Current Status and Future Plan of Seasonal Prediction System at the JMA

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Contents

1-1 Current Seasonal Prediction System at JMA

Forecast Model for 4/7-month

Horizontal resolution	TL95 (about 1.875º Gaussian grid ~180km)
Time integration range	4 months or more, up to 7 months
Executing frequency	Once a month (4-month prediction) Five times a year (Feb., Mar., Apr., Sep. and Oct.) (5- to 7- month predictions for JJA and DJF)
Ensemble size	31 members
Perturbation method	Singular Vector method
SST	Two-tiered method ; Combination of persisted anomaly , climate and prediction by CGCM
Land Sfc Parameters soil temperature soil moisture snow depth	Initial conditions of land parameters are provided by a land data assimilation system, that has been operational since April 2002. Observation of snow depth reported in SYNOP is assimilated.
Note	7-month prediction is an extension of 4-month prediction

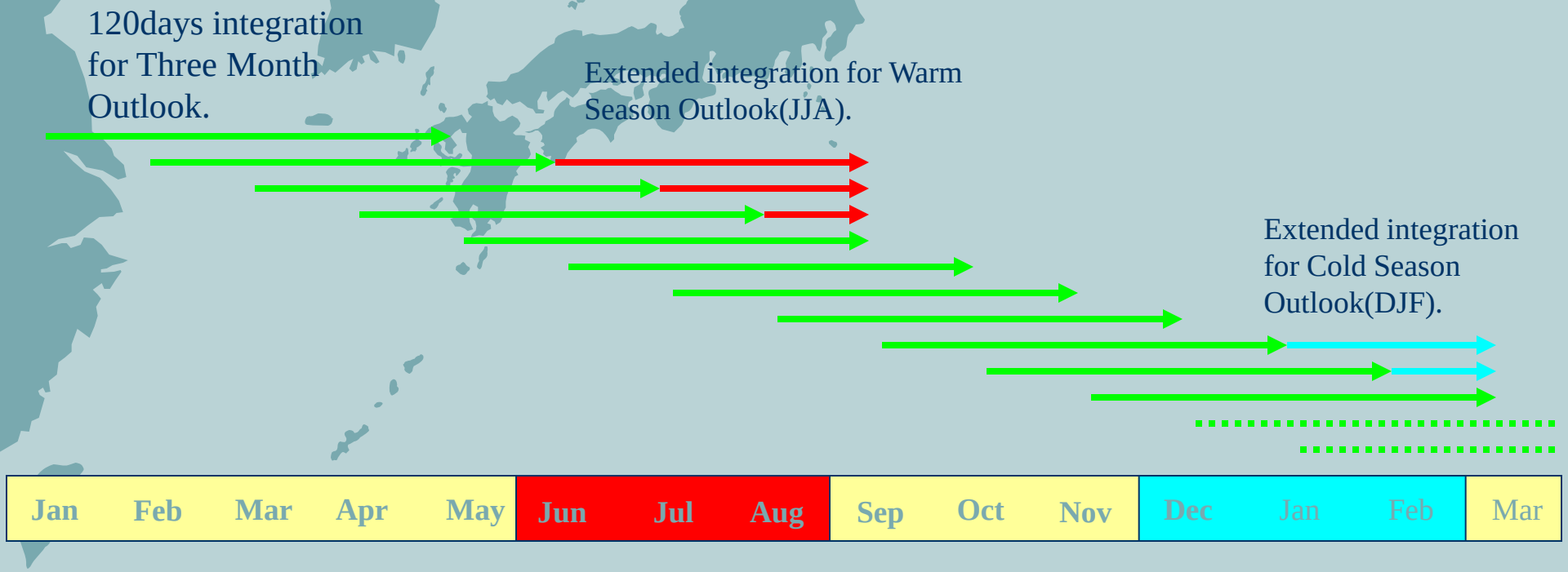
Operation Chart of EPS

4-month EPS : Started in March 2003.

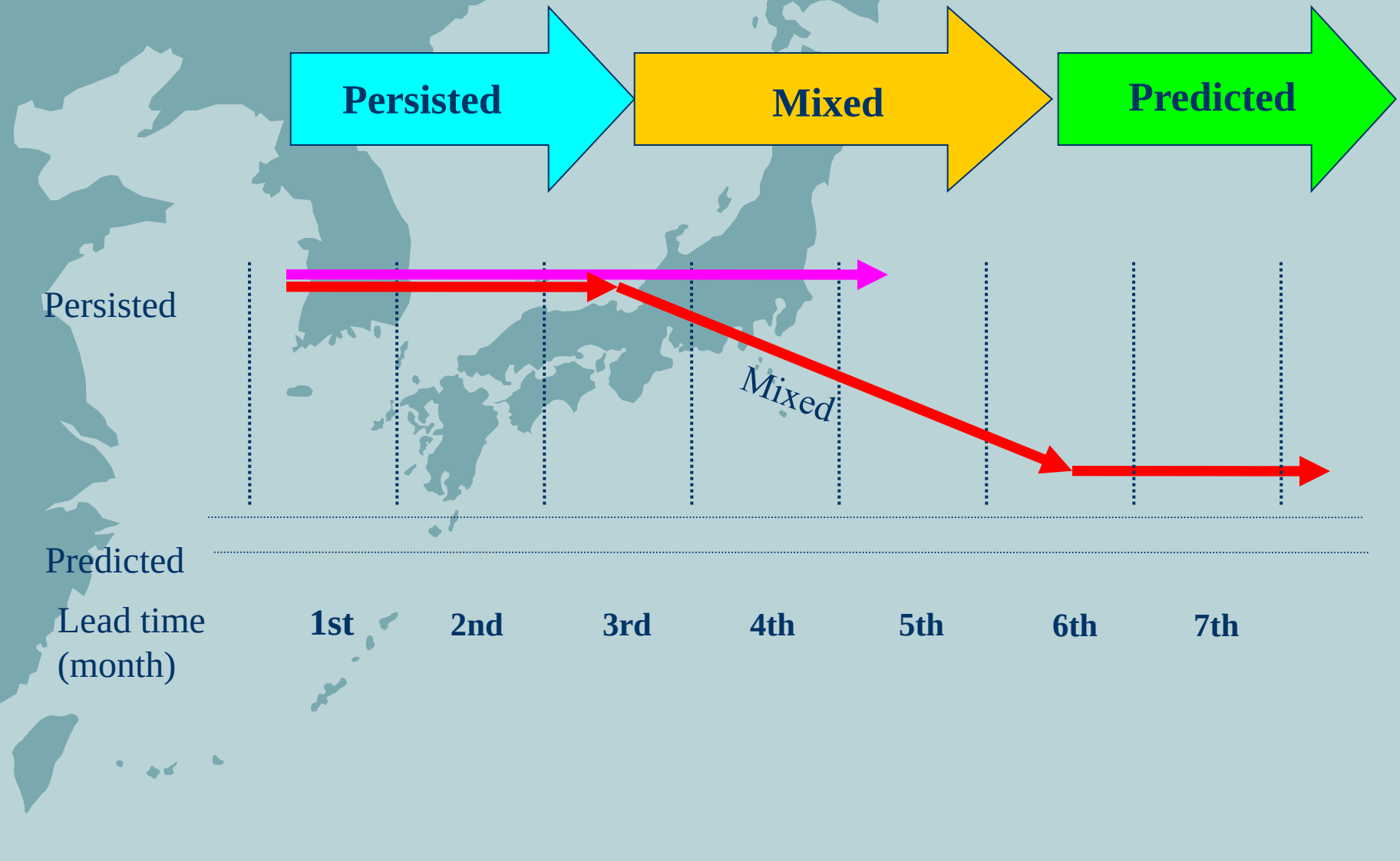
Executed every month.

