

CLIVAR NATIONAL ACTIVITIES - JAPAN

25 February 2013, Akio Kitoh, Chair, Japan National Committee for CLIVAR

CROSSCUTTING (GLOBAL) PANELS: Observations and Data

CLIVAR Global Synthesis and Observations Panel (GSOP)

With regard to the scientific research contribution, JMA/MRI and JAMSTEC submitted the white papers on the ocean data assimilation systems for the seasonal, inter-annual and decadal forecasts, and on the ocean observing system evaluation to OceanObs'09 (Venice, 2009). Also, JMA/MRI and JAMSTEC conducted coupled ocean-atmosphere climate simulations by constraining ocean fields and/or both fields with global observation data. A part of this work was presented in the third CLIVAR/GSOP Committee Meeting (Tokyo, 2009), the WGOMD-GSOP Workshop on Decadal Variability, Predictability, and Prediction (Boulder, 2010), and the WCRP Open Science Conference (Denver, 2011).

Using the advantage of an adjoint assimilation approach, JAMSTEC succeeded in the identification and characterization of the source area and transport process of the decadal warming signal detected in the North Pacific bottom layer by the WOCE revisit observation primarily convened by JAMSTEC. The result was published in *Science* (2010) and also reported in the GODAE OceanView-GSOP Workshop (Santa Cruz, 2011).

CROSSCUTTING (GLOBAL) PANELS: Modeling

Working Group on Seasonal to Interannual Prediction (WGSIP)

JAMSTEC's climate prediction system, based on SINTEX-F, has been used to predict seasonal-to-interannual climate variations. The model has shown good skill for ENSO prediction on a lead-time of up to two years. It has also predicted the associated tropical climate impacts on the regional variations such as the monsoon rainfall of India, Indonesia, East African short rains, rainfall of Australia and East Asia. Like previous events, the SINTEX-F has predicted a moderately warm ENSO event for the summer of 2012. However, the model could not predict the early El Nino termination, which was initiated in October. In addition, it had failed to predict the positive Indian Ocean Dipole (IOD) for the first time. Since these prediction deficiencies are also evident in many other operational prediction models, it is important for us to investigate these deficiencies to improve dynamical climate predictions. Preliminary investigations of the

SINTEX-F model results suggest that effective assimilation of subsurface ocean data will benefit the predictions.

JMA/MRI has participated in the Climate-system Historical Forecast Project (CHFP) based on the atmosphere-ocean coupled general circulation model, JMA/MRI-CGCM since 2007. The skill in the number of typhoon occurrence in the southern islands of Japan, the Okinawa islands, are low in the dynamical predictions.

JMA/MRI is planning to replace the current operational seasonal forecast system to that based on a new version of JMA/MRI-CGCM in 2015. The atmospheric model has a resolution of TL159L60 and the ocean model (MRI.COM) has a horizontal resolution of 1° in zonal and 0.5° in meridional directions and 52 vertical levels with a bottom boundary layer. Sea ice model solves the evolution of its fraction area, heat content, and thickness. It is expected that impact of sea ice evolution on the global atmosphere and ocean in the seasonal time scale can be represented.

WGCM/CLIVAR Working Group on Ocean Model Development (WGOMD)

A framework for historical simulations using ocean-sea ice models (CORE-II; Co-ordinated Ocean-ice Reference Experiments II) has been proposed by WGOMD, and the experiment is conducted by the participation of 20 modeling groups. An ocean modeling and data-assimilation group of JMA/MRI participated in this experiment with both free-running forward and data-assimilating simulation results.

PICES (North Pacific Marine Science Organization) 2012 annual meeting was held October 12-21, 2012 in Hiroshima, hosted by the Government of Japan, in cooperation with the Fisheries Research Agency. CLIVAR-related issues are discussed by active working groups such as "Working Group on North Pacific Climate Variability and Change (WG-27)" and "Working Group on Regional Climate Modeling (WG-29)" during the meeting.

CMIP5

Two groups are participating the Coupled Modeling Intercomparison Project phase 5 (CMIP5). JAMSTEC/AORI/NIES group uses 5 versions of MIROC models, while MRI/JMA uses 4 versions of MRI models.

KAKUSHIN and SOUSEI

"Innovative Program of Climate Change Projection for the 21st Century (KAKUSHIN)" (FY2007-FY2011) funded by MEXT has been successfully finished and their results were contributed to the IPCC AR5. A new 5-year project "Program for Risk

Information on Climate Change (SOUSEI)" (FY2012-FY2016) funded by MEXT has started. Most of climate modeling groups in Japan, including JAMSTEC/AORI/NIES and MRI/JMA, are participating using the Earth Simulator, to predict and diagnose imminent global climate change, to project climate change contributing to stabilization target setting, to develop basic technology for risk information on climate change, and to make precise impact assessments on climate change.

