

Working Group 27 on North Pacific Climate Variability and Change

The 2013 meeting of the Working Group on *North Pacific Climate Variability and Change* (WG 27) was held October 12, 2013 in Nanaimo, Canada, under the chairmanship of Drs. Shoshiro Minobe (Japan), Emanuele Di Lorenzo (USA), and Michael Foreman (Canada) who welcomed participants. All member countries were represented (*WG 27 Endnote 1*).

AGENDA ITEM 2

Meeting agenda

The agenda was reviewed and no changes were made (*WG 27 Endnote 2*).

AGENDA ITEM 3

Extending WG 27 Terms of Reference to 2015

During the WG 27 business meeting the group agreed that it would be useful to extend the lifetime of WG 27 by 1-year. Below is a summary of the main motivations to request an extension.

A. Analyze CMIP5

The output of the IPCC climate models used in the last assessment AR5 has just been released in 2013. WG 27 would like to devote some additional time to process the output of these models in the context of TOR # 5:

5. *Provide improved metrics to test the mechanisms of climate variability and change in IPCC models, and in coordination with other PICES working groups and FUTURE Advisory Panels, assist in evaluating those models and providing regional climate forecasts over the North Pacific.*

More specifically, we would like to use the CMIP5 to conduct analysis of the biogeochemistry and the changes in ocean circulation. Our efforts are aimed at developing a simple diagnostic of the ocean circulation (*e.g.*, a metric that tests the realism of the patterns of circulation and of the dynamics that drive them). We will also extract the ocean current information and make it available to the PICES community as one of the science products of WG 27.

B. Identify gaps between climate and ecosystem science

Although WG 27 has made much progress on most TORs and a final report has been drafted, the members discussed the need of devoting more effort on completing TOR #6:

6. *Understand and fill the gaps between what physical models can currently produce and what ecosystem scientists suggest are the important physical forcing factors required for predicting species and ecosystem responses to climate variability and change.*

We plan to conduct a conference call in the Spring of 2014 to further brainstorm on TOR #6. We also plan to link the material of TOR #3 with the Task Team on *Climate Forcing and Marine Ecosystem Response* (CFAME; 2004–2009) material that has not been published to report on TOR #6.

3. *In conjunction with ecosystem scientists, coordinate the development and implementation of process-based models, which include important processes in simple forms, to hindcast the variability of available long-term biological time series.*

Among the items that we plan to complete are identifying key oceanic forcings: upwelling strength and timing, stratification and mixed layer depth, surface and subsurface temperature, strength of the alongshore and cross-shore transport both at surface and sub-surface, eddies and submesoscale fronts. Understanding the timing of the physical variability in relation to the timing of ecosystem processes is the goal. CFAME produced a meta-diagram of the mechanism but without providing actual quantitative measures supporting the physical/biological links. WG 27 can revise this for the mechanisms where links can be made and quantified.

C. Organize contributions to the 3rd Climate Change Symposium

WG 27 will also work on preparing contributions for the 3rd international ICES/PICES/IOC Symposium on “*The effects of climate change on the world’s ocean*” (March 2015, Santos, Brazil) with the goal of showcasing some of the advances made by WG 27, within the FUTURE key research themes.

D. Develop recommendations for new expert groups

WG 27 proposed a new Study Group on *Socio-Ecological-Environmental Systems* to look at developing an integrated model that would allow the study of dynamics between climate, marine ecosystems and the human dimension, and the exploration of sensitivity of the integrated systems to perturbation in key controls.

AGENDA ITEM 4

WG 27 science products

Below is an updated list of WG 27 science products.

A. WG 27 website and peer reviewed publications

The working group maintains an active website (<http://wg27.pices.int>) where scientific material that is produced by the members, which is relevant to the terms of reference of WG 27, is posted. Since the establishment of WG 27 in 2011, the members have completed over 78 publications (see picture below). The website also gives access to reports and the outcome of the GLOBEC/PICES/ICES ECOFOR workshop on “*Forecasting ecosystem indicators with process-based models*” (September 7–11, 2012 in Friday Harbor, Washington, USA). WG 27 is now in the process of synthesizing the material for its Final Report.



