気象庁
Japan Meteorological Agency

First WMO Workshop on Operational Climate Prediction
Pune, India, 09-11 November 2015

Tokyo Climate Center's activities as RCC Tokyo

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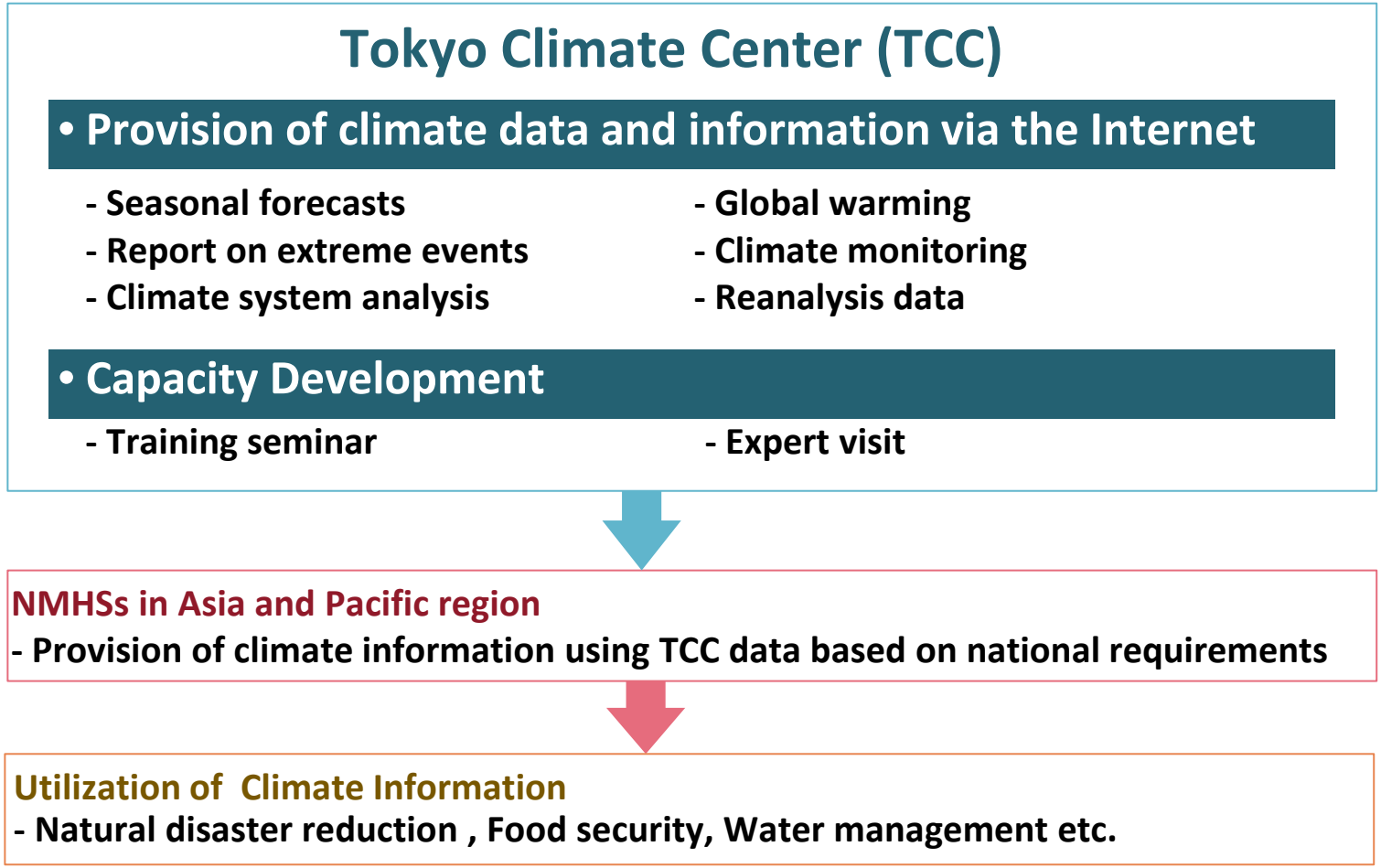
Tokyo Climate Center (TCC)

- TCC supports NMHSs through **data/information provision** and **capacity development activities**
- TCC and BCC have serve as a WMO RCC in RA II



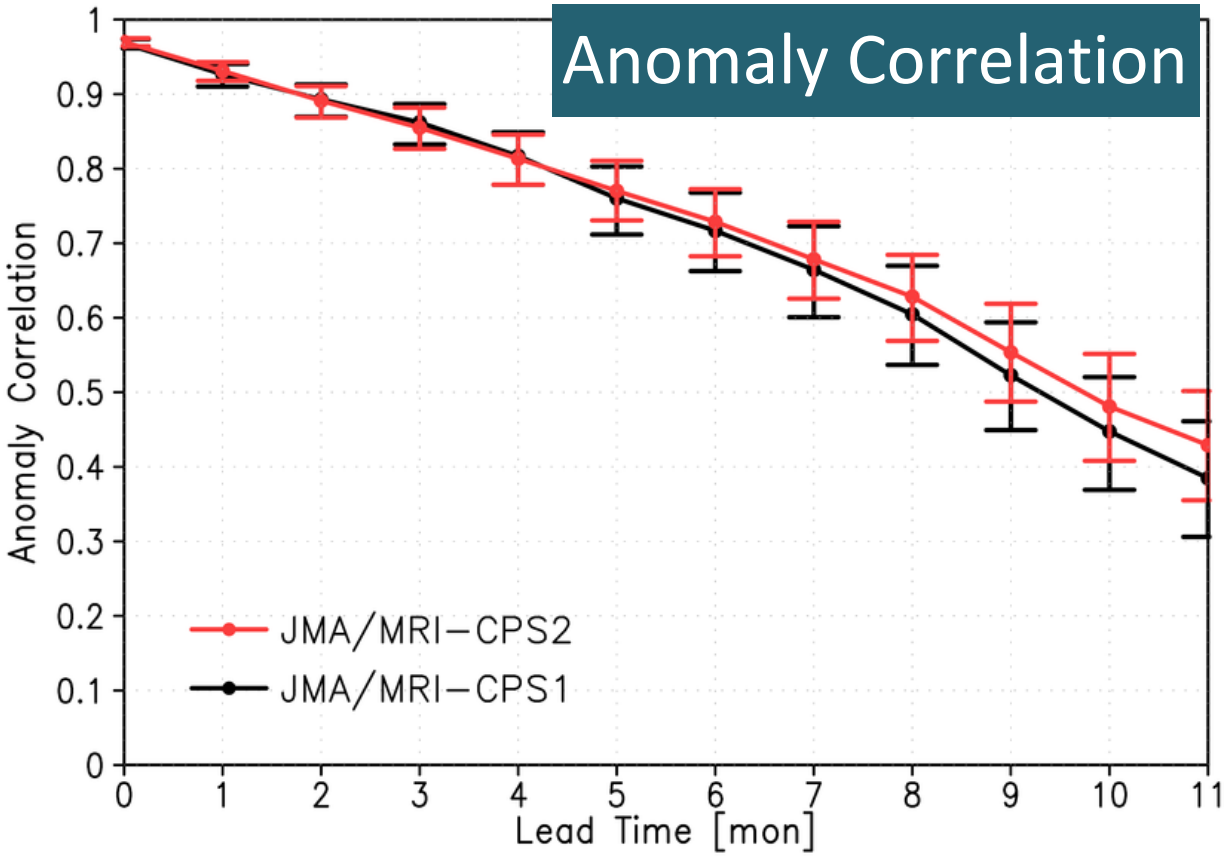
JMA new seasonal prediction system JMA/MRI-CPS2 (June 2015-)