5to7-month EPS : Started in September 2003.

Executed 5 times a year(February March and April for JJA, September and October for DJF)



Sea Surface Temperature for EPS



1-2 Verification of 4-month EPS Experiment

(Hindcast)

Specification of 4-month EPS Experiment (Hindcast)

Model : **JMA AGCM(TL95)**

Target years : **1983 to 2003, 21 years**

Target months : **All months (initial date is the end of every month)**

Integration time : **Four months**

Atmospheric initial condition

: **ERA-15 from 1983 to 1993, and JMA's operational global analyses from 1994 to 2003**

Land surface initial condition

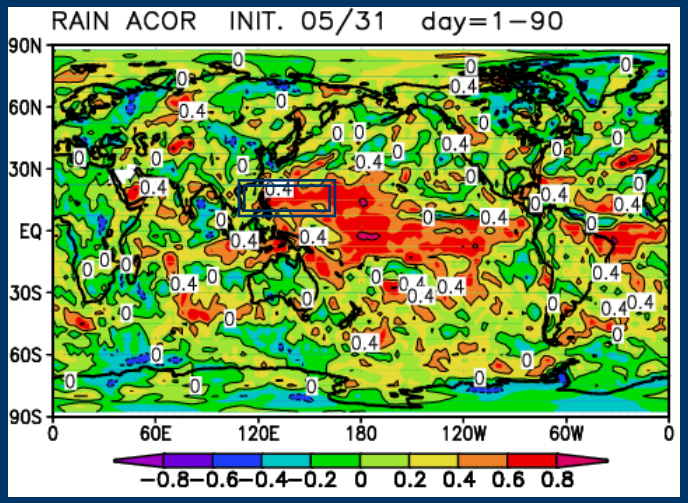
: **Output from SiB forced by ERA-15 from 1983 to 1993, and 10-year average of them for 1994 to 2003**

SST : **Two-tiered method ; Combination of persisted anomaly , climate and prediction by CGCM**

Ensemble size : **5 members**

Forecast Skills of Precipitation (Summer)

Prediction of precipitation in Summer

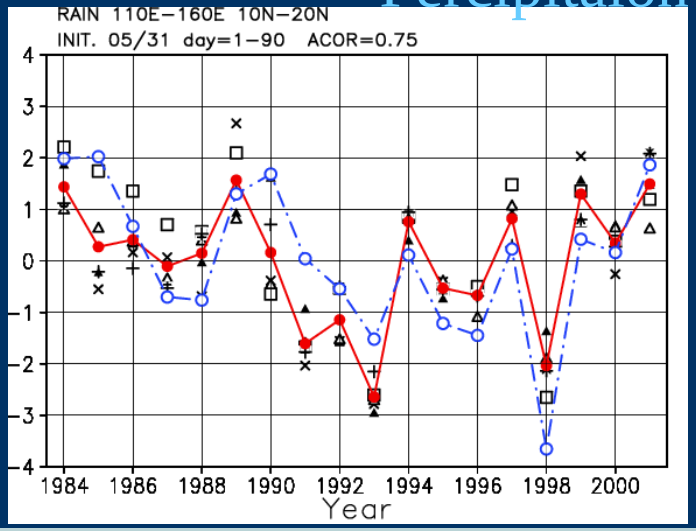


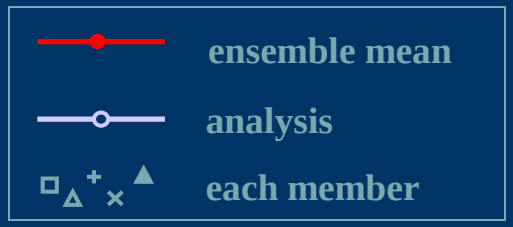
Distribution of inter-annual temporal correlation between observed(CMAP) and model ensemble average forecast precipitation for 21 years(1983-2003)

Initial 31 May

Forecast range: 1-90day (90day mean)

