

Recent development of JMA's climate services

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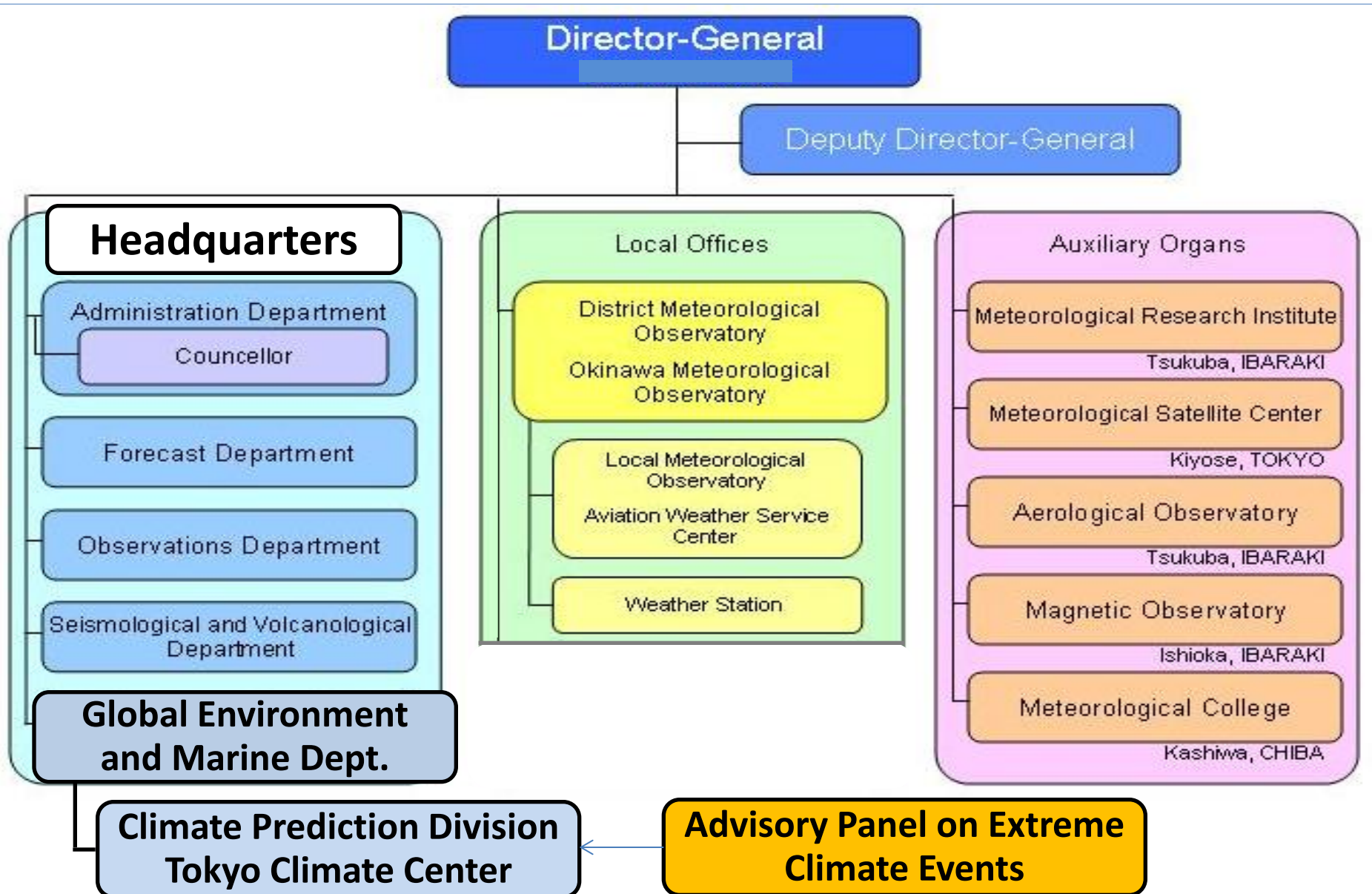
Outline

1. Introduction of JMA's climate services
2. Recent development
 - 2.1 Operational use of JRA-55 (Onogi)
 - 2.2 Major upgrade of One-month EPS (Minami)
 - 2.3 Upgrade plan of Seasonal EPS (Matsukawa)
 - 2.4 Promotion of the use of climate information for CRM (Miyawaki)
 - 2.5 TCC products and services

