
JMA Ensemble Prediction System (EPS) for seasonal prediction

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Climate Prediction Division/ JMA)

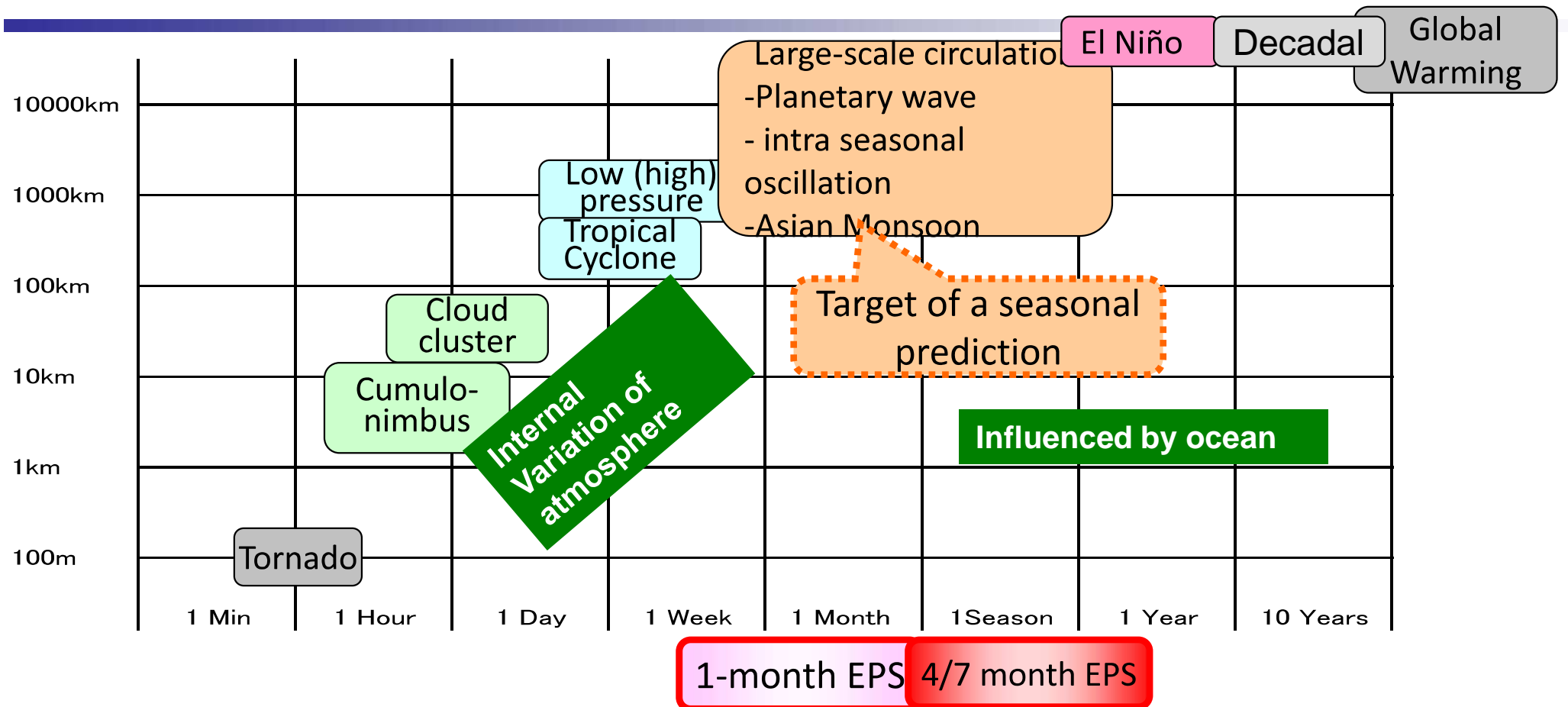
Outline

- Introduction
 - Differences between short-range and seasonal forecasting
 - Uncertainty of prediction
 - Concept of an ensemble prediction
 - Predictability
- Outline of the JMA operational EPS
 - Overview of the JMA Ensemble prediction system for seasonal prediction
 - 1-month EPS (Main target of this seminar), 4/7 month EPS
 - Hindcast
 - Prediction skill of the 1-month EPS
- Model products on the TCC website
 - (Mainly introduce the product of the 1-month EPS)
- First step guide for usage of the gridded dataset (Grid Point Values; GPVs)
 - Demonstration of downloading and visualizing the gridded dataset

Introduction

- Differences between short-range and seasonal forecasting
- Uncertainty of prediction
- Concept of an ensemble prediction
- Predictability

Classification of atmospheric variations according to spatial and temporal scale



- The main target of seasonal prediction is **large-scale circulation** of the atmosphere, which is largely affected by oceanic variations.

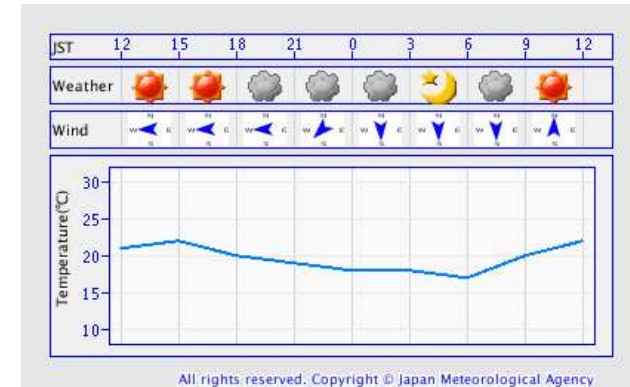
WMO Classification of meteorological forecasting (GDPFS Manual)

	Forecasting target period
Nowcasting	Up to 2 hours
Very short-range weather forecasting	Up to 12 hours
Short-range forecasting	Beyond 12 hours and up to 72 hours
Medium-range weather forecasting	Beyond 72 hours and up to 240 hours
Extended-range weather forecasting	Beyond 10 days and up to 30 days
Long-range forecasting	Beyond 30 days up to two years
Climate forecasting	Beyond two years

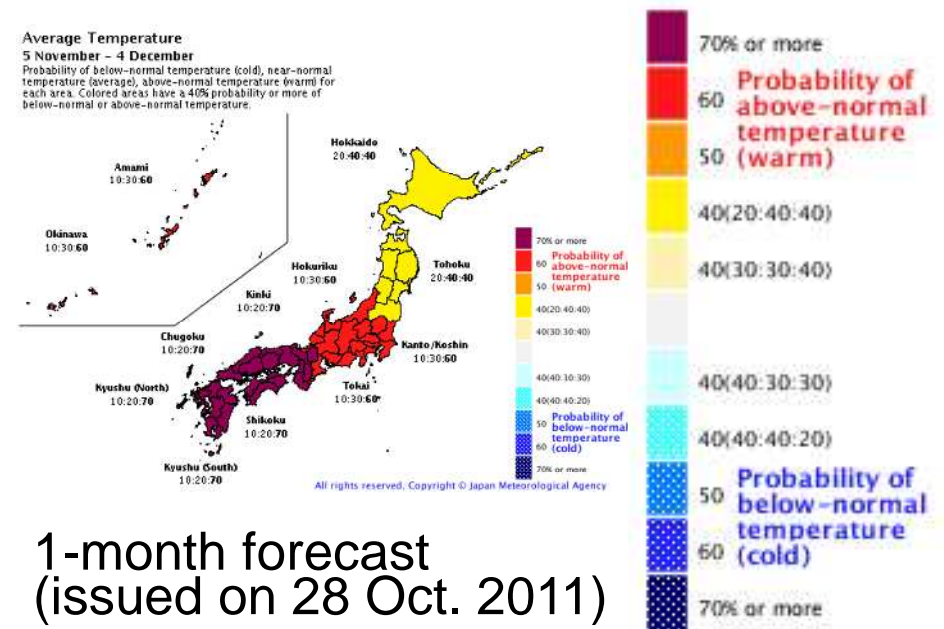
Seasonal forecasting

Difference between short-range and seasonal forecasting

- **Short-range prediction** (up to about 1 week) describes weather parameter variation itself. (not deviation, not averaged)
- **Seasonal forecasting** describes averaged weather parameters, expressed as a departure (deviation, variation, anomaly) from climate values for that period.



3-hourly forecasts of Tokyo (issued at 11:00 JST, 4 Nov. 2011)



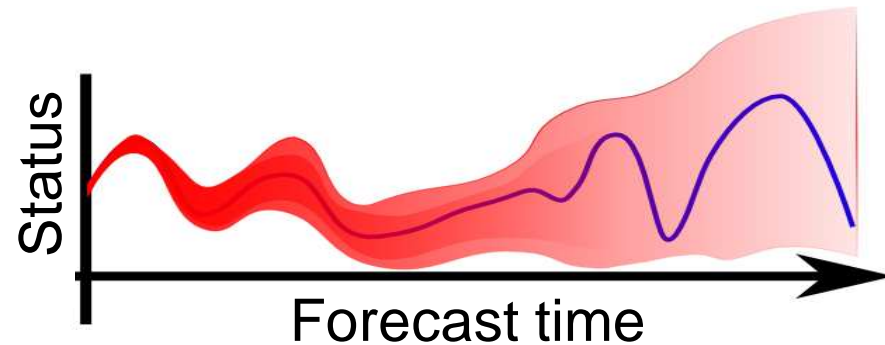
1-month forecast (issued on 28 Oct. 2011)

Uncertainty of prediction

- Causes of prediction error
 - Uncertainty of an initial condition
 - limitation of observation data (especially in ocean)
 - observation error
 - Errors in the objective analysis procedure
 - Uncertainty of the boundary conditions
(ex. SSTs for AGCM)
 - Uncertainty of an NWP model
 - certain limits of resolution
 - Many approximations in the physical processes
(Parameterization)

Growth of initial error -> Ensemble prediction

- Errors contained in the initial states rapidly grows in the beginning of the prediction due to chaotic behavior of atmosphere.

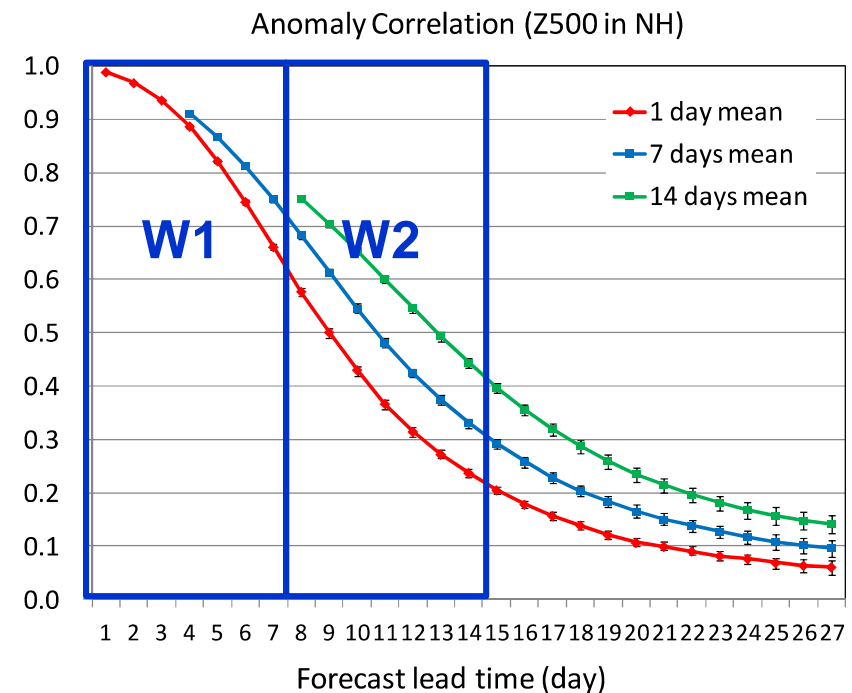


- The limit of **deterministic forecast** is fewer than 2-weeks.