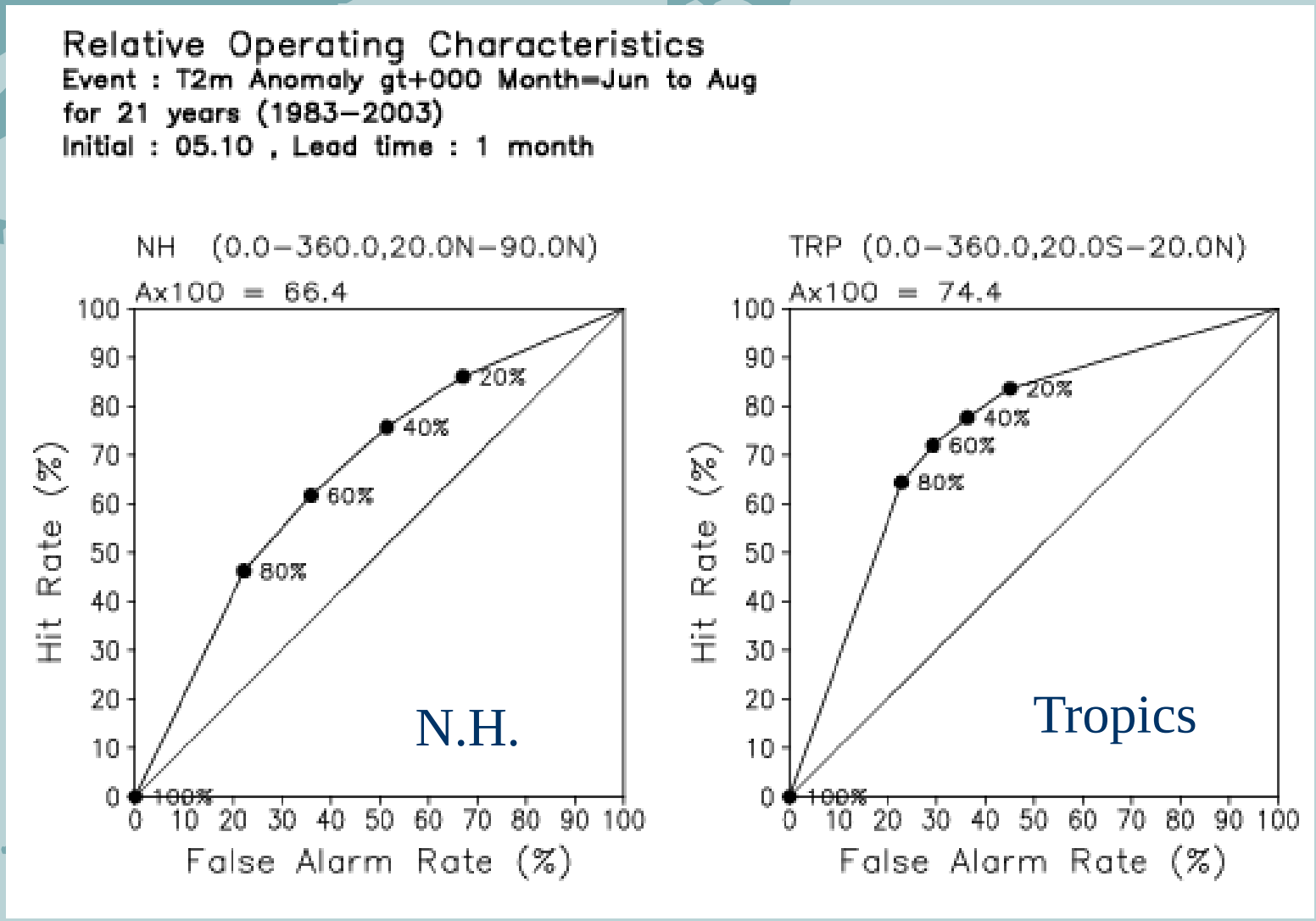
Percipitaion in WNPSM region



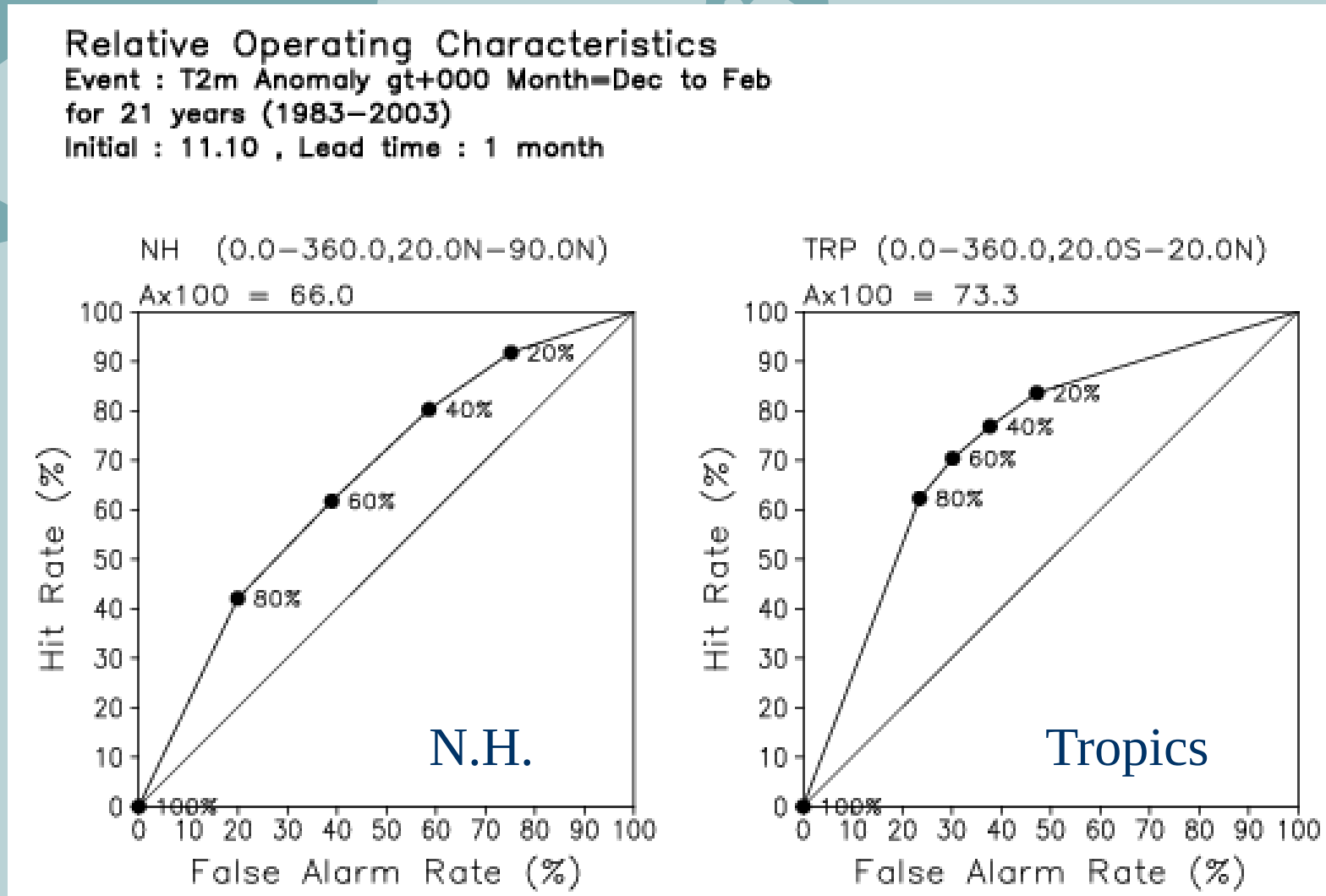


Inter-annual variations of observed and model precipitation anomaly in the western North Pacific summer monsoon region (110-160E,10-20N) in summer