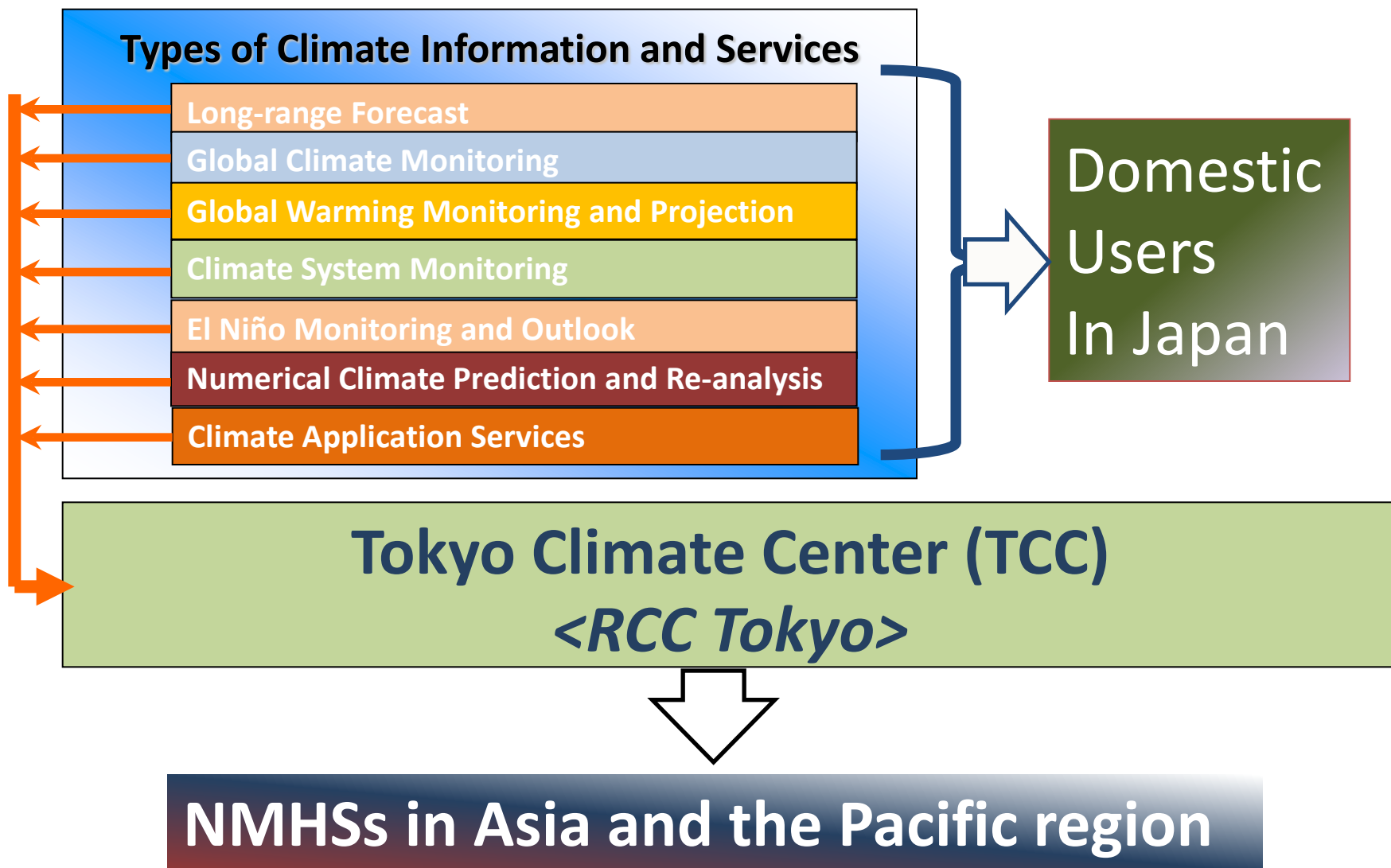
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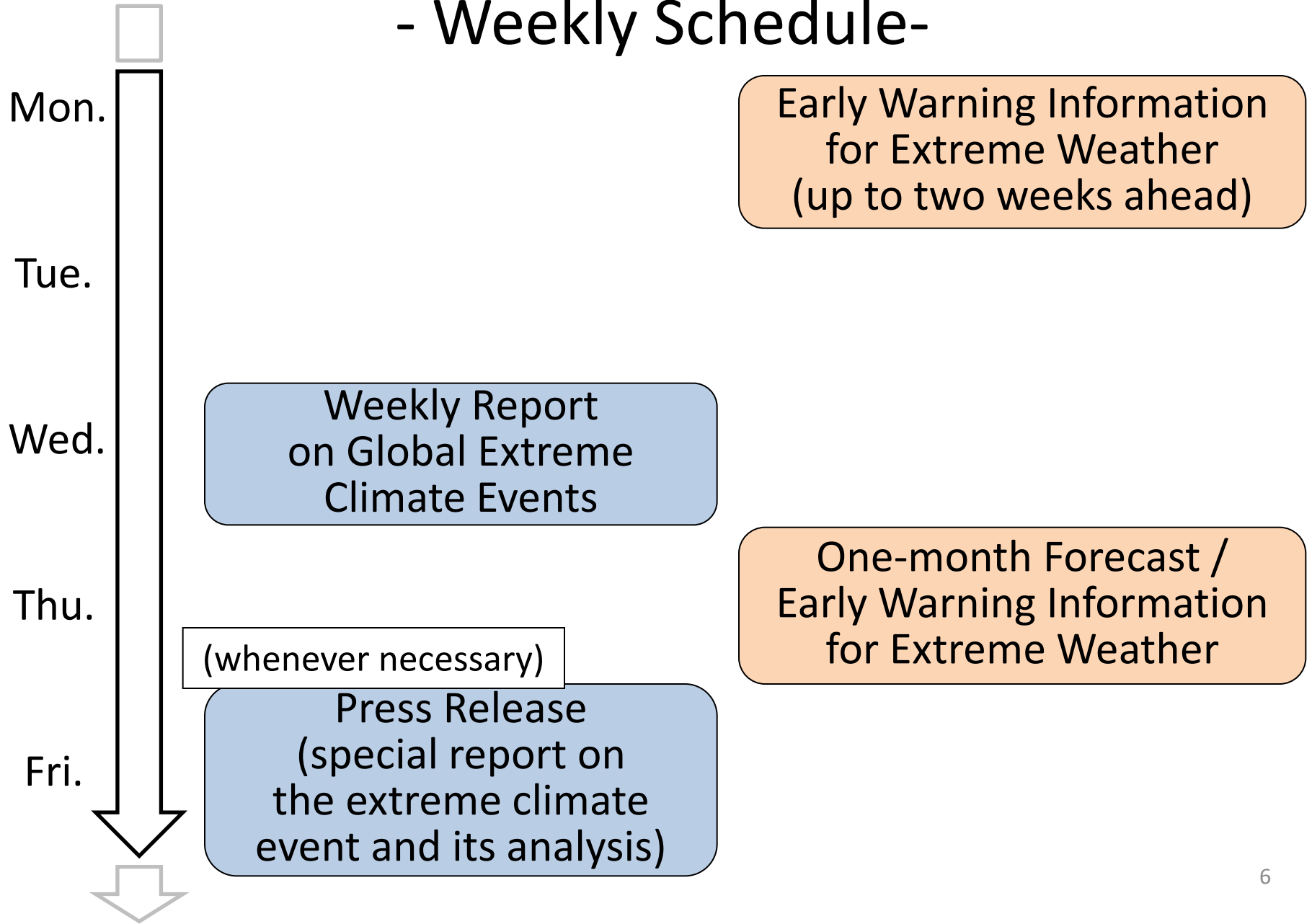
Organization of JMA



