Operational system and Future plan of JMA's Seasonal Forecast models

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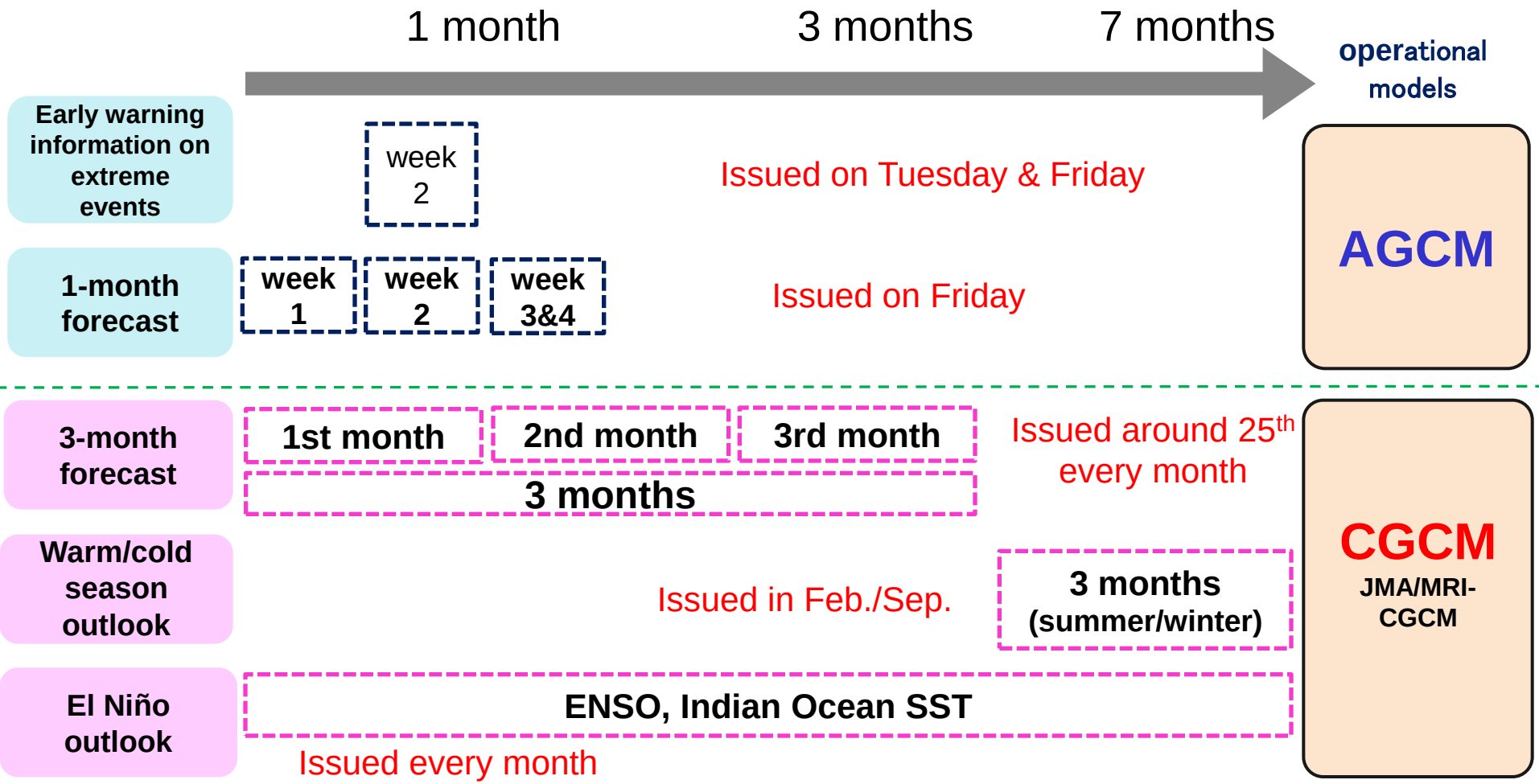
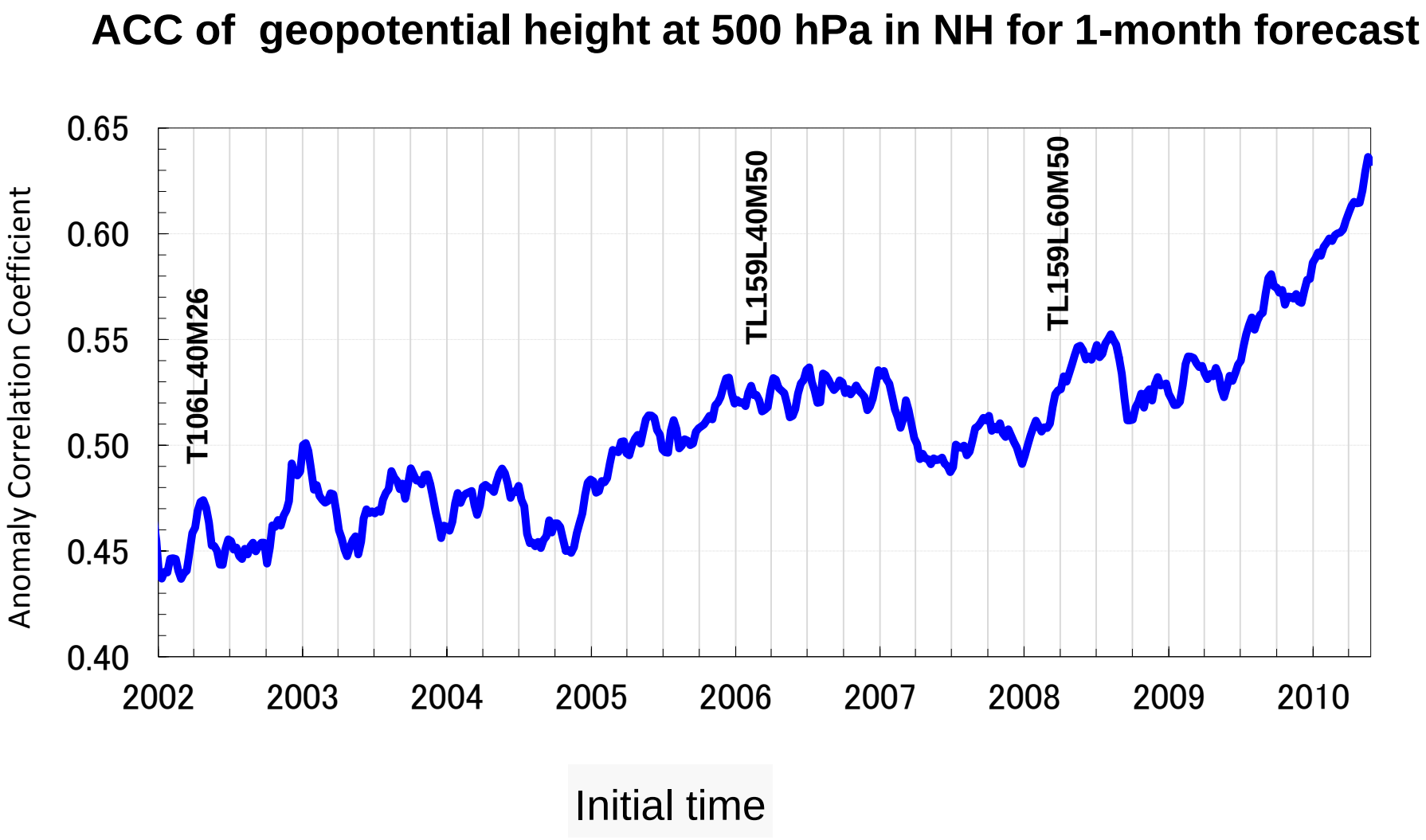
Currently Operational JMA's Medium-range to Seasonal Prediction Systems



