Press Releases

October 8, 2013
JAMSTEC

The Ningaloo Niño was found to be predictable

1. Overview

Takeshi Doi, Researcher of the Application Lab of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC; Asahiko Taira, President) has shown, for the first time in the world, the predictability of the Ningaloo Niño, a regional climate variation off Western Australia.

In the austral summer of 2010/11, an unprecedented oceanic warming was observed off the west coast of Australia This event seriously damaged marine ecosystems and agriculture.This coastal ocean warm event was named "Ningaloo Niño" after the similarity to the equatorial warm event like El Niño in the Pacific.i The Ningaloo Niño is getting great attention from climate and ocean research communities.

The research was carried out using the "SINTEX-F1 seasonal prediction system" (*1), based on the SINTEX-F1 ocean-atmosphere coupled general circulation model developed under an EU-Japan research collaboration on the Earth Simulator at JAMSTEC. The results were compared with observational data over the last 30 years. The SINTEX-F1 seasonal prediction system can predict the occurrence of the Ningaloo Niño/Niña event six months in advance. In particular, the extremely strong Ningaloo Niño event in 2011 was predicted 9 months in advance.

Until now, seasonal prediction research o has focused on tropical climate variations on the scale of several thousand km, such as the El Niño. The present results open a new door into research on predicting a regional climate variation in the mid-latitude on the scale of several hundred kilometers Spurred by this success, the Application Lab will continue to improve the prediction skill of the Ningaloo Niño for societal and economical application.

The paper was published in the October 8, 2013 (JST) issue of *Scientific Reports*, a research publication from the Nature Publishing Group.

Title: Predictability of the Ningaloo Niño/Niña
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*1: SINTEX-F1 seasonal prediction system: A global-scale real-time ensemble seasonal prediction system developed by JAMSTEC to predict seasonal

abnormalities, built on the basis of SINTEX-F1. Each month, the results of real-time seasonal predictions are published on the JAMSTEC website.
URL: http://www.jamstec.go.jp/frcgc/research/d1/iod/e/seasonal/outlook.html

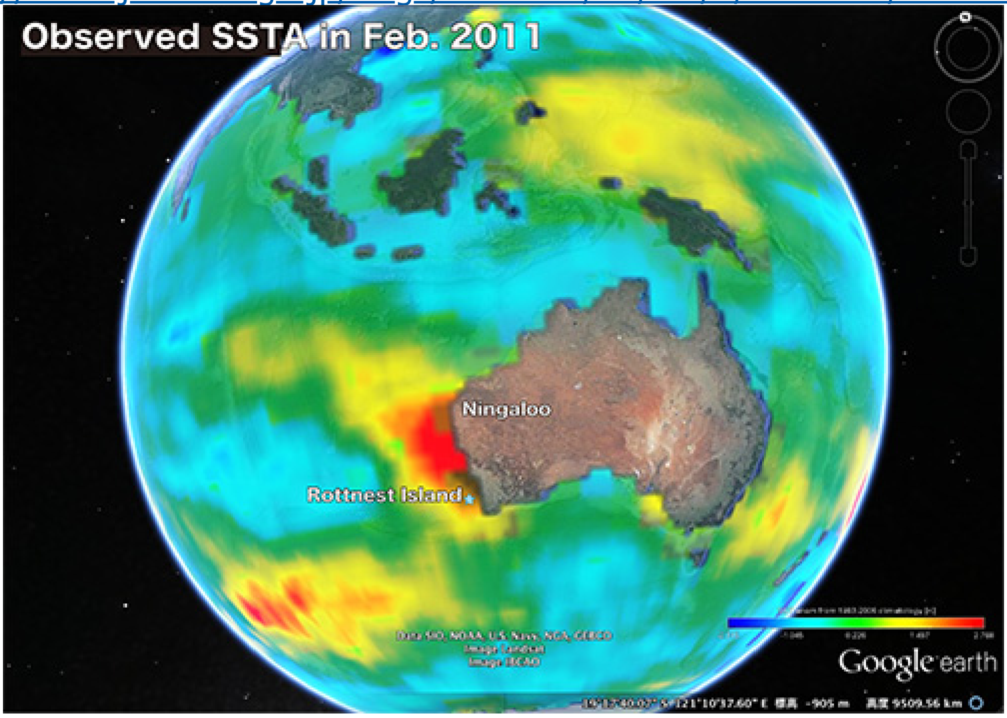

Figure 1: Sea surface temperature (SST) deviations (°C) observed for February 2011. Deviations from the values averaged across years 1983 to 2006. OISSTv2 observation data of the National Oceanic and Atmospheric Administration (NOAA) are used. The seawater temperature off Ningaloo on the west coast of Australia is warmi abnormally. (The visualization is created using rendering software VDVGE developed at the JAMSTEC Earth Simulator
Center, http://www.jamstec.go.jp/esc/research/Perception/vdvge.ja.html)