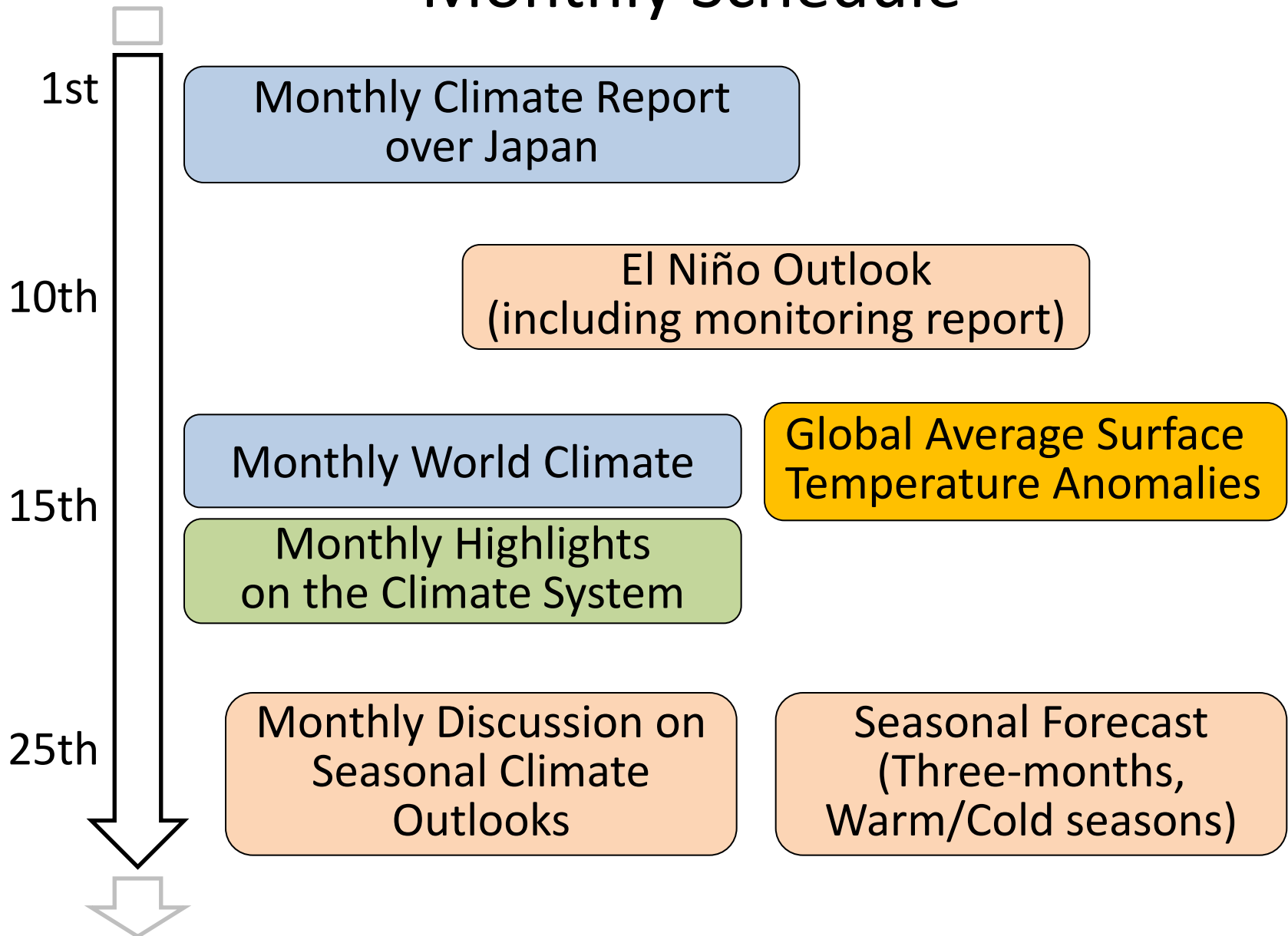
Provision of Climate Information



Provision of climate information - Weekly Schedule-



Provision of climate information - Monthly Schedule-

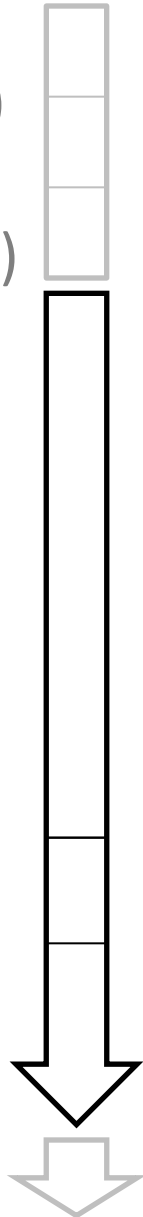


Provision of climate information

- Seasonal Schedule -

Winter (DJF)
Spring (MAM)
Summer (JJA)
Autumn (SON)