Specifications of the NWP EPS system for 1-month forecast

Model	JMA AGCM
Horizontal resolution	TL159 (reduced Gaussian grid)
Vertical Layers	60 (Top Layer Pressure:0.1hPa)
Time integration range	One-month forecast: 34 days Early Warning Information: 17 days
Ensemble size	50 members
Perturbation method	Breeding Growing Mode (BGM) & Lagged Average Forecast (LAF) method
SST	Persisted anomaly
Land surface Parameters	Initial conditions of land parameters are provided by a land surface analysis system. Observation of snow depth reported in SYNOP is assimilated.

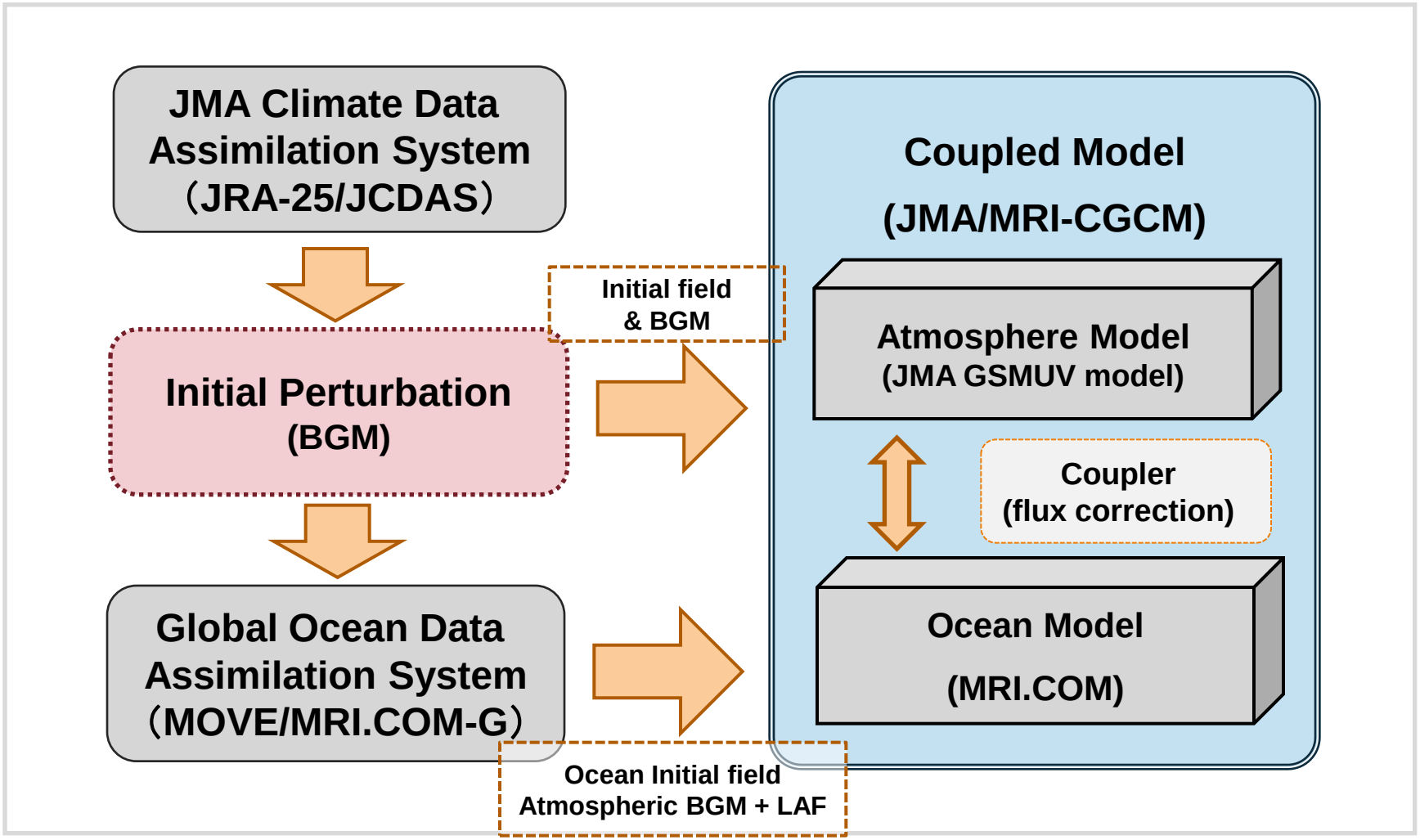
Improvement of 1-month forecast score



Specifications of the NWP model for Long-range forecast

Model	JMA/MRI-CGCM
