functioning, improving an ocean-related multi-hazard warning system, and expanded programs in capacity building, education, and ocean literacy.

There was wide consensus within the Group that the Decade of Ocean Science must also transform how nations around the world invest in ocean science, both from the public and private sectors, and how decisions-makers use the available scientific knowledge to make better-informed policies for ocean management. All the EPG members agreed that capacity development and the transfer of marine technology also need to be a key and cross-cutting priority, embedded deep into the planning process.

Within the context of the 2030 Agenda, in order to achieve the Sustainable Development Goals, we need an ocean that enables key social objectives. We need an ocean that is **clean**, where pollution is dramatically reduced. We need a **healthy ocean**, in which marine ecosystems are mapped and protected, where multiple impacts, including climate change, are measured and reduced, and the provision of ocean ecosystem services is maintained. We need better **predicted ocean processes**, where society has the capacity to understand current and future ocean conditions and forecast their change and impact on human well-being and livelihoods, thereby ensuring a sustainable future. We

Executive Planning Group members with the IOC Secretariat at the UNESCO Headquarters in Paris during the 1st EPG Meeting on December 17-19, 2018.

need a **safe ocean**, where human communities are protected from ocean hazards and where the safety of operations at sea and on the coast is ensured. We need a **sustainably harvested and productive ocean**, that ensures the continuing provision of food and alternative livelihoods needed to meet the needs of humans into the future. Finally, we need a **transparent and accessible ocean**, where all nations, stakeholders, and citizens have access to ocean data and information, have relevant technologies, and have the capacity to inform their decisions, thereby guaranteeing just and equitable access to ocean resources.

IOC Executive Secretary Vladimir Ryabinin says, *"This is the decade that is going to create the science we need for the ocean we want, and the ocean we need for the future we want."*

25th Session of the International Oceanographic Data and Information Exchange (IODE) of the IOC

Yutaka Michida
Professor, Center for International Collaboration

The 25th Session of the International Oceanographic Data and Information Exchange (IODE) was held on February 20–22, 2019, at Iino Hall Conference Center in Tokyo. An IODE Scientific Conference was also organized on February 18–19, 2019, just prior to the IODE Session at the same venue. At this Conference, global experts discussed possible ways to improve international oceanographic data and information sharing, which will be one of the key infrastructures for achieving a successful UN Decade of Ocean Science for Sustainable Development (2021–2030). A series of presentations were made regarding the future of IODE and emerging opportunities including the UN Decade of Ocean Science, regional IODE development and capacity building, and cooperation with partners. Ms. Mami Oyama, the Secretary General of the Japanese National Commission for UNESCO, gave an address at the opening session of the conference, and stated that the Japanese government would fully support preparation for the UN Decade of Ocean Science by providing extra-budgetary resources in addition to the regular contribution to the UNESCO. The conference was attended by approximately 150 experts from 40 countries including Dr. Vladimir Ryabinin, the Executive Secretary of the IOC, and leading scientists such as Prof. Toshio Yamagata and Dr. Yoshihisa Shirayama. It is noted that participants were not only from the academic community and governmental organizations, but also included related experts from private sectors.

Prof. Michida leading the IODE session. From right to left, Mr. Yabuki (the Director of JODC), Dr. Ryabinin (the Executive Secretary of IOC), Prof. Michida, and Dr. Chandler.

Professor Yutaka Michida has contributed a great deal to all IODE activities since the 1980s, when he was an officer of the Japan Oceanographic Data Center (JODC), the Japanese national contact to the IODE programme, and has been one of the co-chairs of IODE since 2015. He, together with Dr. Cyndy Chandler of the USA (another co-chair), led discussions during the session of IODE. Major issues discussed at the

IODE session covered: i) the IODE contribution to the UN Decade of Ocean Science for Sustainable Development, ii) development of the IOC Ocean Data and Information System (ODIS) as a one-stop service for oceanographic data and information, iii) enhancement of cooperation with partner organizations including JCOMM and related projects. The session adopted several decisions and recommendations, two of which were prepared as draft decisions for adoption at the IOC Assembly at its 30th Session.

Current co-chairs of IODE, Prof. Michida and Dr. Chandler, finished their chairpersonship at the end of the session. Dr. Sergey Belov of the Russian Federation and Dr. Taco de Bruin of The Netherlands were elected as new co-chairs for the next intersessional period until 2021. Prof. Michida and Dr. Chandler both received IODE Awards as out-going co-chairs.

Outgoing IODE co-chairs receive IODE Award. From left, Prof. Michida, Dr. Ryabinin (the Executive Secretary of IOC), Dr. Chandler, and Mr. Pissierssens (Head of the IODE Project Office)

Participants of the 25th Session of IODE

30th Session of the Assembly of the Intergovernmental Oceanographic Commission (IOC-30)