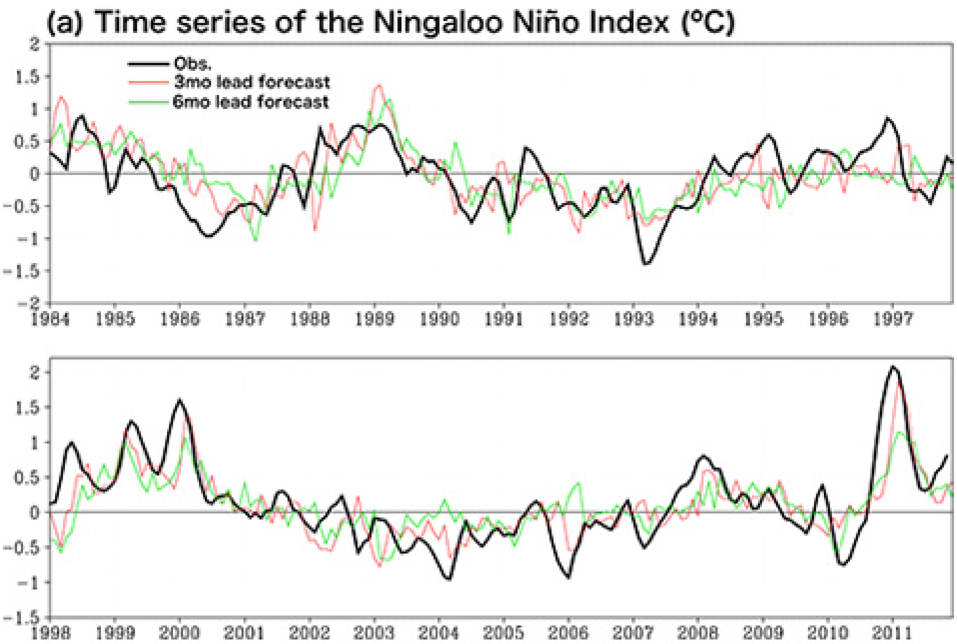

Figure 2: Time series of the Ningaloo Niño index (a calculation of the amount (°C) by which the SST off the west coast of Australia averaged at 108°–116°E, 28º–22ºS differed from that of the same location during a normal year). Black line: observation;

Red line: predicted value from 3 months prior; Green line: predicted value from 6 months prior.