Horizontal resolution	AGCM: TL95 (about 1.875º Gaussian grid ~180km) OGCM: 1.0deg in lon. X 0.3-1.0 deg in lat.
Vertical Layers	AGCM: 40 (Top Layer Pressure:0.4hPa) OGCM: 50
Time integration range	7 months
Executing frequency	Every five days (9 members for each initial date)
Ensemble size	51 members from six different initial dates.
Perturbation method	Breeding Growing Mode (BGM) & Lagged Average Forecast (LAF) method
SST	One-tiered method
Land surface Parameters	Climatology
Initial field	JCDAS (CDAS based on JRA-25 DA system)

Coupled Ensemble Prediction System



Improvement by CGCM (Atmosphere)

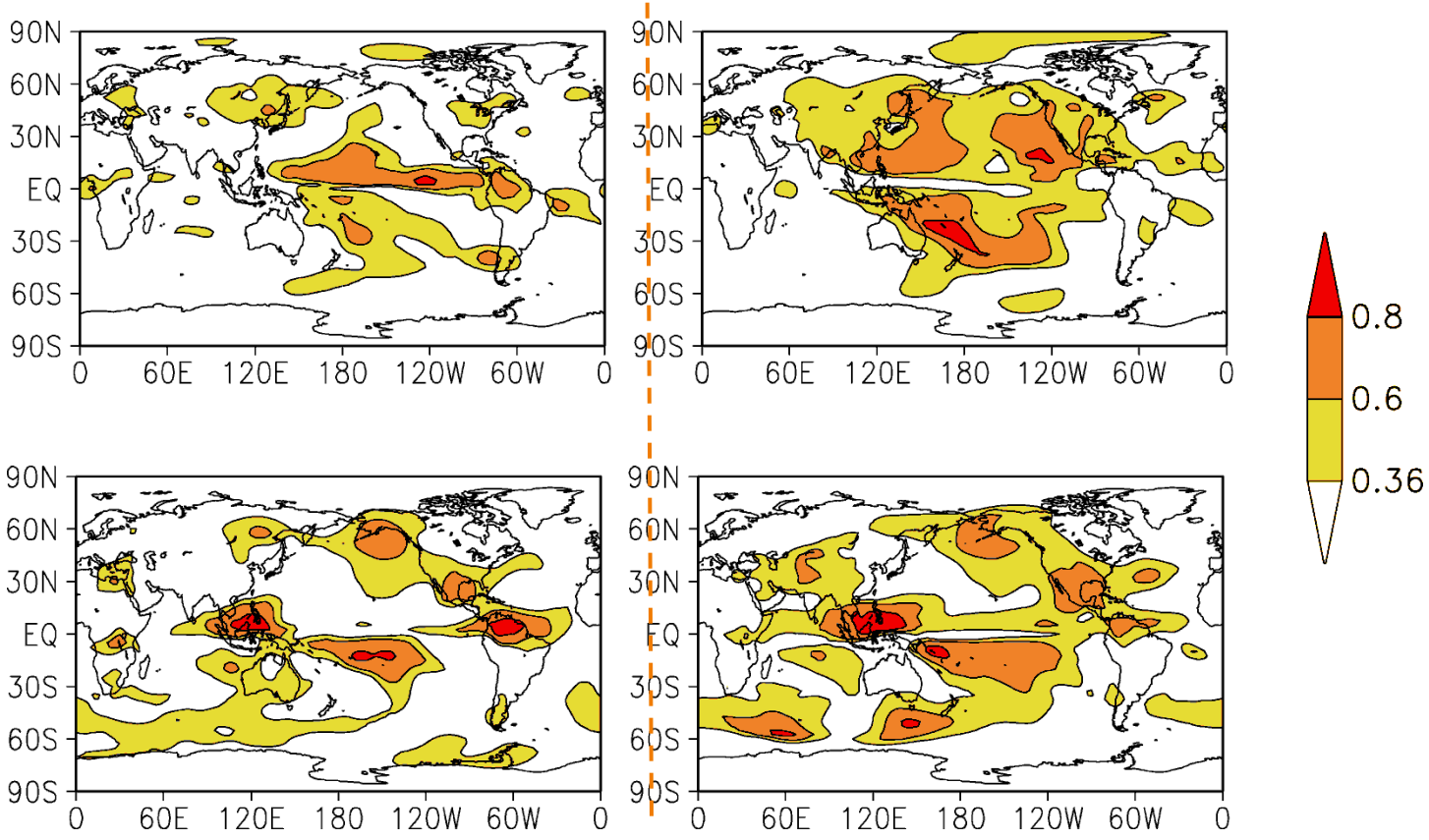
Anomaly Correlation Coefficient of Steam function at 850 hPa