Yutaka Michida
Professor, Center for International Collaboration

The 30th Session of the Assembly of the Intergovernmental Oceanographic Commission (IOC) was held from June 26 to July 4, 2019, at UNESCO's headquarters in Paris. Professor Yutaka Michida, director of the Center for International Collaboration (CIC) of AORI, participated as the head of the Japanese delegation. Professor Hiroaki Saito also attended the meeting as a delegation member. The session adopted various decisions to prioritize programs and projects of the IOC. Of significant impact in terms of the entirety of the IOC activities for the next decade was a resolution adopted by the Assembly (IOC Resolution XXX-1) to accelerate the preparation activities for the UN Decade of Ocean Science for Sustainable Development (2021–2030), having examined the progress made during the last intersessional period since the Executive Council in 2018. The progress reports included the outcomes from the Executive Planning Group meeting in December 2018 and those from the First Global Planning meeting held in Copenhagen, Denmark, in May 2019. The resolution followed the proclamation by the United Nations General Assembly (UNGA) at the 72nd session in December 2017 and recalled the UNGA's invitation to the IOC to prepare an implementation plan for the Decade, and the Resolution IOCEC-LI.1 on the Decade adopted at the Executive Council in 2018. Based on Resolution XXX-1, a series of regional planning workshops have been organized to identify societal needs, and the scientific and technical requirements to meet these needs, from regional perspectives. Members in Japan hosted one of these workshops (in partnership with the North Pacific Marine Science Organization: PICES) in Tokyo on July 31 to August 2, 2019 (see the related article in this issue). The UN Decade of Ocean Science will start at the beginning of 2021 and the IOC should accelerate preparation of the implementation plan within the next year. Dr. Mitsuo Uematsu, Professor Emeritus of the University of Tokyo, and former director of the CIC, one of the 19 members of the Executive Planning Group (EPG) for the UN Decade of Ocean Science, will participate in the second meeting of the EPG to be held in Paris in January 2020. The results of the EPG meeting are to be reported to and discussed at the second Global Planning Meeting in March 2020, and then at the Ocean Conference in Lisbon in June 2020. The CIC will actively contribute to these plans for the UN Decade of Ocean Science in close partnership with the oceanographic and marine political community in Japan as well as with the Japanese government.

Another decision related to strategic matters of the IOC was a newly proposed body to enhance the collaboration with the World Meteorological Organization (WMO). The IOC Assembly adopted a resolution to establish a Joint WMO-IOC Collaborative Board, through the IOC Resolution XXX-2, which was a parallel resolution (WMO Resolution 9) adopted at the 18th WMO Congress. With the resolution, the IOC and WMO jointly established the Joint Board as a high-level coordination mechanism with broader engagement of the key relevant bodies of WMO and IOC. The Board consists of equal numbers of members from both organizations and will provide

Japanese delegation at the 30th Session of the IOC Assembly. From the left on the front row, Professor Saito, Professor Michida (the head of the delegation), and Dr. Kawano of JAMSTEC.

Professor Michida, voting a ballot paper for the election of the members of Executive Council of the Commission, on July 3, 2019.

the governing bodies of both organizations (the Assembly for IOC and Congress of the WMO, respectively) with strategic advice on joint work between WMO and IOC. With regard to the cooperation between WMO and IOC, there has been a very successful mechanism through the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM), established in 1999 by parallel resolutions taken by the WMO and IOC Assembly. Both WMO and IOC decided to abolish the JCOMM with establishment of the Joint Collaborative Board, after its successful 20-year history. One of the practically important issues for the next intersessional period as a transition to the new stage of collaboration between WMO and IOC is how to facilitate the continued work of all previous JCOMM functions and activities including appropriate working arrangements on both sides.

During the Assembly session, Professor Michida was appointed as the chairperson of the Resolutions Committee to review the draft resolutions and report results back to the plenary.

PICES-2019 Annual Meeting

Mitsutaku Makino
Professor, Center for International Collaboration

Coffee break discussions at the Victoria Conference Center (photo by PICES Secretariat)

Located at the southernmost part of Vancouver Island, the city of Victoria is one of the most beautiful and popular places in Canada. It is famous for the (relatively) warm climate, old English-style architectures and gardens, afternoon tea, as well as the offshore sightseeing tour for wild whales and orcas. During October 16–27, 2019, the City of Victoria hosted the 27th Annual Meeting of the North Pacific Marine Science Organization (PICES). More than 630 researchers, of which about 150 were early career scientists, participated under the theme "Connecting Science and Communities in a Changing North Pacific".

At the Opening ceremony, the PICES Science Board Chair, Professor Hiroaki Saito of the CIC summarized the organization's annual activities, including publications, collaborations with other international organizations/projects, and capacity development activities. The PICES-2019 Wooster Award was presented by Professor Saito to Dr. R. Ian Perry (DFO, Canada), for his distinguished academic achievements in ocean science and leading roles in PICES activities. Also, the PICES-2019 Chair Award went to Dr. Patricia Livingston (NOAA, USA) for her sustained contributions to PICES. During the meeting period, 331 oral and 113 poster presentations were made by presenters from 25 countries at the Science Board Symposium, 15 Topic Sessions, 5 Paper Sessions, and 19 Workshops. The Best Oral Presentation Award of the Science Board Symposium (S1) went to Dr. Aoi Sugimoto, Japan Fisheries Research Agency. At the Closing Session, Professor Saito received the certificate of thanks for his 3-year term as the Science Board Chair since 2016 (Photo), and the new Science Board Chari, Dr. Vera L. Trainer (NOAA, USA) was introduced.

Professor Saito (right) receiving the Certificate of Recognition for his service as the Science Board Chair

The next annual meeting will be held in Qingdao, China, October 22 to November 1. The theme is "How does 30 years of research on changing North Pacific ecosystems inform the UN Decade of Ocean Science for Sustainable Development Goals?"