ROC score (T2m:JJA)



ROC score (T2m:DJF)



Summary for Probabilistic Verification

3-month mean ROC score

T2m	N.H.	Tropics	S.H.
JJA（Initial : May）	66.4	74.4	68.2
DJF（Initial : Nov）	66.0	73.3	60.4

Precipitation	N.H.	Tropics	S.H.
JJA（Initial : May）	53.5	62.2	53.9
DJF（Initial : Nov）	55.6	61.6	53.9

Conclusions for Current Status

4-month prediction)

1 Forecast skill in temperature is significant.

2 Forecast skill in precipitation is not zero.

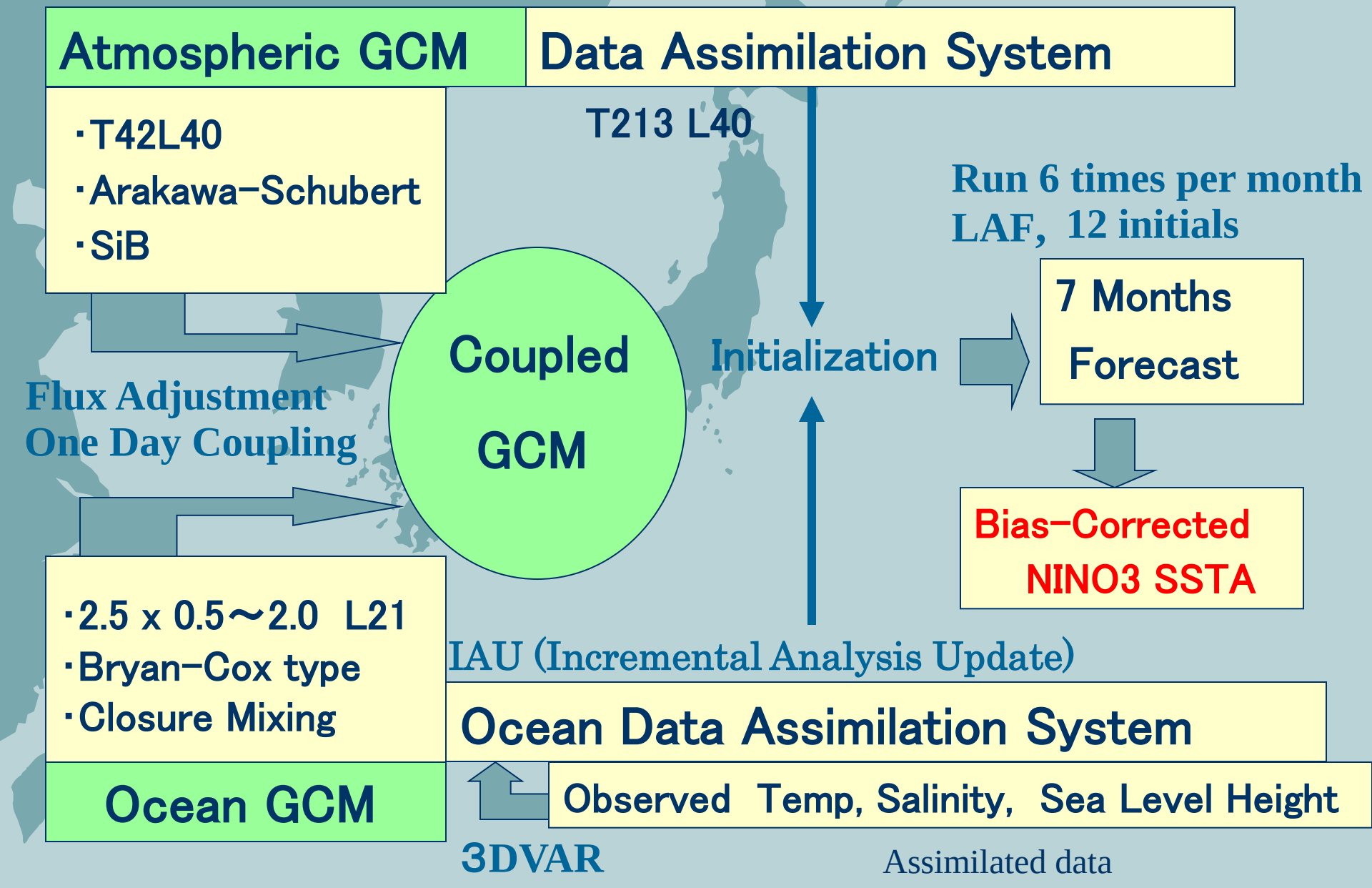
3 Forecast skill are better in ENSO years.

