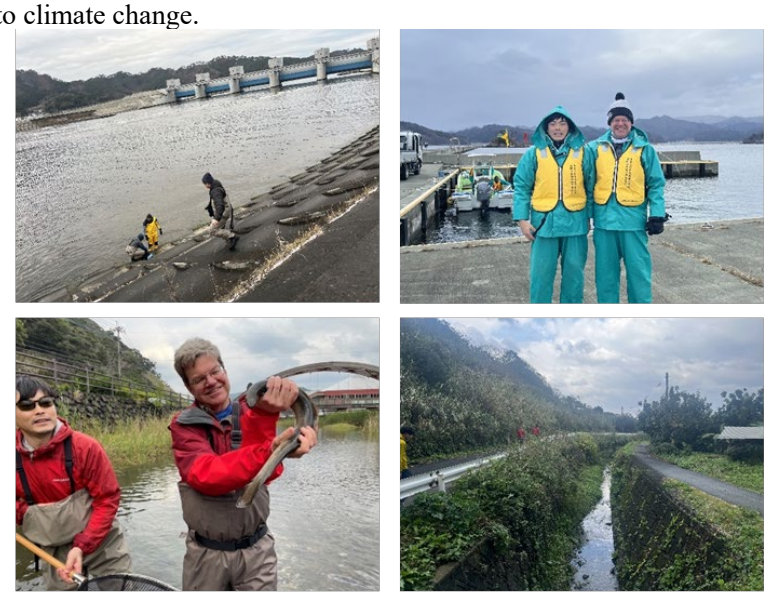
# Visiting Professors' Report 2023

**Prof. David H. Secor**
*University of Maryland Center for Environmental Science*

It was an honor and privilege to receive a visiting Professor appointment at AORI (Nov 2023-Feb 2024) within the Department of Living Marine Resources hosted by Professor Shingo Kimura and Assistant Professor Hikaru Itakura. AORI has a remarkable legacy in fisheries oceanography. No wonder that the research of AORI scientists K. Tsukamoto, T. Otake, S. Kimura, J. Aoyma, and K. Sato figured prominently in my book, *Migration Ecology of Marine Fishes*. So, it was a career highlight for me to participate in the fisheries oceanography program. Working on a near daily basis with H. Itakura and R. Wakiya, research addressed (1) how climate is influencing Japanese eel river and coastal ecology in transitional ecosystems at the trailing (Amami Island) and leading (Otsuchi) edges of the species range; and (2) a novel retrospective analysis to assess how marine heatwaves influence estuarine fish production.

Eels in transitional ecosystems: During week-long visits, we undertook telemetry monitoring of Japanese eels and other top predators. At Otsuchi, eels overlap with chum salmon, the latter species at its southern limit; and at Amami, Japanese eels overlap with the giant mottled eel, that species at the leading edge of its range. Thus, these study sites represent great opportunities to study the response of fish communities to "tropicalization." At both locations, particularly impressive was the degree with which eels adapt to human-engineered river and coastal habitats. Mountains crowd narrow coastal regions at both Otsuchi and Amami causing a high degree of potential coastal hazards. At Otsuchi this means extreme protections following the 2011 tsunami ― 15 m seawalls, tidal storm surge protection at each river mouth, and hardened and channelized rivers. At Amami, I enjoyed pristine and protected rainforests, mangroves, and riverscapes, but also observed hardened mountainsides to protect against mudslides and conversion of receiving rivers into culverts and canals. Yet eels persist and even thrive as top predators in these altered environments. Japan's engineered rivers had been ignored by generations of eel scientists, in part because >95% of eels marketed come from aquaculture. Dr.s Itakura and Wakiya are finding that these altered habitats are far from dead, show important connections to coastal ecosystems, and are sensitive to climate change.

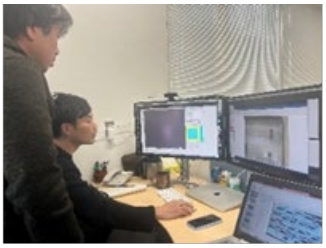
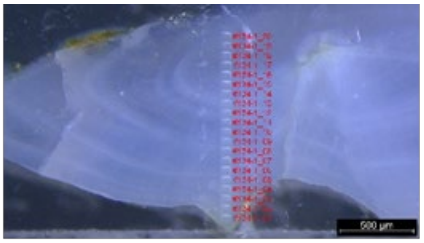


Transitional ecosystems for Japanese eels. Top panels: retrieving telemetry receivers at Otsuchi. Bottom panels: Collection of giant mottled eels from channelized rivers in Amami. Shown are H. Itakura and D. Secor.