The 2019 Wooster Award Winner Dr. R. Ian Perry (front left) at the whisky tasting party (photo by PICES Secretariat)

AORI and the National Taiwan Ocean University (NTOU) hold a joint symposium and conduct joint research

Hiroaki Saito
Professor, Center for International Collaboration

Attendees of the joint symposium.

AORI and NTOU exchanged an MoU regarding academic exchange in 2011. On March 14－15, 2019, NTOU president Prof. Ching-Fong Chang and faculty members visited AORI and held the AORI-NTOU Joint Symposium on Marine Science. We presented recent findings on our mutual interests such as the physical and ecological characteristics of the Kuroshio, biological diversity, environmental physiology, fisheries resources, hydrothermal vents, and coral reef ecosystems. AORI's graduate students gave three talks on hydrothermal ecosystems, phytoplankton growth in ultraoligotrophic ecosystems, and the life history of cephalopods. We also discussed future collaboration between the agencies. In 2019, Taiwan built three rsearch vessels, one of them called "Ocean Researcher 2" (45 m, 800 Gton). The ship will be operated by NTOU. Prof. Chang kindly offered shiptime for an NTOU-AORI joint cruise and logistical support for AORI scientists conducting field sampling along the coast of Taiwan. These were exciting and precious offers that are rare and a result of international collaboration. AORI acknowledged them, and AORI and NTOU scientists are planning some joint cruises in 2020–2021. Also, field samplings of cephalopods and benthos were realized. AORI offered use of our Joint Usage/Research facilities such as NanoSIMS and the International Coastal Research Center, and invited R/Vs Hakuho Maru and Shinsei Maru to research cruises. The next planned joint symposium will be in Keelung, Taiwan, based on joint scientific activities.

Academic Exchange Agreement between AORI and College of Environmental and Marine Science and Technology, Pukyong National University (CEMST-PKNU)


Ceremony exchanging MoU.

Hiroaki Saito
Professor, Center for International Collaboration

Pukyong National University, Busan, Korea has a long history of conducting research on marine and environmental sciences from its predecessor as the National Fisheries University of Busan. In 2000, AORI exchanged a Memorandum of Understanding (MOU) on academic exchange with the Korea Inter-University Institute of Ocean Sciences, PKNU; they have since collaborated on studies, especially on fisheries and geology. Therefore, in response to the structural reform of PKNU, both agencies decided to renew the MoU between AORI and CEMST-PKNU. CEMST consists of eight Departments (Environmental Engineering, Ocean Engineering, Oceanography, Earth and Environmental Sciences, Environmental Atmospheric Sciences, Energy Resources Engineering, Spatial Information Engineering, Ecological Engineering) and two institutions, and is the leading school of Korean marine sciences. On February 27, 2019, Dean and Professor Sanhoon Bae, Professor Seok Jin Oh, and other CEMST faculty members visited AORI and the MoU exchange ceremony was held. The faculty were welcomed by Prof. Hiroaki Saito, as a representative of Director Tomohiko Kawamura, Prof. Shingo Kimura, as a managing Professor of the MoU, and Associate Professor Jin-Oh Park. After the ceremony, future collaboration between AORI and CEMST was discussed. AORI explained their guest professorship system and invited the faculty of CEMST to apply. PKNU recently built R/V Nara (70.7 m, 1,893 tons). Prof. Bae invited AORI scientists to use R/V Nara for joint research. A tour of the Joint Use/Research facilities at AORI was given to consider future joint studies. AORI and CEMST decided to exchange scientists, have a joint symposium, and continue discussions regarding collaborating on studies to solve marine scientific issues of mutual interest.

Strategic Partnership activities during the FY2019 with the Australian National University

Yusuke Yokoyama
Analytical Center for Environmental Science: ACES

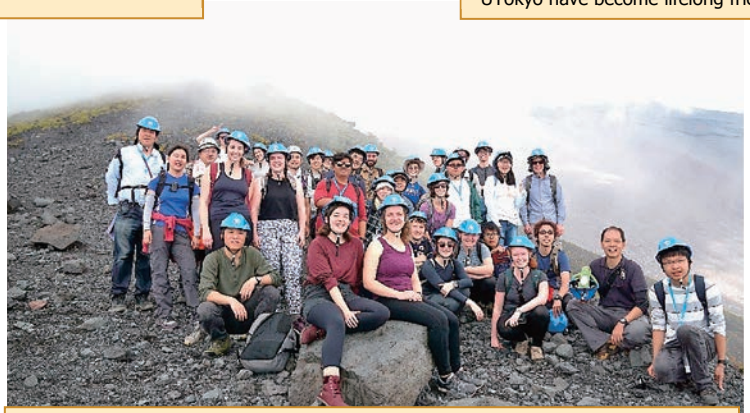
Another year of active exchanges of students and staff between the Atmosphere and Ocean Research Institute (AORI) and the Australian National University (ANU) were conducted during FY2019. Twenty delegates from ANU consisting mainly of undergraduate students, visited AORI and other locations of Japan in September as part of the Earth and Planetary Environmental Science International Short Course II (EPESIS Course II). At the University of Tokyo (UTokyo), this course is offered to all UTokyo students (undergraduate and graduate). From these, more than 10 students from different schools of the university joined. The total of 30 students were divided into 5 groups during the course and stayed at the same accommodations throughout. The fortnight experience made their mutual understanding of cultures and friendships stronger and collective efforts in writing daily reflections provided a venue suitable for nurturing camaraderie. This was the third EPESIS-I course held in Japan and the first time that it included a visit to Otsuchi after the new building was opened last year at the International Coastal Research Center (ICRC). Students learned about various aspects of geohazards during the trip. Thanks are extended to Professors Michida, Hyodo, Makino, Shinzato, Kawamura, Aoyama, Fukuda, Tanaka, and Hayakawa, as well as to Dr. Nobata and the staffs of AORI and ICRC for various help in running the course. Detailed information on the course can be found at [(https://twitter.com/hashtag/geohazardsncp19?src=hash) (https://www.instagram.com/explore/tags/geohazardsncp19/)].