The image is a screenshot of a web browser displaying the website for the PICES Working Group 27. The browser's address bar shows the URL wg27.pices.int/publications/publications.php. The website has a blue header with the text "PICES WORKING GROUP 27". On the left side, there is a circular logo for "Pacific Climate Variability & Change WG27 PICES" and a vertical navigation menu with links for "HOME", "MEMBERS", "TERMS", "PUBLICATIONS", and "ECOFOR WS". The main content area features a group photograph of the working group members. Below the photo, there is a section titled "PUBLICATIONS RELEVANT to TERMS of REFERENCES" with an "Add Record" button. A list of publications follows, including:

- 78. Cummins, P.F. and D. Masson, 2013: Climatic variability and trends in the surface waters of coastal British Columbia, *Progress in Oceanography*, (accepted, pending minor revision). - [Update]
- 77. Sang-Wook Yeh, Won-Mo Kim, Young Ho Kim, Byung-Kwon Moon, Rokjin J. Park, and Chang-Keun Song, 2013: Changes in the variability of the North Pacific sea surface temperature caused by direct sulfate aerosol forcing in China in a coupled general circulation model, *JOURNAL OF GEOPHYSICAL RESEARCH: ATMOSPHERES*, VOL. 118, 1261–1270, doi:10.1029/2012JD017947 [PDF] - Update
- 76. MinHo Kwon, Sang-Wook Yeh, Young-Gyu Park and Yoon-Kyoung Lee, 2013: Changes in the linear relationship of ENSO-PDO under the global warming, *INTERNATIONAL JOURNAL OF CLIMATOLOGY*, 33: 1121–1128 (2013) [PDF] - Update
- 75. Jae-Heung Park & Soon-Il An & Sang-Wook Yeh & Niklas Schneider, 2013: Quantitative assessment of the climate components driving the Pacific decadal oscillation in climate models, *Theor Appl Climatol*, 112:431–445 [PDF] - Update
- 74. Bo Young Yim • Yign Noh • Sang-Wook Yeh • Jong-Seong Kug • Hong Sik Min • Bo Qiu, 2013: Ocean mixed layer processes in the Pacific Decadal Oscillation in coupled general circulation

B. Draft of the Final Report

WG members discussed and agreed on the format and content of the Final Report. Action items have been developed and assigned to different members. An early draft of the Report is now in place and will be expanded during the year 2013–2014.

C. Synthesis papers

WG 27 members agreed that it would be important to complete two synthesis papers that outline the progress made on the main TORs. After some discussions the group isolated the following:

1. Reduced complexity models to hindcast and forecast North Pacific Climate
(Cummins, Di Lorenzo, Davis, Yeh, Taguchi, Bograd)
Application of auto-regressive multivariate models of order 1 to hindcast the physical variability of the North Pacific basin-scale climate and of coastal environments. Provide examples for the Gulf of Alaska, California Current System and Kuroshio-Oyashio Extension.
2. Coherent changes in North Pacific climate and ecosystems
(King, Ito, Minobe, Chiba, Davis, Ustinova, Zuenko, Di Lorenzo)
Synthesis of how climate forcing drives coherent changes between the eastern and western boundaries of the North Pacific (1) climate framework, (2) lower-trophic framework, and (3) higher trophic framework.

D. Ocean currents database

From the output of the PICES and ICES sessions and from the discussion within WG 27 it is clear that information on how ocean currents are changing is critical to make advances in understanding the mechanism of ecosystem response to climate forcing. Drs. Shoshiro Minobe and Enrique Curchister offered to help in assembling a database with the output of regional-scale model hindcast as well as the output of the AR5 models. Where this database will be hosted is still being discussed.

AGENDA ITEM 5

PICES-CLIVAR collaborations

1. WCRP/CLIVAR second International Symposium on Boundary Current Dynamics
(Lijiang, China July 7–9, 2013).

In this symposium, a joint session between CLIVAR and PICES was held as a one of three sessions. The session was devoted to “biophysical interaction”, with the corresponding convenors, Shoshiro Minobe (Hokkaido University, Japan, WG 27 Co-Chair) and Hiroaki Saito (Fisheries Research Agency, Japan). The session had five invited and four contributed talks, which covered global paleo ecosystem modeling and ecosystems in the southern Indian Ocean, but the majority of the presentations were devoted to the western North Pacific and its marginal seas. A topic commonly discussed in the latter papers was nutrients, and its physical controls including vertical mixing, upwellings, and advections, in association with the Kuroshio (Fig. 1). These studies helped to clarify the large uncertainty of the nutrient budget. Summarizing the session, it is suggested that a holy grail may be a three-dimensional budget of nutrients for mean climatology, climate variability on interannual and decadal timescales, and climate change. We appreciate travel support provided by the Local Organizing Committee (especially Prof. Xiaopei Lin, Ocean University of China, China) for the convenors and one invited speaker and from PICES for two invited speakers (Shoshiro Minobe, Hiroaki Saito), and Science Committee Chair, Prof. Lixin Wu (Ocean University of China, China). Profs. Wu and Lin are WG 27 members.