Next
month



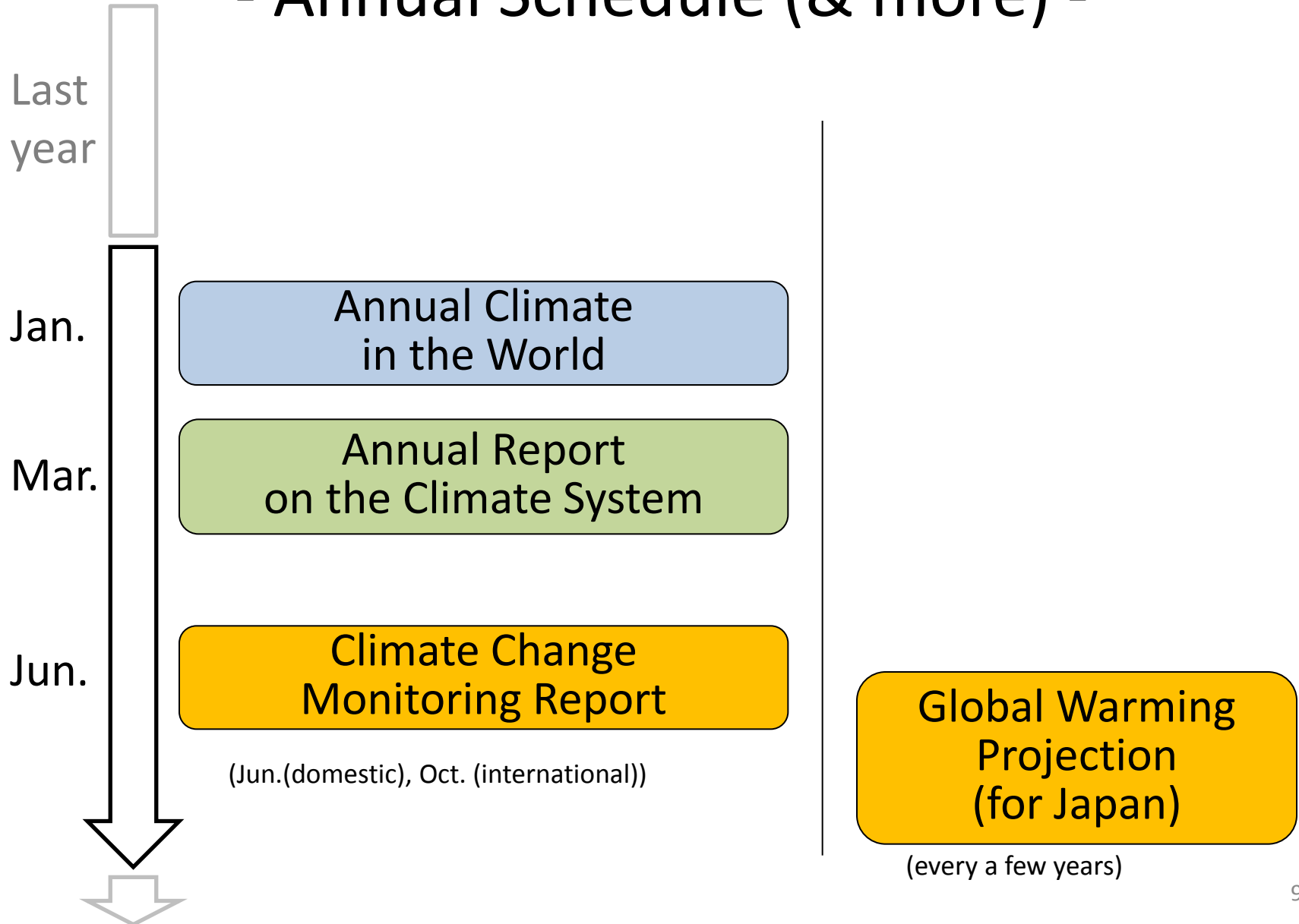
Seasonal Climate Report
over Japan

Seasonal Highlights
on the Climate System

Seasonal Climate
in the World

TCC News

Provision of climate information - Annual Schedule (& more) -



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JRA-55: Japanese 55-year Reanalysis

JRA-25 (1979~2004)

by JMA and CRIEPI

(Central Research Institute for Electric Power Industry)



JRA-55 (JRA Go! Go!) (1958~2012)

by JMA

- **JRA-55** is the first reanalysis which covers more than 50 years since 1958 with 4D-var data assimilation system.
- JMA operates **JRA-55** continuously in real time basis after 2013.