An associated program (namely EPESIS I) will be held in February 2020. Students from UTokyo will travel to the South Eastern coast of Australia as well as to ANU campus. They will learn about the culture and landscape of Australia through ANU professors and indigenous rangers. AORI also co-organized another exchange program run by the Go Global Gateway office in January–February 2020. This was mainly an exchange program for 1st and 2nd year students; hence teaching assistants and lecturers were provided to support the activities held in Tokyo, Mt. Fuji, and in Australia.

Active collaborative research activities should also be noted here. Australian researchers also visited AORI this year to conduct collaborative projects. An example is Dr. Penxiang Hu, an expert on paleogeomagnetism, who was in residence at ACES to conduct ^{10}Be chemistry. Students and staff also visited the Department of Nuclear Physics of ANU to learn chemistry related to conducting accelerator mass spectrometry (AMS) in February 2020. Prof. Yokoyama met Professors Eggins and Heslop, respectively, the director and vice director of the Research School of Earth Sciences at ANU, to discuss plans for future exchanges.

Students learnt about Tsunami mitigation plan on top of "life saving mound (INOCHI YAMA)" in Hamamatsu City.

A picture taken at the farewell party. Students from ANU and UTokyo have become lifelong friends.



A group photo taken at the Hoei crater, Mt Fuji.

The 2019 University Allied Workshop on Climate and Extreme Weather, August 21–23, 2019

Masaki Satoh
Professor, Center for Earth Surface System Dynamics

The student convener team and the host professors. From left to right: Prof. Chung-Hsiung Sui (NTU), Mr. Takahiro Ishiyama (AORI), Mr. Yong-Jhih Chen (NTU), Mr. Chung-Wei Lee (NTU), and Prof. Masaki Satoh (AORI).

The 2019 University Allied Workshop on Climate and Extreme Weather was organized for the period August 21–23, 2019 by the Atmosphere and Ocean Research Institute (AORI), at The University of Tokyo, jointly with the Department of Atmospheric Sciences at National Taiwan University (NTU). This series of workshops between AORI and NTU is held every two years. Previous workshops were held at NTU in August 22–24, 2017, and at AORI in September 29 to October 1, 2015. These workshops are intended mainly to enhance communication between the students and early career researchers of the two institutes. Through the workshop, we expect intense discussions on research topics of interest to participants, to foster future possible collaboration and communication.

Student group discussions, August 22, 2019.

The workshop theme of this year is “climate and extreme weather”. Because this year was part of the period for synthesizing the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6), we encouraged presentations on recent advances in understanding, analysis, observations, and numerical modeling on climate variability, climate change, and their effects on extreme weather including extreme rainfall and typhoons. There were about 50 participants in the workshop, including 12 students/post-docs and six members of the faculty of NTU.

The workshop was organized by students from AORI and NTU. Mr. Ishiyama (AORI), Mr. Yong-Jhih Chen (NTU), and Mr. Chung-Wei Lee (NTU) formed a student convener team, and communicated before the workshop to formulate the program. They arranged the abstracts into oral and poster presentations, and longer presentation time was given to Ph.D. students. They also invited all the faculty members to give presentations on hot topics or to give overview talks about their specialties. In the afternoon of the second day, the students were divided into five splinter groups to have intensive discussions on the following topics:

1. Anthropogenic influence on weather and climate extremes
2. Can global resolution large eddy simulations (LES) reproduce climate change?
3. What is needed to make a perfect prediction of a typhoon?
4. Current problems of tropical weather and prospects for the next 10 years
5. How many satellites should be launched to advance science?

Each group summarized the discussions and reported the results on the third day to stimulate further discussions with all the participants. The discussion material, along with the program and meeting information, can be found at the meeting site http://cesd.aori.u-tokyo.ac.jp/uaw2019/.

Group photograph at the 2019 University Allied Workshop on Climate and Extreme Weather, August 21, 2019. Atmosphere and Ocean Research Institute, The University of Tokyo.

The next joint workshop between AORI and NTU will be held at NTU in August 2021. Although this workshop is intended to provide an opportunity for communications between the members of the two universities, students are encouraged to visit mutual universities either for short- or long-term stay. We also encourage students to communicate with mutual faculty members for continuous commitment by students to their progress in research.

For the participating students from NTU, AORI provided support in the form of travel fees. We acknowledge support by the Research Hub for Big Data Analysis of Global Water Cycle and Precipitation in Changing Climate (led by Prof. Yukari Takayabu), the Center for the International Collaboration Atmosphere and Ocean Research Institute, and the Center for Earth Surface System Dynamics.