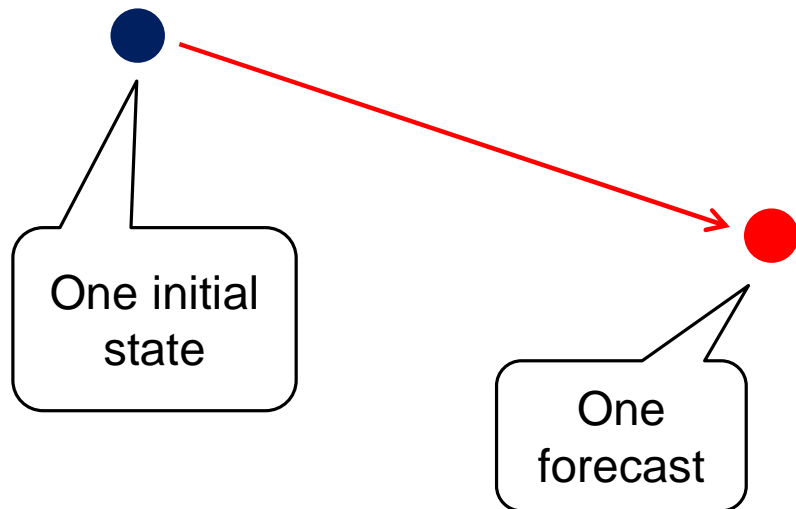
- The necessity of **probabilistic forecast** for seasonal forecasting

Ensemble prediction is essential for seasonal forecasting



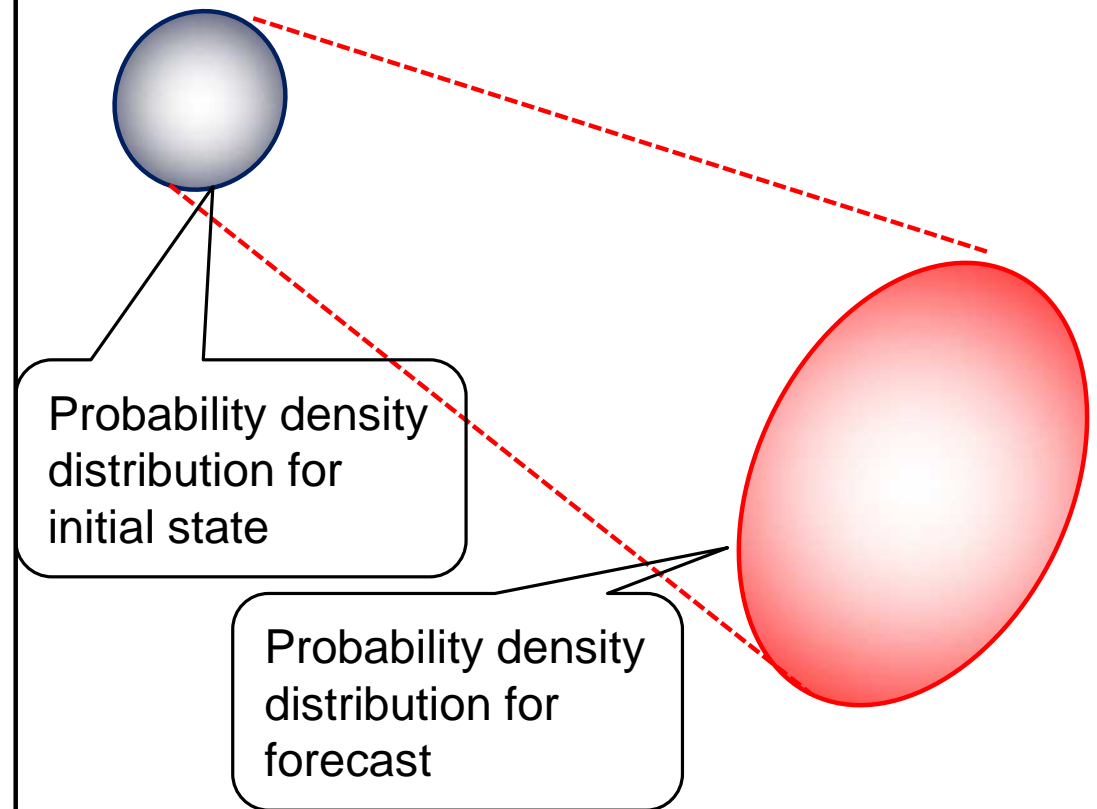
Deterministic and probabilistic forecast

Deterministic forecast



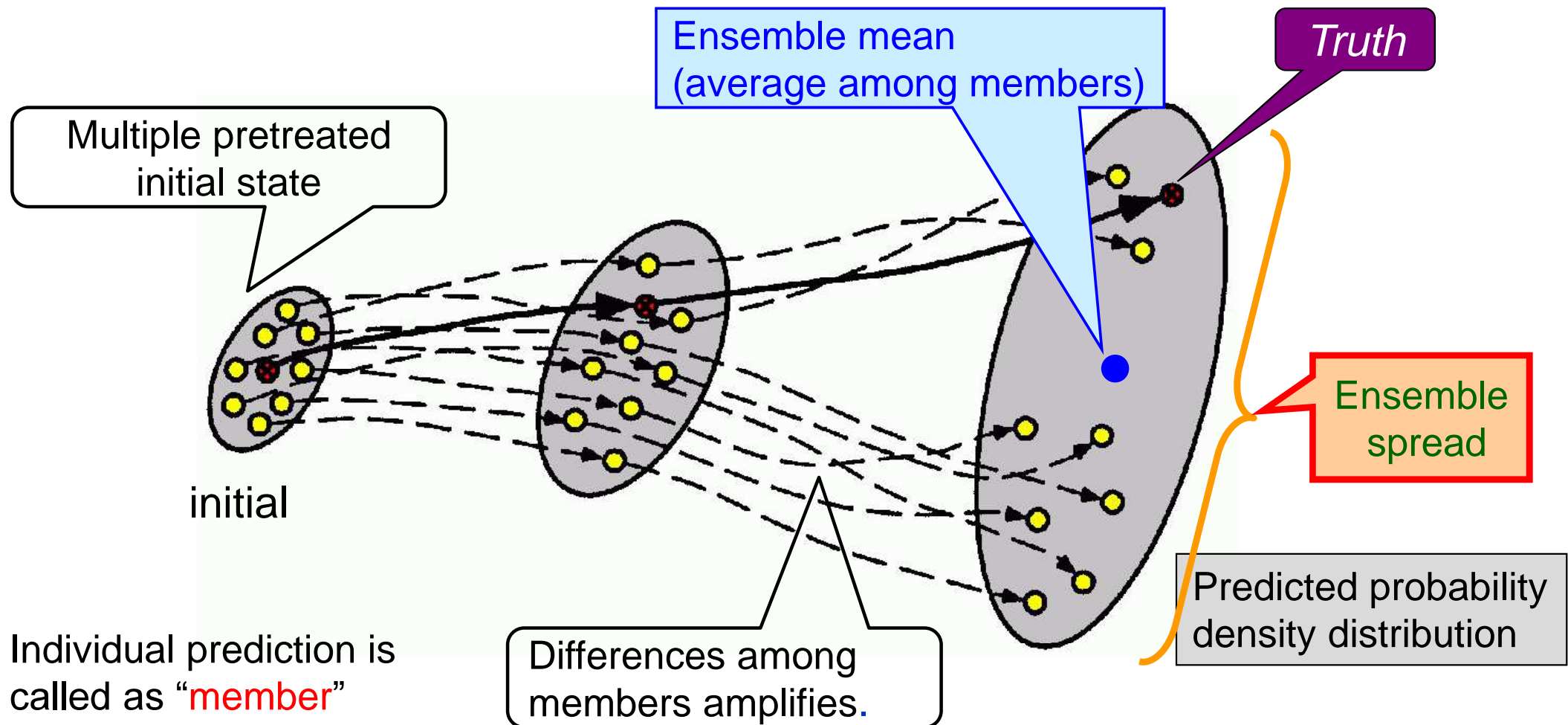
Calculate one forecast
using one initial state

Probabilistic forecast



Concept of ensemble prediction

- Initial ensemble prediction
calculating model using slightly different initial condition (perturbation)



(Reference)

Ensemble mean and Ensemble spread

- Basics of the ensemble prediction statistics
 - **Ensemble mean** : average of the all member results
 - **Ensemble spread** :
 - Standard deviation of individual ensemble members
 - indicate variability of predictions

RMSE of ensemble mean forecast

Spread: $s = \sqrt{\frac{1}{M} \sum_{i=1}^m (x_i^m - \bar{x})^2}$ ← ((Hopefully)) comparable → $RMSE = \sqrt{\frac{1}{N} \sum_{i=1}^N (f_i - a_i)^2}$

x_i : predictions by each member,
 \bar{x} : ensemble mean

f_i : predictions, a_i : truths

- Idealized ensemble prediction system:
(error of ensemble mean) = (ensemble spread)

Example of uncertainty of initial condition

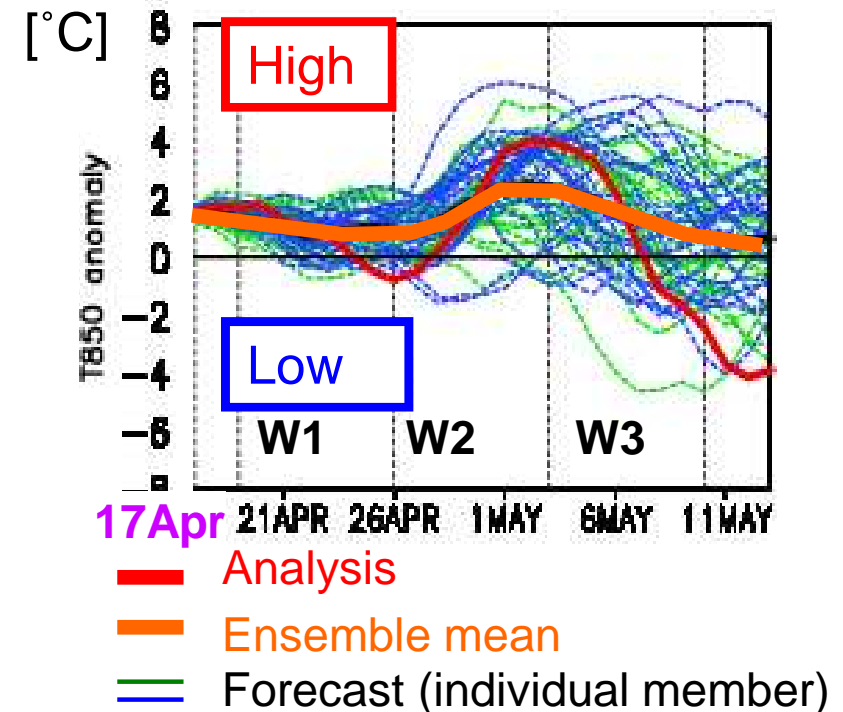
- Ensemble mean
 - average of the all member
 - most likely forecast
 - Ensemble mean is better forecast than the individual member forecast.