4 Forecast skill in precipitation in WNPSM region is good.

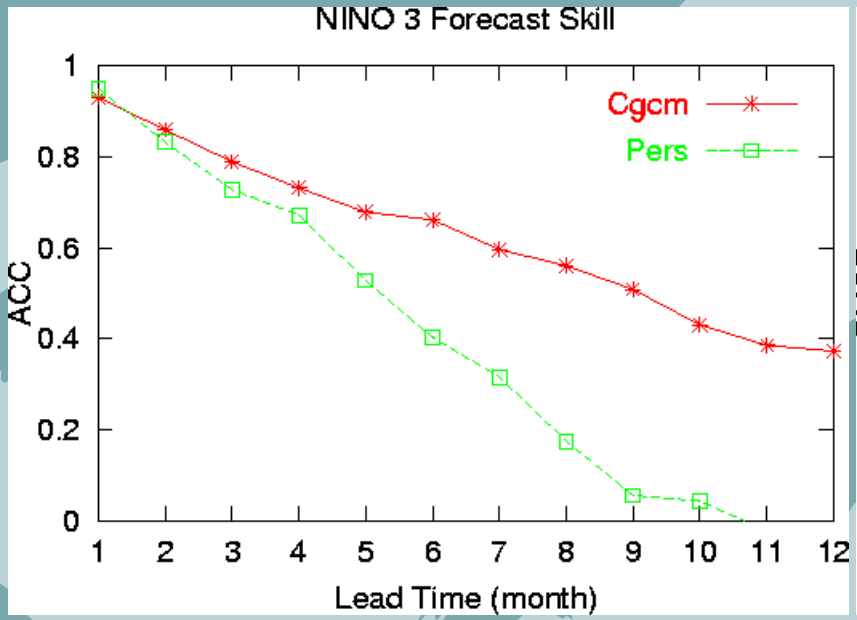
1-3 El Niño Prediction System

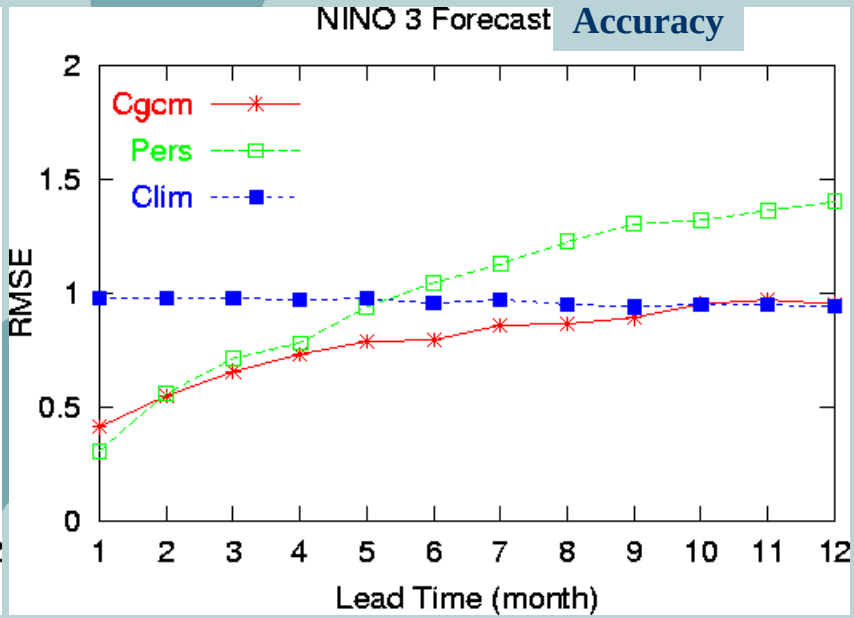
New El Niño Forecast Model (JMA-CGCM02)

Since July 2003, Modified in June 2005



NINO.3 SST forecast skill and accuracy of the operational El Niño forecast in JMA





ACC

RMSE

- The coupled model ACC remains above 0.6 and RSME remains below 0.8 degree Celsius up to 6 months lead time.
- Both the skill and accuracy of the coupled model are better than those of persistence forecast after 2-3 months lead time.

2. Future Plan

2-1 Next Generation of El Niño Prediction System

Hindcast Skill for SST in the equatorial Pacific in the new MRI/JMA Coupled Model

A new system for forecasting SST in the equatorial Pacific using a coupled atmosphere-ocean model has been developed at MRI/JMA.

System Components

a) the TL95L40 version of the JMA atmospheric model

b) the new MRI Community Ocean Model (MRI.COM)

c) the new Ocean Data Assimilation System "Multivariate Ocean Variational Estimation System (MOVE)" developed in MRI

We are now continuing to develop this system, which will replace the current JMA operational system in 2008.

CGCM Components and Ocean Data Assimilation System

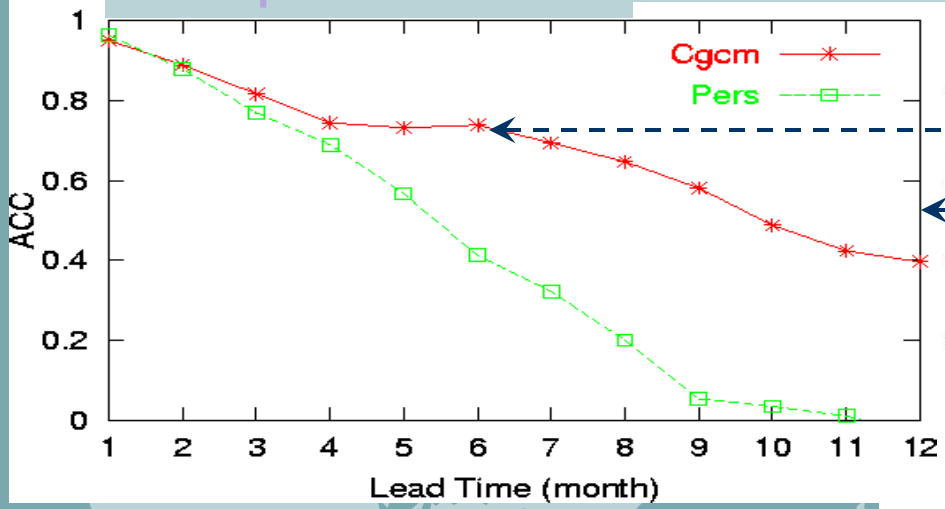
	JMA Operational Model (KOOKAI 2003)	MRI/JMA-CGCM3
AGCM	T42L20	TL95L40
OGCM	JMA-OGCM ・zonal: 2.5deg ・meridional: 0.5-2.0deg ・vertical: 20 levels	MRI.COM ・zonal: 1.0deg ・meridional: 0.3-1.0deg ・vertical: 50 levels
Coupling	・Coupling time: 24 hours ・Momentum and heat fluxes adjustment	・Coupling time: 1 hour ・Momentum and heat fluxes adjustment
Ocean Data Assimilation System	JMA-ODAS ・3D-VAR(T,S) ・Observation: T, S on GTS, COBE-SST, SSH ・Incremental Analysis Update (IAU: 1 day) ・Error statistics: unvariate ・Linear constraints	MOVE/MRI.COM ・3D-VAR(T,S) ・Observation: T, S on GTS, COBE-SST, SSH ・IAU (10 days) ・Error statistics: multivariate ・Nonlinear constraints