☐ Increased resolution ☐ Improved physics ☐ Interactive sea ice model

☐ Green House Gases ☐ Land initialization ☐ Stochastic physics

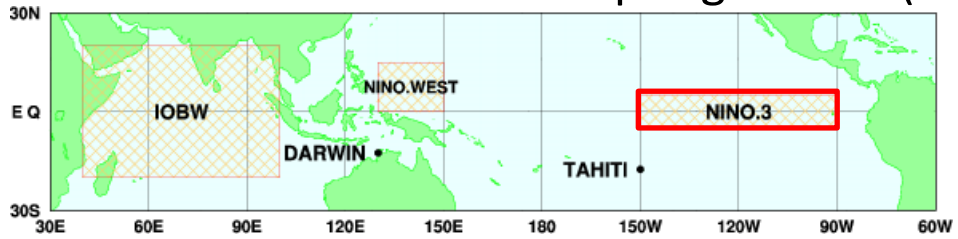
	JMA/MRI-CPS1 (Old)	**JMA/MRI-CPS2 (New)**
Atmosphere (JMA-GSM)	TL95L40, ~180km, Up to 0.4hPa	TL159L60 , ~110km, Up to 0.1hPa Stochastic Tendency Perturbation GHG forcing from RCP4.5 scenario
Ocean (MRI.COM) (Tsujino et al 2010)	1.0° (lon) x 0.3-1° (lat) L50 75° S-75° N Ocean Sea-ice climatology	1.0° (lon) x 0.3-0.5° (lat) L52+BBL Global Ocean with Tripolar Grid Sea-ice model
Coupler (Scup) (Yoshimura & Yukimoto 2008)	1-hour coupling interval Momentum and heat flux adjustments	1-hour coupling interval No flux adjustment
Initial Condition	Atmosphere: JRA-25 Land: Climatology with ERA-15 forcing Ocean: MOVE/MRI.COM-G T, S&SSH (Usui et al. 2006) Sea-ice climatology	Atmosphere: JRA-55 Land: JRA-55 land analysis Ocean: MOVE/MRI.COM-G2 T, S & SSH Sea-ice model

NINO.3 prediction



The new operational system (JMA/MRI-CPS2) improves:

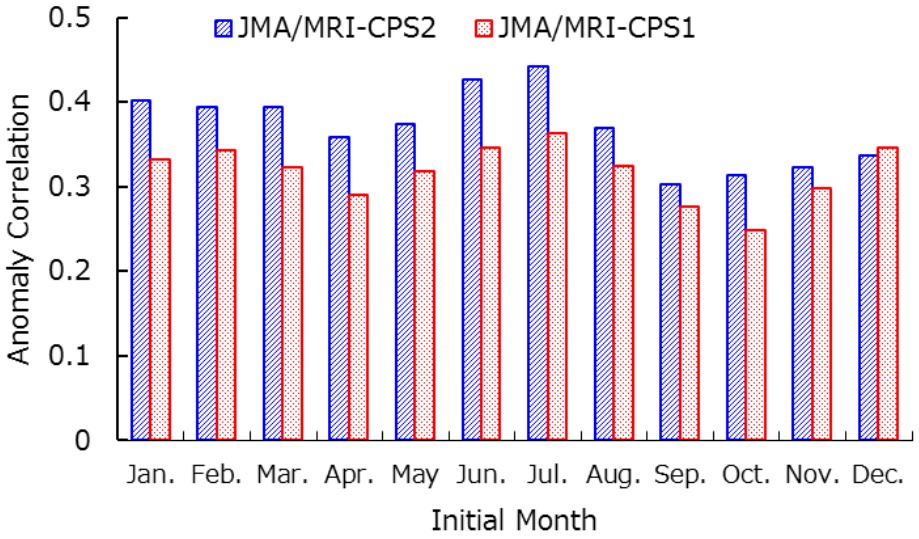
- Predictive skills in longer lead time
- Predictive skills over the spring barrier (not shown)



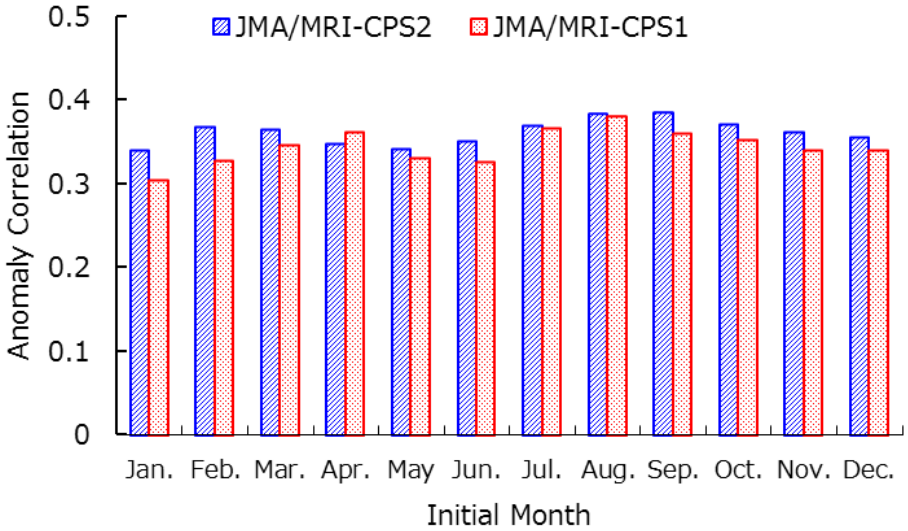
NINO.3 : 150W-90W, 5S-5N

ACC for 3-month forecast

ACC(T2m) averaged in NH



ACC(Precip) averaged in TRP



- For 3-month forecast, ACC for T2m in NH and Precip in TRP of the new system is **greater** than those of the old system in almost all initial months.
- Scores for other regions, other lead time, other variables are **generally improved**.

NH : 20N-90N,0E-360E
TRP :20S-20N,0E-360E

Long Range Forecasts

Forecast and verification maps for one-month, seasonal and ENSO predictions are available.

One-month

forecast map

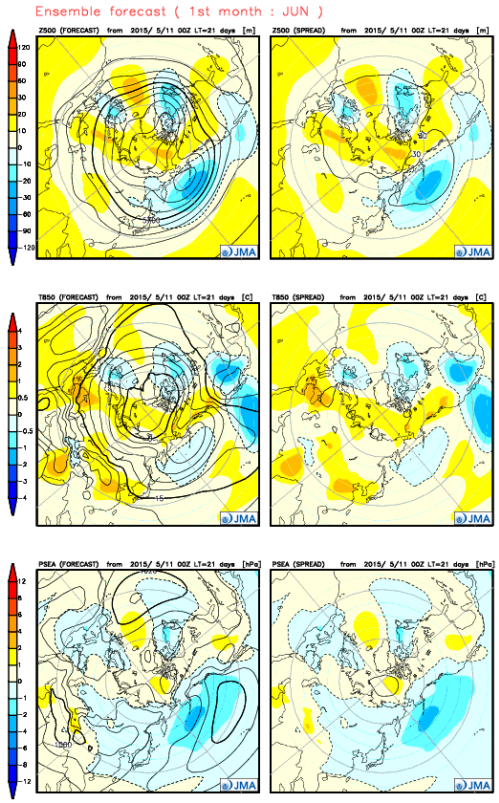
forecast period
the first month
initial date
2015.05.11.00Z

coresponding verification

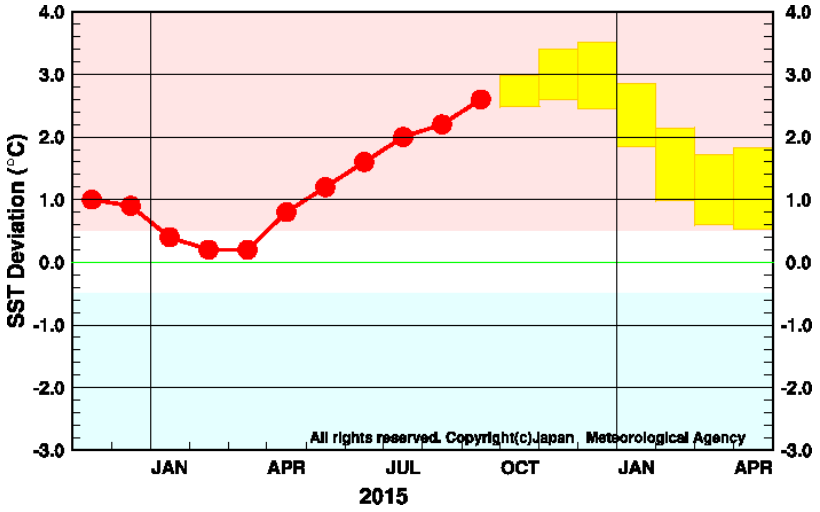
LT : lead time(day)
kt : lead time(hour)

[FORECAST](left figures)
top : Contours show 500hPa height in an interval of 60m.
middle : Contours show 850hPa temperature in an interval of 3C.
bottom : Contours show sea level pressure in an interval of 4hPa.
(Shaded pattern show anomalies.)

[SPREAD](right figures)
top : Contours show spread of 500hPa height in an interval of 30m.
middle : Contours show spread of 850hPa temperature in an interval of 2C.
bottom : Contours show spread of sea level pressure in an interval of 4hPa.
(Shaded pattern show anomalies.)

