PICES Working Group 20: Accomplishments and Legacy

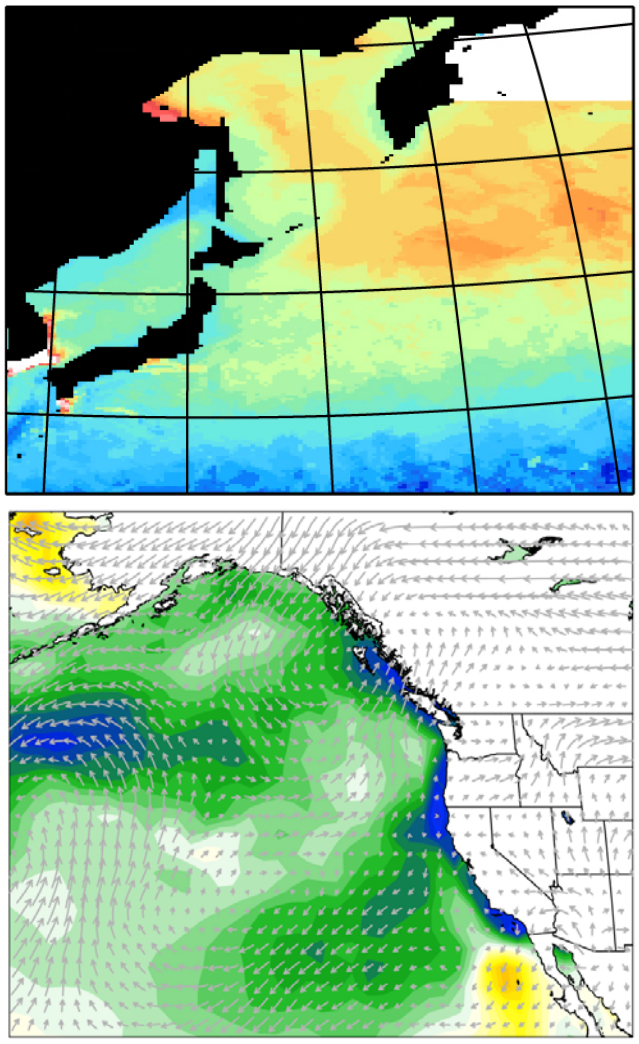
by Michael Foreman, Emanuele Di Lorenzo and Chan Joo Jang

PICES Working Group on *Evaluations of Climate Change Projections* (WG 20) was approved at the 2006 PICES Annual Meeting (PICES-2006) in Yokohama, Japan. As previous climate studies within PICES had generally been retrospective, it was felt that the upcoming 2007 release of the 4th Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC), and the Global Climate Model (GCM) projections associated with it, could provide a credible set of forecasts for forward-looking ecosystem studies in the North Pacific. Accordingly, the motivation for creating the working group was to evaluate these IPCC projections and, where possible, to downscale them to sufficiently fine spatial scales so that they would be useful for continental shelf and coastal ecosystem studies. Though WG 20 was originally assigned a 3-year term, this was extended to 4 years at PICES-2008 (Dalian, China) in order to allow collaborations with the soon-to-be created ICES/PICES Working Group on *Climate Change Impacts on Fish and Shellfish*. The Physical Oceanography and Climate Committee (POC) was the only parent committee of WG 20, and Michael Foreman (Canada) and Yasuhiro Yamanaka (Japan) co-chaired the working group. The terms of reference (TOR) of WG 20 are listed below:

1. Analyze and evaluate climate change projections for the North Pacific and its marginal seas based on predictions from the latest global and regional models submitted to the Intergovernmental Panel on Climate Change (IPCC) for their 4th Assessment Report;
2. Facilitate analyses of climate effects on marine ecosystems and ecosystem feedbacks to climate by, for example computing an ensemble of the IPCC model projections for the North Pacific and making these projections available to other PICES groups such as CFAME (*Climate Forcing and Marine Ecosystem Response*) Task Team;
3. Facilitate the development of higher-resolution regional ocean and coupled atmosphere-ocean models that are forced by, and take their boundary conditions from, IPCC global or regional models;
4. Facilitate the development of local and regional data sets (*e.g.*, SST, river flow, sea ice cover) by incorporating information from climate model projections as well as observations and historical re-analyses;
5. Ensure effective two-way communication with the Climate Variability and Predictability Program (CLIVAR);
6. Convene workshops/sessions to evaluate and compare results;
7. Publish a final report summarizing results.