20th Anniversary Ceremony of the Research Cooperation between AORI and the Institute of Natural Sciences and Mathematics of Ural Federal University (INSM/UrFU)

Ryoichi Imasu
Professor, Division of Climate System Research

Group photo of primary members at the joint seminar

The Institute of Natural Sciences and Mathematics of Ural Federal University (INSM/UrFU), Russia, and the Atmospheric and Oceanic Research Institute (formerly the Center for Climate System Research) of The University of Tokyo (AORI/UTokyo), Japan, began collaborating on atmospheric science research over 20 years ago. To celebrate the 20th anniversary of their partnership, a ceremony and joint seminar were held on October 8, 2019, at UrFU. A total of 30 participants from UrFU, including the director of the Institute, related deans, members of the Russian Academy of Sciences, and several faculty, researchers, and students participated. From the Japanese consortium, Professor Imasu, and several Ph. D. students and researchers participated in the event, supported by CIC for travel accommodations. At the ceremony, the history of the research cooperation between the two institutes was reviewed. The most notable result in the group's history was the world's first measurement of the isotope (deuterium) ratio of atmospheric water vapor, attained by analyzing spectrum data observed by an infrared sensor on a Japanese earth observing satellite. After the ceremony, the group held a joint seminar, at which the details for the ongoing joint research satellite project were reported, and both institutes had professors and students provide introductions for the studies they are currently working on. The two laboratories signed their first collaboration agreement back in 2012, and they renewed it in 2018. Currently, the groups are continuing research cooperation and are primarily focused on the development of data analysis methods for Japanese greenhouse gas observation satellites. Evolutionary results are expected in this field of research in the future, as the collaboration between the institutes continues.

Atmospheric carbon dioxide and aerosol measurement equipment used in the joint research at Kourovka observatory of UrFU.

Visiting Professors

Name / Affiliation	Nationality	Length of stay	Subject for study
PURCELL, Anthony Patrick Geodynamics Department, RSES, ANU Research Fellow	Australia	2018/4/1 - 12/1	Sea-level change model and observation comparison for the last 140,000 years.
SHEN, Chuan-Chou 沈 川洲 Dept. of Geosciences, National Taiwan University Distinguished Professor	Taiwan ROC	2018/11/2-2019/1/29	Past hydroclimate and environmental changes in East Asia monsoon territory
LEICHTER, James Scripps Institution of Oceanography University of California, San Diego Professor	USA	2018/10/29-12/15	A Japan-U.S. collaborative study on the environmental and community dynamics in coastal marine ecosystems
DUAN, Cunming 段 存明 Department of Molecular, Cellular and Developmental Biology, University of Michigan, Ann Arbor Professor	USA	2018/10/1-12/31	Hormonal control of fish ionocyte proliferation and osmoregulation
RYKACZEWSKI, Ryan School of Earth, Ocean and Environment, University of South Carolina Assistant Professor	USA	2018/7/10-8/10	Comparative study on sardine and anchovy life strategy in the world ocean using numerical models
CHEN Guanghua 陳 光華 Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China Professor	China	2018/7/1-12/31	A study on the temporal-spatial distribution and evolution of convective and stratiform precipitation during the TC genesis.
STEVENS, Bjorn Max Planck Institute of Meteorology Director	USA	2018/9/1-10/31	Global cloud resolving modelling and climate change.
WEBSTER, Jody Michael The University of Sydney Associate Professor	Australia	2018/12/4-2019/1/19	Studies on tropical and subtropical sea level and reef responses

Visiting Professors' report

Anthony Patrick Purcell
Research Fellow, Geodynamics Department, RSES, ANU

Over the past several years Professor Yokoyama of the ACES has worked to establish an effective research partnership between Tokyo University and the Australian National University, my home institution. This partnership has been particularly beneficial for the already-strong synergy in technical and analytical expertise between AORI and ANU's RSES. On-going collaboration between RSES and AORI on the impacts of past climate forcing and the potential impacts of modern climate change are particularly timely and relevant.

My visit to AORI has presented an opportunity to deepen communication between the modelling and observation communities. Interpretation of marine records requires accurate models of changes in surface elevation and geoid due to surface mass redistributions. This process (known as glacial isostatic adjustment or GIA) is physically and mathematically complex and not widely understood. My work at RSES focuses on modelling GIA effects and using paleo-sea-level records to constrain ice sheet geometry. During my visit I have been working to develop a model for the Antarctic Ice Sheet consistent with changes in global mean sea level (GMSL) through the end of the last glacial cycle.

Previous efforts to model the Antarctic Ice Sheet ignored GMSL constraints and produced models inconsistent with far-field sea level records. In combination with models for the northern hemisphere ice sheets developed by our group, Professor Yokoyama's analyses of sea level records at locations far from former ice sheets suggests that during the Last Glacial Maximum the Antarctic Ice Sheet contained at least 25 metres sea level equivalent more than at present. His analyses of Antarctic marine sediments have also provided tighter constraints on the extent and timing of the Antarctic ice sheet.

I have been fortunate to have had the opportunity to visit AORI and work with Professor Yokyama for the past three months. It has provided a valuable opportunity to benefit from his expertise and develop a stronger understanding of the evolution of the Antarctic Ice Sheet. I am enthusiastic that our on-going collaboration will result in a more accurate model of Antarctic deglaciation.