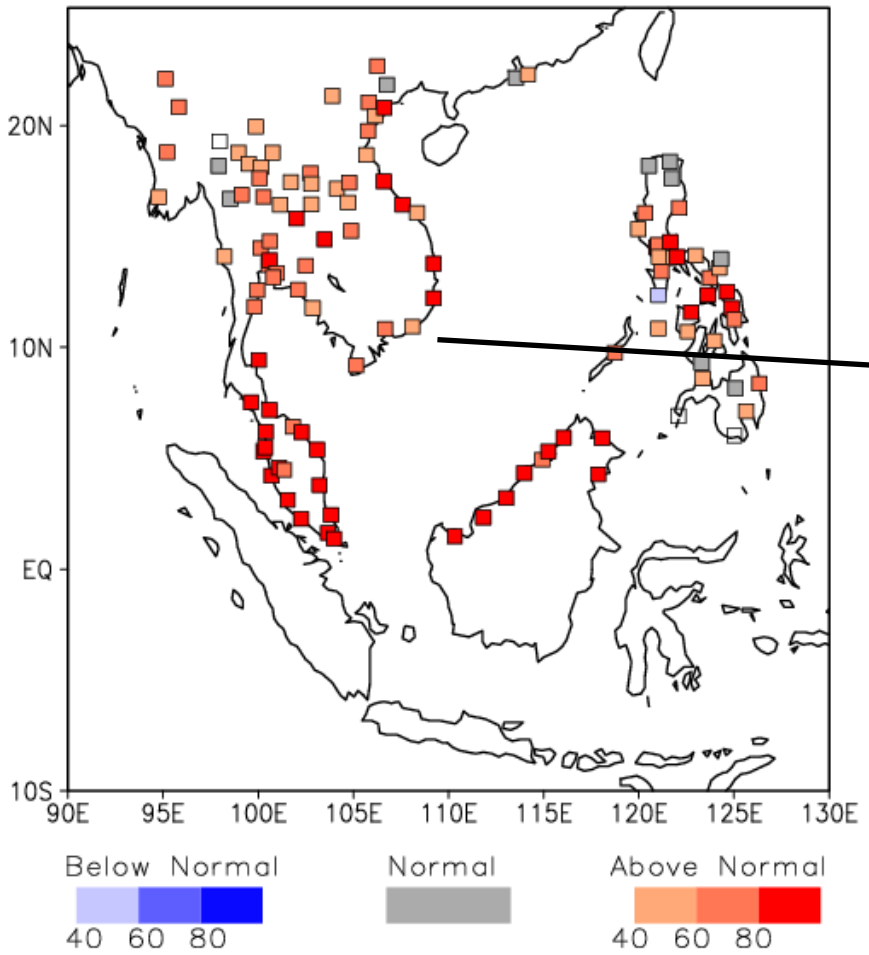


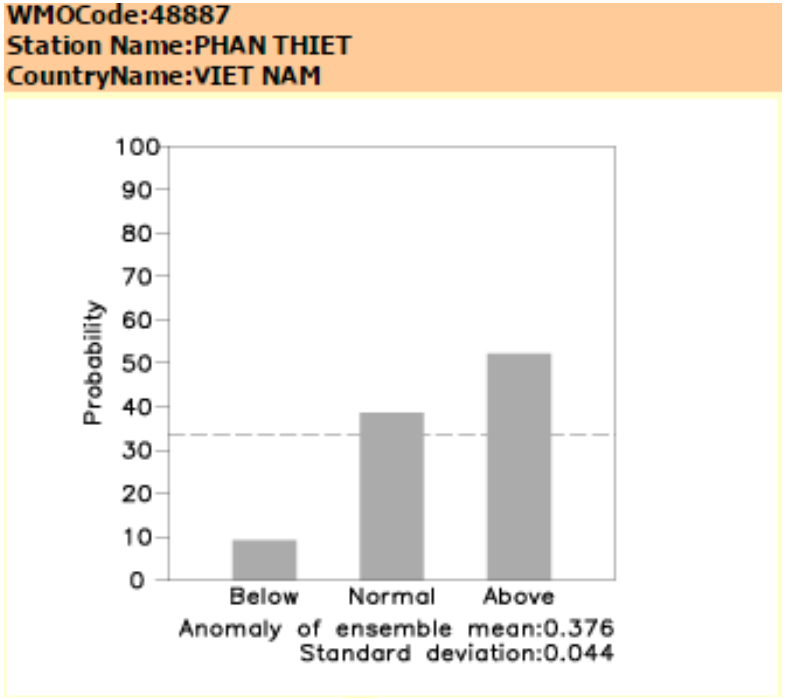
ENSO

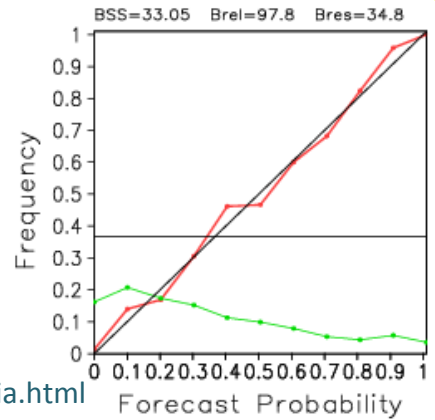


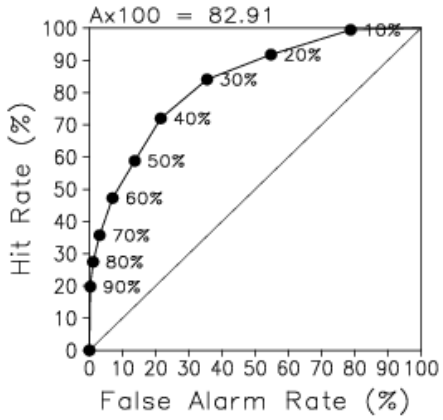
http://ds.data.jma.go.jp/tcc/tcc/products/model/index.html

One-month Probabilistic Forecasts for Southern Asia with statistical downscaling techniques









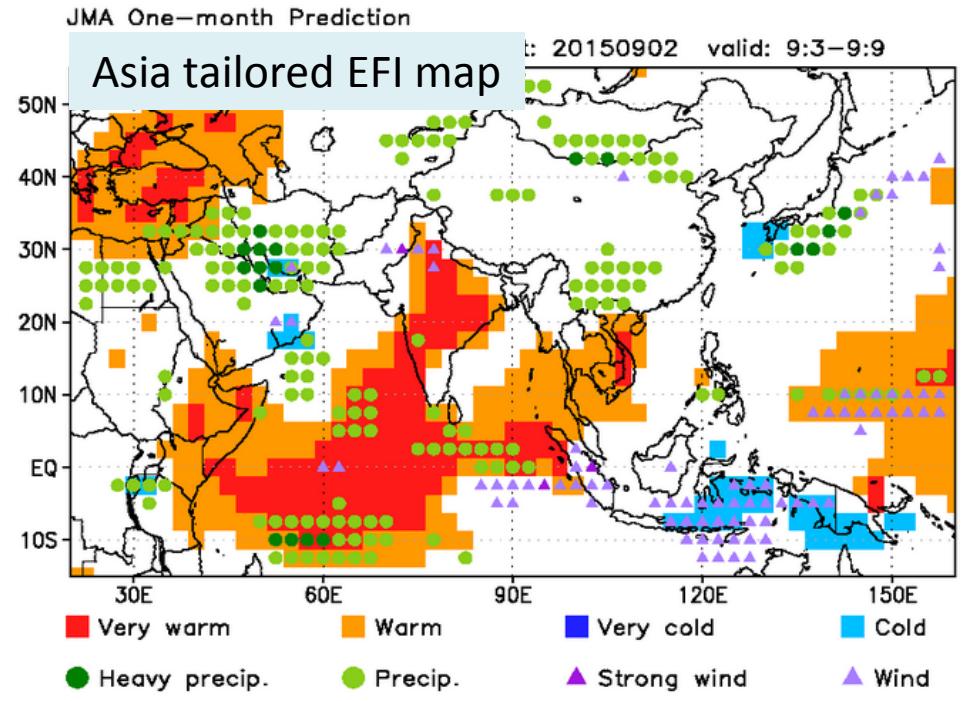
They are updated every Friday.