Biochronology and marine heatwaves. The theme of climate change was the focus of otolith research conducted with partners at AORI (H. Itakura, K. Shirai) and Kyoto University (H. Asanuma and A. Suzumura). For Hudson River (New York, US) striped bass and American eels, hundreds of otoliths were selected from a large archive of samples collected over my career. Otolith sections were digitized and annuli measured resulting in biochronology records for the last 4-5 decades. For American eel, we completed analysis showing a pervasive negative influence of marine heatwaves on growth. For striped bass, data was collected for 264 otoliths supporting ~1400 measures of yearly growth rates. Ongoing analysis is addressing the hypothesis that the Hudson River no long supports summertime growth by striped bass, owing to pervasive marine heatwaves.

Eels and striped bass have tails, so complementary microchemistry analysis was conducted to evaluate how migration patterns might influence the relationship between growth and marine heatwaves. Eels residing in freshwater or brackish water were similarly sensitive to marine heatwaves. Using a state-of-the-art LA-ICPMS at Kyoto University,

we tested whether striped bass juvenile migration behaviors carryover to adult migration behaviors. Initial findings strongly support the affirmative.

Laser ablation ICPMS analysis of striped bass otolith. Shown are K. Shirai and H. Itakura.

Department engagement. Dr.s Kimura and Itakura provided ample opportunities to interact with AORI students through attendance at Division and Laboratory seminars, one-on-one student meetings, and interaction with their students in the lab and in the field. I gave seminars at the Japanese Society of Fisheries Oceanography in Sapporo, Hokkaido, where I met several colleagues from my work in Japan over the past 30 years. I presented an AORI departmental seminar and provided feedback on student manuscripts. I'm a big fan of sumo and a highlight was a trip organized by Professor Kimura to attend the January tournament. I also enjoyed Shinnenkai, which attracted over 20 Kimura-lab alumni and a retirement party for my short-lived but eventful AORI career.


Sumo outing and AORI retirement party with Professor Kimura's laboratory group.

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**Prof. Fei-Fei Jin**
*University of Hawaii*

Photo at BBQ party

A Visit to AORI Recalls and Adds Wonderful Memories and More

My wife and I just enjoyed a wonderful and memorable one-month visit to AORI from May 20 to June 20, 2023, kindly hosted by Prof. Masahiro Watanabe. Our thanks for his well-organized arrangements and Ms. Kyoko Arakawa's help in every way. Our visit this year brought back many vivid memories from our first sabbatical visit at CCSR (together with our three young sons, then 13, 3, 1) in the Spring and Summer of 2000, which was also hosted by our dear friend Prof. Masahide Kimoto who had sponsored my JSPS fellow application. One of the great outcomes of that visit was to successfully persuade Prof. Watanabe, then a enthusiastic and energetic new postdoc, to visit the University of Hawaii in 2001. His visit that year began a lasting line of collaborative research that continues on to this day. Our collaboration first focused on the dynamics of so-called synoptic eddy-low frequency (SELF) feedback in the pattern formation of modes of climate variability in the middle latitude. (cf. Watanabe and Kimoto, 2000, Watanabe and Jin 2003, Jin, Pan and Watanabe 2006, Watanabe, Jin and Pan 2007).

This rejuvenating second sabbaticals visit, albeit shorter, has continued and expanded our collaborative research, which has been now further extended to understanding the dynamics of tropical climate variability including dynamics of MJO (Hayashi and Jin 2023, to be submitted), ENSO (El Nino and Southern Oscillation) and its interaction with modes

in other tropical basins as well as the dynamics of global warming (Chen et al. 2023 in preparation). Thanks to Prof. Watanabe's effort in arranging the schedules, I had the opportunity to have multiple meetings with research groups of Profs Masahiro Watanabe, Ayoko Abe-Ouchi, Kei Yoshimura, and Tomoki Miyakawa. These allow me to learn about their exceptional work on many fronts. The discussions involved certainly awakened and excited my interests in the dynamics of global warming, AMOC, tropical cyclones, and even the isotope patterns associated with climate modes and beyond. Moreover, the seminars on June 6 and 12 at AORI and NIES, respectively, gave me great opportunities to interact with wide audiences in two excellent institutions. The wonderful and fruitful Hakone workshop (June 13-15) was also very memorable, not only because of truly exciting mountain train rides, hot springs, and beautiful surrounding sceneries but more so because of the interactions with many talents from a newer generation, including Profs. Yukiko Imada, Yu Kosaka, and Tomoki Tozuka, and Drs. Michiya Hayashi, Takahito Kataoka, Takeshi Doi, Tomoki Iwakiri, Masaki Toda, Xi Cao, Suqiong Hu, among many others. The relaxing environment for scientific brainstorming, especially about the last point of the final discussions at the end of the workshop, was surely hard to forget and offered much insight into the coordination of bright minds to address the interplay of physical and social aspects of climate change scenario solutions.