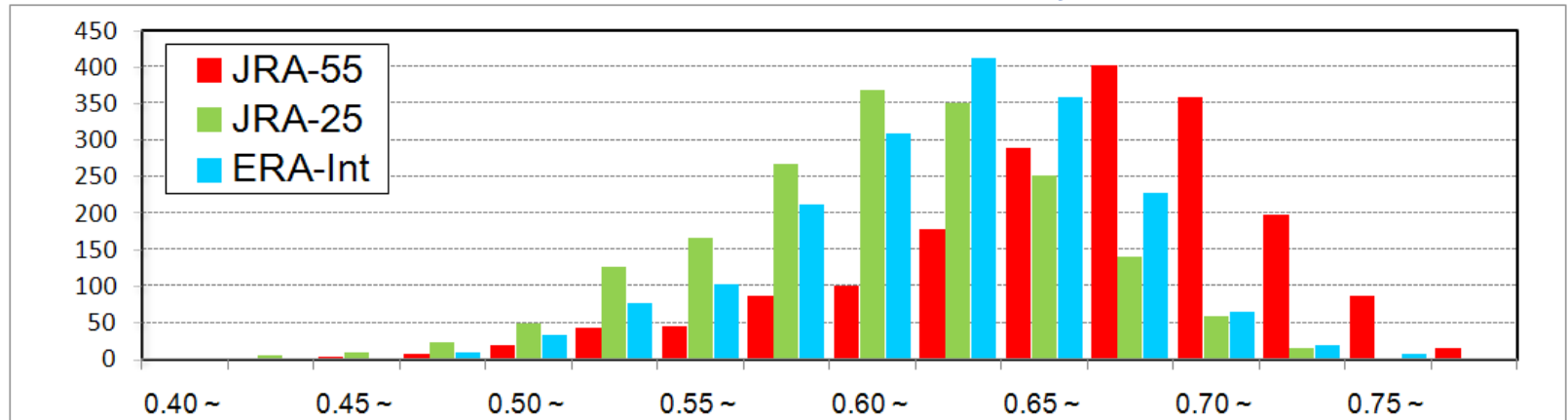


Quality improvement from JRA-25

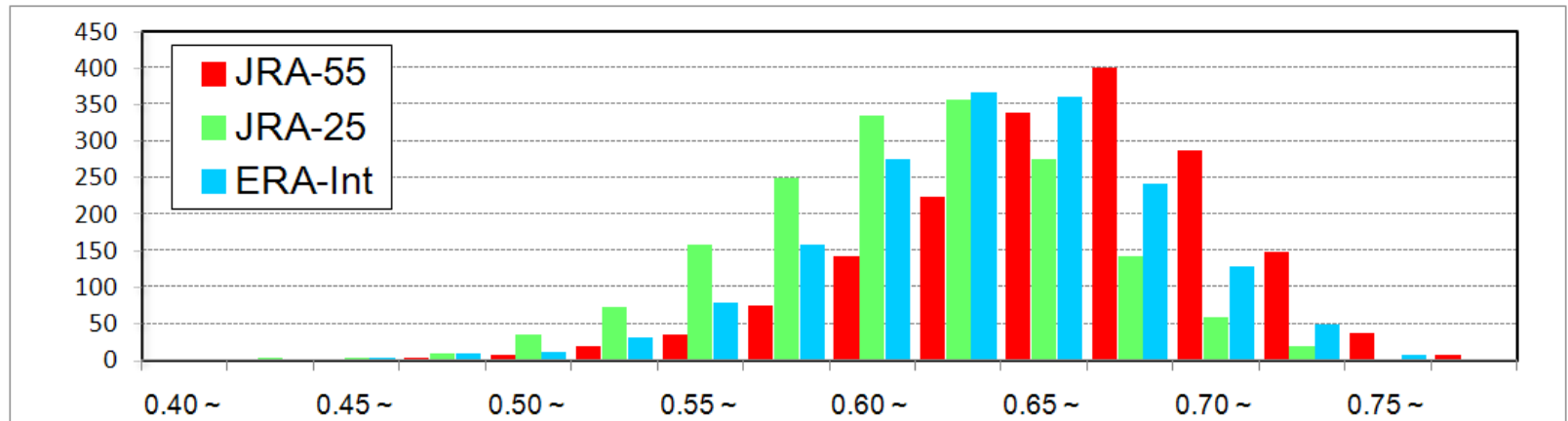


~precipitation pattern in the tropics~

Warm season in the Northern hemisphere (1 May. – 30 Sep.)



Cold season in the Northern Hemisphere (1 Nov. – 31 Mar.)



Frequency of spatial correlation of daily precipitation over tropical region (22°S-22°N) against TRMM from 1998 to 2009

The red, green and blue bars show JRA-55, JRA-25/JCDAS and ERA-Interim.