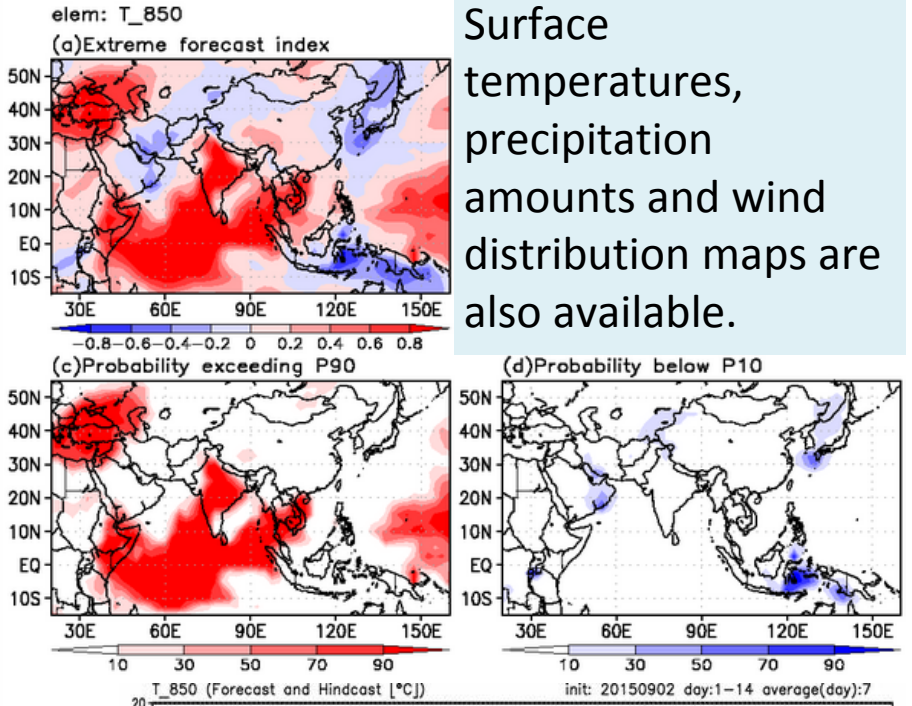
http://ds.data.jma.go.jp/tcc/tcc/products/guidancetst/map_temp_asia.html

For Early Warnings for Extreme Weather Events (EFI)

New!

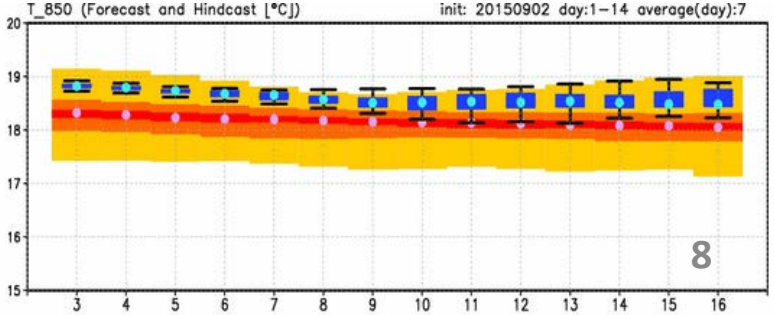
To support the Asia-Pacific NMHSs in the provision of early warnings for extreme events, TCC developed a set of extreme weather warning products based on JMA's operational one-month ensemble prediction system. They are updated every Thursday.





Surface temperatures, precipitation amounts and wind distribution maps are also available.

Time-series representations of EFI and EPSgrams are provided for selected major cities.

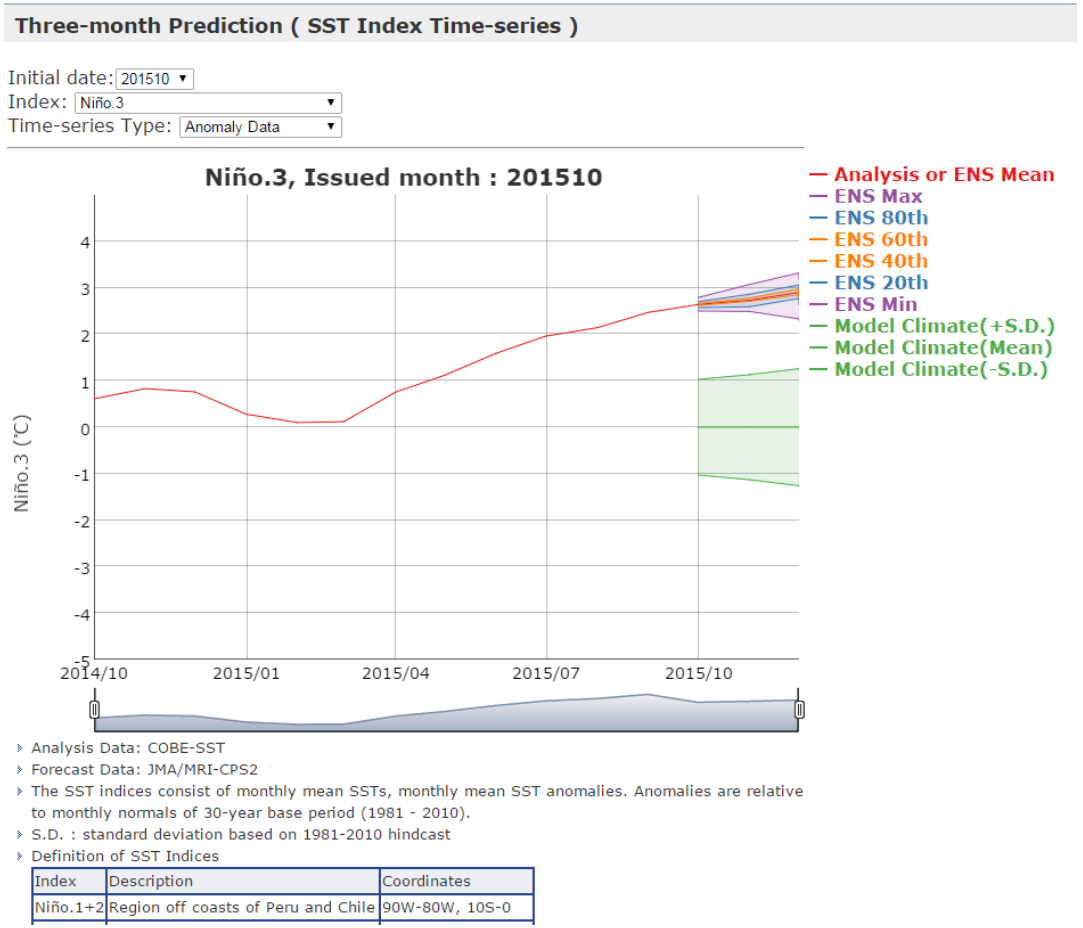


http://ds.data.jma.go.jp/tcc/tcc/gpv/EFI/index.php (password-protected)

Products and data requested at 2013 Brasilia workshop and 2014 ET-OPSLS meeting

New!

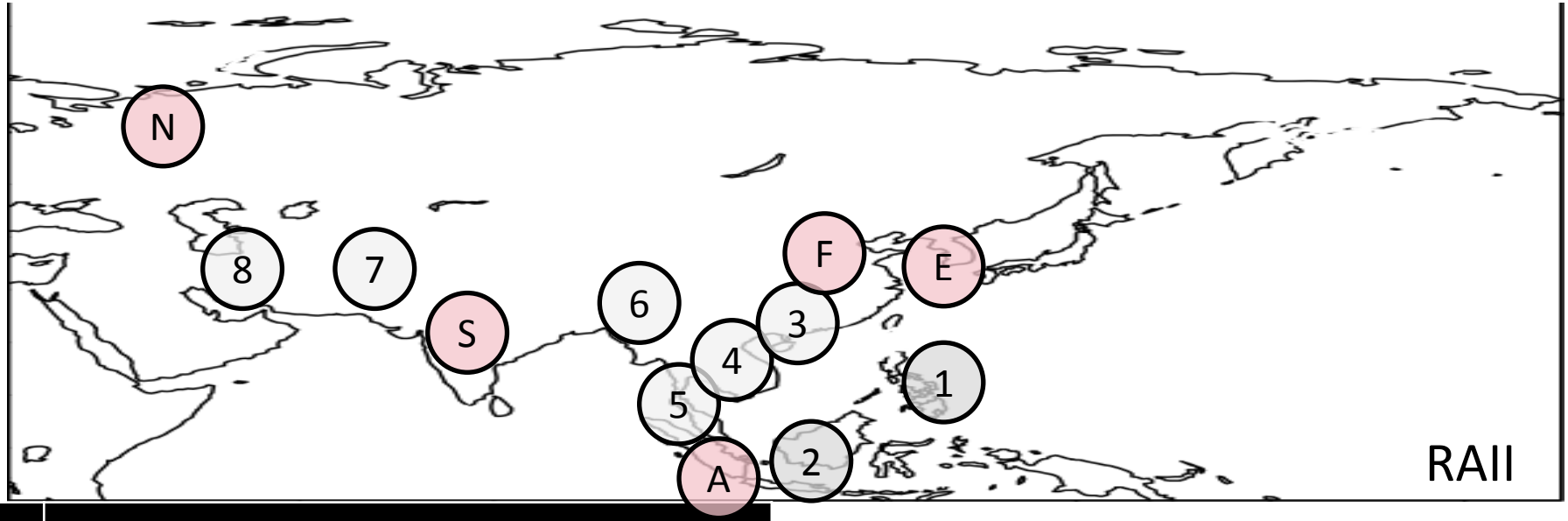
Index	Description
Nino.1+2	Region off coasts of Peru and Chile (90W-80W, 10S-0)
Nino.3	Eastern/Central Tropical Pacific (150W-90W, 5S-5N)
Nino3.4	Central Tropical Pacific (170W-120W, 5S-5N)
Nino.4	Western/Central Tropical Pacific (160E-150W, 5S-5N)
TNA	Tropical North Atlantic (55W-15W, 5N-25N)
TSA	Tropical South Atlantic (30W-10E, 20S-0)
TAD	Tropical Atlantic Dipole (TNA-TSA)
WTIO	Western Tropical Indian Ocean (50E-70E, 10S-10N)
SETIO	Southeastern Tropical Indian Ocean (90E-110E, 10S-0)
IOD	Indian Ocean Dipole (WTIO-SETIO)