We certainly echo Prof. Watanabe's remark that "this visit feels so too short" when he was very kind to give us a ride to the airport on our returning way back to Honolulu, Hawaii. Indeed, we are already looking forward to the next visit to the University of Tokyo, which will surely take place before too long. In the meantime, the wonderful collaborations begun and friendships renewed will continue and expand to the betterment of our field and of humanity.

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**Prof. Gregory F. Moore**
*University of Hawaii*

Greg wit Ako Taira

I am very happy to report on a very busy two-month stay at AORI during September-October, 2023. My visit, originally scheduled for 2020 (postponed due to COVID) allowed me to catch up with many colleagues at AORI and across Japan.

The research aspects of my visit focused on similarities and differences between the Nankai Trough and Hikurangi subduction zones. I had the opportunity to make a presentation highlighting my research to faculty, staff and students at AORI (including a simultaneous Zoom broadcast to many other Japanese Universities and agencies). This presentation laid the groundwork for several fruitful discussions with Assoc. Profs Asuka Yamaguchi and Jin-Oh Park and their students about potential future joint research projects. I also visited Tsukuba University to present a more focused summary of deformational processes at the toe of the Hikurangi accretionary prism.

It was fortunate that an international meeting (Slow to Fast Earthquake Science) was convened on the Tokyo University campus during the second week of my visit. Two weeks later, I attended another international conference on IODP drilling in the Nankai subduction zone. Both meetings included spectacular field trips and allowed me to gain insights from many Japanese and foreign colleagues.

I also joined Prof. Yamaguchi on an amazing field trip to the Mino Belt near Nagoya, where he showed me classic exposures of deformed cherts and associated sedimentary rocks – ancient analogs of contemporary deformation at Nankai and Hikurangi. Such field experiences in Japan are so valuable for understanding processes in currently active subduction environments.

I also visited colleagues at JAMSTEC and ERI to discuss on-going research on seismic reflection data at the toe of the Nankai prism. They are making nice progress on understanding the relationship between slow-slip events and accretionary deformation. My
long-term colleague, Gaku Kimura (Tokyo University Emeritus Professor), asked me to join his publication on SSEs in eastern Nankai, which has been accepted by G-cubed.

I met Dr. Miho Asada, former AORI graduate student, now a staff member at GSJ to discuss past and future research cruises focused on mid volcanoes in the Nankai Trough. I first met Dr. Asada during my 2000 visit to ORI and joined her for a Nankai mud volcano cruise in 2016.

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It was also nice to meet former ORI students, Dr. Shini`ichi Kuramoto, now JAMSTEC Executive Director and Dr. Toshihiro Ike (ORI MS, UH Ph.D.), now a manager at JOGMEC.

In addition, I was asked to give a short speech at the award ceremony for Emeritus Professor Asahiko Taira. I first worked with Prof. Taira in 1987 when I joined a cruise of ORI's R/V Tansei Maru to the Nankai Trough. I later joined Prof. Taira as co-chief Scientist on IODP Exp 190 and first came to ORI as a Visiting Professor in 2000, so my ties to AORI go back more than 35 years.

The AORI Visiting Professor program is among the best in the world and I am honored to have been a part of such a great program.

In addition to Greg and Prof. Taira, we can see ORI graduates Dr. Nobu Eguchi (left) and Dr. Shi`ichi Kuramoto (right) both now JAMSTEC members.

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## Prof. Jody Michael Webster

*The University of Sydney*

It has been a great pleasure and honor to be a Visiting Professor at AORI for 8 weeks (Nov-Jan) in 2023-24. 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 new and existing collaborative projects. First, we were focused on advancing the new International Ocean Discovery Program (IODP) Expedition 389 (Hawaiian Drowned Reefs) project. This involved organising numerous information sessions via Zoom with the entire 30 member Exp. 389 Science Party, including Japanese Scientists (Yusuke Yokoyama (AORI), Naoto Fukuyo (Geological Survey of Japan), (Ryuji Asami (Tohoku University) and Marc Humblet (Nagoya University). These sessions, plus other disciplines-specific workshops centred around the main Exp. 389 scientific objectives (dating/sea level, paleoclimate and reef response), were highly effective in focusing the sample requests and establishing collaborations ahead of the Onshore Science Party (OSP) that was held successfully in February in Bremen at the MARUM core repository.