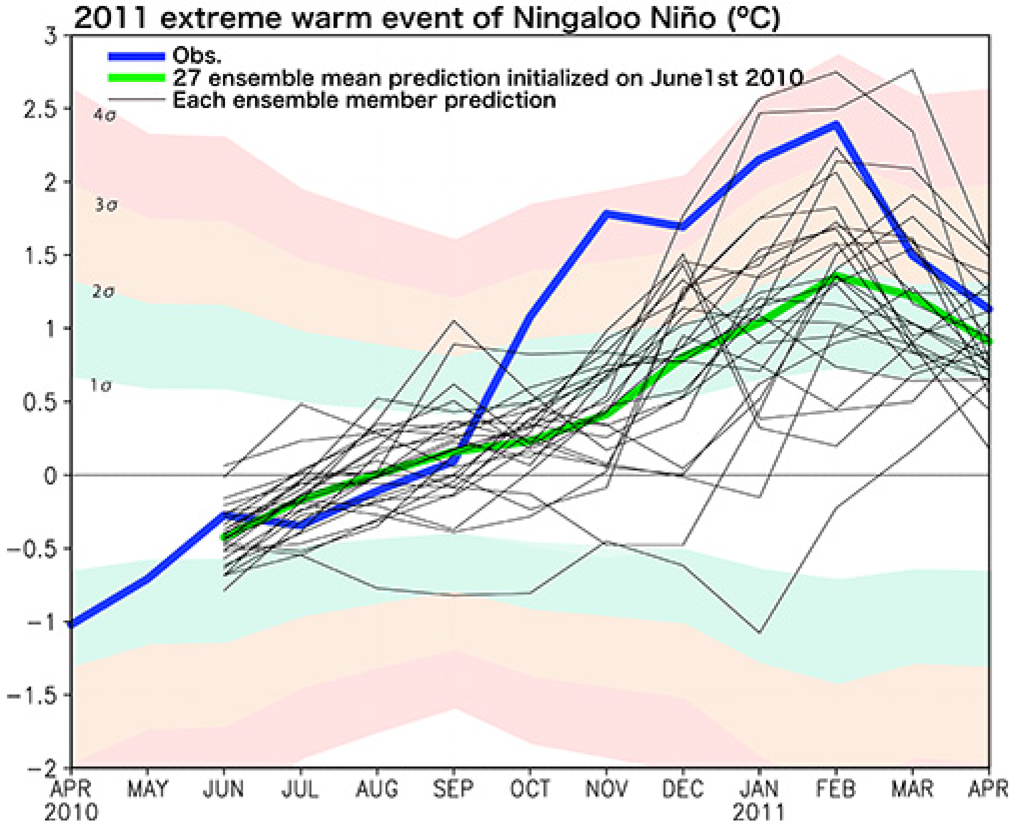

Figure 3: 2010/2011 Ningaloo Niño index (NNI): The amount (°C) by which the SST off the west coast of Australia averaged at (108°–116°E, 28°–22°S) varies from that of a normal year.
Bold blue line: Observed values
Bold green line: 27 ensemble mean predictions initialized on June 1, 2010
Thin black lines: Prediction of each ensemble experiment (27)
Shaded forms: Multiples of the average amplitude of the annual flucuation (standard deviation (σ)) calculated from the observed data between 1983 and 2006.

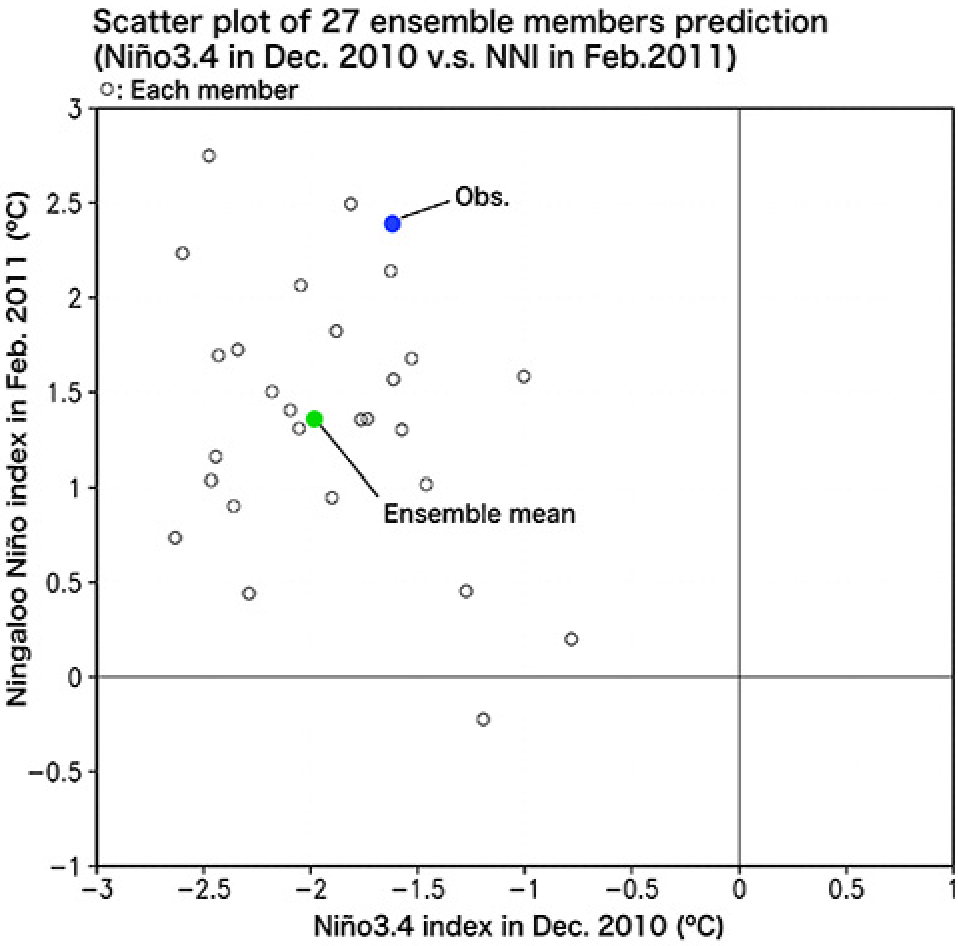

Figure 4: A scatterplot (°C) of each ensemble prediction of the Feb. 2011 NNI against that of the Dec. 2010 El Niño index Niño 3.4 (°C) [the amount by which the SST tropical eastern Pacific averaged at (190°E-240°E, 5°S-5°N)] varies from that of a normal year.], both initialized on June 1, 2010.
Blue dot: Observation
Green dot: 27 ensemble mean predictions initialized on June 1, 2010
○: Prediction of each ensemble experiment (27)
The successful prediction of the Ningaloo Niño is related to that of the La Niña phenomenon (a climate phenomenon that is the opposite of El Niño)