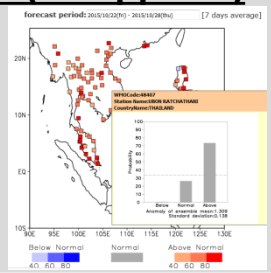


Predictions of SST indices in graphical and CVS formats are available.
Tailored probabilistic forecasts for extremes are (5-category) under development.

http://ds.data.jma.go.jp/tcc/tcc/products/model/indices/3-mon/indices1/shisu_forecast.php

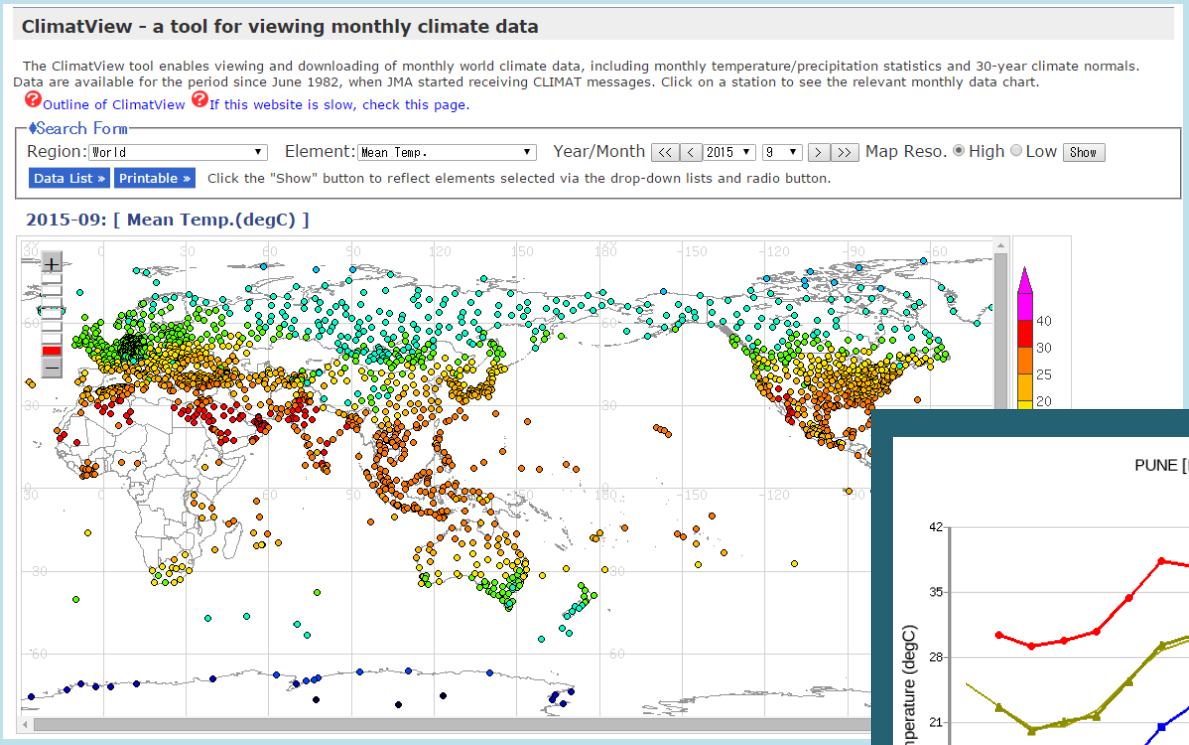
Example for applying our products into forecast activities on NMHSs and contributions to RCOFs

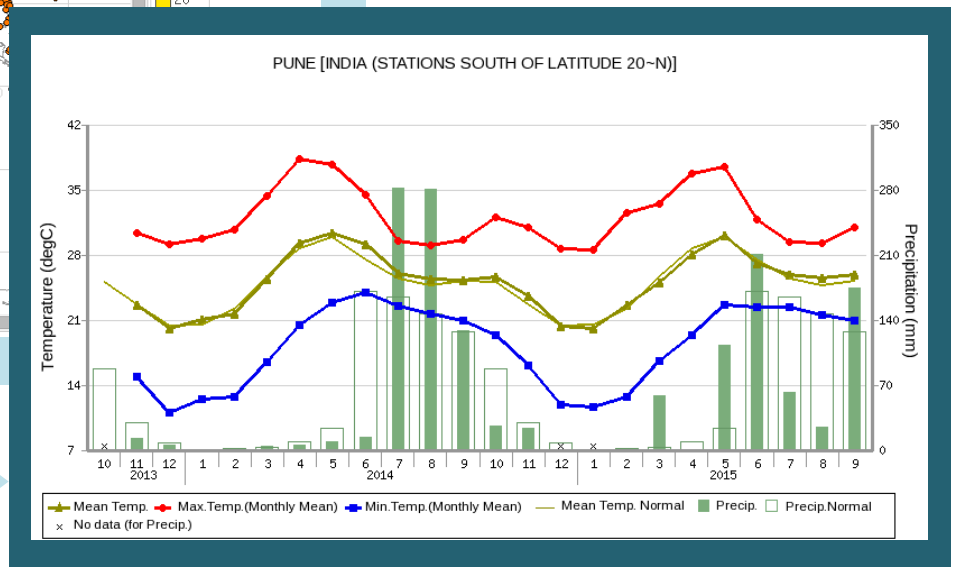


#	NMHSs and RCOFs
1 2	**BMKG (Indonesia) and PAGASA (Philippines)** is developing "one-month probabilistic forecast at station point" using our gridded forecast data and their historical data 
3	**Hong Kong observatory**
4	**Thailand**
5	**Malaysia**
6	**Bangladesh**
7	**Pakistan**
8	**Islamic Republic of Iran**
F	FOCRAII
E	EASCOF
N	NEACOF
S	SASCOF
A	ASEANCOF