REGIONAL PANELS

Asian-Australian Monsoon Panel (AAMP)

The AAMP has established an ad hoc Monsoon Metrics Team to promote the systematic evaluation of climate models. An intercomparison of CMIP3 versus CMIP5 simulations of the Asian summer monsoon during the late 20th century has been published.

JMA and MRI are conducting the JRA-55 reanalysis project. Calculation of the main product of JRA-55 will be completed by March 2013, and the product will be open for research communities by the autumn 2013. Calculation of the sub-product JRA-55C is now under processing and the product will be open in 2014.

Asian Monsoon Year (AMY 2007-2012) has come to an end. AMY reanalysis for the years 2008-2010 conducted by MRI is ongoing with support by the University of Tokyo and other many AMY participating research institutes. The AMY reanalysis will be completed in the first half of 2013 and its data will be open for research communities. The AMY International Science Workshop is to be held in Macao in conjunction with the WMO Fifth International Workshop on Monsoons (IWM-V) in October 2013.

CLIVAR/IOC-GOOS Indian Ocean Panel

JAMSTEC has been maintaining three m-TRITON buoys and one ADCP mooring in the eastern equatorial Indian Ocean, which are important contributions to IndOOS/RAMA observing system. Recoveries and deployments of the mooring buoys, together with the hydrographic observations along the cruise track, were conducted by R/V Mirai.

Bilateral SATREPS projects with South Africa and Indonesia funded by JICA and JST are successful examples of capacity building on climate related research in both countries. The project in South Africa will finish in coming March, while that in Indonesia will continue one more year.

Indian Ocean Panel, together with SIBER project under IMBER, is trying to initiate a new research initiative on eastern Indian Ocean upwelling system, in which

physical-biogeochemical collaboration is considered as a core element. The first planning meeting of the initiative will be held in April 2013 in Yokohama, Japan.

Pacific Implementation Panel

JAMSTEC has been maintaining the TRITON array in the western tropical Pacific, as an effort to sustain the tropical TAO/TRITON observing system. JAMSTEC and JMA have been contributing to the international Argo Program mainly in the North Pacific both through float deployment and data management activity. JAMSTEC and MRI/JMA also have been collaborating on OSSE activity especially regarding the TAO/TRITON array and the Argo array. JAMSTEC has been conducting shipboard observation in the western Pacific, contributing to NPOCE and SPICE. Ongoing MEXT project (2010-2014) “Hot Spot in Climate System” is involving several universities and agencies and targeting coupled ocean-atmosphere variability over monsoonal Asia, Far East and the western North Pacific. This project covers mid-latitude coupled ocean-atmosphere processes and thus is complementary to NPOCE. Regarding linkage between climate research (CLIVAR) and biogeochemical/ecosystem research (IMBAR), Japanese scientist on both sides have been corroborating through organizing joint sessions in the PICES annual meeting and the CLIVAR international symposium. JAMSTEC has been conducting a new interdisciplinary project “Western North Pacific Integrated Physical-Biogeochemical Ocean Observation Experiment (INBOX)”, which is another Japanese contribution to the linkage.

List of acronyms

JMA	Japan Meteorological Agency
MRI	Meteorological Research Institute
JAMSTEC	Japan Agency for Marine-Earth Science and Technology
AORI	Atmosphere and Ocean Research Institute
NIES	National Institute for Environmental Studies
MEXT	Ministry of Education, Culture, Sports, Science and Technology
m-TRITON	m-Triangle Trans-Ocean Buoy Network
ADCP	Acoustic Doppler Current Profiler
IndOOS	Indian Ocean Observing System
RAMA	Research Moored Array for African, Asian, Australian Monsoon Analysis and Prediction

SATREPS	Science and Technology Research Partnership for Sustainable Development
JICA	Japan International Cooperation Agency
JST	Japan Science and Technology Agency
SIBER	Sustained Indian Ocean Biogeochemistry and Ecosystem Research
IMBER	Integrated Marine Biogeochemistry and Ecosystem Research
TAO	Tropical Atmosphere Ocean Array
OSSE	Observing System Simulation Experiments
NPOCE	Northwestern Pacific Ocean Circulation and Climate Experiment
SPICE	Southwest Pacific Ocean Circulation and Climate Experiment