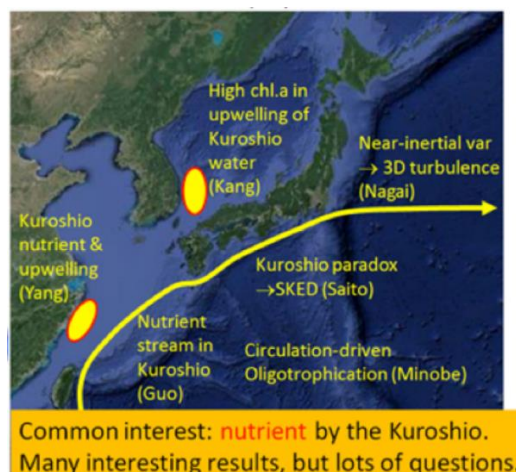


Fig. 1. Summary figure of biophysical interaction session of the symposium.

2. Biophysical interaction and dynamics of upwelling systems

Dr. Minobe, representing PICES and Japan, was invited to attend a CLIVAR Scientific Steering Group meeting held May 6-9, 2013 in Kiel, Germany. This SSG meeting was important because CLIVAR will evolve into its second phase from 2014. Thus this SSG meeting was a place where CLIVAR was to determine its new structure and activities. In new CLIVAR, sciences will be conducted by “core panels” and “focused and integrated research opportunity”. Some research opportunities can be related to PICES, but the most important one would be “biophysical interactions and dynamics of upwelling systems”. During the meeting, the leader of the tiger team for this research opportunity, Prof. Ken Drinkwater (University of Bergen, Norway), presented a motivation and expected activities. At PICES-2012, the POC Committee had discussed this research opportunity and agreed that the phrase “upwelling systems” should be modified in the title. This was because it sounded as if this research opportunity would focus on just upwellings in the eastern boundary regions, and thus exclude important upwellings such as dynamical uplift in the western boundary currents. Following POC’s suggestion, Dr. Minobe proposed at the SSG meeting that the title should be modified, for example change “upwelling systems” to “upwellings”, but no decision was made about it during the meeting. Through discussions with Dr. Drinkwater and CLIVAR Co-Chairs, Dr. Minobe was invited to join the tiger team.

In a related activity, Dr. Minobe attended the 8th CLIVAR Pacific Panel Meeting held July 9–11, 2013, in Lijiang. He presented a number of research opportunities related to CLIVAR’s new focus on “biophysical interactions and dynamics of upwelling systems”, and suggested modification to the title, as well as ideas for major themes and specific activities that the Pacific panel might include in their work on Pacific upwelling systems.

AGENDA ITEM 6

ICES and PICES joint sessions in 2013

Following the 2012 ECOFOR workshop, WG 27 submitted two identical proposals on “*Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and “data dreams” for the future*” as a theme session (Session M; Co-Convenors: Emanuele Di Lorenzo (PICES/USA), Marc Hufnagl (ICES/Germany), Arthur Miller (USA)) at the ICES 2013 ASC and as a workshop (Co-Convenors: Emanuele Di Lorenzo (WG 27/USA), Marc Hufnagl (ICES/Germany), Jacquelynne King (WG 27/Canada) Arthur Miller (USA), Shoshiro Minobe (WG 27/Japan), Ryan Rykaczewski (USA) and Kazuaki Tadokoro (Japan) at PICES-2013. The goal was to collect input on this topic from both the ICES and PICES communities. For a summary of the workshop (W2) and list of presentations, see page 35 of the [Session Summaries](#) of the PICES-2013 Annual Report.

WG 27 Endnote 1**WG 27 participation list**Members

Enrique Curchitser (USA)
 Emanuele Di Lorenzo (USA, Co-Chairman)
 Michael Foreman (Canada, Co-Chairman)
 Jingtian Guo (China)
 Shin-ichi Ito (Japan)
 Chan Joo Jang (Korea)
 Jacquelynne King (Canada)
 Guimei Liu (China)
 Takashi Mochizuki (Japan)
 Shoshiro Minobe (Japan, Co-Chairman)
 Jae-Hun Park (Korea)
 Elena Ustinova (Russia)
 Yury Zuenko (Russia)

WG 27 Endnote 2**WG 27 meeting agenda**

1. Welcome and introductions
2. Meeting agenda
3. Extending WG 27 Terms of Reference to 2015
4. WG 27 science products (progress update)
5. Report on PICES-CLIVAR collaborations
6. ICES and PICES joint sessions in 2013

WG 27 Endnote 3**Proposal for a Study Group on *Socio-Ecological-Environmental Systems***

Terms of Reference

1. Assemble a team of experts for all the components that make up a Social-Ecological-Environmental System (SEES) and initiate a tighter communication among the experts to understand the challenges of conducting integrated science that include the climate, marine ecosystem and human dimensions explicitly.
2. Develop an integrated model of SEES case study for hypoxia and acidification in the coastal ocean and select a suitable focus region.
3. Conduct a meeting at the FUTURE Open Science Meeting (April 2014) and implement the steps needed to initiate the development of the integrated model.
4. Conduct a meeting at the PICES Annual Meeting (October 2014) to finalize a report with recommendations for how the Organization can advance in this field of coupled SEES modeling in the near future.