Statistically (in huge cases), MSE for ensemble mean (E) would be about half of MSE for one member (e), if model and perturbation would be perfect.

$$\langle E^2 \rangle = \left(1 - \frac{N-1}{2N} \right) \langle e^2 \rangle \quad (\text{N is about 50 for typical EPS})$$

T850 anomaly over Eastern Japan

(initial date: 17Apr2008)



Merits of an ensemble prediction

- **Ensemble prediction:** Prediction with the multiple member



- **Ensemble mean:** Possible to increase prediction skill comparing with the one member forecast
- **Probability density distribution:** Possible to predict probability of the targeted phenomena

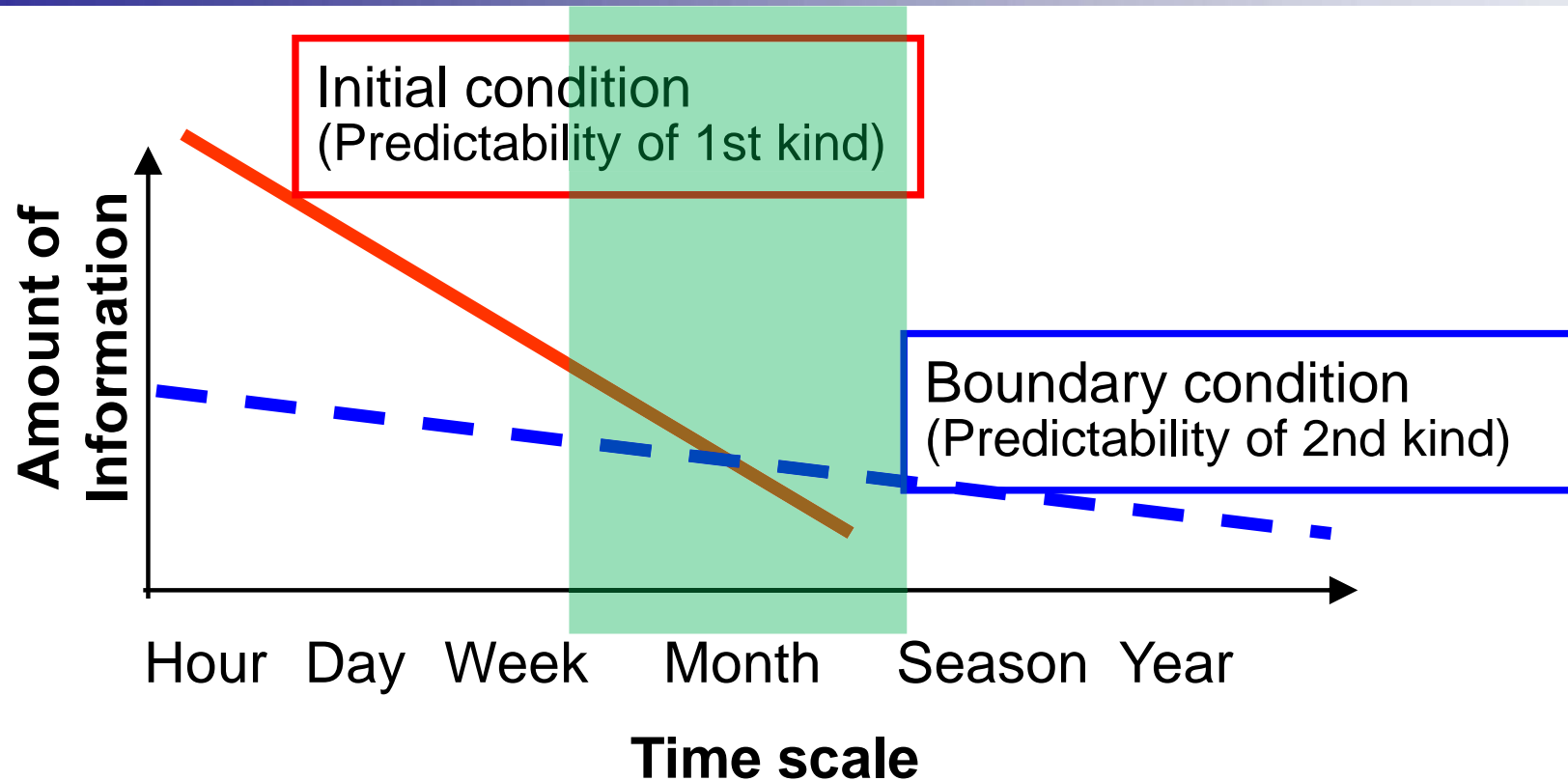


- (Notice) It is not correct that “*some members might be hit when many members are prepared*”.

Two kinds of Predictability

- Predictability came from initial state (predictability of 1st kind)
 - Initial error rapidly grows due to chaotic nature of the atmosphere.
 - Limitation of a deterministic forecasting is about 2-weeks.
- Predictability came from boundary condition (predictability of 2nd kind)
 - As lead time becomes long, deterministic forecasting falls.
 - Probabilistic forecasting with Ensemble prediction system (EPS)
 - Forcing by boundaries (especially ocean) on atmosphere is “signal” for seasonal forecasting.

Importance of initial and boundary condition



- For shorter range, initial condition is important.
- For longer range, impact of boundary condition become large.
- For one month forecasting, both are important.

Outline of the JMA operational EPS

- Overview of the JMA Ensemble prediction system for seasonal prediction
 - 1-month EPS (Main target of this seminar), 4/7 month EPS
- Hindcast
- Prediction skill of the 1-month EPS

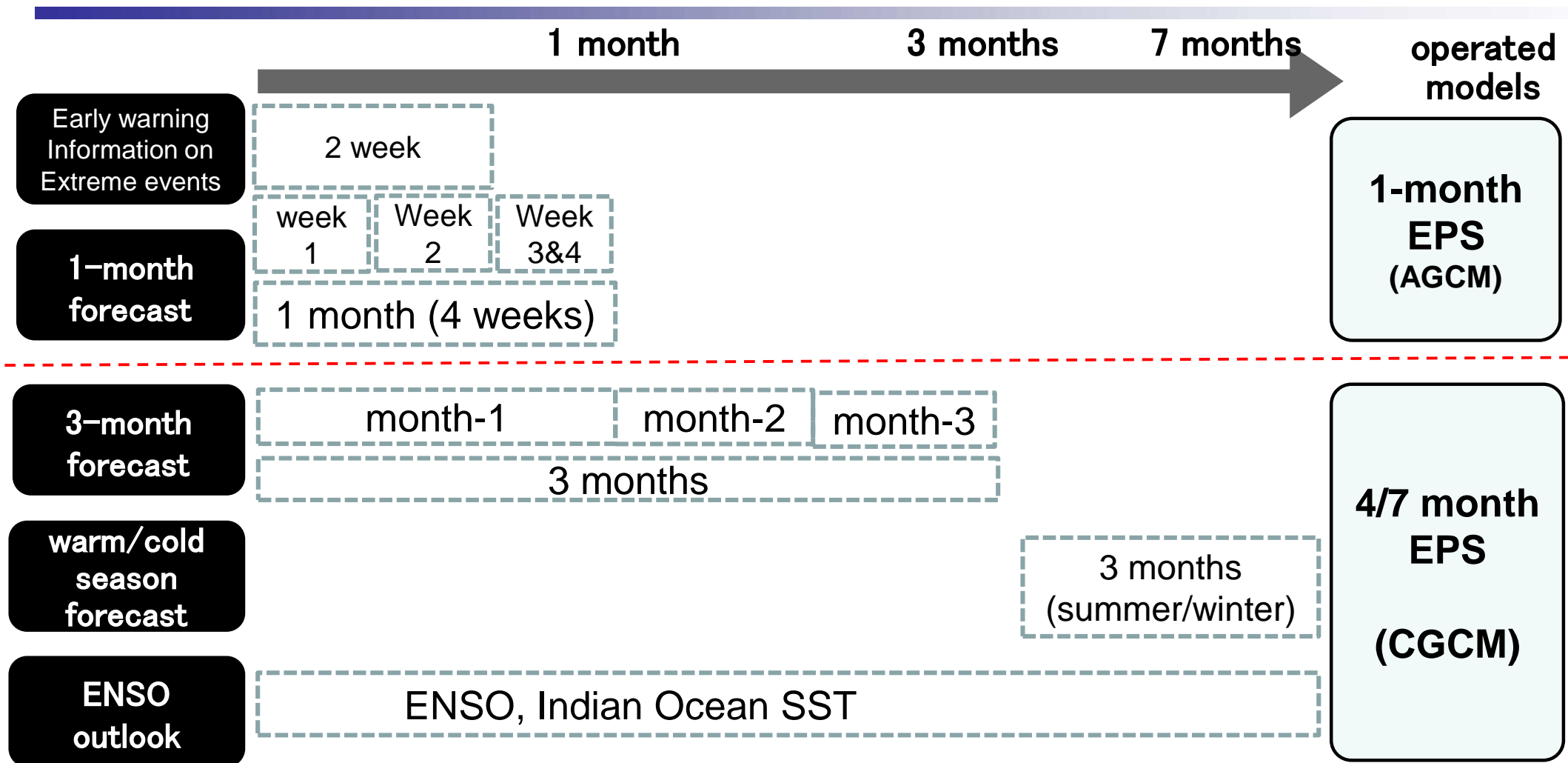
Operational models of JMA

	Main target	Horizontal resolution	
Meso-Scale Model (MSM)	<ul style="list-style-type: none"> •Disaster reduction •Aviation 	5km Around Japan	
Global Spectral Model (GSM)	<ul style="list-style-type: none"> •Short-range forecasting 	20km Global	
Typhoon EPS (TEPS)	<ul style="list-style-type: none"> •Typhoon forecasting 	60km Global	
One-week EPS (WEPS)	<ul style="list-style-type: none"> •One-week forecasting 	60km Global	
One-month EPS	<ul style="list-style-type: none"> •Early warning Information on •Extreme events •One-month forecasting 	110km Global	
4/7-month EPS	<ul style="list-style-type: none"> •Seasonal forecasting •El Niño outlook 	180km Global	

Numerical Prediction Division/JMA

Climate Prediction Division/JMA

Overview of forecasts at CPD/JMA



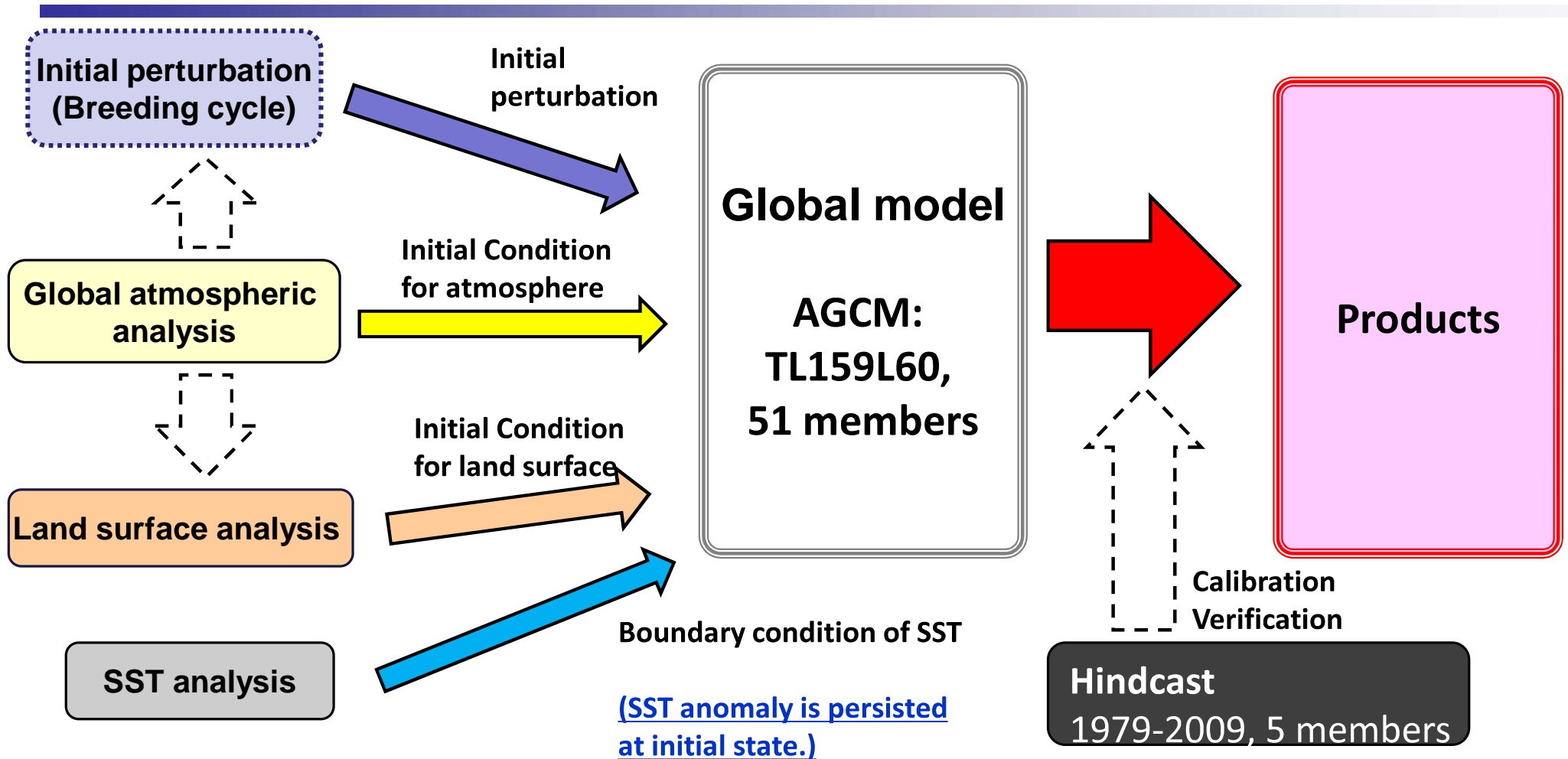
In order to support seasonal forecast, two ensemble prediction systems (EPSs) are operated; 1-month EPS and the 4/7-month EPS