Chuan-Chou Shen (River)
Lifetime Distinguished Professor,
Department of Geosciences, National Taiwan University

It was my honor to be invited by Prof. Yuji Sano as a Visiting Professor at The Atmospheric and Ocean Research Institute (AORI), University of Tokyo from November 2nd, 2018, to January 29, 2019. I really enjoyed working here with Environmental Geochemistry group led by Prof. Yuji Sano and Paleo-environmental Research/Environmental Analysis group headed by Prof. Yusuke Yokoyama. My primary objectives at AORI included (1) conducting noble-gas studies and preparing manuscripts, (2) addressing coral-inferred Pacific culture and marine ^{14}C variability, (3) giving talks and creating possible new collaborative projects, and (4) introducing the new Association of Pan-Pacific Anthropocene (APPA) and the 1st Conference on Pan-Pacific Anthropocene (ConPPA) to Japanese colleagues at The University of Tokyo and other schools.

My colleagues and I at the Department of Geosciences, NTU, have been collaborating with Dr. Yuji Sano for over 10 years. During my visit, a PhD student of mine, Dr. Sano, and I prepared one manuscript on "Mantle-derived fluids associated with a crustal-scale fault in subducting continental crust" using He/Ne isotopic data of groundwater, hot springs, and bedrock samples from a major fault system that separates regional-scale blocks of accreted, continental materials in southern Taiwan. In this study, the isotopic signatures indicate significant mantle contamination, suggesting deep seated active fault system consistent with deep, non-volcanic tremors. This paper is under review. We are preparing our 2nd paper on helium isotopic signature

of the plate boundary suture in an active arc-continent collision.

Prof. Yusuke Yokoyama and his team helped measure ^{14}C ages for fossilized corals to estimate marine reservoir ^{14}C ages of 406 ± 42 years over the past 1500 years. The reservoir ages were used to correct the measured shell ^{14}C ages. Both coral ages determined by U-Th techniques and corrected shell ages will be used to reveal the history of the fading ancient culture in the Nan Madol, an archaeological site just officially selected as one of the World Heritage sites in Pohnpei, Micronesia. The reservoir ages will also be used to reconstruct past regional ocean circulation in the Pacific. Thank Prof. Masahide Kimoto, Prof. Masahiro Watanabe, and Prof. Ayako Abe-Ouchi for agreeing about the possible collaboration and participation to APPA.

Some presentations were also given during this visit. A talk about coral U-Th dating and its applications was expressed at Kashiwa campus on November 7, 2018. Two topics titled "A study of Orbital-scale East Asian-Australian summer monsoon dynamics" and "A centennial earth's magnetic reversal event at 98 ka" were delivered at Hongo campus on November 13. During these talks and other events, I consistently introduced a new international Association, APPA, at the University of Tokyo and other schools. The information on 1st ConPPA, which will be held on May 14-16 followed by one-day field trip on May 17, 2019, was also released. The abstract submission website is: http://www.gl.ntu.edu.tw/rcfe/appa.html.

My family flew from Taipei to Tokyo many times and enjoyed everything including food and sites of tourist attraction around Tokyo. Thank you again for inviting me and my family to have a great time together with you. I believe my team will successfully work with Japanese colleagues at AORI and other schools on diverse projects in the near future. See you sometime soon. LOVE YOU!

Cunming Duan
Professor of Molecular, Cellular, & Developmental Biology
University of Michigan

It has been a great honor and privilege to be invited by Professor Susumu Hyodo to work at The Atmosphere and Ocean Research Institute (AORI), University of Tokyo from November 12, 2018 to February 2, 2019. This stay in AORI is specially rewarding for me because I was a graduate student in this Institute from 1988 to 1991. It is a great pleasure for me to come back to AORI again and see the new location, new building, and new research activities. This stay has provided me the valuable opportunity to discuss research questions of mutual interest with AORI colleagues and other departments on this campus. I have also enjoyed the many opportunities to discuss with graduate students and postdoctoral fellows about their ongoing experiments and future aspirations. It is my sincere hope that my stay in AORI will encourage personal exchanges and research collaborations between the University of Michigan and AORI in the future.

I would like to give my special thanks to Professor Hyodo and his lab members. I met Professor Hyodo when we were both graduate students. I have been following his outstanding research program for three decades. His work on hormonal regulation of osmoregulation in bony fish and sharks has had a strong impact on me and other colleagues around the world. My own work with fish has been focused on growth regulation. In recent years, we have moved into two new directions. One aims to elucidate the molecular basis of oxygen sensing and hypoxia response in fish. In another new line of recent investigation, we have discovered that insulin-like growth factor signaling, a hormonal pathway known for its role in growth, plays a critical role in regulating calcium ion uptake in fish. Professor Hyodo invited me to AORI to discuss our recent work on insulin-like growth factor signaling and its interaction with epithelial calcium channel and other ion transporters. While in AORI, I have given three lectures on these topics. I have also had the privilege to attend the Hyodo lab weekly lab meeting. As a result of these interactions, I have had the opportunity to initiate dialogs and future collaboration with Dr. Kanda and Dr. Wong in the Hyodo lab on electrophysiological recording of epithelial cells and on the role of insulin-like growth factor binding proteins in regulating epithelial growth in Japanese eels during seawater adaptation. It is my hope to pursue these together with these AORI colleagues for many years to come.

Jody Michael Webster
Associate Professor, Geocoastal Research Group, School of Geosciences,
The University of Sydney

It has been a great pleasure and honor to be a Visiting Professor at AORI for 6 weeks (Dec-Jan) in 2018-19. This fellowship has allowed me to work closely with my colleague Professor Yusuke Yokoyama and his very active research group. I am deeply appreciative of all the kind support and opportunities I received while at the AORI.