Hindcast Skill: NINO3.4 SST for 1990-1999

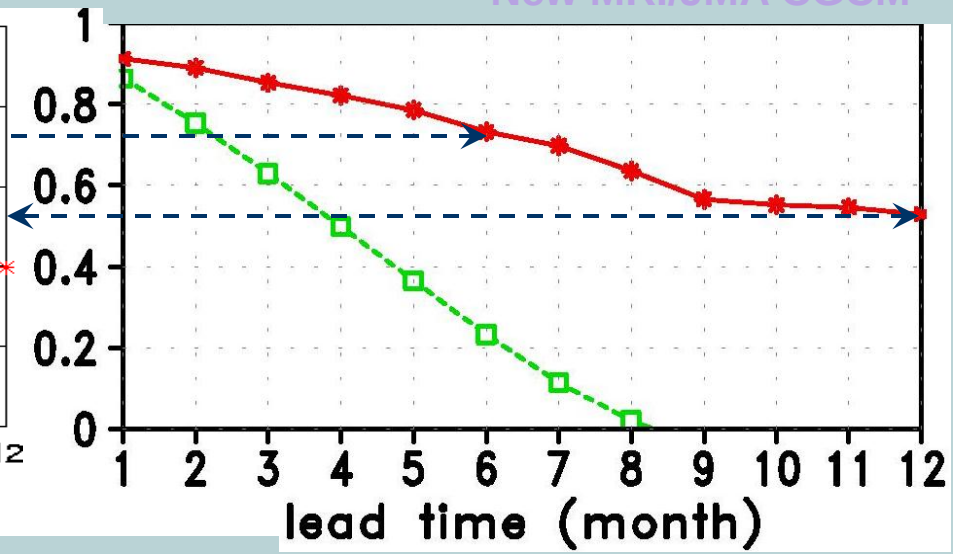
Note: large & persistent skill after 10-month lead time

Anomaly Correlation

JMA Operational Model

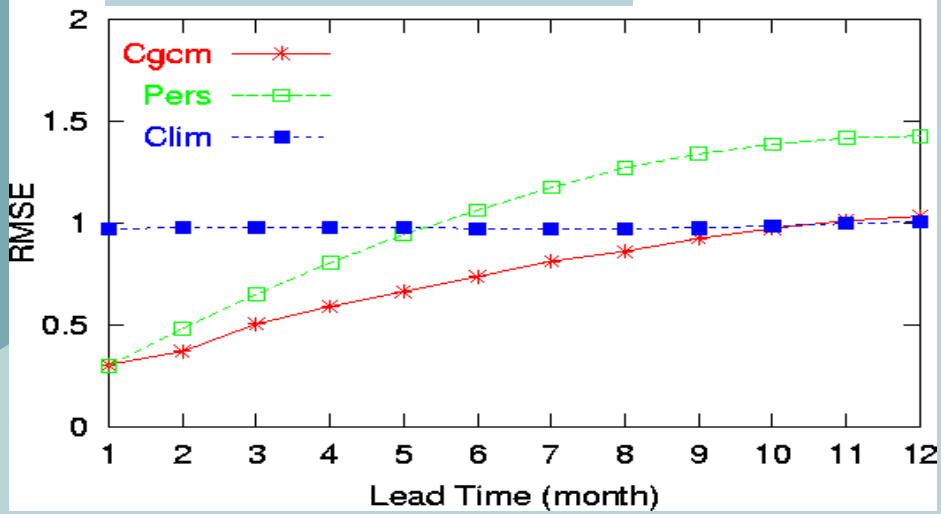


New MRI/JMA CGCM

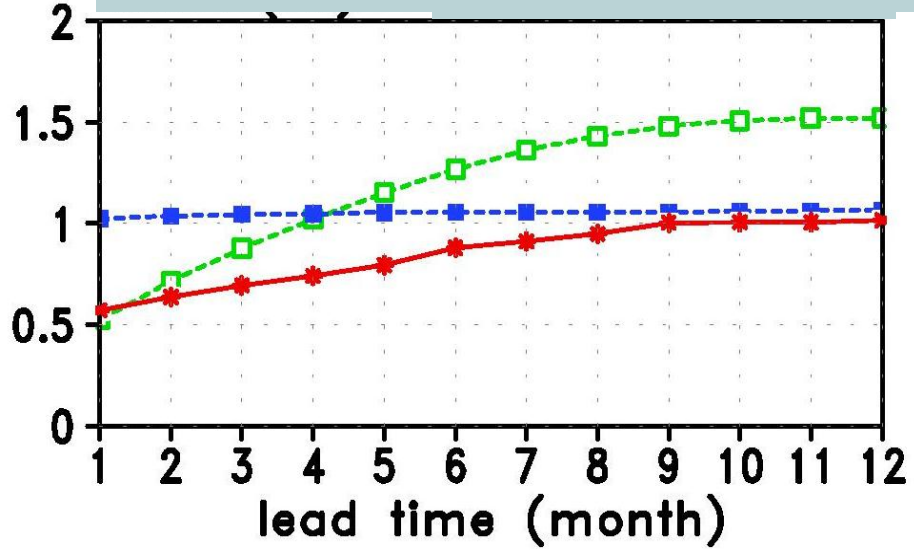


RMSE (degC)