Previous AGCM

Operational CGCM

JJA forecast From February

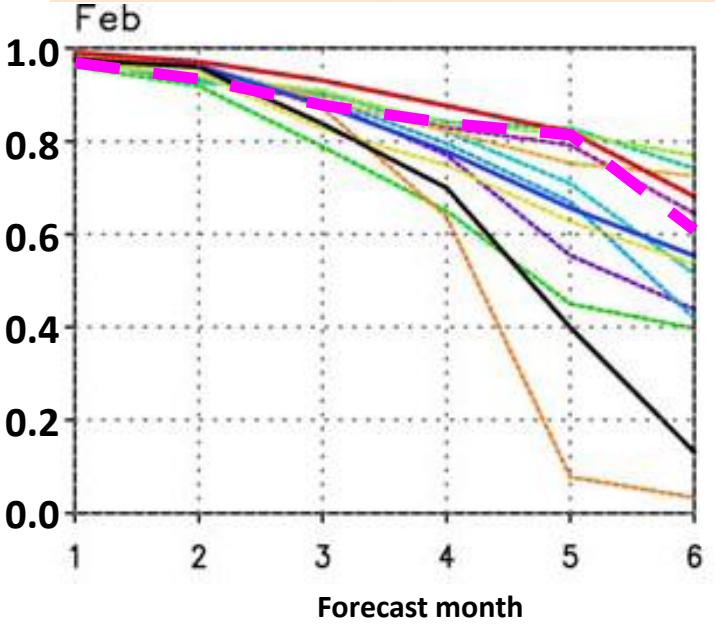
DJF forecast From September



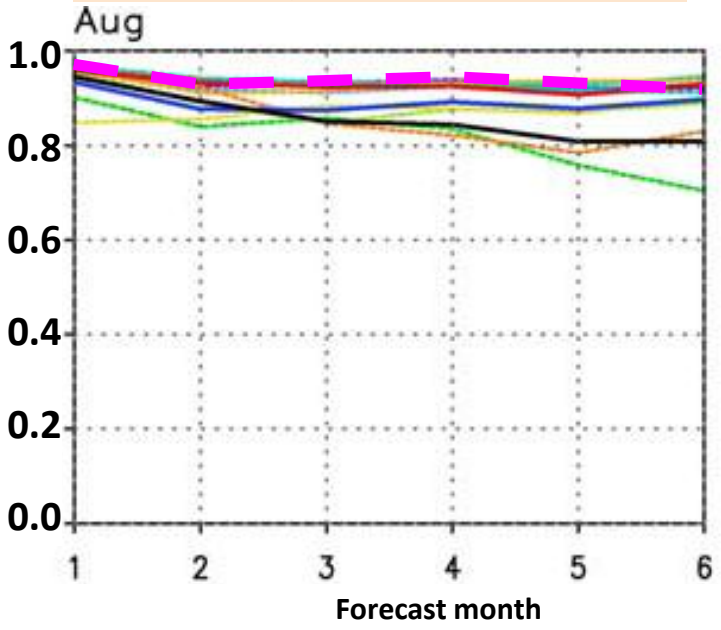
Comparison of SST forecast for NINO3.4 region

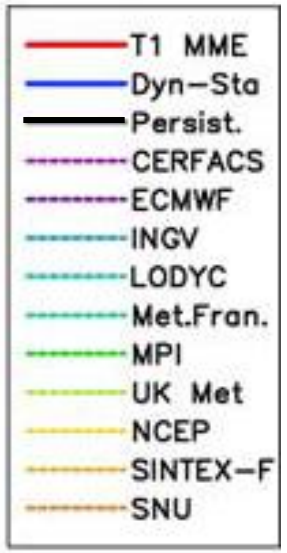
(Anomaly Correlation Coefficient)

From February (1980-2001)



From August (1980-2001)