Specifications of seasonal EPSs

Main target of this seminar

	1-month EPS	4/7-month EPS
Model	AGCM	CGCM
Resolution	Horizontal: approx. 110 km (TL159) Vertical: 60 levels (~0.1 hPa)	* Atmospheric component Horizontal: approx. 180 km (TL95) Vertical: 40 levels (~0.4hPa) * Oceanic component Horizontal: 1.0° longitude, 0.3–1.0° latitude (75°S – 75°N) Vertical: 50 levels
Forecast range	Up to 34 days	7-month (initial month of Sep., Oct., Feb., Mar., Apr) 4 months (other initial month)
SST	Persisted anomaly	Prognostic variable of CGCM
Sea ice		Climatology
Ensemble method	Combination of Breeding of Growing Modes (BGM) and Lagged Average Forecast (LAF)	Growing Modes (BGM) and Lagged Forecast (LAF)
Ensemble size	50 (25 BGMs & 2 days with 1-day LAF)	51 (9 BGMs & 6 days with 5-day LAF)
Frequency of operation	Every Wednesday and Thursday	Every 5 days
Frequency of model product creation	Once a week Every Friday	Once a month Around the 20th (no later than the 22nd) of every month

One-month EPS



For more details;

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

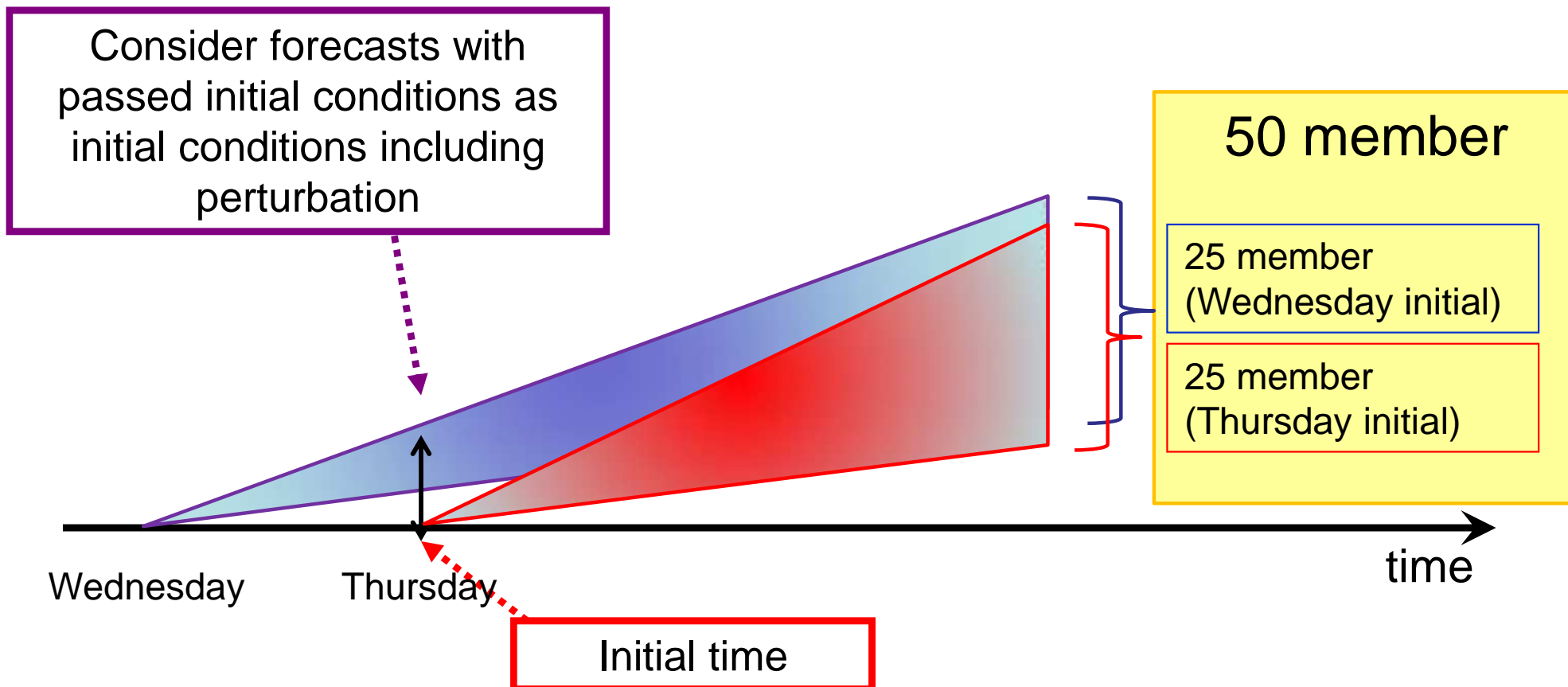
<http://www.jma.go.jp/jma/jma-eng/jma-center/nwp/nwp-top.htm>

(Reference) LAF method

LAF (Lagged Averaged Forecasting) method:

The past forecasts with the earlier analyses are included in the ensemble

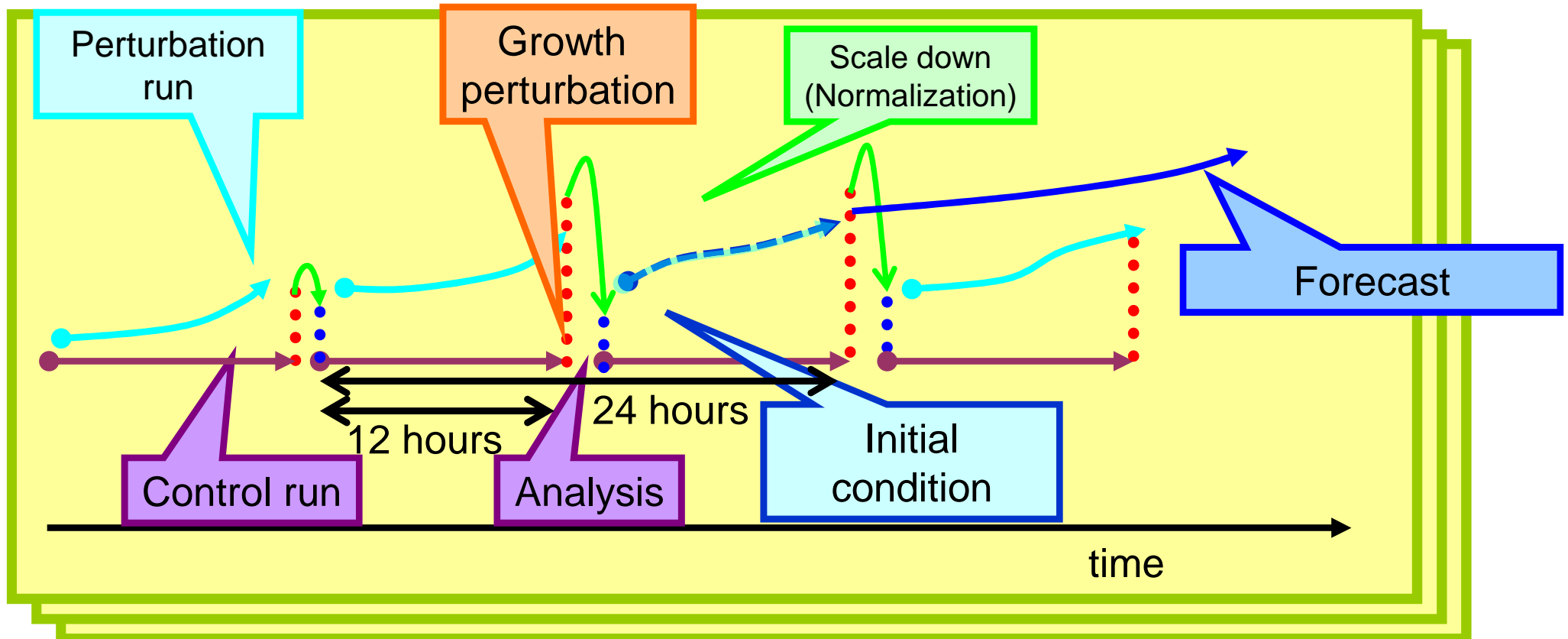
Example; 1-month EPS



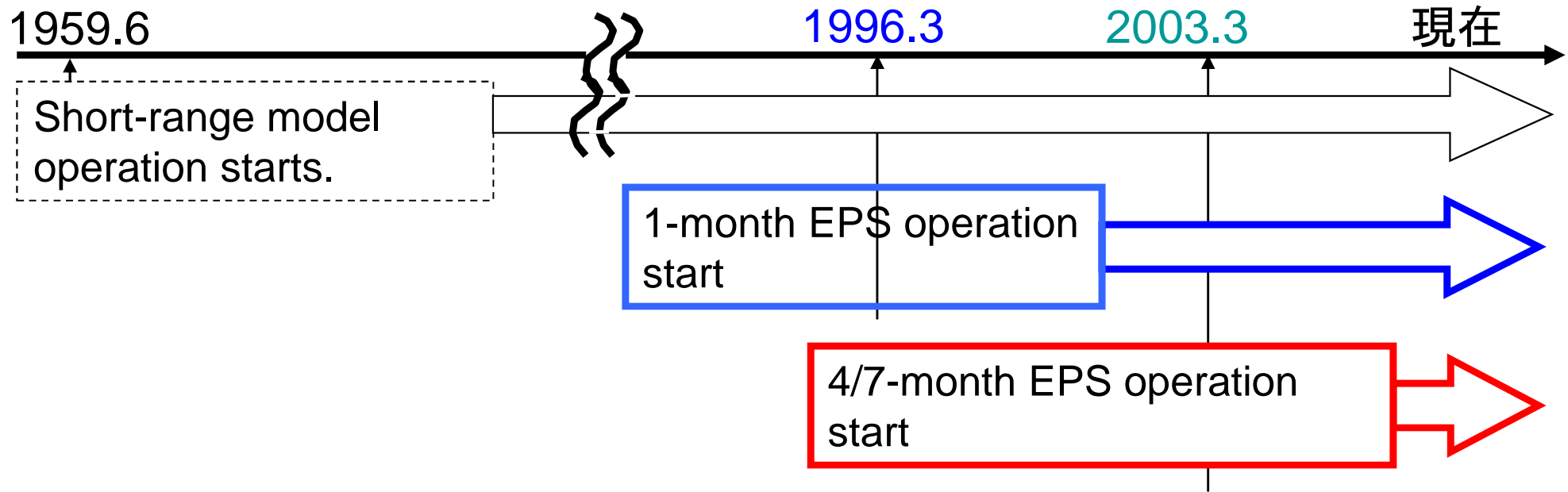
(Reference) BGM method(Breeding cycle)

Toth, Z. and E. Kalnay, 1997: Ensemble forecasting at NCEP and the breeding method. Mon. Wea. Rev., 125, 3297-3319.