My scientific objectives while in Japan were focused on a range existing and new projects that Yusuke and I are working on. First, we were focused on finalizing and advancing several new papers associated with the International Ocean Discovery Program (IODP) Expedition 325 (Great Barrier Reef Environmental Changes). With the recent publication of the two main results papers in *Nature* and *Nature Geosciences*, this has set a firm foundation for several new Exp. 325 related papers investigating the development for coral algal assemblages, microbialites and large benthic foraminfera derived relative sea-level records preserved in the fossil GBR reefs. In this period, one my colleagues from the University of Nagoya (Dr. Marc Humblet) was able to visit Kashiwa and we were able to finalize one of these papers. During this time, I was also very busy working on logistics and site planning for the upcoming IODP Exp. 389 (Hawaiian Drowned Reefs) scheduled for Sep-Oct 2019. This project will drill a series of drowned fossil reefs that date back to at least 500 kyrs and will also involved Yusuke and his group.

My family and I were also fortunate enough to experience a white Christmas while in Nagano. We were then able to visit Kanazawa where I spent some time during my PhD years. Kanazawa has changed a lot in 20 years but it still such a special place. I was also invited to give a research seminar on IODP fossil coral reef drilling at Kanazawa University where I was based all those years ago. Overall it was a great two days and it was wonderful to catch up with old friends and colleagues.

Just after new year we then headed south to Okinawa to escape the cool temperatures and experience the subtropics. While in Okinawa I also had the opportunity to visit the University of the Ryukyus and our collaborator Prof. Kazuhiko Fujita. Kazu led the work on the large benthic forams recovered from the IODP Exp 325 GBR cores. I gave seminar, we discussed future work, and we also spent the morning looking at some beautiful fossil reef outcrops. We visited first a sequence of Holocene raised reefs and several Holocene sea level notches. Then we observed the Minatogawa formation which is comprised some beautiful detrital Pleistocene limestones and coral reef units. It was a great trip.

Returning to Tokyo, I was able to work closely again with Yusuke on several exciting new research directions. First, we integrated new lithologic and coralgal information with new C14-AMS ages from fossil reef cores that were collected using a seabed rock drilling in ~80 m of water on the north west shelf of Australia. The goal is better understand coral reef development and sea level changes during the poorly constrained MIS3 to LGM transition (~30-20 ky). Finally, we were able to make enormous progress on constructing a new, highly accurate geomorphic map using a unique topographic LIDAR data set that was collected from the famous raised reef terraces on the Huon Peninsula. This data will be synthesised with existing U/Th coral age data to better understand the structure and spatial continuity of the raised reefs and the existence and surface expression of active tectonics features (ie. faulting). This study has the potential to greatly improve our understanding of several important geologic questions about coral reef development, sea level changes, and geologic hazards in the region.

In summary, AORI is an amazing place, with world class scientists and facilities, combined with a warm and collegial atmosphere. My trip was both highly productive and enjoyable and one that my family and I will always remember. I am now looking forward to hosting Yusuke and his students for a day at the University of Sydney as we continue to strengthen the wonderful relationship between our two institutions.

Bjorn Stevens
Director, Max-Planck-Institut für Meteorologie

It is very exciting to visit the AORI Division for Climate System Research at the University of Tokyo. Climate research at the CCSR has a long and illustrious history. The concentration of expertise within its faculty remains at the forefront of climate science worldwide.

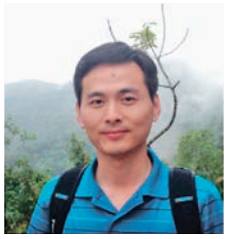
I first became familiar with the University of Tokyo group twenty-five years ago, during my graduate studies at Colorado State University. Work at the University of Tokyo, particularly through strong links to UCLA (whose students, Dave Randall, Wayne Schubert and Chin-Hoh Moeng were important mentors), greatly shaped my view of climate science. Taroh Matsuno's paper on equatorial wave dynamics is a foundational study for our understanding of both Earth's climate, and today is even informing studies of exo-planets. I also have been greatly influenced by the work of Michio Yanai and Akio Arakawa, both with Tokyo roots, and who I had the good fortune to work with as colleagues during a ten-year tenure at UCLA. In this context studies by Tsuyoshi Nitta and Michio Yanai on the heat budget of the Atlantic trade-wind regions is closely linked to field work being done by my group in the tropical Atlantic. In terms of modelling, I have also become interested in the fluid dynamics associated with the model problem of radiative convective equilibrium, a field of study launched at the University of Tokyo, by the seminal paper of Kensuke Nakajima and Taroh Matuno in 1988, but to which other colleagues at the University of Tokyo have also made important contributions — especially my host Masaki Satoh.

During my visit to AORI I have been working on the analysis of DYAMOND (DYnamics of the Atmospheric general circulation Modeled on Non-hydrostatic Domains) output. Finally, after 15 years the rest of the world is catching up to efforts, launched and led by Satoh-san and Tomita-san, to apply storm (or cloud) resolving models to the study of Earth's atmosphere and climate. Masaki Satoh and I used the occasion of a workshop organized last year by another colleague at AORI (Masahiro Watanabe) to propose the first ever intercomparison of Global Storm Resolving Models. One year later we have the results in the form of output from nine groups from around the world who have performed simulations of forty days with global grid meshes of 5 km or smaller. During my visit we have been writing a paper describing the DYAMOND protocol and first results, finishing a review of global storm-resolving modelling and planning a special issue of the Journal of the Meteorological Society of Japan focusing on international analysis of the DYAMOND output. We also put in motion plans for future cooperations in the area of global storm resolving simulations (see below).