WG 20 completed its tenure in October 2010, and a final report summarizing its accomplishments and providing recommendations can be downloaded from the PICES website (http://www.pices.int/publications/scientific_reports/default.aspx).

With the IPCC 5th Assessment Report (AR5) presently in preparation and various chapters scheduled for release over the next two years, it is timely to review these recommendations and their status with respect to present and future PICES activities.



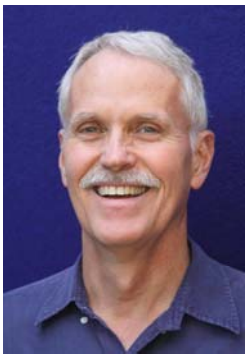
Two examples of member activities applied to Working Group 20's first and third terms of reference. Top: A regional ecosystem model version of COCO-NEMURO applied to the lower trophic level marine ecosystem simulating the timing of maximum chlorophyll concentration (dark blue is January, red is June) in the spring bloom in the Kuroshio-Oyashio system. (See Yamanaka et al. for more details.) Bottom: A Northeast Pacific regional climate model nested in the CCSM global climate model relative to the CCSM model showing sea surface temperature (dark blue is –3.0°C and red is +3.0°) and wind anomalies (maximum is approximately 1.5 m/s) in August. (See Curchitser et al. for more details.)

1. Though it was not recommended that a new working group be established to evaluate the projections from AR5, a need to continue this work was foreseen and several PICES members have started to analyse the associated global climate model output that is now available on the CMIP5 archive (http://cmip-pcmdi.llnl.gov/cmip5/data_portal.html). It is expected that updates on these analyses will be regularly reported at PICES Annual Meetings and in particular, those of the Advisory Panels on *Climate, Oceanographic Variability and Ecosystems* (AP-COVE) and *Status, Outlooks, Forecasts, and Engagement* (AP-SOFE) and the Section on *Climate Change Effects on Marine Ecosystems* (S-CCME). For example, WG 29 (see below) is planning to analyse CMIP5 projections, especially changes in ecosystem-related variables, including mixed layer depth or stratification, focusing on the North Pacific.
2. A new working group (WG 27) to investigate North Pacific climate variability and change was created in 2011 with the goal to develop essential understandings of the mechanisms of North Pacific climate variability and change that can better guide the formulation of process-based hypotheses underlying the links between physical climate (*e.g.*, Pacific Decadal Oscillation, North Pacific Gyre Oscillation, El Niño) and ecosystem dynamics (http://wg27.pices.int).
3. A working group on *Regional Climate Modeling* (WG 29) was formed last year to ensure that the work beginning under TOR#3 of WG 20 would be continued (http://www.pices.int/members/working_groups/wg29.aspx).

Though live-access servers or ftp sites have yet to be created to archive and provide easy access to results from North Pacific regional climate models (recommendation 4), analogous to the global climate model output available *via* CMIP5, this could certainly be done for the various models associated with WG 29 and would be a natural consequence of their TOR#1, "Assemble a comprehensive review of existing regional climate modeling efforts". This work could be performed in collaboration with WG 27, as there is certainly an overlap with their TOR#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."

And though links to websites that provide access to global and regional climate model output, and a guide for using them (recommendation 5) have yet to be made available on the PICES website, this could also be easily done. WG 27 has already created its own website (http://wg27.pices.int) and at least initially, this might be a home for this information.

In short, though WG 20 was successful in meeting most of its terms of reference over its short 4-year timeframe, the work that it began is continuing though other PICES expert groups and can be expected to play an important role in the second PICES integrative scientific program, FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems).



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