Another highlight was the opportunity to visit a fascinating archaeological site in the Kanoya region of Kagoshima where Yusuke's team is involved in a project to provide new age constraints on an excavation site. Yusuke and I then travelled to Nagano to visit Yashiro High School where I had the opportunity to talk to some very curious and engaged high school students about coral reef systems in the Great Barrier Reef and elsewhere my research group is working on. Yashiro High School is involved in an ongoing science/teaching collaboration with AORI that is now extended to the University of Sydney. In Dec 2023, about 20 high Yashiro High School students visited my research group in Sydney with another trip planned in Dec 2024.

Lecture at Yashiro High School

During the period before Christmas, we were also able to finalize and submit another key collaborative paper to the journal *Quaternary Science Reviews* focused on the use of fossil reef cores to reconstruct paleowater quality, including the influx of nutrients and land-derived sediments and their impact on the Great Barrier Reef (ie. ecology, growth, bioerosion).

Sanborn, K.L., Webster, J.M., Erler, D., Webb, G.E., Salas-Saavedra, M., Yokoyama, Y., The impact of elevated nutrients on the Holocene evolution of the Great Barrier Reef. Quaternary Science Reviews 332. https://doi.org/10.1016/j.quascirev.2024.108636

This paper is part of an ongoing collaborative program of research involving USYD and University of Tokyo and several national partners focused on comparing changes in Holocene water quality, and other environmental parameters like sea surface temperature, with corresponding changes in reef responses in the Great Barrier Reef.
Over the Christmas and New Year period my family and I were also fortunate enough to visit Yakushima Island, including the spectacular World Heritage listed forests that were the inspiration for Hayao Miyazaki's film Princess Mononoke. This was a real highlight for my two daughters who are huge fans of the Ghibli studio films.

After returning to Tokyo, I then joined Yusuke and some of his team just after new year and headed south to Kikai-jima in the Ryukyu Islands to undertake field work to sample submarine groundwater. This is part of large ongoing project to study environmental change in the subtropical regions of Japan. For me personally, this was an incredible opportunity to return to Kikai-jima after almost 30 years! I spent over six months on the island in the mid 90s when I was a Monbusho supported student undertaking research for my PhD. It was a wonderful experience to be able to revisit some of the spectacular Holocene fossil reef outcrops that I worked on so many years ago. Overall, it was a special trip and I look forward to working with Yusuke and his team as they continue to investigate these unique fossil reef outcrops.

Returning to Tokyo, I was able to work closely again with Yusuke to advance another major project related to our collaboration on IODP Exp. 325 (Great Barrier Reef Environmental Changes). We integrated new C14-AMS ages from fossil reef cores with lithologic and coralgal information to better understand coral reef development and sea level rise during an important but poorly constrained deglacial interval called meltwater pulse 1B (~11.5 ka) and will soon submit this manuscript for publication.

In summary, AORI continues to be 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 cherish. I look forward to continuing to work with Yusuke and his team as we continue to strengthen the wonderful relationship between our two institutions.

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## Associate Prof. John Morrongiello
*The University of Melbourne*

In June 2023, I had the honour of visiting Professor Ito's lab at the Atmosphere and Ocean Research Institute (AORI), The University of Tokyo, supported by the Institute's generous Overseas Researcher Fellowship.
Professor Ito and I first met as co-chairs of an ICES/PICES joint working group, where we discovered our shared interest in understanding how rapid ocean warming affects fish growth, body size, and fishery productivity. I was humbled when Ito-sensei nominated me for the fellowship and excited by the opportunity to work with him and his students.

The fellowship enabled me to spend six weeks at AORI, where I was truly impressed by the quality and diversity of marine and atmospheric research. It was incredible to experience an institute dedicated to all aspects of ocean-based research. I received a warm welcome from Ito-sensei and other academics, including a memorable table tennis tournament organised by his students.

During my stay, Ito-sensei and I began work investigating the drivers of body size change in marine fish and latitudinal shifts fish distributions, making preliminary progress and exploring opportunities for additional funding. I was privileged to learn from him about running a successful lab group and enjoyed our enlightening conversations on academia in Japan and Australia.

I had the fantastic opportunity to meet with masters, PhD students, and postdoctoral fellows working in fields such as biological oceanography, marine microplastics, fisheries science, and eco-evolutionary biology. I was impressed

by their depth of understanding and our engaging scientific discussions. As part of my visit, I gave a seminar on my lab group's work exploring the impacts of fishing and warming in our oceans, appreciating the opportunity to share our research and receive excellent feedback.

I was humbled by the opportunity to contribute to two PhD student projects, co-authoring manuscripts with Sk Istiaque Ahmed on novel methods to quantify eDNA in the ocean and using this technology to explore patterns of biodiversity. I have never worked on eDNA before but found I could contribute by providing advice on statistical analyses and writing of the manuscript. Zhen Lin's PhD on the impacts of warming on fish growth is highly complementary to my own research interests. We shared a series of engaging conversations about her work and explored new ways to analyse the data and interpret results. I am excited about our upcoming manuscript.