JMA Operational Model



New MRI/JMA CGCM



Hindcast Anomaly Correlation : SST for 1990-1999

JMA Operational Model

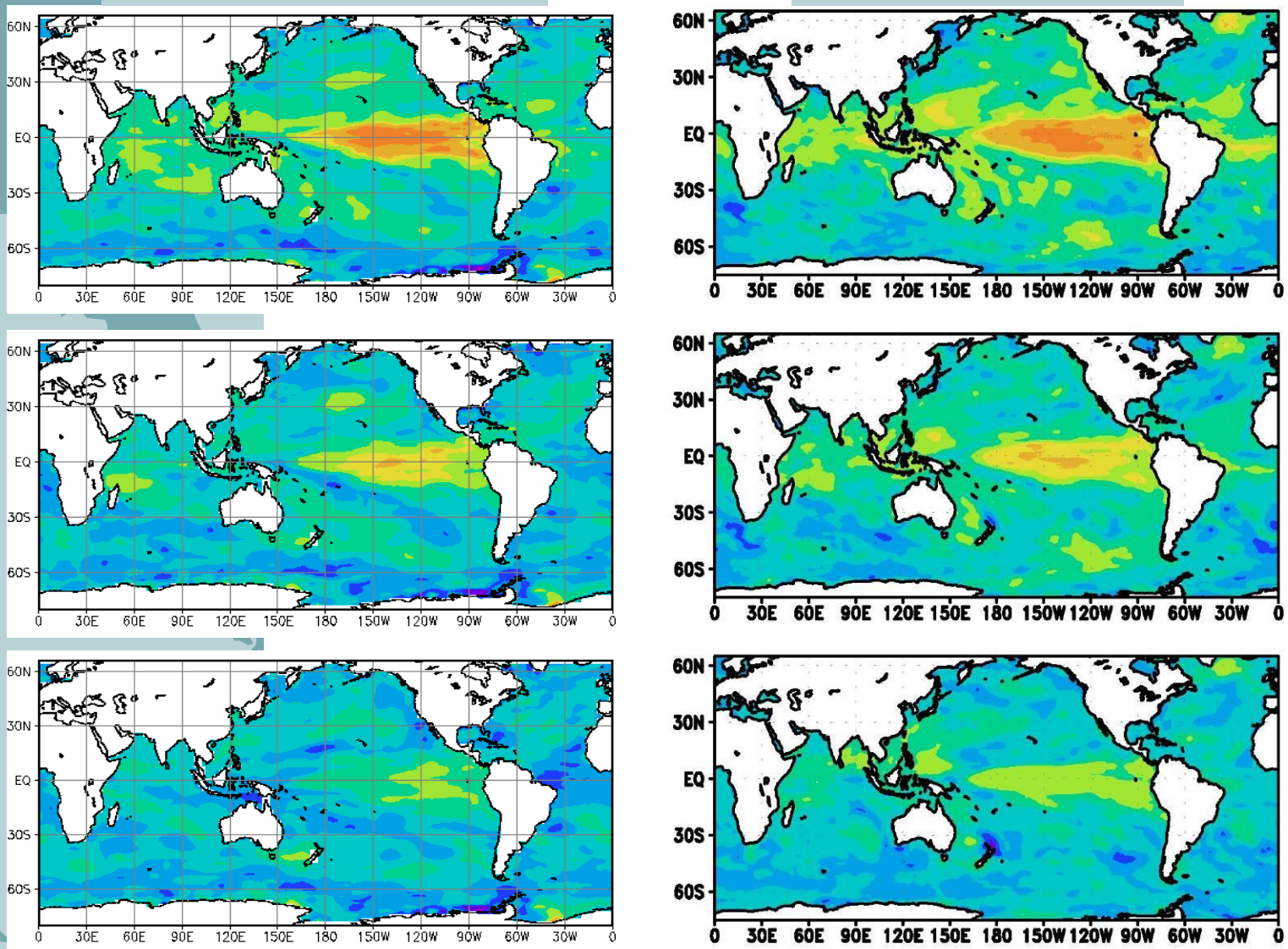
New MRI/JMA CGCM

Lead time

3 month

6 month

12 month



Note: large & persistent skill in tropics

Hindcast RMSE (degC) : SST for 1990-1999

JMA Operational Model

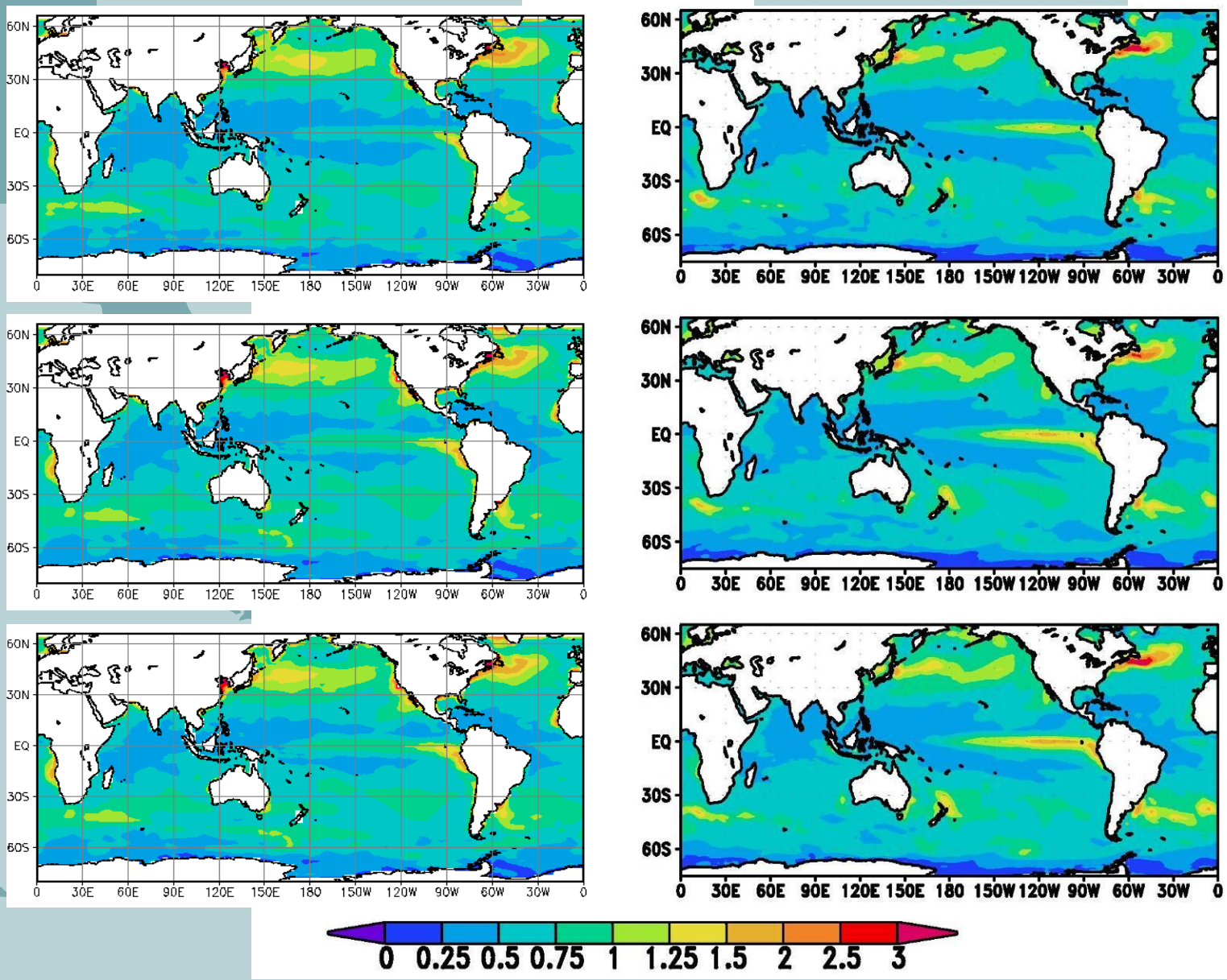
New MRI/JMA CGCM

Lead time

3 month

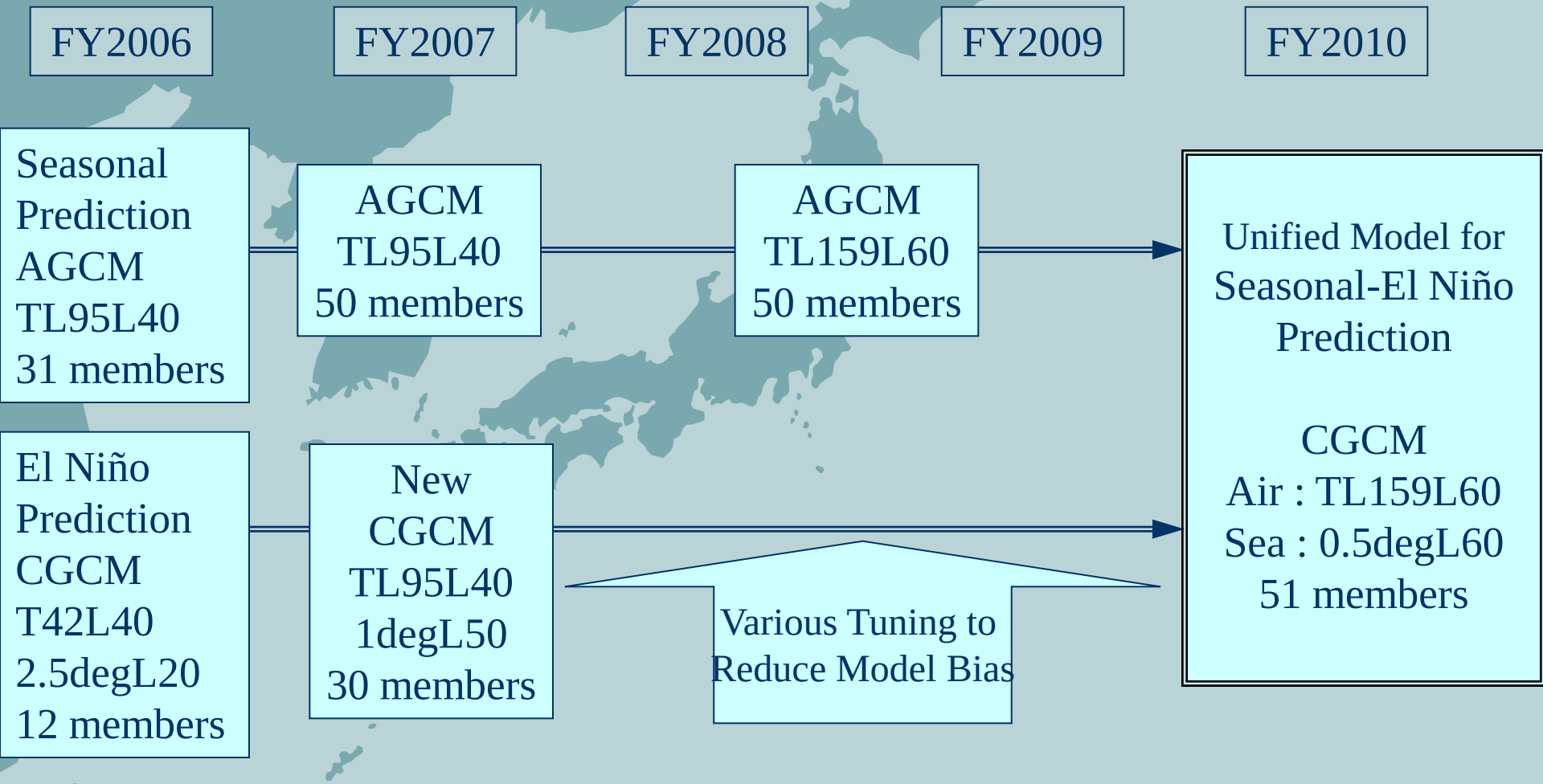
6 month

12 month