- Prepare initial perturbations, which is slightly different with analysis field.
- Perturbations are based on forecast error of very short-range (e.g. 12 hours)



History of the seasonal EPSs at JMA



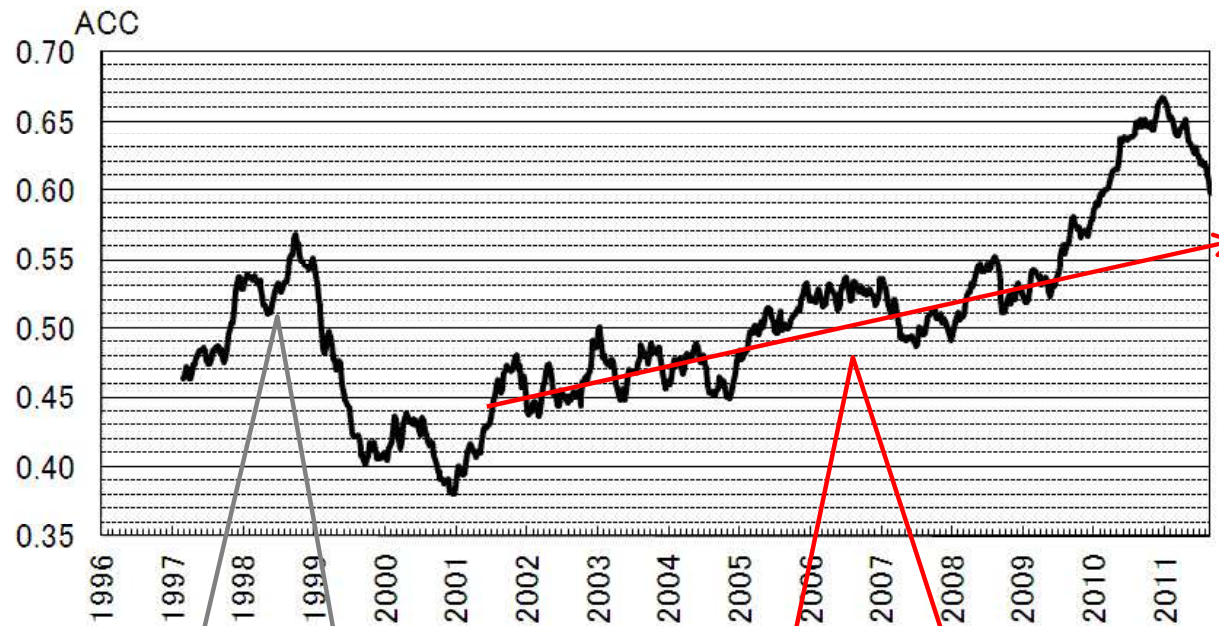
Seasonal EPSs does not have a long history.

	Mar 1996	Mar 2001	Mar 2003	Mar 2006	Sep 2007	Mar 2008	Feb 2010
1-month EPS	T63L30M10	T106L40M26	→	TL159L40M50	→	TL159L60M50	→
4/7 month EPS			T63L40M31	TL95L40M31	TL95L40M51	→	Introduction of CGCM

AGCM CGCM

Improvement of prediction skill of the 1-month EPS

Anomaly correlation of Z500 over NH
(4-week average, 1 year (52-weeks) running mean)



Large atmospheric influence of historic El Niño might be increase predictability

Upward trend of prediction skill reflecting upgrade the EPS

Hindcast

- **Hindcast** (= behind + forecast)
: A set of systematic forecast experiments for past cases
- Object of hindcast
 - to understand prediction skill
 - to calculate the model statistics for applied product
 - Systematic bias, Model climate

Essential for seasonal forecasting!
- Difficulty
 - Huge computing resources
 - Specifications (e.g., ensemble size, calculation frequency) of hindcast needs must be limited than those of operational system forecasts

Specifications of the 1-month EPS hindcast

	Hindcast	Operational system
Ensemble size	5 (5 BGMs, not using LAF)	50 (25 BGMs & 2 days with 1-day LAF)
Forecast range	Initial date + 33 days	2, 3, 4,...31, 32 days from the later initial date (Thursday)
Initial date	10th, 20th, end of month	Every Wednesday and Thursday
Target period	1979 – 2009	---

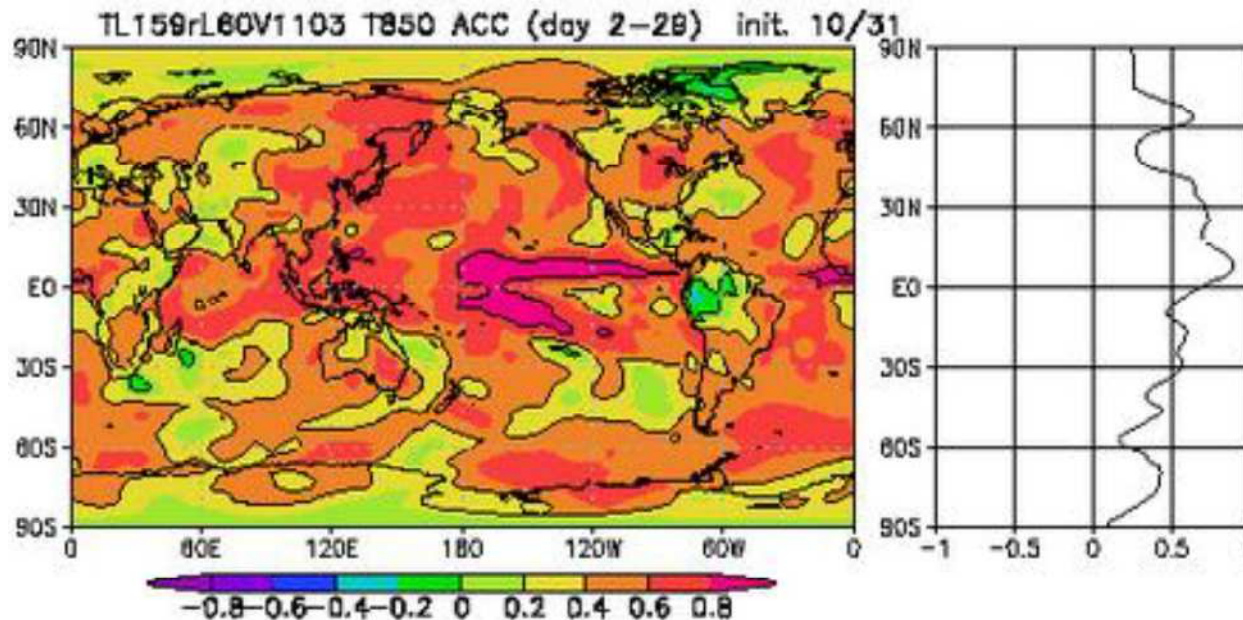
Although the specifications of the hindcast is limited, huge computing resources are required.

➤ $36(\text{initial date}) * 31(\text{years}) * 5(\text{member}) = 5580$ (forecast runs)

Anomaly correlation for T850 of 4-week forecast (1-month EPS hindcast)

Initial date: 31 Oct

T850



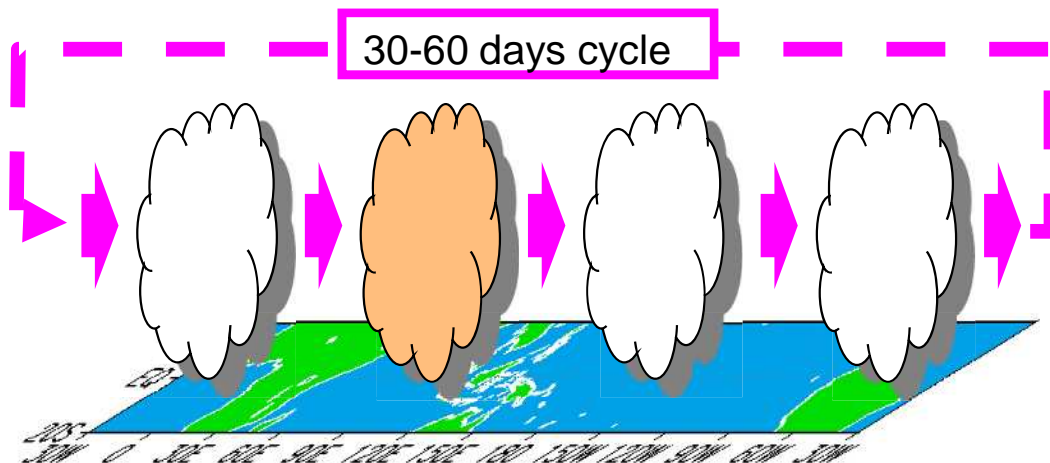
- Anomaly correlation is high in the tropics reflecting tropical ocean variability.
- In the mid-high latitudes, anomaly correlation is small due to dominant of the atmospheric internal variability.

http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/hindcast/1mE/tro_acor.html

(Reference) MJO (Madden Julian Oscillation)

(Details are referred to the lecture by analysis unit.)

- Propagate eastward in tropics
- Wave number = 1
- Period = about 30-60 days
- Often monitor with anomaly fields of OLR and/or velocity potential
- Often affect the mid-latitudes



Phase of MJO (winter)

Wheeler and Hendon 2004, MWR, 132, 1917-1932.

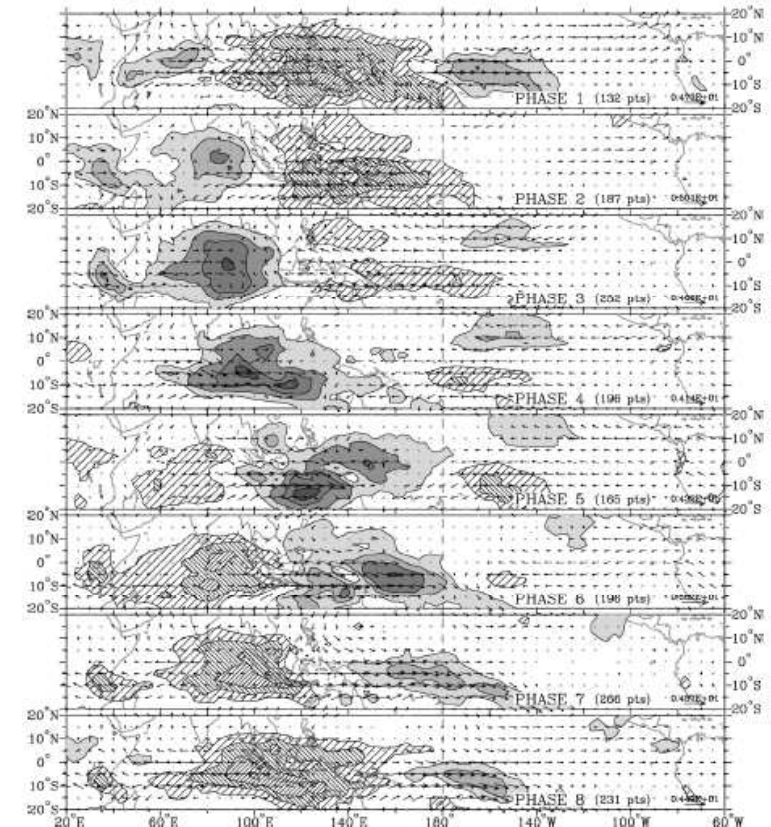


FIG. 3. DJF composite OLR^a and 850-hPa wind vector anomalies. Shading levels denote OLR anomalies less than -7.5, -15, -22.5, and -30 W m⁻², respectively, and hatching levels denote OLR anomalies greater than 7.5, 15, and 22.5 W m⁻², respectively. Black arrows indicate wind anomalies that are statistically significant at the 99% level, based on their local standard deviation and the Student's *t* test. The magnitude of the largest vector is shown on the bottom right, and the number of days (points) falling within each phase category is given.