Perhaps most important for my visit was the chance it offered to meet many other well known (and some new) colleagues, beginning with Kimoto-san, who shares a common history at UCLA and has been an important and free thinking symbol of climate science at AORI for many years. Increasingly I find my path intersecting with the wide-ranging interests of Watanabe-san, with particular areas of overlap related to cloud feedbacks, pattern effects, and climate sensitivity. The latter topic also relates to research by Abe-Ouchi-san, while here I became fascinated by her group's studies of ice-sheet dynamics, whose hysteresis curves are also a work of art and explain the asymmetric waxing and waning of the great ice sheets. It was an honor and pleasure to interact with Takayabu-san whose pioneering research on heating from shallow precipitating convection has been very influential in my thinking over many years. I enjoyed again meeting Suzuki-san who shares interests in cloud microphysics and aerosol forcing which I look forward to seeing influence the NICAM development. Likewise I enjoyed meeting Yoshimori-san again, as well as Miyakawa-san, and Ito-san. Yoshimori-san's work on feedbacks from high-clouds was very exciting for me to see and think about. Miyakawa-san is leading the very first work on global coupled storm-resolving and eddy resolving models, something I had hoped our group in Hamburg would do, until I came here and realized that he as quicker, but on the optimistic side it opens up possibilities for collaboration. His interests overlap, I think, also with the interests of Ito-san, in particular the role of boundary layer momentum transport on tropical sea-surface temperature biases. Equally stimulating was the chance to interact with a very bright group of (PhD and Master) students and postdocs (also at some of the other institutes I visited), who are very much at the forefront of the field on a wide range of topics — from studies of (ice) microphysics, to inter seasonal variability, to tropical cyclone studies. Tomorrow I finally will have the chance to meet also with Miura-san, and learn about his work on new dynamical cores.

A final very stimulating aspect of my visit was the chance to visit different laboratories, in Kobe, Kyoto, Nagoya, and Yokohama, and to visit different parts of Japan. My visit to Miyajima and Hiroshima touched many emotions, but I prefer to focus on the one evoked by the attached picture from Dainichido Temple (on Mt Misen). Seeing Mt Fuji from the train was equally inspiring, and I am very much hope that plans to go skiing at Asahi-dake are successful, and provide a crowning touch to my visit and a good start to the new year.

Guanghua Chen
Professor, Institute of Atmospheric Physics,
Chinese Academy of Sciences



Since this July when I start my visit in AORI, I spent happy time on exchanging the thoughts including scientific ideas and Sino-Japan traditional culture with the AORI staffs. First of all, I'd like to express my sincere appreciation to Prof. Yukari Takayabu, the host of my visit. On the basis of the common interests, our valuable discussion helps me clarify the research object and advance our research output. Her deep insights into the satellite-based observation and analysis makes me feel the quality of a Japanese style, world-class scholar. During my visit, our study mainly aims at the comparison of convective and precipitation properties in small and large-sized tropical cyclones (TC), based on the unique merits of three-dimensional measurement from TRMM and GPM satellites. The systematic examination is carried out to reveal the relative importance of stratiform and convective precipitation on the evolution of TC size. Moreover, the study also provides a reliable validation between the modeling hypotheses and satellite observations. The finding and analysis will form a scientific paper to be submitted to an international journal.

In addition, the kindness and generosity from Yukari sensei also impress me deeply. Her attentive care during my visit strengthens my feeling of Japanese hospitality and friendliness. Besides, I also express my thanks to two secretaries, Ms. Eiko Niikura and Marie Iwagami, for their kind assistance in the many administrative work and personal needs. Meanwhile, I am also grateful to the members of the laboratory, Dr. Chie Yokoyama, Hiroki Tsuji, and Ms. Orui Daichi, Kaneko Wataru, Nakamura Yuhi, Aoki Shin, and Takano Yuki for their constructive comments and technic support during my visit.

Lastly, my visit is also coming to an end. It is time for me to say good-bye to other professors and staffs in AORI. Their leading brains and diligent attitude in the scientific research will inspire me in the future study. I'd like to welcome you to visit my institute, Institute of Atmospheric Physics, Chinese Academy of Sciences in the future. Please let me try my best to reciprocate your kindness.

STAFF

Director of CIC Prof. Yutaka Michida
International Scientific Planning Prof. Yutaka Michida
International Advanced Research Prof. Mitsutaku Makino
International Research Cooperation Prof. Hiroaki Saito

Prof. Koji Inoue
Prof. Yusuke Yokoyama
Prof. Ryoichi Imasu
Assoc. Prof. Jin-Oh Park
Assoc. Prof. Sachihiko Itoh

Center for International Collaboration
Atmosphere and Ocean Research Institute,
The University of Tokyo
5-1-5 Kashiwanoha, Kashiwa, Chiba 277-8564, JAPAN
Phone&Fax : +81-4-7136-6361
URL : http://www.aori.u-tokyo.ac.jp/