My trip was not solely academic. This was my first visit to Japan, and I was amazed by the rich culture, vibrant cities, and beautiful landscape. My family joined me for the last three weeks of my visit, and we enjoyed exploring the Kashiwa and Tokyo region, Kyoto, and Nikko, savouring the food (including my son Xavier's sushi-making experience with master itamae), visiting amazing gardens, and enjoying the peacefulness of many temples.

I enjoyed my incredible time in Japan and working with staff and students at AORI. Thank you to all who made my family and me feel so welcome. I am excited by our continuing collaborations and the excellent science AORI's students are producing. We all agree that we will be back to visit Japan very soon!

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**Dr. Meghan F. Cronin**

***National Oceanic and Atmospheric Administration/University of Washington***

Thank you Eitarou Oka-san and Thank you AORI for a fabulous visit Oct 1 – Dec 10, 2023!

My visit began with a Grand Tour of Japan, which gave me an opportunity to talk about my work "Observing Air-Sea Interactions in Frontal Regions from the Tropics to Western Boundary Current Extensions" and to meet with colleagues. Using a 2-week JR shinkansen pass, the trip included visits to JAMSTEC in Yokosuka (Thank you Honda-san!), RIKEN in Kobe (Thank you Oishi-san!), and the University of Hokkaido in Sapporo (Thank you Tomita-san)! Once settled into Tokyo, I was able to also give seminars and meet up with colleagues, students and early career scientists at the University of the Tokyo Campuses of AORI (Thank you Oka-Sensei!), Hongo (Thank you Tozuka-san!), and RCAST (Thank you Nakamura-san!).

A highlight of the 2-month visit was an "Air-Sea Interaction Workshop" in Kyoto with ~ 20 of my collaborators & coauthors from the past two decades organized by Oka-san and Konda-san from University of Kyoto. I was able to hear what my friends are currently working on, discuss new climate experiments in the Tropical Pacific and the Kuroshio, and the UN Decade of Ocean Sciences for Sustainable Development programme that I co-lead (Observing Air-Sea Interactions Strategy – OASIS). I was also able to ask the group a question that I have long had -- "Where are the women in physical

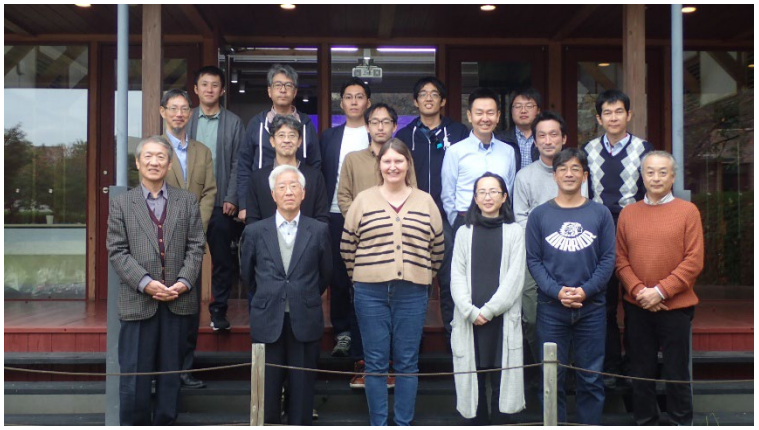
oceanography?". No satisfactory answer was found, although a number of hypotheses were shared. Wide ranging conversations continued over the dinners and sake each evening. Kyoto was beautiful in the rain.

Oka-san also invited me to Otsuchi to meet with Tanaka-san at the AORI Coastal Research Center following a meeting he had there. My husband and I stayed with Oka-san at an inn that was rebuilt on the hillside after the tsunami of 2011 placed a boat on its roof. Like many in this community, the inn keepers were connected to the sea: the inn keeper had a fishing boat and our breakfast and dinner were from the morning's catch. At lunch we went to a restaurant where we ate a table full of oysters! It was thus very moving to hear about and see the devastation from the tsunami in 2011. Oka-san also talked with us about the extreme summer heat and the warming waters that are shifting the fisheries, and his proposal, which has now just begun: "A habitable Japan: Sustainability of atmospheric and oceanic environment as a survival basis of island country Japan".

Following the Otsuchi visit, Oka-san invited me to meet with his Hot-Spot-2 working group that was meeting in Sendai. This then provided me and my husband an opportunity to hike up the mountain to the beautiful Yamadera temple. The fall colors were spectacular! In Sendai, I was also able to give a seminar, meet with students and colleagues, and hear about the new World Premier Institute (Thank you and Congratulations Suga-san!).