2-2 Unification of Seasonal Prediction Model and El Niño Prediction Model

Time Schedule

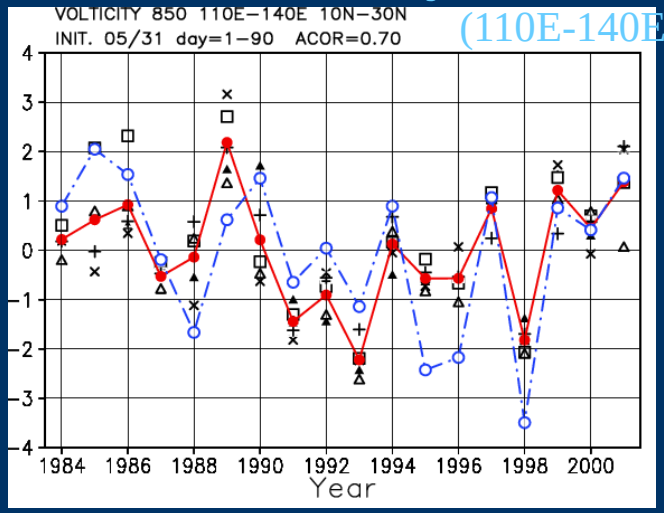


Seasonal Forecast with Coupled Model (CGCM) after 2010


Thank you very much !
JMA

Forecast Skills of circulation in the western North Pacific

850hPa Vorticity



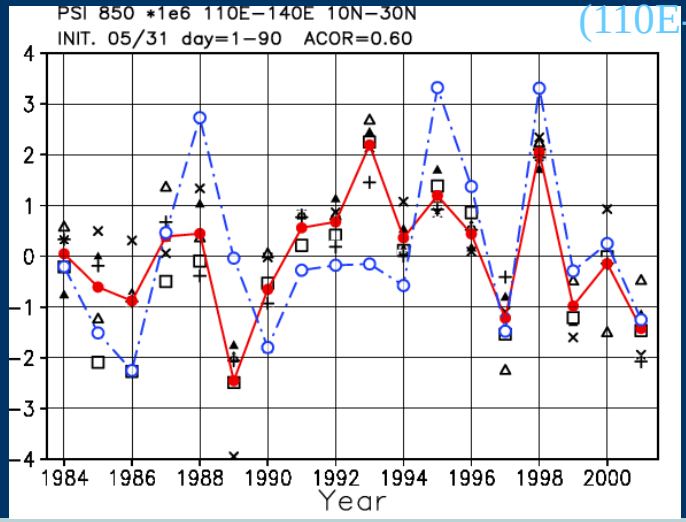
(110E-140E,10N-30N)

ensemble mean

analysis

each member

850hPa Stream Function Anomaly



(110E-140E,10N-30N)

ensemble mean

analysis

each member