Climat View

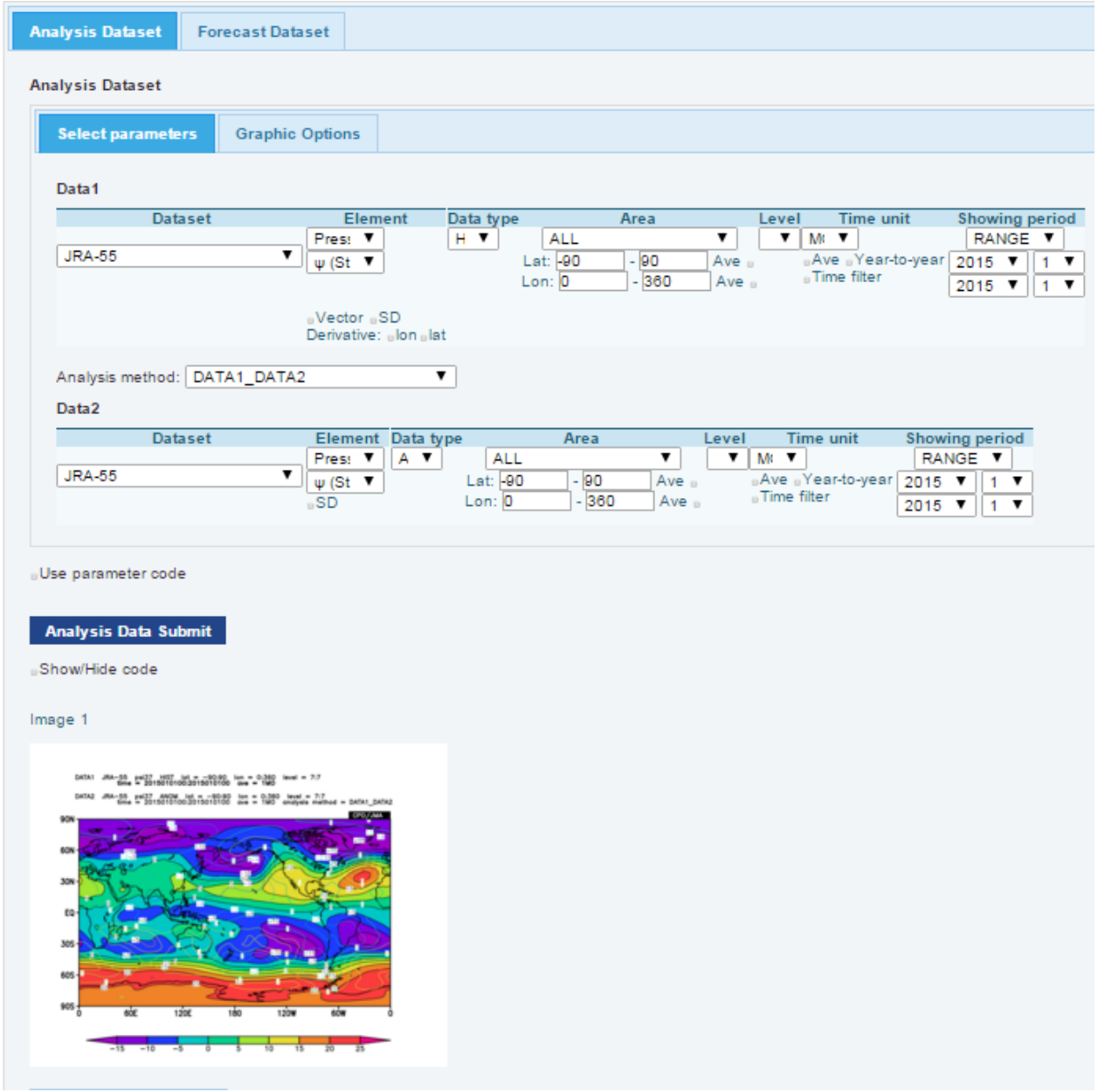
Powerful tool for displaying and downloading monthly world climate data.
It allows users to see and obtain monthly mean temperatures, monthly total precipitation amounts and its anomaly or ratio at all available stations.





http://ds.data.jma.go.jp/gmd/tcc/tcc/products/climate/climatview/frame.php

iTacs



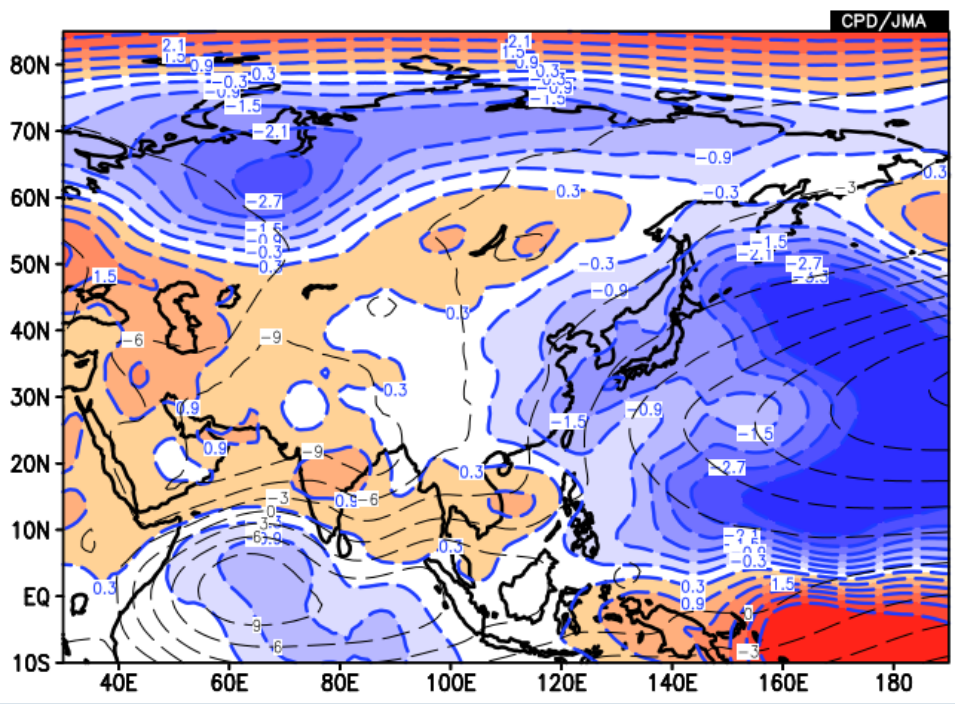
TCC has developed an Interactive Tool for Analysis of the Climate System (iTacs) for NMHSs.

iTacs is a web-based application software for climate analysis such as composite, correlation, EOF and SVD.

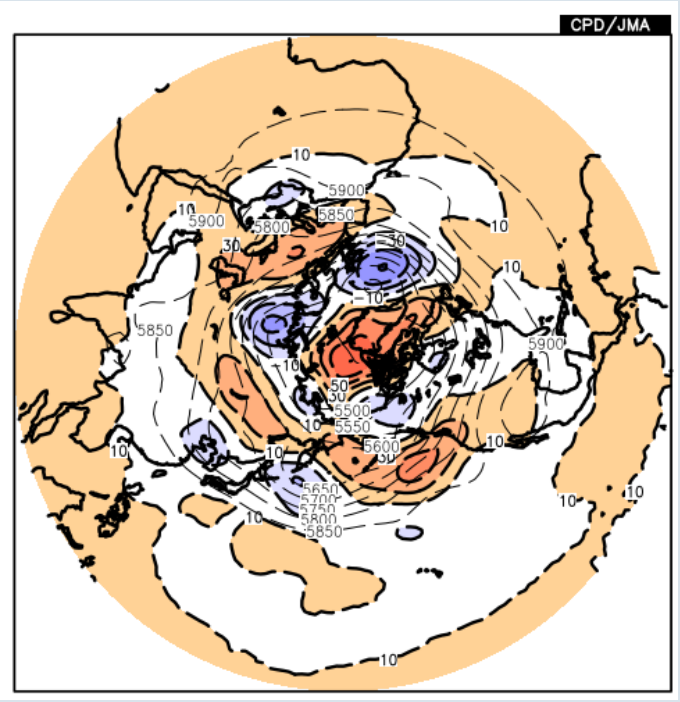
http://extreme.kishou.go.jp/tool/itacs-tcc2011/

iTacs

TCC has developed an Interactive Tool for Analysis of the Climate System (iTacs) for NMHSs. iTacs is a web-based application software for climate analysis such as composite, correlation, EOF and SVD.



Latitude-Longitude Map

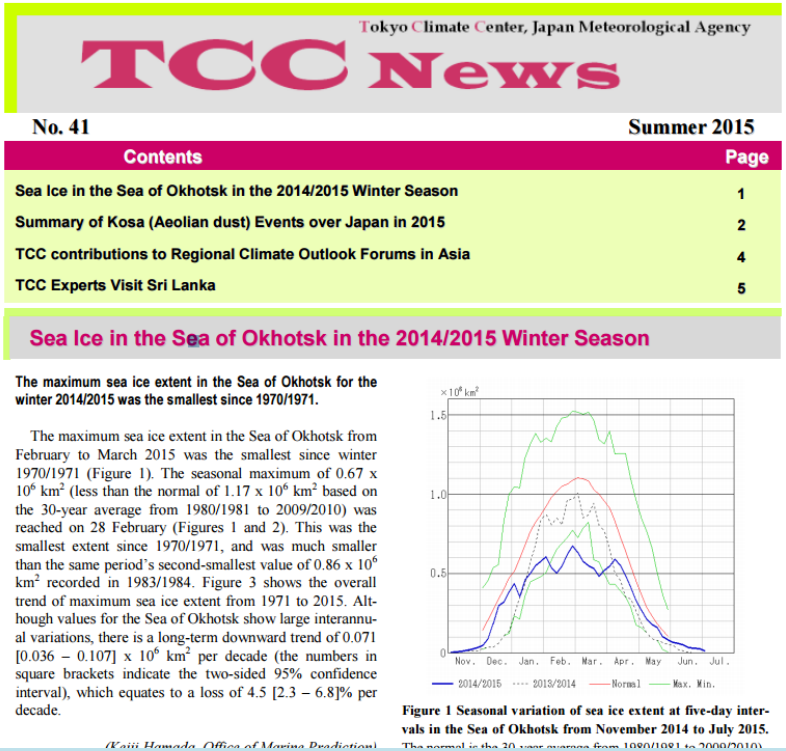


Polar Stereographic Map

http://extreme.kishou.go.jp/tool/itacs-tcc2011/

TCC News

TCC issues a quarterly newsletter TCC News in February, May, August and November containing articles on the latest climate information (significant climate events, seasonal outlook…..), introduction of TCC's new products and relevant activities.