Vector: 850hPa Wind anomaly
Shading: OLR anomaly

Example of MJO seen in the operational 1-month EPS

Initial date: 30Dec2010

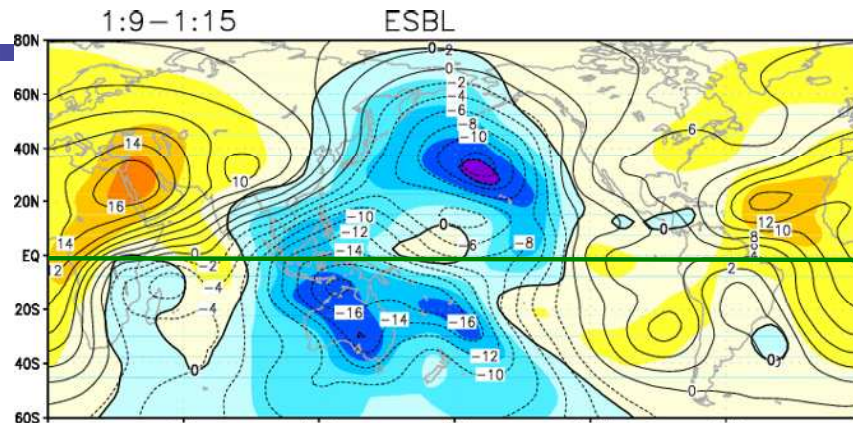
Region of activated convection:

Maritime continent

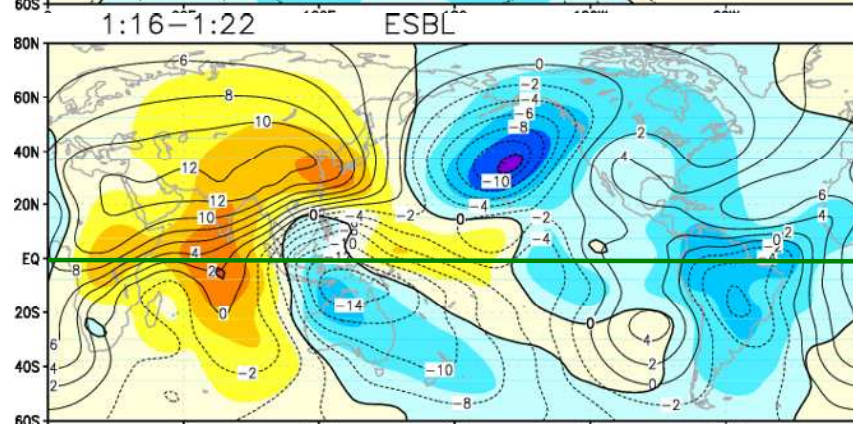
Eastern Pacific

Africa

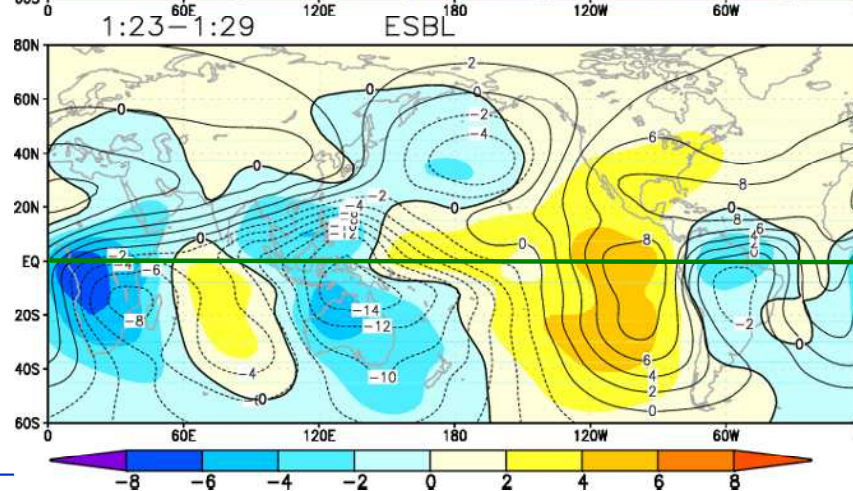
Week-1



Week-2

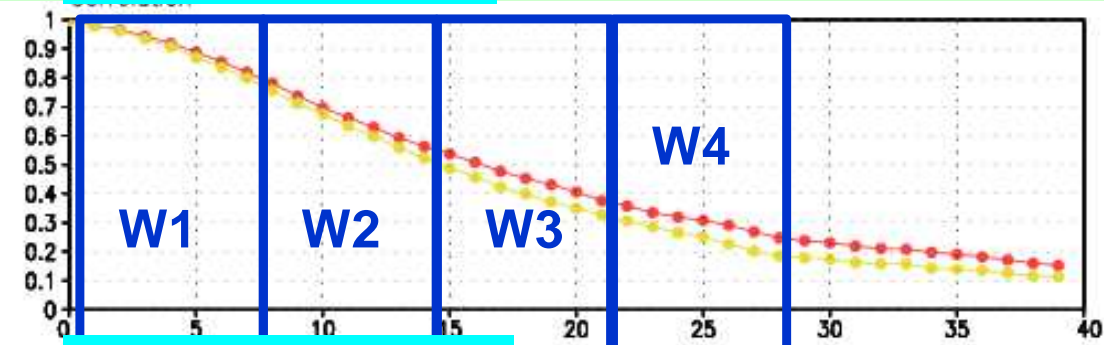


Week-3

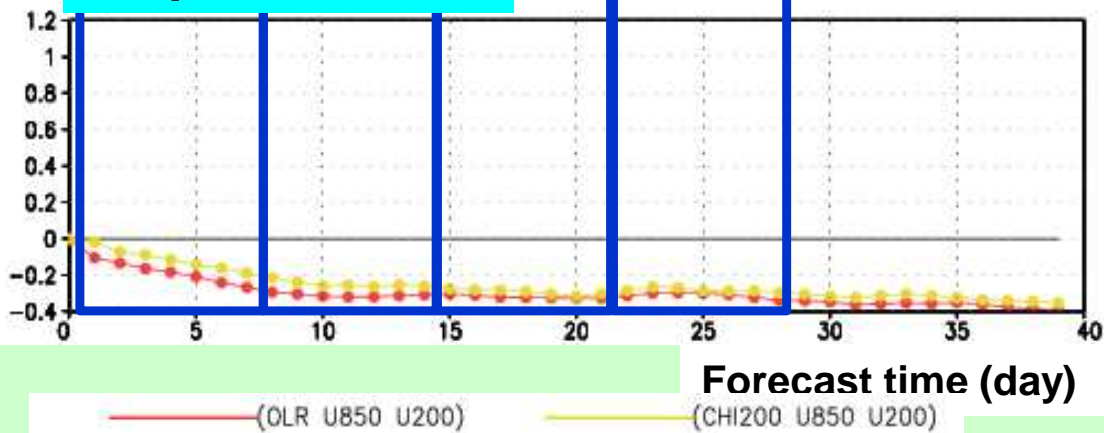


Prediction skill of MJO index (hindcast of the 1-month EPS)

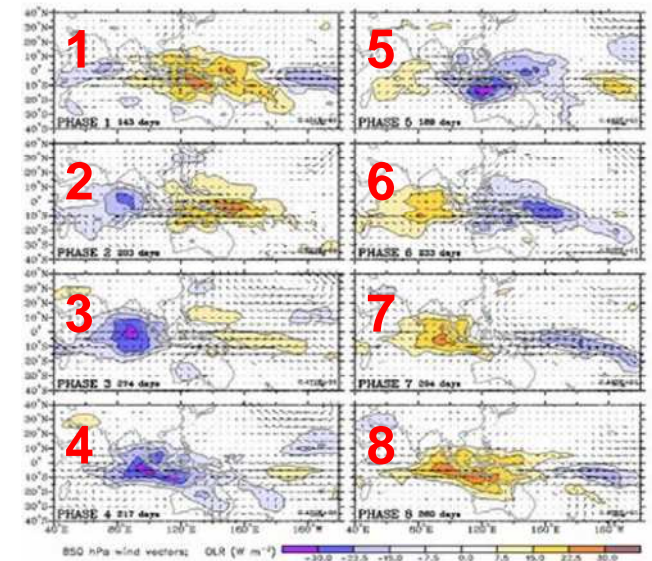
Correlation



Amplitude Error



(Reference) Phase of MJO
Wheeler and Hendon (2004)



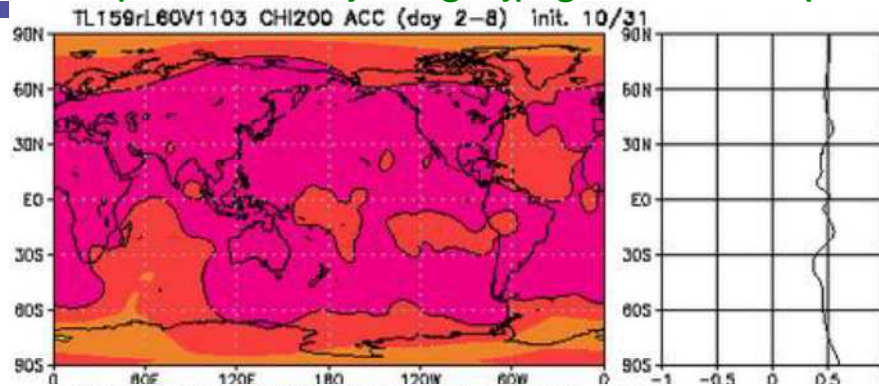
- Prediction skill of MJO is about 2-3 weeks.
- Weak bias of MJO is found in the JMA's model.

Verified by Matsueda-san (Numerical prediction unit/ CPD/JMA)
(Please refer to the presentation on 10 Nov.)

Lead-time dependency of prediction skill over tropics (200hPa velocity potential)

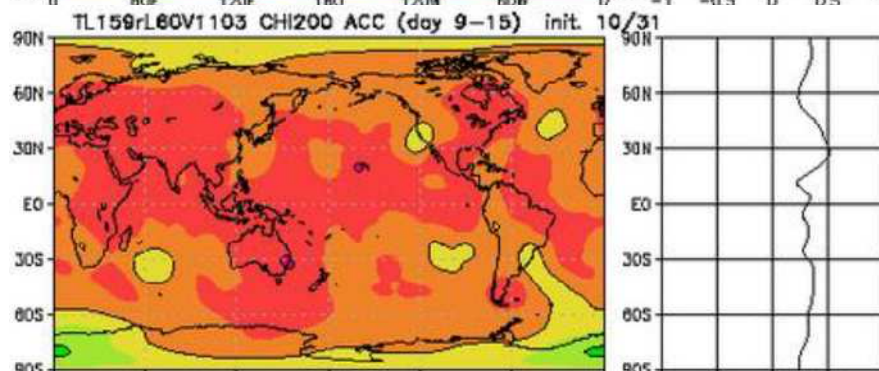
http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/hindcast/1mE/tro_acor.html

Week-1

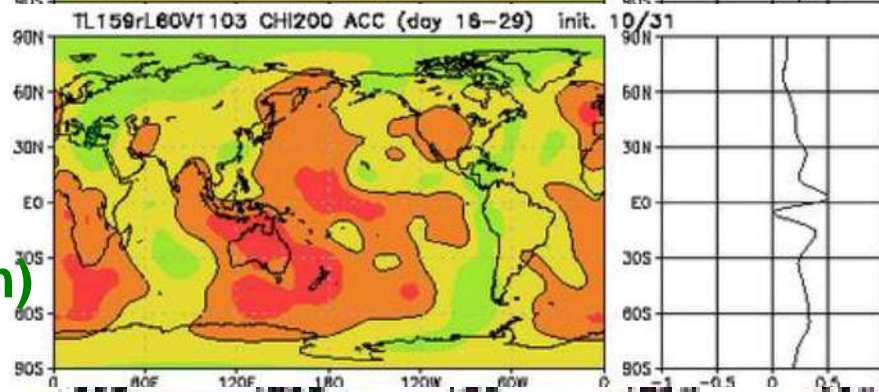


Initial date: 31 Oct

Week-2



Week-3,4
(2-weeks mean)



After week-3, prediction skill clearly decreases.