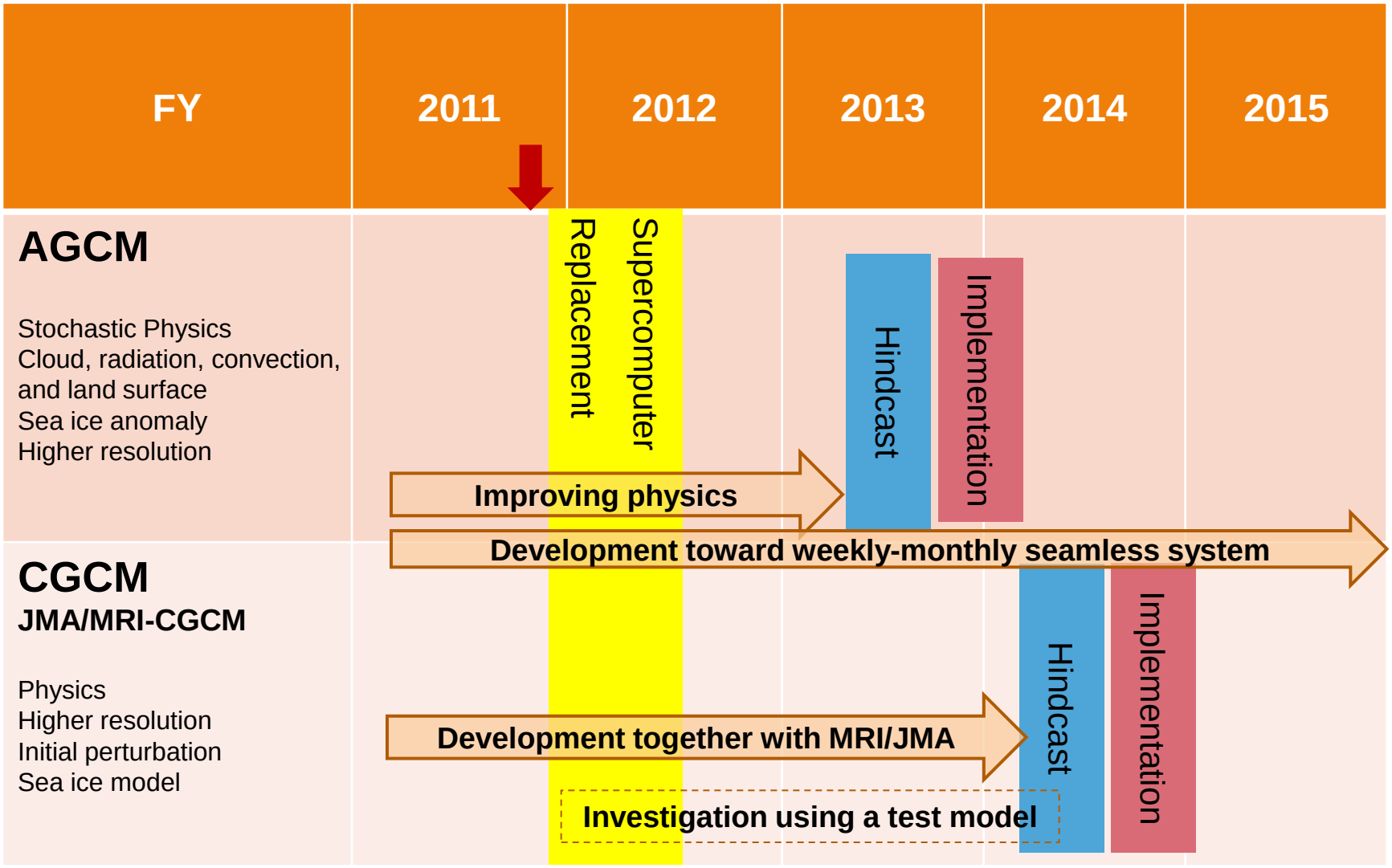


(JMA/MRI-CGCM)

NINO.3.4 region: 120W-170W, 5S- 5N

Jin E. K., James L. Kinter III, B. Wang, C.-K. Park, I.-S. Kang, B. P. Kirtman, J.-S. Kug, A. Kumar, J.-J. Luo, J. Schemm, J. Shukla and T. Yamagata, 2008: Current status of ENSO prediction skill in coupled ocean–atmosphere models. Clim. Dyn., 31, 647–666.