During my final week in Japan, I participated remotely in the Second Cooperative Study of the Kuroshio and its Adjacent Regions (CSK)-II symposium taking place in Qingdao, China, and in the JAMSTEC-NOAA bilateral meeting that took place at my home laboratory in Seattle, WA USA (NOAA Pacific Marine Environmental Laboratory). It was gratifying and felt very fitting to be able to personally thank both the Executive Director of JAMSTEC (Dr. Takeshi Kawano) and the Assistant Administrator of NOAA's Office of Oceanic and Atmospheric Research (Dr. Steven Thur) for being able to maintain the Kuroshio Extension Observatory for two decades now. These long time series marking the changes in the ocean and climate are vitally important. I am humbled and grateful for the many friends and collaborators I have made in Japan over these past two decades.

Thank you Oka-san for making this visit possible, and for directing me towards people and places that have opened my mind and world. I would particularly like to thank Kawamoto-san and the AORI administrative staff for handling the extensive paperwork involved in the trip, and to Kobayashi-san for finding my husband and me a wonderful apartment in Asakusa and for making me feel so welcomed in AORI.

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# Visiting Professors' Report 2023

**Dr. Paul Griffiths**
*University of Cambridge*

It has been a pleasure to be a guest professor at AORI from late September through to December. My grateful thanks to AORI for hosting me, and to Professor Ryoichi Imasu for this chance to work him and his group at Tokyo University.

I have been visiting from Cambridge where I work as a research scientist in the Yusuf Hamied Department of Chemistry of Cambridge University. I also work for the UK's National Centre for Atmospheric Science (NCAS). My interests are in atmospheric chemistry modelling, with a current focus on ozone, methane and tropospheric oxidising capacity. I also work on various international projects, having been a contributing author to WG1 of the IPCC 6th Assessment Report, and am leading contributions to the IGAC Tropospheric Ozone Assessment Report due to be published next year.

While here, I have been working on two main projects. Firstly, writing a review article about the AerChemMIP project, which was the CMIP sub-MIP addressing atmospheric chemistry and aerosol. I hope this paper will contribute to the development of the next phase of the CMIP project. Being a community-driven paper, it has involved some late nights on conference calls with colleagues in the US, but it has progressed well and we expect to submit our manuscript in the next few weeks.

During my visit, Professor Ryoichi and I have been working to use model data as priors to use in GOSAT retrievals. To this end, I spent most of November working on a second project, also involving NCAS colleagues, on setting up a high-resolution version of the UK's UKESM-1 Earth system model. Of course, 'high resolution' means different things to different people, and global atmospheric chemistry modelling is a long way from state-of-the-art storm-resolving simulations - the computational cost of chemistry calculations and tracer transport currently presents a very high barrier to working at the km-scale.

After a lot of debugging, we now achieved a chemistry configuration at an unprecedented resolution (and which would actually qualify for HighResMIP!) of 50km in the mid latitudes, and we are now producing some benchmark data for use by colleagues. This is a big step forward for us - truly a high-resolution chemistry-climate model operating with global coverage. This will be a valuable resource for model evaluation, and it will be exciting to see how chemistry models perform against the increasing coverage of high spatial resolution EO data. It will also be fascinating to investigate the chemistry-climate interactions in this model, something not possible with CTMs, and a particular focus in the future will be on the upper troposphere/lower stratosphere region where the radiative forcing of ozone is critical. I'm very glad to have worked on this new capability and it serves as a reminder of the productive research environment that AORI has provided, and of the excellence of my NCAS colleagues!

My time at Kashiwa campus has been memorable for the interesting discussions with Prof Ryoichi's group. It's been great to be able to attend group discussions, and I am very grateful to Mr Arthur Li and other group members for continuing these interesting discussions over trips for lunch and coffee.

A very stimulating aspect of my visit has been visiting colleagues in Tsukuba. In December I gave a seminar at the Japan Meteorological Research Institute, with CMIP6 colleagues in the audience, and was also able to spend a very pleasant and stimulating day at the National Institute for Environmental Studies. I visited Prof Tonokura's lab where many surprising overlaps between our research emerged, and I enjoyed the opportunity to present my recent work to his research group. At the end of my time at ToDai, I was honoured to present a short seminar in CCSR.

Working in Professor Imasu's group has provided me with many interesting insights into the use of Earth observation products, and I will be taking many new ideas for model evaluation using GOSAT products back to Cambridge with me. I will also be returning with very fond memories of my stay: Ms Ando's unstinting help both prior to and during my stay, Professor Ryoichi's unfailing kindness as a host, a memorable trip with him and group members to the Tsuchiura fireworks, the many pleasant meals with the group and, of course, the warm welcome from AORI.