Application of JRA-55 for operational climate services



Operational climate services

Climate System Monitoring

Data for monitoring and diagnosing climate system variation including intraseasonal, interannual, and decadal variation

Long-range forecast

El Niño Outlook

Atmospheric, terrestrial and oceanic initial and verification data for seasonal prediction model

Climate research

Data for climate researches; analysis of extreme climate events, mechanism studies on climate variation, development and improvement of seasonal prediction model

JRA-55



Forcing data for Ocean Assimilation System (MOVE-G)

Major upgrade of One-month EPS

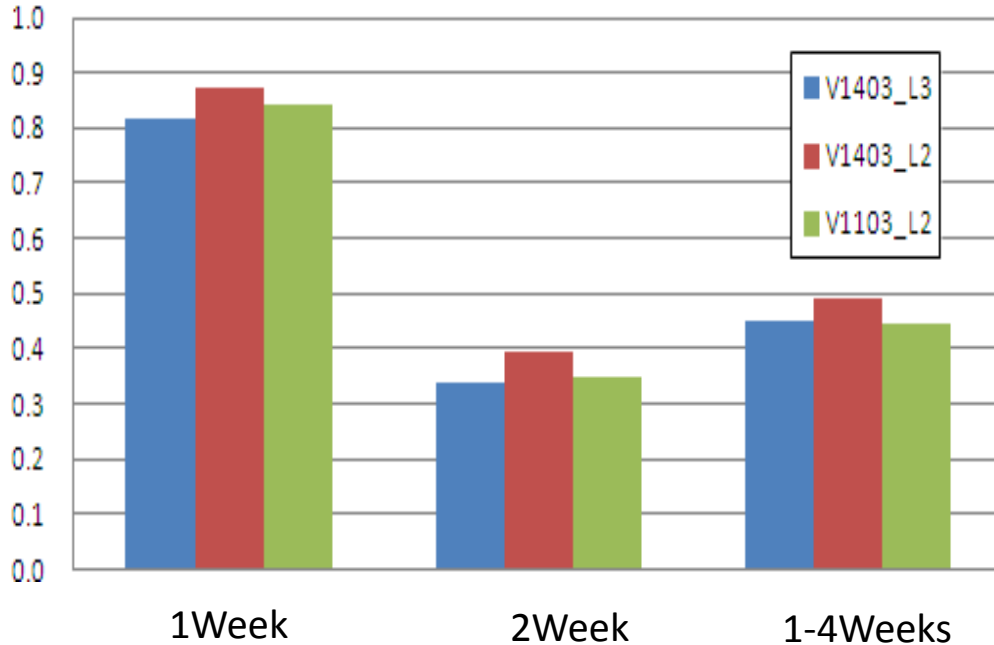
- In March 2014, JMA's One-month Ensemble Prediction System (one-month EPS) was updated.

		Old system	New system
Numerical model		JMA-GSM (<u>Atmospheric General Circulation Model</u>)	
Dx, Dz		Approx. 110km, L60 (Top: 0.1hPa)	Approx. 55km , L60 (Top: 0.1hPa)
Initial condition	Atmosphere	Analysis of global atmosphere	
	Land	Land surface analysis	
Lateral boundary condition	SST	Persisted anomaly ($1^\circ \times 1^\circ$)	Persisted anomaly (<u>$0.25^\circ \times 0.25^\circ$</u>)
	ICE	Climatology	<u>Statistically estimated using initial anomaly with climatological variation</u>
Ensemble size		50 members (25members \times 2 initials)	
Perturbation method		Breeding Growing Mode (BGM), Lagged Average Forecast (LAF)	BGM, LAF, and <u>stochastic physics scheme</u> <u>(Buizza et al. 1999)</u>

Improved Prediction skill

~ Results of 30 year (1981-2010) Hindcast ~

T850 ACC NH Annual



Since Verification of the hindcasts shows significant prediction skill improvement, JMA changed the issue date of one-month forecasting from Friday to Thursday without change of the valid date in Mar 2014.

Anomaly correlation coefficients of 850-hPa temperature (T850) over the Northern Hemisphere (20° N-90° N). The green and red bars denote the old system (V1103) and the current system (V1403), respectively. Lead time is two days. The blue bar denotes V1403 but lead time is three days. The verification period is 1981 to 2010.

Upgrade plan of Seasonal EPS

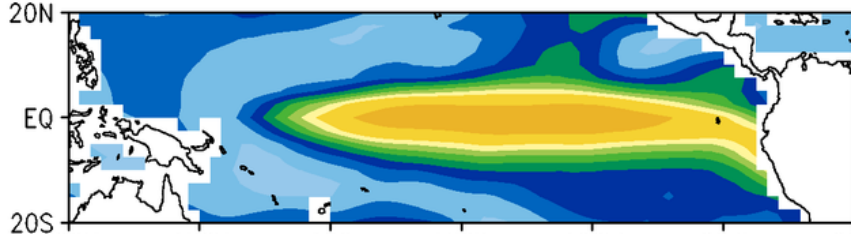
	JMA/MRI-CGCM (Current)	JMA/MRI-CGCM2 (Next)
Atmosphere (JMA-AGCM)	<i>TL95L40</i> , ~180km, Up to <i>0.4hPa</i>	<i>TL159L60</i> , ~110km, Up to <i>0.1hPa</i> <i>Stochastic Tendency Perturbation</i> <i>GHG forcing</i> from RCP4.5 scenario
Ocean (MRI.COM) (Tsuji et al 2010)	1.0° (lon) x <i>0.3-1</i> ° (lat) <i>L51</i> 75° S-75° N Ocean <i>Sea-ice climatology</i>	1.0° (lon) x <i>0.3-0.5</i> ° (lat) <i>L53</i> <i>Tripolar Global Ocean</i> <i>Sea-ice model</i>
Coupler (Scup) (Yoshimura and Yukimoto 2008)	1-hour coupling interval <i>Momentum and heat flux adjustments</i>	1-hour coupling interval <i>No flux adjustment</i>
Initial Condition	Atmosphere: <i>JRA-25</i> Land: <i>Climatology with ERA-15 forcing</i> Ocean: <i>MOVE/MRI.COM-G</i> T, S&SSH (Usui et al. 2006) <i>Sea-ice climatology</i>	Atmosphere: <i>JRA-55</i> Land: <i>JRA-55 land analysis</i> Ocean: <i>MOVE/MRI.COM-G2</i> T, S & SSH <i>Sea-ice model</i>
Ensemble Size	51 (<i>9</i> BGMs, <i>6</i> days with 5-day LAF)	51 (<i>13</i> BGMs, <i>4</i> days with 5-day LAF)