Model development plan and schedule

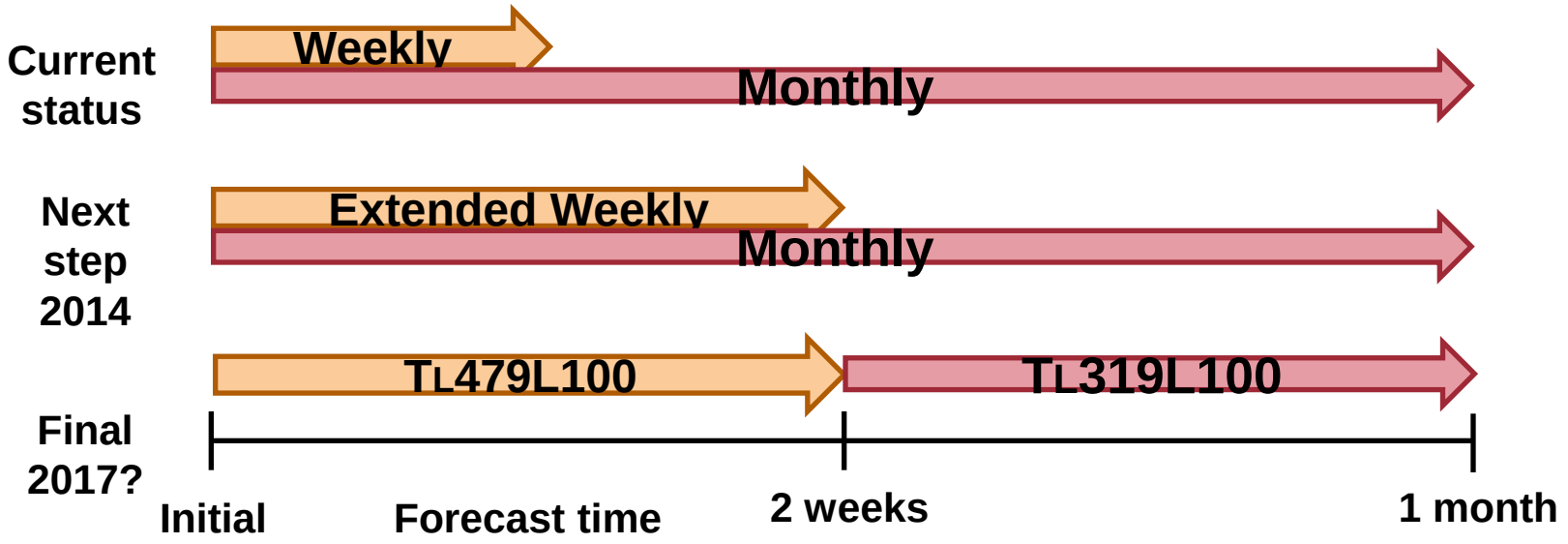


AGCM and CGCM plans

- Improving precipitation forecast skill in the tropics
- AGCM (to be implemented around 2013)
  - Higher resolution (TL159L60 → TL319L100)
  - Improvement of physics
    (cloud, radiation, convection, land surface, …)
  - Stochastic Physics for initial perturbation
  - Sea Ice anomaly (investigation)
  - Weekly-Monthly seamless system
- CGCM (to be implemented around 2014)
  - Sea Ice model (investigation)
  - Higher resolution (TL95L40 → TL159L60)
  - Improvement of physics
  - Including polar region (> 75 lat.) in the ocean model

Weekly-Monthly seamless EPS (plan)

- Currently Weekly and Monthly ensemble prediction systems are separated.
  - Weekly : NPD, Monthly : CPD
- Development toward a seamless forecast system



Japanese 2nd reanalysis JRA-55

- JRA-55 (JRA Go! Go!)
- It covers 55 years, extending back to 1958, when the global radiosonde observing system was established.
- Many of the deficiencies found in the first Japanese reanalysis JRA-25 have been improved.
- It aims at providing a comprehensive atmospheric dataset that is suitable for studies of climate change or multi-decadal variability, by producing a more time-consistent dataset for a longer period than JRA-25.
- An interim report of JRA-55 (Ebita et al. 2011) is available from
  http://www.jstage.jst.go.jp/article/sola/7/0/7_149/_article/-char/ja/

Comparison between JRA-25 and JRA-55

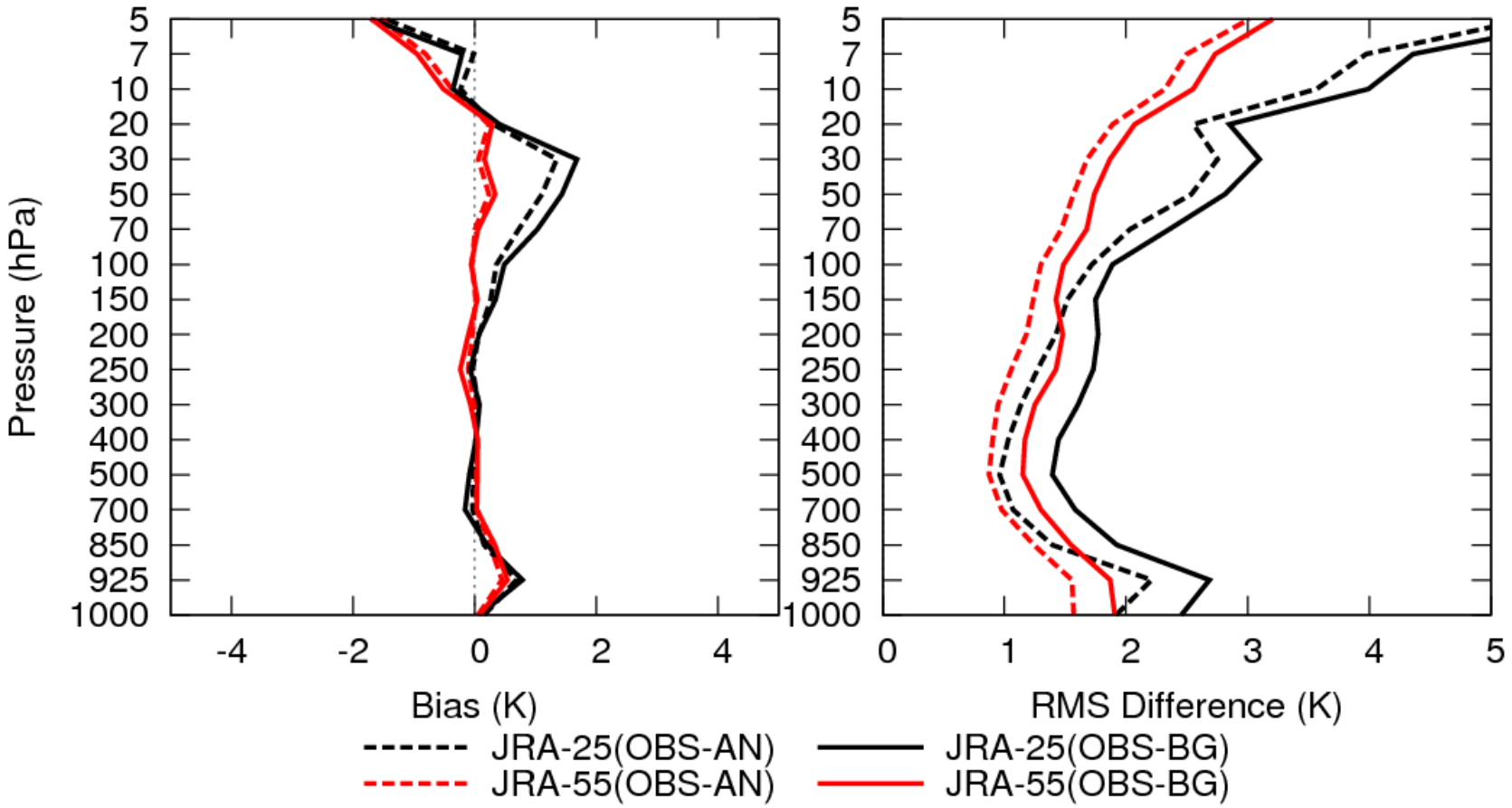
	JRA-25	**JRA-55**
Reanalysis years	1979-2004	**1958-2012**
Equivalent operational NWP system	As of Mar. 2004	**As of Dec. 2009**
Resolution	T106L40 (~120km) *(top layer at 0.4 hPa)*	**TL319L60 (~60km)** ***(top layer at 0.1 hPa)***
Assimilation scheme	3D-Var	**4D-Var** ***(with T106 inner model)***
GHG concentrations	Constant at 375 ppmv (CO_2)	Annual mean data is interpolated to daily data (CO2,CH4,N2O)