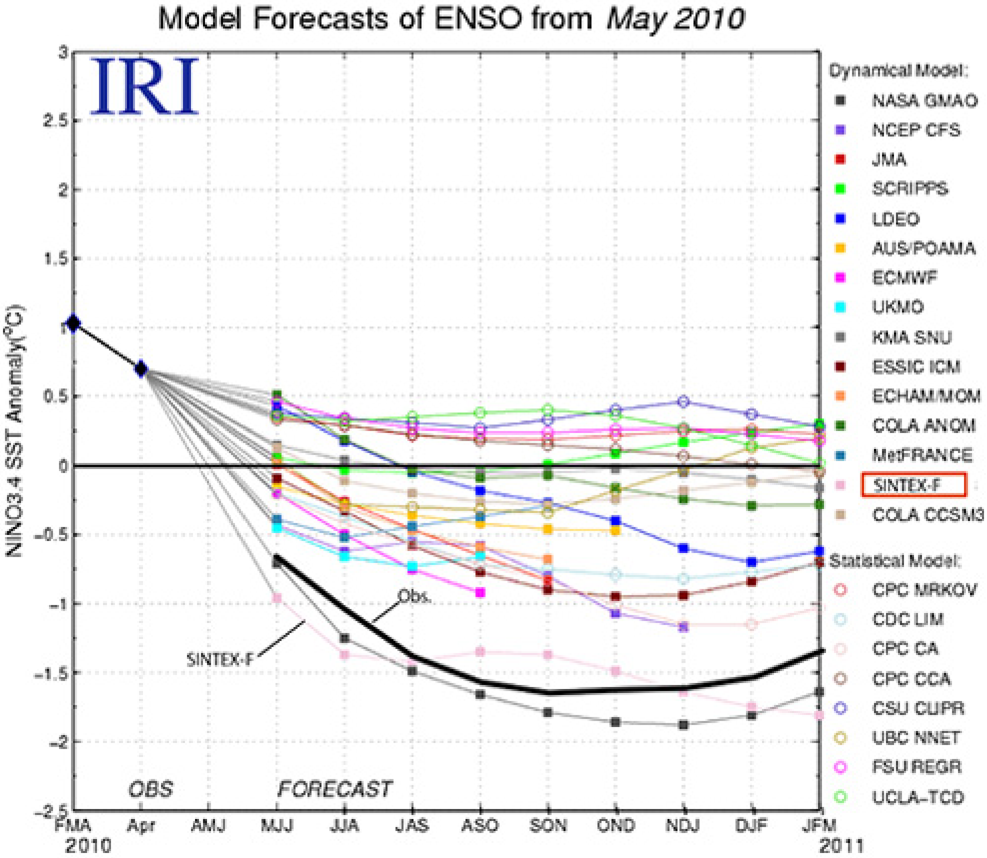

Figure 5: The predicted results of the 2010/11 La Niña phenomenon by multi-models in the world. El Niño index Niño 3.4 [the amount (°C) by which the SST of the tropical eastern Pacific averaged at (190°E–240°E, 5°S–5°N) differs from that of a normal year].
Bold black line: Observed values.
Colored lines: The results of the predictions initialized in May 2010 by each climate model. The SINTEX-F1 model has had success in predicting the 2011 La Niña phenomenon with extremely high accuracy as compared with other models. (To compare SINTEX-F1 with other models in terms of El Niño prediction, check the web page of the International Research Institute for Climate and Society (IRI) by Columbia University,
http://iri.columbia.edu/our-expertise/climate/forecasts/enso/

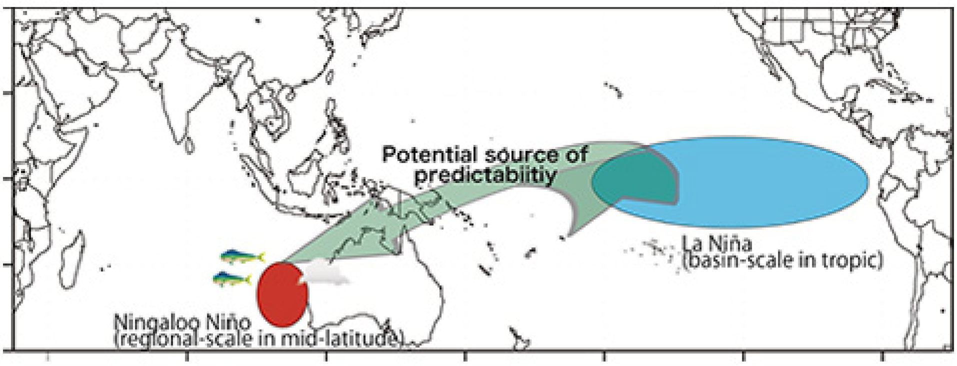

Figure 6: A schematic diagram of the results of this research.

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