Improved ENSO variability

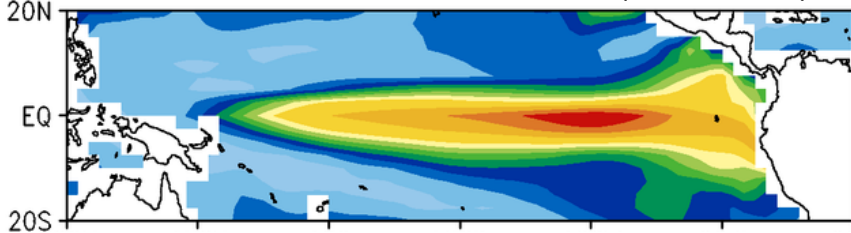
~ Results of 30 year (1981-2010) Hindcast ~

- Too large amplitude of SST interannual variability in current system is reduced in next system

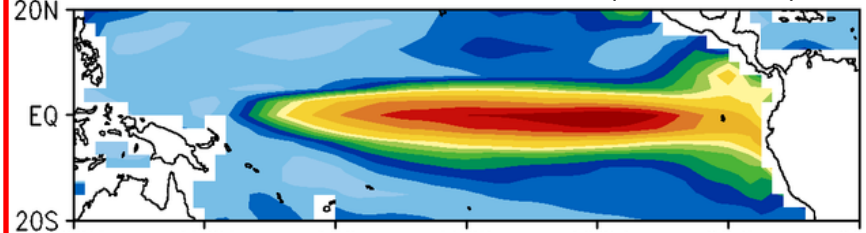
COBE-SST



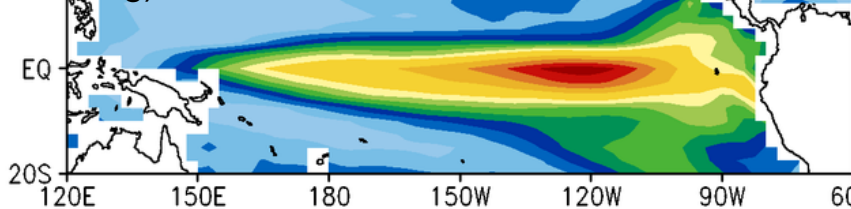
JMA/MRI-CGCM2 ; LT=1 month (initial: Nov)



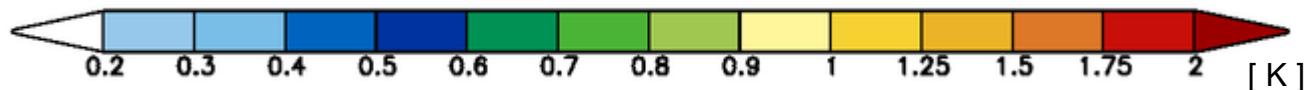
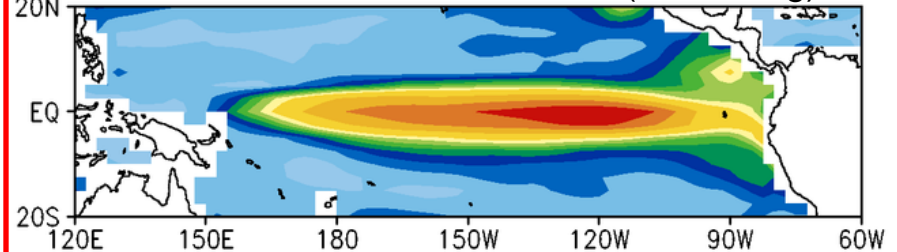
JMA/MRI-CGCM ; LT=1 month (initial: Nov)



JMA/MRI-CGCM2 ; LT=4 months (initial: Aug)



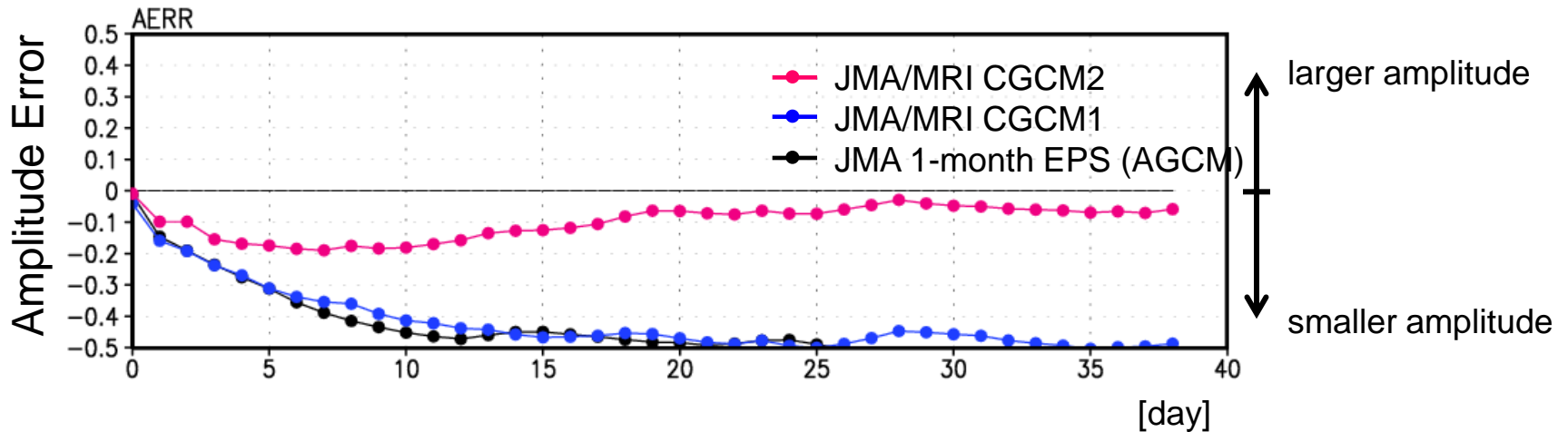
JMA/MRI-CGCM ; LT=4 months (initial: Aug)