Onogi et al. 2007 (JMSJ)

Ebita et al. 2011 (SOLA)
(as an interim report)

To be completed in 2013

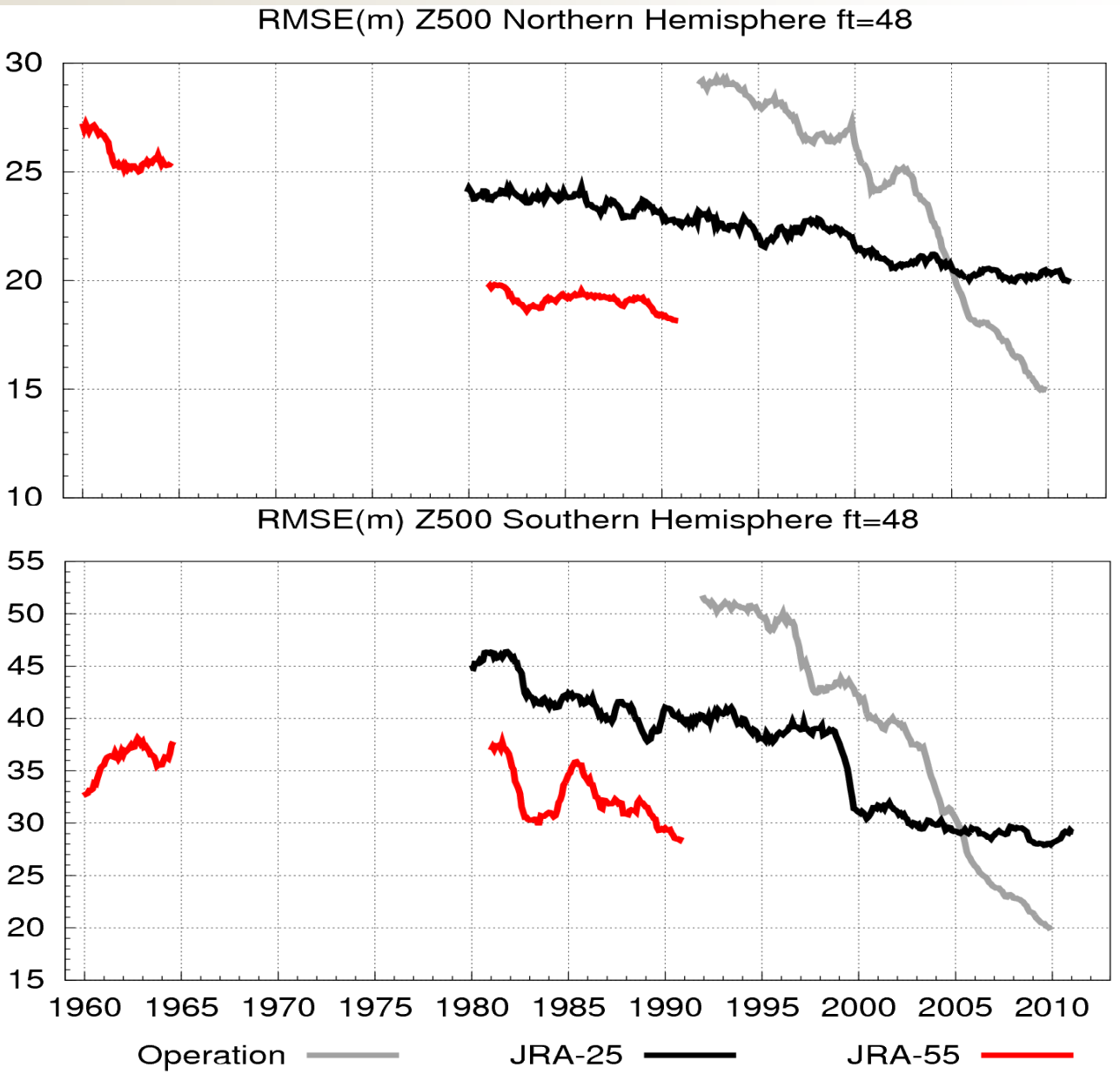
Improvement of vertical profiles



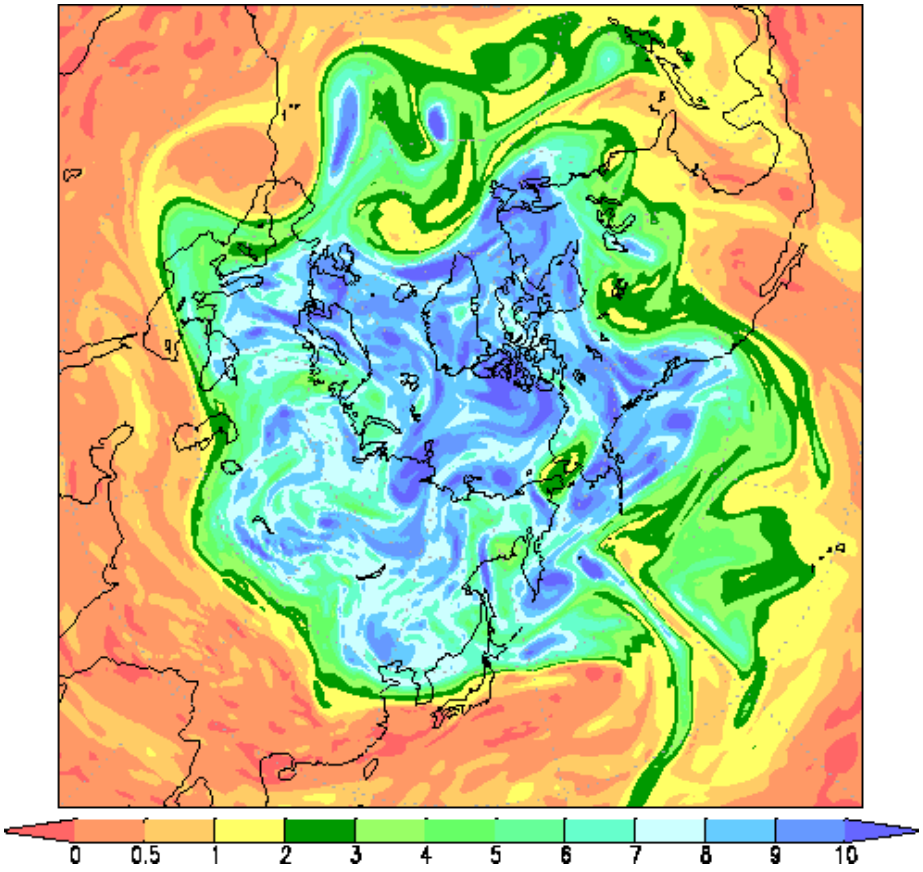
Vertical profiles of global mean bias and RMS difference between radiosonde temperature measurements and the background (solid lines) and