Tokyo Climate Center, Japan Meteorological Agency

TCC News

No. 41 Summer 2015

Contents	Page
Sea Ice in the Sea of Okhotsk in the 2014/2015 Winter Season	1
Summary of Kosa (Aeolian dust) Events over Japan in 2015	2
TCC contributions to Regional Climate Outlook Forums in Asia	4
TCC Experts Visit Sri Lanka	5

Sea Ice in the Sea of Okhotsk in the 2014/2015 Winter Season

The maximum sea ice extent in the Sea of Okhotsk for the winter 2014/2015 was the smallest since 1970/1971.

The maximum sea ice extent in the Sea of Okhotsk from February to March 2015 was the smallest since winter 1970/1971 (Figure 1). The seasonal maximum of 0.67 x 10^6 km^2 (less than the normal of 1.17 x 10^6 km^2 based on the 30-year average from 1980/1981 to 2009/2010) was reached on 28 February (Figures 1 and 2). This was the smallest extent since 1970/1971, and was much smaller than the same period's second-smallest value of 0.86 x 10^6 km^2 recorded in 1983/1984. Figure 3 shows the overall trend of maximum sea ice extent from 1971 to 2015. Although values for the Sea of Okhotsk show large interannual variations, there is a long-term downward trend of 0.071 [0.036 – 0.107] x 10^6 km^2 per decade (the numbers in square brackets indicate the two-sided 95% confidence interval), which equates to a loss of 4.5 [2.3 – 6.8]% per decade.

Figure 1 Seasonal variation of sea ice extent at five-day intervals in the Sea of Okhotsk from November 2014 to July 2015.

World Meteorological Organization
Weather • Climate • Water

Media Centre

Menu

41st issue of the TCC News (Japan Meteorological Agency)

News from Members

11 August 2015

The Tokyo Climate Center (TCC) of the Japan Meteorological Agency (JMA) has released the 41st issue of the TCC News on the TCC website.

This issue covers:

- Sea Ice in the Sea of Okhotsk in the 2014/2015 Winter Season
- Summary of Kosa (Aeolian dust) Events over Japan in 2015
- TCC contributions to Regional Climate Outlook Forums in Asia
- TCC Experts Visit Sri Lanka

Read more

http://ds.data.jma.go.jp/tcc/tcc/news/index.html

Monthly discussion on Seasonal Climate Outlooks

Monthly Discussion on Seasonal Climate Outlooks (No. 20)

(23 October 2015)

Tokyo Climate Center (TCC)
Japan Meteorological Agency (JMA)

1

Outline

Notes:

- The present monthly discussion is intended to assist National Meteorological and Hydrological Services (NMHSs) in WMO RA II (Asia) in interpreting GPC Tokyo's seasonal prediction products. It does not constitute an official forecast for any nation. Seasonal outlooks for individual countries should be obtained from the relevant NMHS.
- Seasonal predictions are based on a JMA's Seasonal Ensemble Prediction System (EPS), which is based on the coupled atmosphere-ocean general circulation model (CGCM).
- JMA provides three-month prediction products around the 20th of every month with warm-season (Jun. – Aug.) prediction products in February, March and April, and with cold-season (Dec. – Feb.) prediction products in September and October.

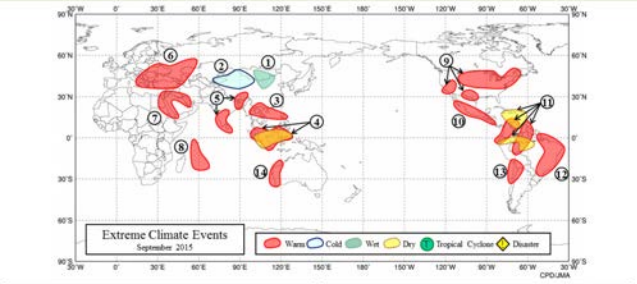
2

http://ds.data.jma.go.jp/tcc/tcc/products/model/monthly_discussion/latest.pdf

Monthly discussion on Seasonal Climate Outlooks

Latest State of the Climate System

<September 2015> Extreme Climate Events



1.Heavy precipitation from central Mongolia to northern China
2.Low temperature from northwestern China to the eastern part of Central Asia
3.High temperature from the northern Philippines to the northern Indochina Peninsula
4.High temperature and light precipitation in and around western Indonesia
5.High temperature from southwestern China to northeastern India and from southern India to Sri Lanka
6.High temperature from southwestern Russia to southeastern Europe
7.High temperature around the Persian Gulf and around the Red Sea
8.High temperature from Seychelles to Mauritius
9.High temperature in the northern and southwestern USA
10.High temperature in and around southern Mexico
11.High temperature and light precipitation around the eastern Caribbean Sea and in the northern part of South America
12.High temperature in eastern Brazil
13.High temperature in and around northern Chile
14.High temperature in western Australia

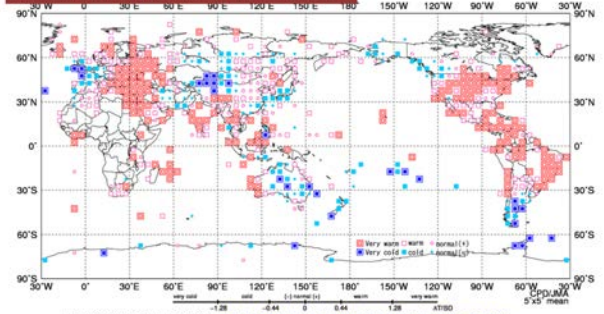
<Monthly Climate in the World> http://ds.data.jma.go.jp/tcc/tcc/products/climate/monthly.html

6

<September 2015> Temperature

- Temperatures were well above normal in many parts of the world including eastern Europe to western Russia, South Asia to Southeast Asia, the USA, Central America and northern South America.
- Temperatures were below normal in western Europe, northwestern China and southern Argentina.

Normalized anomaly of monthly mean temperature

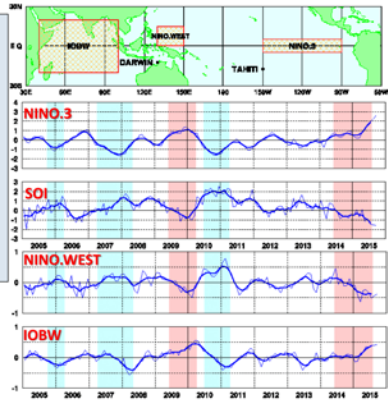


<Monthly Climate in the World> http://ds.data.jma.go.jp/tcc/tcc/products/climate/monthly.html

7

ENSO Monitoring Indices

- El Niño conditions continue in the equatorial Pacific.
- In September 2015, the index for NINO.3 was above normal at +2.6°C. The indices for NINO.WEST and the Indian Ocean Basin Wide (IOBW) were below and above normal, respectively.
- The Southern Oscillation Index (SOI) was negative at -1.6, consistent with weaker than normal trade winds.



Monthly values (thin lines) and five-month running means (thick lines). The shading indicates El Niño (red) and La Niña (blue) events.

< El Niño Monitoring and Outlook>

10

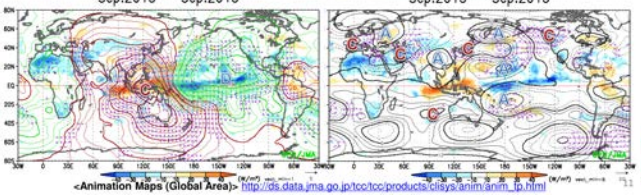
<September 2015> Upper-level Circulation

- Convective activity (inferred from OLR) was enhanced across the equatorial central to eastern Pacific, and was suppressed over the equatorial eastern Indian Ocean to the Maritime Continent.
- In the 200 hPa stream function field, equatorial symmetric anticyclonic circulation anomalies were noticeable in the Pacific. A wave train pattern was seen across Eurasia, with anticyclonic anomalies centered over southern China and cyclonic anomalies over the Sea of Japan.

Monthly average 200 hPa velocity potential, divergent wind vector, and outgoing longwave radiation (OLR) anomalies
Vector: divergent wind vector anomalies (m/s)
Shading: OLR anomalies (W/m²)
D and C indicate the centers of large-scale divergence and convergence anomalies, respectively.