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# Visiting Professors' Report 2023

**Prof. Stevens Bjorn**
*University of Hamburg/ Max Planck Institute for Meteorology*

Thinking about adaptation

I once again had the great pleasure and privilege to visit AORI for six weeks. I arrived just in time to see the cherry blossoms in Schuzenji in late march of 2023, and the brilliant blooming of the Azaleas at Nezu Shrine in April, before returning to Hamburg, via a taste of craft beer seasoned by the hops and legends of Tono, in mid May.

At AORI I shared an office with Mamiko Shimada with the pleasure of a window toward Mt Fuji. Fuji would reveal itself many times to me in passing, but not once from the window, and not when I approached it too closely. On the Kashiwanoha campus I enjoyed meetings with Abe-Ouchi-Sensei, Miyakawa-Sensei, Takayabu-Sensei and Watanabe-Sensei and their groups. I also met many colleagues more informally by joining the football game after lunch. There I had the good fortune tobe on the team that benefited from Niino-san′s quickness and ball skills that seemed to have eluded any hint of aging. With Roh-san I visited Kosetsu wholesale market to talk about EarthCARE, andthe possibilities to link it to a measurement site my team maintains on Barbados. EarthCARE, a new satellite which will finally be launched in May of this year (2024), and for which JAXA built a state of the art cloud radar, was a recurrent theme of my visit. It was the topic of the workshop with the cherry, then plum, blossoms in Schuzenji, which inaugurated my arrival, and of a mission advisory group meeting with gathered first at NICT, and later, on my birthday, in Shinjuku. EarthCARE brought me to JAXA in Tsukuba where I had the pleasure to meet Riko Oki, to whom I introduced EVE, and Takuji Kubota who told me more about GPM. I enjoyed a tour of the marvelous visitor center thanks to Toshi Tanaka who coordinated my visit. There I got my JAXA shirt, and one for my daughter. It is one of my favorites*, and over the past 1 year I have worn it for major presentations I held in Kigali, Berlin and San Francisco. For me it became a symbol of how we build great institutions to sample space, but none to sample our future, i.e., to explore climate and climate change.

I had noodles with Woosub Roh — does it seem that we were only eating lunch? — and Shuhei Matsugishi in Chohachi in Nagareyama, where I learned more about the unprecedented simulations of Earth′s atmosphere, using NICAM with a 200 m grid. NICAM, the progenitor of new generation of climate models, that came to life twenty years ago, thanks to the skill and creativity of Profs. Satoh and Tomita (and later Miura and others) was the topic of a workshop in Yamanaka, where Fuji-san remained modestly behind the clouds. Unfortunately not the clouds that Masanao Abe taught us to see. NICAM brought me to NIES where I met one of its modern developers, Hisashi Yashiro, and later to Kawasaki, where I discussed collaborations with Chihiro Kodama during a walk through Kawasaki Daishi, followed later by the chance to meet his son. NICAM took me to Riken, where I visited Prof Tomita and his group. While in Kobe I also met with Prof Shin-Ichiro Shima who had been hosting a student of mine, Clara Bayley, who had come to learn from him about super particles − as of us are wondering how to incorporate them into our new global models. My wife and I also made a small excursion to Osaka, where I visited Shitennoji temple, relived the battle of Osaka from its famous castle, and had perhaps the most magical cup of coffee in the most inconspicuous of places. Some how it summed up for me the modesty of Japan.

By now you might be wondering where Japan fits in; well that is what I learned about during my visit to the AORI Otsuchi Coastal Research Center, in the most unlikely of ways. There we had a small workshop to discuss the complex dynamics of coastal eco-systems. These ecosystems, as we learned by our walk back to the Ryokan being interrupted by a bear and its cub, are indeed complex, and sometimes dangerous. Up and down the Iwate coast we witnessed the most wonderful seascapes, haunted by sparse urban areas, rebuilding under the shadows of great walls enlarged in response to the great Tsunami of 2011. Thinking of living on the edge of, but hidden from, a sea that would periodically shed its tranquility to rise up and devour you and all that you cherish left me with enduring thoughts of what it means to adapt to natural hazards, and what it will mean to adapt to climate change. How can our science give people a more tangible sense of the threats they face, or will they be forced to metaphorically build ever larger sea-walls as they stagger from one calamity to the next. These are thoughts we developed later in the initiative of EVE, which leave me convinced that the way to do so will require technologies like NICAM, embolden by insights from satellites like. EarthCARE, and powered by computers like Fugaku. It made me rethink our approach to science, which led me to write a critical essay on CMIP, one whose first drafts I wrote in my apartment at the International Lodge in Kashiwanoha. My visit and experiences encouraged me in my thoughts that real progress might be borne of modesty, but not of complacency.