Standard Deviation (DJF) of Observed(upper panel) and Predicted SST

Improved MJO variability

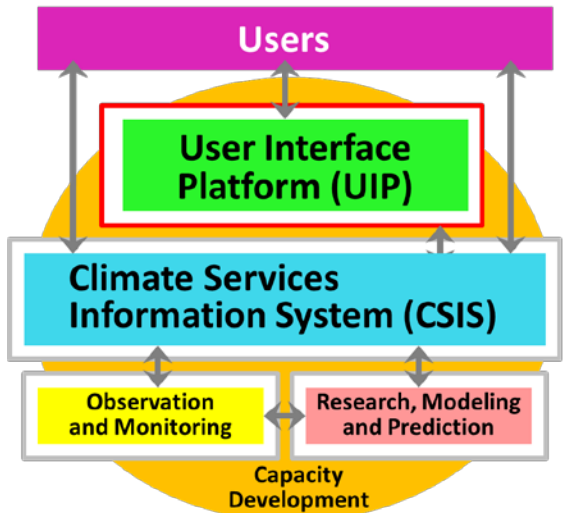
~ Results of 30 year (1981-2010) Hindcast ~



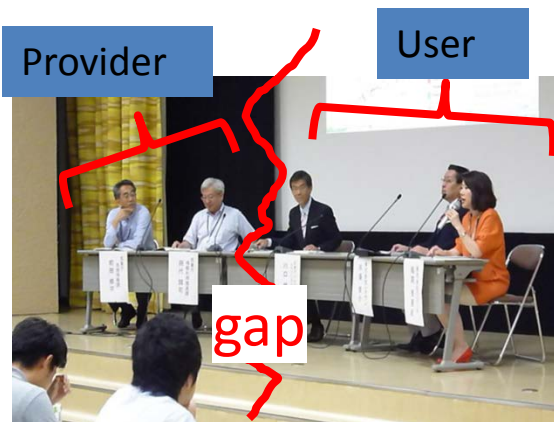
The verification of Wheeler-Hendon indices indicates that too small MJO amplitude is improved.

~JMA plans to upgrade Seasonal EPS in July 2015~

Promotion of the use of climate information for Climate Risk Management (CRM)



GPCS five pillars and their links to users



Apparel seminar (2013)

To promote use of climate information for CRM, JMA is conducting several activities as follows;

1. Creating good practices of CRM in collaboration with user sectors

@Agriculture, Fishery

@Apparel/Drugstore/Power industries,

2. Launching of new CRM portal site

@Clarification of the basic CRM concept and the related processes

@Information on good practices of CRM

@Historical and prediction data to support CRM

<http://www.data.jma.go.jp/gmd/risk/index.html>

3. Holding seminars on CRM

@User sectors

@Private weather companies, weather casters

TCC products and services

March 2014:

Developed and launched a dedicated website on the WMO RA II Pilot Project on Information Sharing on Climate Services.

(<http://ds.data.jma.go.jp/tcc/pilot/index.html>).



March 2014:

Started providing a new product, *Monthly Discussion on Seasonal Climate Outlooks* (<http://ds.data.jma.go.jp/tcc/tcc/products/model/index.html>).

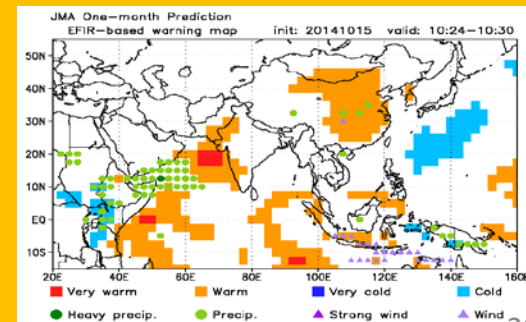
Outline

1. Summary and Discussion <Slides 3 and 4>
2. Latest State of the Climate System (Aug. 2014) <Slides 5 – 14>
3. Three-month Predictions (Oct. – Dec. 2014) <Slides 15 – 21>
4. Cold Season Predictions (Dec. 2014 – Feb. 2015) <Slides 22 – 28>
5. Explanatory Notes <Slides 29 – 33>

August 2014:

Started providing early warning products, which are made from JMA's one-month EPS, for extreme weather events covering the period up to two weeks ahead

(<http://ds.data.jma.go.jp/tcc/tcc/gpv/EFI/index.php>).



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