Monthly average 200 hPa stream function & OLR anomalies
Contour: stream function anomalies (10^6 m²/s)
Vector: wave activity flux (m²/s²)
Shading: OLR anomalies (W/m²)
A and C indicate the centers of anti-cyclonic and cyclonic circulation anomalies, respectively.

Sep.2015 – Sep.2015 Sep.2015 – Sep.2015

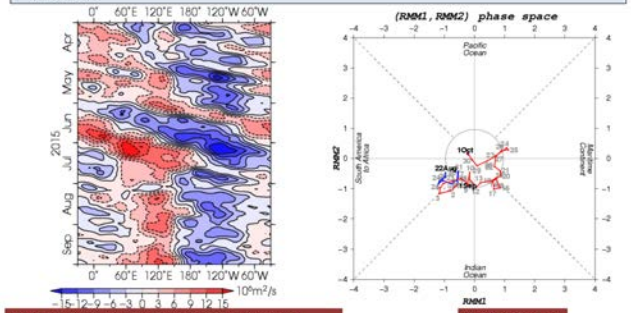


<Animation Maps (Global Area)> http://ds.data.jma.go.jp/tcc/tcc/products/clisys/anim/anim_fp.html

11

Equatorial Intraseasonal Oscillation

- Throughout September, the active phase of the Madden-Julian Oscillation (MJO) remained barely identifiable and the pattern of convective activity enhanced over the central to eastern Pacific and suppressed over the Indian Ocean to the Maritime Continent was sustained.



Time-longitude cross section of seven-day running mean 200 hPa velocity potential anomalies (5°S – 5°N)

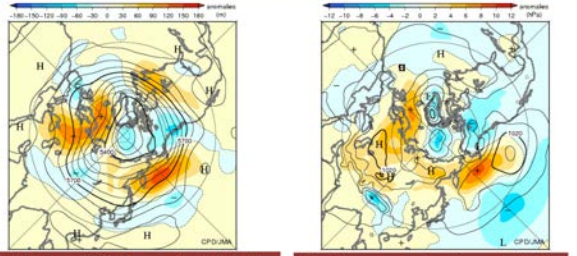
MJO diagram

<MJO> http://ds.data.jma.go.jp/tcc/tcc/products/clisys/mjo/moni_mjo.html

13

<September 2015> Northern Hemisphere Circulation

- In the 500-hPa height field, positive anomalies were centered over eastern Europe to western Russia, the Bering Sea and eastern Canada. Negative anomalies were seen in western Europe, western Siberia, Japan and northwestern North America.
- In the sea level pressure field, positive anomalies were seen across northern Eurasia, and negative anomalies were seen over northwestern North America.



Monthly mean 500 hPa geopotential height
Contour: geopotential height
Shading: geopotential height anomalies

Monthly mean sea level pressure (SLP)
Contour: SLP
Shading: SLP anomalies

<Monthly mean Maps (N.H.)> http://ds.data.jma.go.jp/tcc/tcc/products/clisys/figures/db_hist_mon_tcc.html

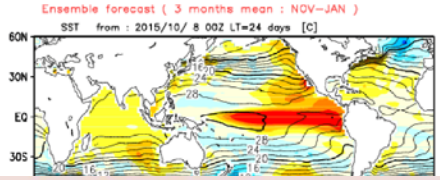
14

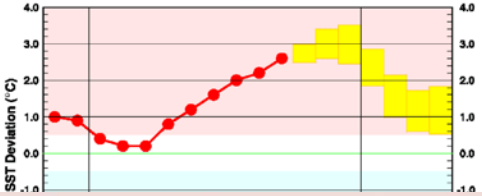
Monthly discussion on Seasonal Climate Outlooks

Predictions

<NDJ 2015/16> Sea Surface Temperature (SST)

- It is likely that El Niño conditions will continue until the Northern Hemisphere spring.
- It is likely that the NINO.WEST SST will be roughly below normal until the Northern Hemisphere spring.
- It is likely that the IOBW SST will be above normal until the Northern Hemisphere spring.

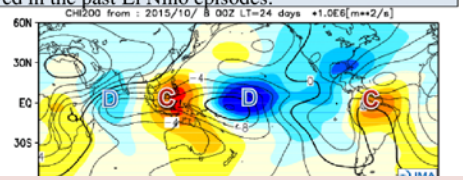




< NDJ 2015/16 > Global Circulation

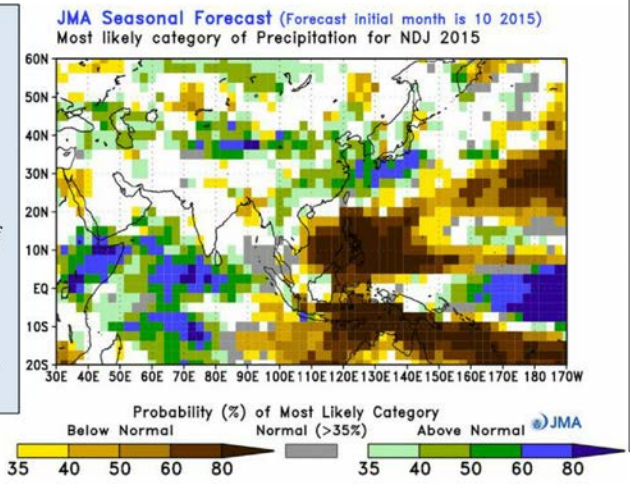
- In the 200 hPa velocity potential field, negative (large-scale divergence) anomalies over the central to eastern Pacific and positive (large-scale convergence) anomalies over the Maritime Continent are predicted.
- In the 200 hPa stream function field, anticyclonic circulation anomalies extending across the central to eastern Pacific straddling the equator are predicted. Cyclonic anomalies are predicted over and to the east of southern China, indicating that the subtropical jet stream will be displaced southward of its normal position over East Asia.
- These circulation patterns are similar to those observed in the past El Niño episodes.

200 hPa velocity potential (10^6 m^2/s)
Contour: three-month average
Shading: anomalies



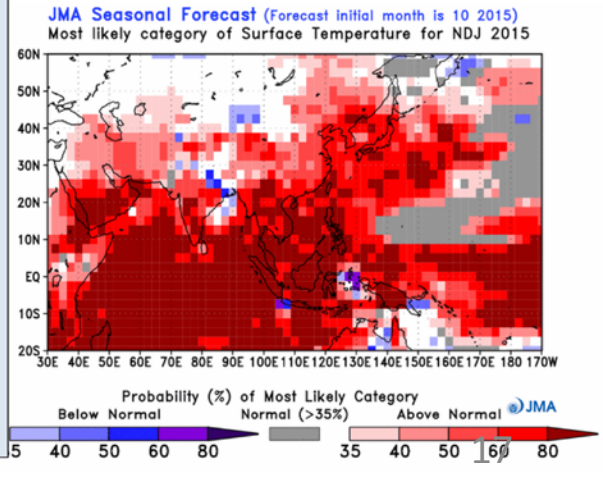
<NDJ 2015/16> Probability Forecasts (precipitation)

- A high probability of above normal precipitation is predicted for the equatorial western Indian Ocean and the equatorial central Pacific.
- A high probability of below normal precipitation is predicted for the eastern part of the Maritime Continent.
- A slightly high probability of above normal precipitation is predicted to the south of Japan.



<NDJ 2015/16> Probability Forecasts (temperature)

- A high probability of above normal temperatures is predicted for a wide swath of areas from South Asia to Southeast Asia.
- A slightly high probability of above normal temperatures is predicted for East Asia.
- Note that a slightly high probability of below normal temperatures extending to the west and south of New Guinea should be viewed with *low confidence* because of limited model skill at predicting (boreal) cold season temperatures for these regions.



TCC Annual Training Seminar

As part of TCC's capacity-building activity in its role as RCC, TCC holds annual training seminars on the application of its climate monitoring and prediction products.

Each seminar deals with a different theme depending on TCC's progress in climate and analysis capabilities, such as the introduction of upgraded climate models.

	Theme	Number of Participating Countries
2008	Climate Information and Forecasting	13
2009	Climate Analysis using Reanalysis Data	11
2010	Application of Seasonal Forecast Gridded Data to Seasonal Forecast Products	19
2011	One month Forecast Products	13
2012	Climate Analysis Information	12
2013	Seasonal Forecast Products	16
2014	Global Warming Projection Information	13
2015	One Month Forecast	15

http://ds.data.jma.go.jp/gmd/tcc/tcc/library/index.html

Thank you for your attention.

Please visit the TCC website.

http://ds.data.jma.go.jp/tcc/tcc/index.html