This evening, before writing this report, I watched "Perfect Days", which is graced by the brilliant performance of Kōji Yakusho. It was another reminder of what I like about Japan, and its ability to maintain a passion for perfection with an appreciation of Komorebi. It is another reason to thank Professor Masaki Satoh, AORI, and my many colleagues for so generously sharing their ideas, and time, and thoughts about the challenges for our science at a time when the seas are on the march all around us.

*: Well I still very much like my Hakuho Maru Research Vessel shirt, even if it is not as famous, and fits less to the them of my visit.

# Visiting Professors' Report 2023

Otsuchi, and its sea wall.

Oysters in Yamada, Iwate

Rocket, Satoh-san and me at JAXA

Images of me in the clouds at Osaka Castle

Preparing the perfect cup of coffee

With my Andrea (my wife) at Kashiwanoha campus station

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## Prof. Xianglei HUANG

***University of Michigan at Ann Arbor***


With generous sponsorship from AORI, I was fortunate to visit this world-renowned institute from May 8 to June 30, 2023. My host is Prof. Kentaroh Suzuki in the Division of Climate System Research. This is my fourth visit to Japan and my most extended stay. This is my first trip back to East Asia since the COVID era. I spent seven wonderful weeks on the Kashiwa campus.

Besides giving a seminar on recent research progress in my group, I led a series of discussions on radiative transfer, especially a hierarchical view of the subject and how to use toy models to understand the essence of radiative transfer physics. Graduate students, research staff, and faculty members attended the discussion, and the feedback was very positive.

# Visiting Professors' Report 2023

Research-wise, using the past NICAM simulation output produced by Prof. Suzuki and his collaborators, I examined the co-variability of temperature and humidity at different temporal and spatial scales as simulated by such a high-resolution global model and then compared such results with counterparts from satellite observations, reanalyses, and CMIP6 low-resolution model simulations. Understanding the moisture and temperature relations in the region immediately above the tropical convective boundary layer (~ 600-800 hPa) across multiple timescales has important implications, such as stability of the tropical middle troposphere, pre-moistening conditions for the MJO developments and associated precipitation events, water vapor and lapse-rate feedbacks in response to the global warmings. Two decades ago, radiosonde observations, reanalysis, and climate models tended to disagree on the co-variability between tropical averaged temperature and humidity interannual anomalies in the region mentioned above, more so than in other parts of the tropical troposphere. We showed that the most recent generations of satellite observations, reanalyses, and climate models (high-resolution and low-resolution) have this discrepancy much reduced, but still with noticeable differences in the same region. Together with some works done in my group, the analysis results highlighted the dependence of temperature and humidity co-variabilities on temporal and spatial resolutions, providing scientific justification for more accurate measurements of mid-tropospheric humidity. We presented the findings in a workshop jointly held by AORI and the Department of Atmospheric Science at the National Taiwan University and submitted an abstract to the AMS (American Meteorological Society) 2024 Conference.

I also talked with other professors and colleagues in the CCSR during my stay to learn about their cutting-edge research projects. Through these activities, I have broadened my knowledge horizon and learned more about the Japanese research community and relevant earth science observational efforts made by JAXA. I am sincerely thankful to Prof. Suzuki for being such a wonderful host and to Uchida-San for helping me settle down and handling a variety of administrative chores. This stay also gives me a precious chance to learn more about Japanese culture and adventure around Tokyo. Overall, it has been a fruitful and wonderful visit for me. どうもありがとうございました！

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**Prof. Yair Rosenthal**
*Rutgers University*

During the months of May-June 2023 I was a visitor scholar at AORI, working with Prof. Yusuke Yokoyama. A main purpose of the visit was to work on collaborative papers related to a joint sea going expedition to the Chilean margin, in 2019. During the visit we completed one paper related to the expedition led by Dr. Yokoyama′s postdoc (Sproson, A.D., Yokoyama, Y., Miyairi, Y., Aze, T., Clementi., V.C., Riechelson, H., Bova, S.C., Rosenthal, Y., Childress, L.B., and the Expedition 379T Scientists. (2024). Near synchronous Northern Hemisphere and Patagonian ice sheet variability through last glacial cycle. Nature Geoscience ). We also collaborated on a second paper with one of Dr. Yokoyama as a lead author, that plan to submit in the next couple of months and discussed a potential deep sea drilling proposal in the Sabrina Basin of east Antarctica.

During my visit, I also presented a paper at the JPGU meeting and gave a seminar at AORI entitled:″ "Neogene climate change: reappraisal of biogeochemical controls on atmospheric pCO2 ". Overall, it has been a very productive visit and I am grateful for this opportunity, and look forward for future collaborations.