analyzed values (dotted lines) from JRA-25 (black) and JRA-55 (red) for January 1981.

Forecast Scores

Time series for RMS of 2-day forecast of geopotential height at 500 hPa for NH (top) and SH (bottom)

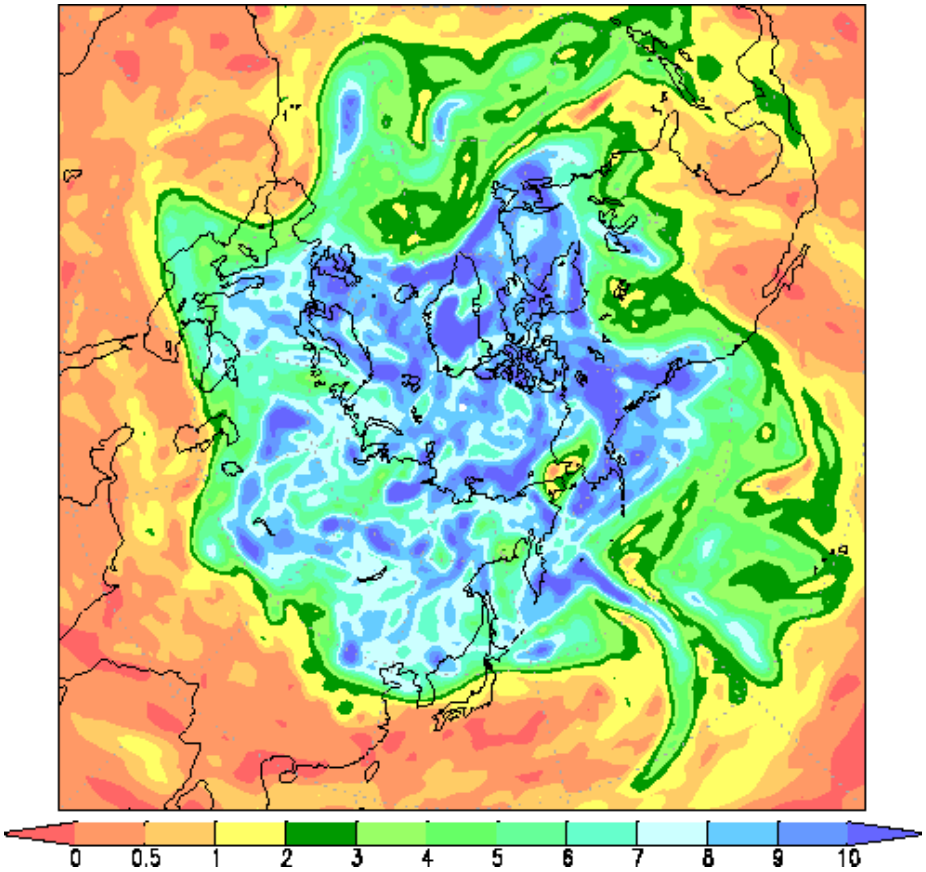


Potential vorticity at 350K isentropic level



JRA-55

(smoother streams)



JRA-25

Thank you !