Example of the operational JMA 1-month EPS (Comparison between Analysis and Forecast)

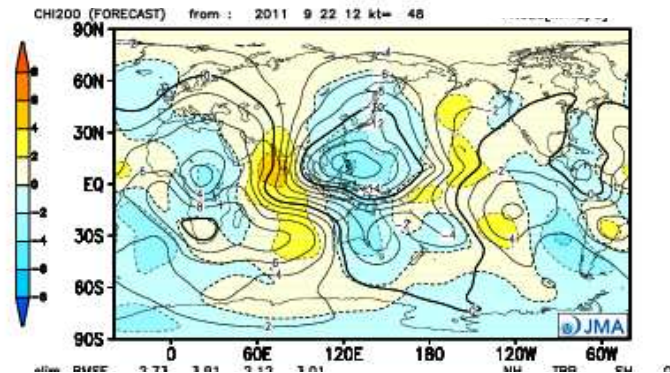
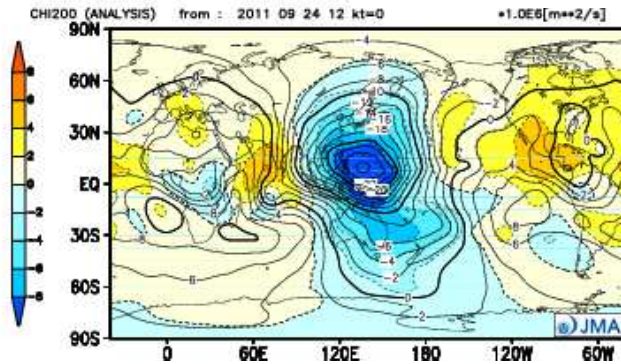
<http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/verif/1mE/vrfmap/week/zpcmap.php>

Analysis

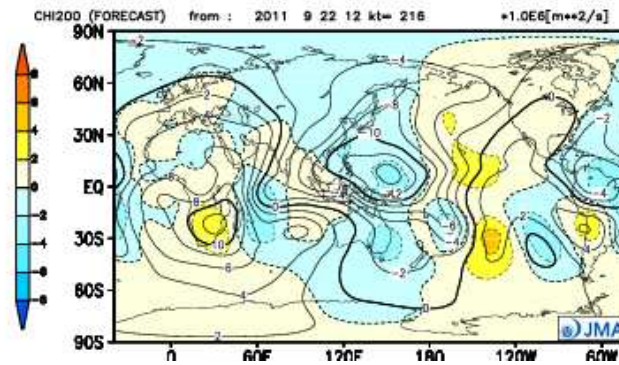
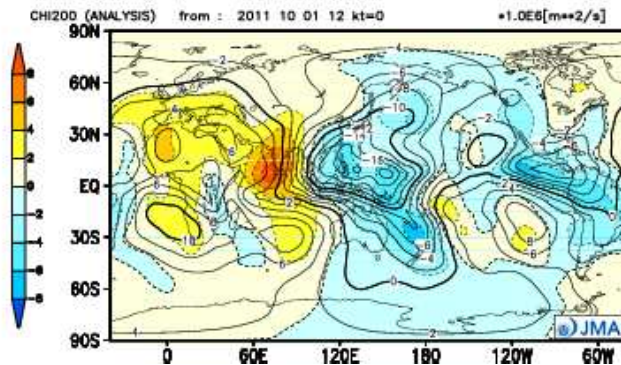
Forecast

Initial date: 22 Sep 2011

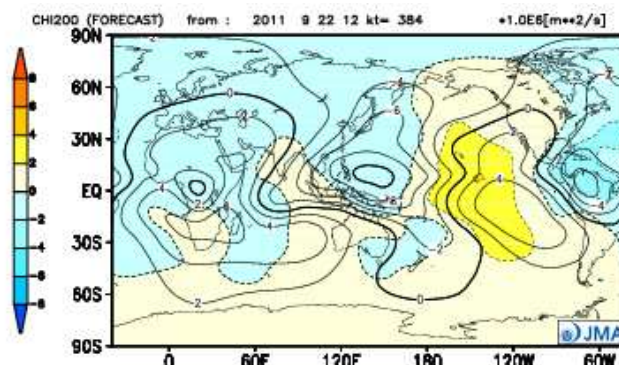
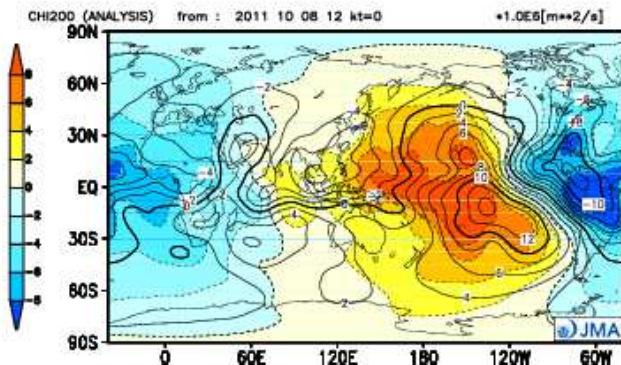
Week-1



Week-2

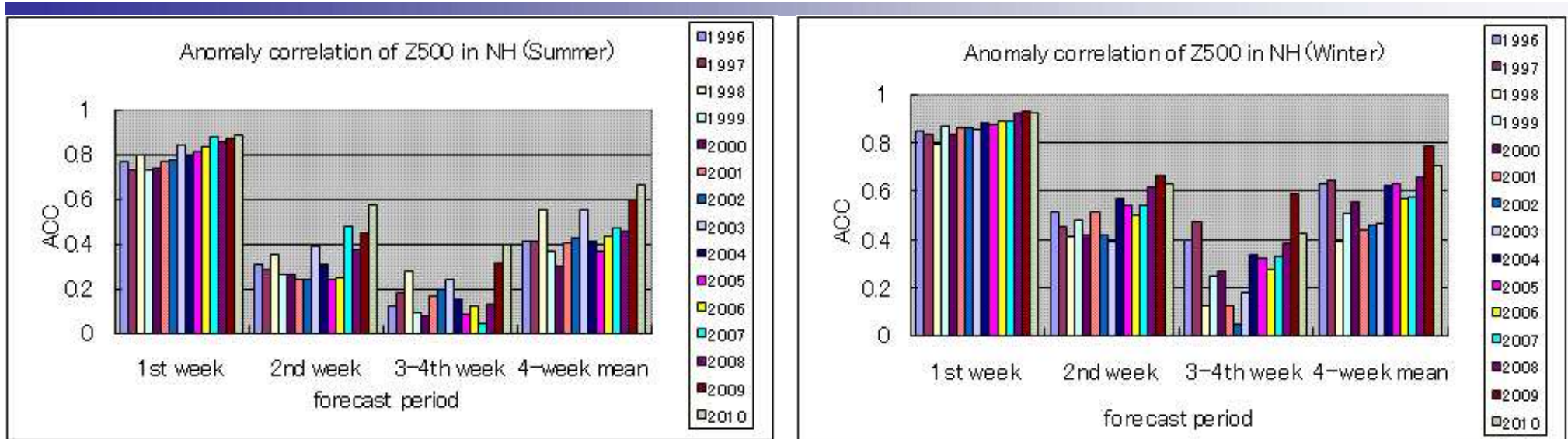


Week-3,4



- Phase of MJO is reasonably predicted in this case.
- However, amplitude of MJO become small, as forecast time increases.

Anomaly correlation for Z500 over NH (operational 1-month EPS)

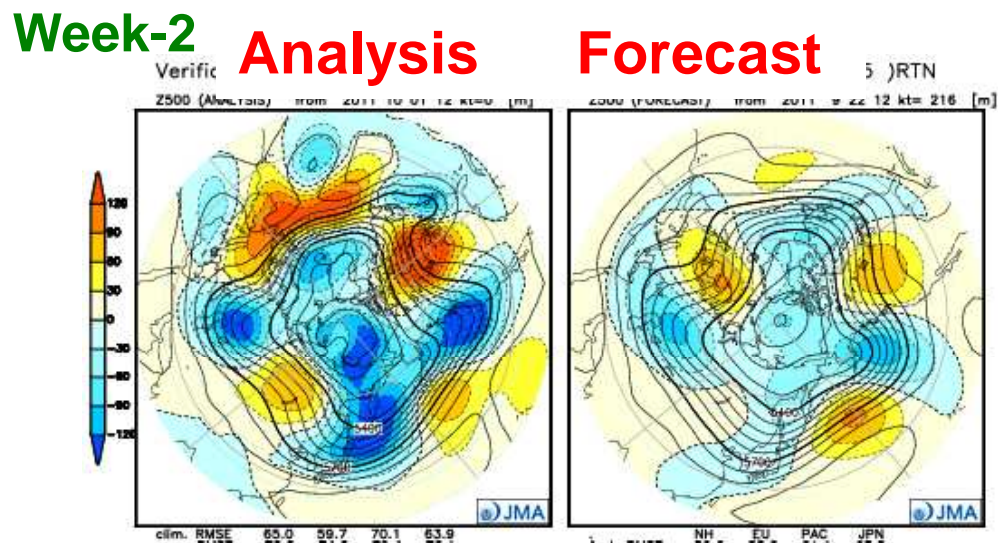
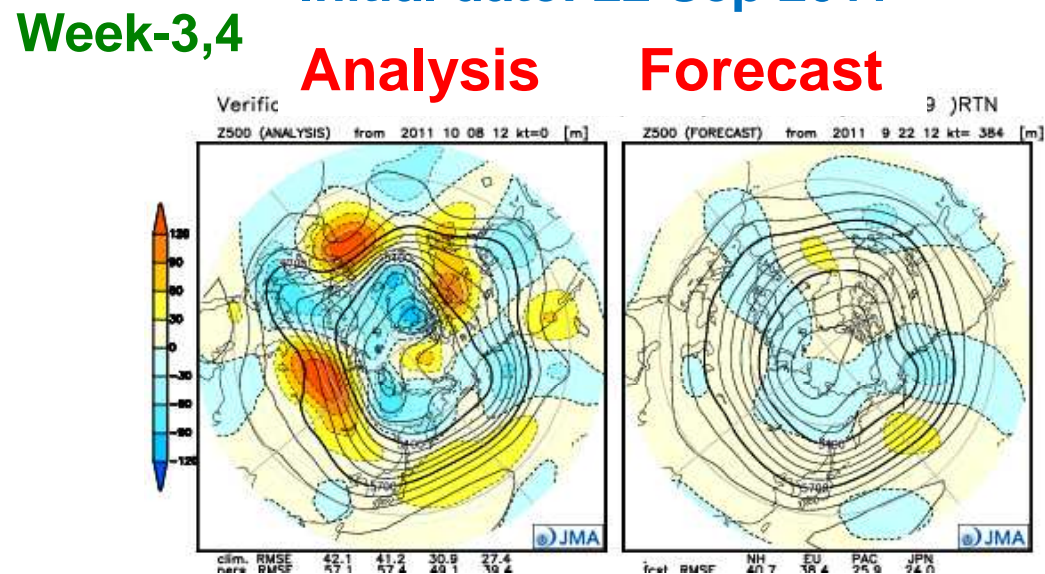
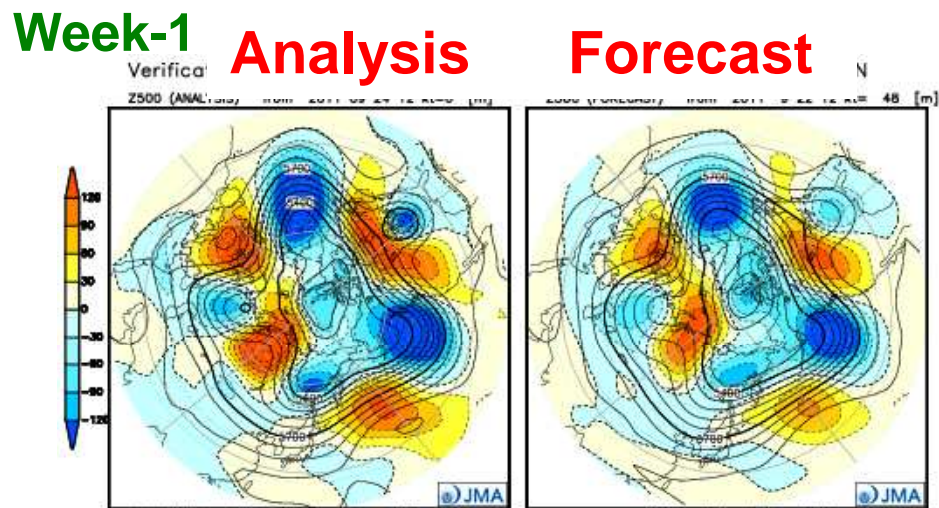


- In general, predictability over mid-high latitudes associating with westerlies is about 2-week.

http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/verif/1mE/2010/2010_e.html

Example of the operational JMA 1-month EPS (Comparison between Analysis and Forecast)

Initial date: 22 Sep 2011



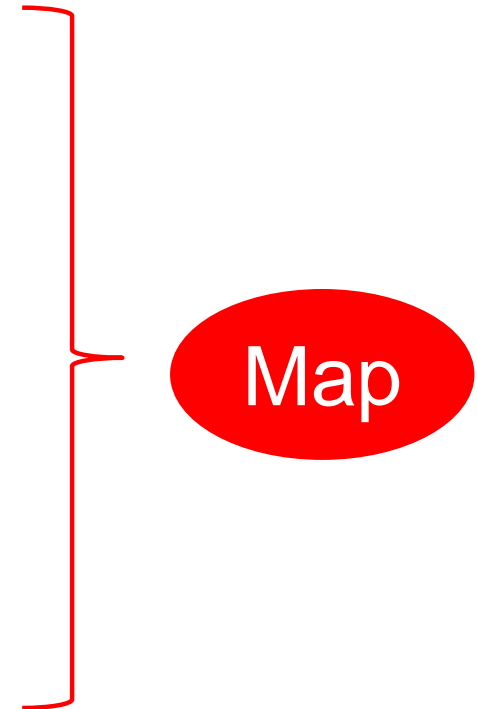
After week-3,4, prediction error becomes large.

<http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/verif/1mE/vrfmap/week/pzmap.php>

Model products on the TCC website

Products available on TCC website

- **Forecast Maps**
 - Ensemble mean forecasts
- Calibrated probabilistic forecasts
- Verification charts
 - Real-time
 - Hindcast
- Gridded dataset (Grid Point Values; GPVs)



TCC Website

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

NWP Model Prediction



Tokyo Climate Center (WMO Regional Climate Center)

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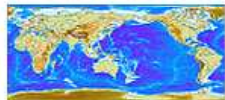
Home World Climate Climate System Monitoring El Niño Monitoring **NWP Model Prediction** Global Warming Climate in Japan Training Module Press release

HOME

RCC Functions and Main Products

- Operational Activities for LRF
- Operational Activities for Climate Monitoring
- Operational Data Services to support operational LRF and climate monitoring
- Training in the use of operational RCC products and services
- Additional Functions

ClimatView



GPC Tokyo (a Global Producing Center for Long-range Forecasts (LRF))



Introduction to ITACS



Monthly Highlights on Climate System (latest issue)



TCC News



STRATALERT

TOKYO last updated : 22 Apr 2011

text figures

What's New

- 25 October 2011 **EW NI**
 - Climate Change Monitoring Report for 2010
- 14 October 2011 **EW NI**
 - New Release: Monthly Highlights on Climate System (September 2011)
- 14 October 2011 **EW NI**
 - Updated Information: Global Average Surface Temperature Anomalies - Monthly Anomalies (September 2011)
- 14 October 2011 **EW NI**
 - Updated Information: World Climate - Monthly Report (September 2011)
- 12 October 2011 **EW NI**
 - Updated Information: El Niño Outlook (October 2011 - April 2012)
- 7 October 2011 **EW NI**
 - Updated Information: Climate in Japan - Monthly Report (September 2011)
- 5 October 2011 **EW NI**
 - New Products available: Verification Score Maps and Time-series Circulation Index of the one-month ensemble prediction system according to hindcast experiments
- 27 September 2011 **EW NI**
 - Grounds for Cold Season Outlook (December 2011 to February 2012)
- 26 September 2011 **EW NI**
 - Grounds for Three-month Outlook (October to December 2011)
- 2 September 2011 **EW NI**
 - New Service: Download of Daily grid point value products of One-month Forecasting (only for registered NMHS users)

Links

- RA II Regional Climate Center (RCC) Network Homepage
- WMO DDB (Various Climate-related Products and Data)
- Monthly Climate Statistics for Japan
- Satellite Imagery of MTSAT-1R
- Tropical Cyclone Advisory : Tokyo Typhoon Center
- Japanese 25-year Reanalysis Project (JRA-25)
- JRA-25 Atlas
- World Data Center for Greenhouse Gases
- RSMC Tokyo
- Meteorological Satellite Center, JMA
- World Meteorological Organization
- GCC
- Mon
- Beijing Climate Center
- APEC Climate Center
- Korea Meteorological Administration
- Asian Disaster Reduction

Download gridded data

TCC news (newsletter)



“NWP Model Prediction” on TCC Website

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

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Tokyo Climate Center (WMO Regional Climate Center)

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Home World Climate Climate System Monitoring El Niño Monitoring **NWP Model Prediction** Global Warming Climate in Japan Training Module Press release

HOME > Ensemble Model Prediction

JMA's Ensemble Prediction System (Products of GPC Tokyo)

JMA operates the ensemble prediction system of an atmospheric global circulation model (AGCM) for one-month prediction and atmosphere-ocean coupled global circulation model (CCM3) for three-month prediction. Ensemble prediction products, verification charts and description of the ensemble prediction system are available on this page.

Notice

- GPV products for seasonal forecasts have been upgraded since 17 February 2010. Please refer to the top page of the "TCC News No. 19" for details.

Main Products

Latest Products

- One-month Prediction**
 - One-month Prediction (21 Dec 2011)
 - Z500, T850 & SLP (Northern Hemisphere) (21 Dec 2011)
 - Stream Function, Velocity Potential & Surface Air Temperature (60N-60S) (21 Dec 2011)
 - Verification (21 Dec 2011)
 - Hindcast **NEW**
 - One-month Probabilistic Forecasts at station points
- Three-month Prediction**
 - Three-month Prediction (17 Dec 2011)
 - Z500, T850 & SLP (Northern Hemisphere) (17 Dec 2011)
 - Stream Function, Velocity Potential & Surface Air Temperature (60N-60S) (17 Dec 2011)
 - Verification (17 Dec 2011)
 - Hindcast
 - Probabilistic Forecast and Verification (17 Dec 2011)
- Warm/Cold Season Prediction**
 - Warm/Cold Season Prediction (17 Dec 2011)
 - Z500, T850 & SLP (Northern Hemisphere) (17 Dec 2011)
 - Stream Function, Velocity Potential & Surface Air Temperature (60N-60S) (17 Dec 2011)
 - Hindcast
 - Probabilistic Forecast and Verification **NEW** (17 Dec 2011)

Model Descriptions

- Model Outlines
- Operations for Extended-range Forecast Model
- for Long-range Forecast

Download GPC Long-range Forecast (LRF) Products

- Download Grid Point Value (GPV) File (Only registered NMHSs can access this page)
- Application

When receiving an e-mail entitled "[JDDS/JMA] Your Password will expire in a few days" from JDDS_admin (JDDS_admin@data.jma.go.jp), you are kindly requested to change your password at <http://ds.data.jma.go.jp/changepasswd/>. Password should be at least eight characters. For questions about ID and/or password, please e-mail to: tcc@met.kishou.go.jp

Latest Products
(--> Various forecasts maps Verification)

Products for NMHSs
(ID/Password is required.)
Gridded dataset (GPV)
Additional product

Model Descriptions

Administration
Korea Meteorological Administration
Asian Disaster Reduction Center
Severe Weather Information Center
World Weather Information Service

(Note)

Some products are required UID.

- Some products are required UID.
 - For Application;
<http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/Application.html>
 - Gridded dataset (Grid Point Values, GPVs)
 - The other additional products
 - animation maps of 1-month EPS
 - Predicted indices by 4/7 month EPS for statistical downscaling

“Latest Product” of 1-month EPS

Latest Products

1-month EPS

One-month Prediction

- ▶ [One-month Prediction](#) (21 Oct 2011)
- ▶ [Z500, T850 & SLP \(Northern Hemisphere\)](#) (21 Oct 2011)
- ▶ [Stream Function, Velocity Potential & Surface Air Temperature \(60N-60S\)](#) (21 Oct 2011)

Forecast maps

▶ [Verification](#) (23 Oct 2011)

Verification (Real-time)

▶ [Hindcast](#) **NEW**

Verification (Hindcast)

▶ [One-month Probabilistic Forecasts at station points](#)

Calibrated probabilistic forecasts

Three-month Prediction

▶ [Three-month Prediction](#) (21 Oct 2011)

Forecast map (Ensemble mean, NH map)

<http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/map/1mE/map1/pztmap.php>

Forecast Period
•W-1, W-2
•W,3-4 (2-weeks mean)
•W1-4 (4-weeks mean)

Initial date

Forecast map of 1 month forecast - Windows Internet Explorer

http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/map/1mE/map1/pztmap.php

forecast map

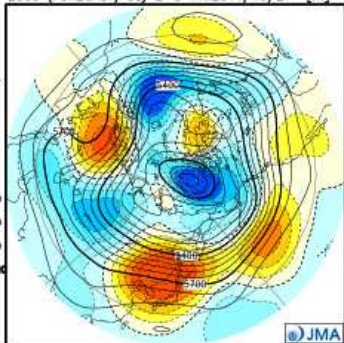
forecast period
the first week

initial date
2011.10.27.12 Z

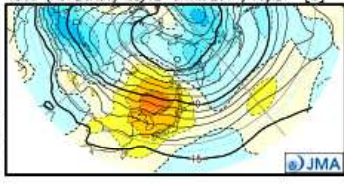
[coresponding verification](#)

(from top to bottom)
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 patterns show anomalies.)

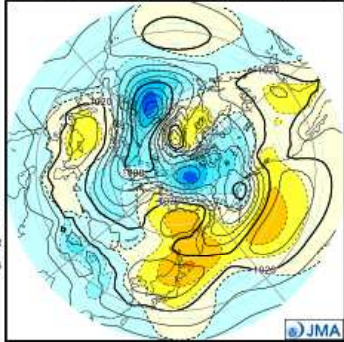
Ensemble Mean forecast (07 day mean)RTN
Z500 (FORECAST) day 2-8 init:2011/10/27 [m]



T850 (FORECAST) day 2-8 init:2011/10/27 [C]



PSEA (FORECAST) day 2-8 init:2011/10/27 [hPa]



Z500

T850

SLP

Forecast map (Ensemble mean, Tropics map)

<http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/map/1mE/map1/zpcmap.php>

forecast map

forecast period
the first week

initial date
2011.10.20.12.2

area
60N-60S
Asia

corresponding verification

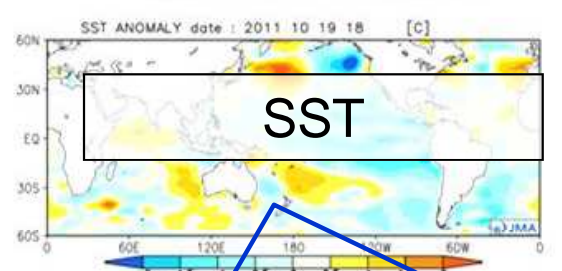
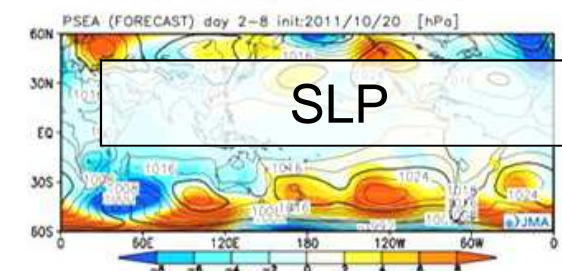
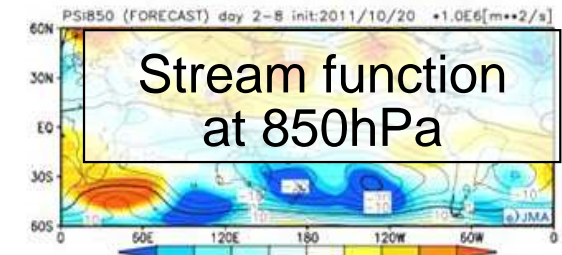
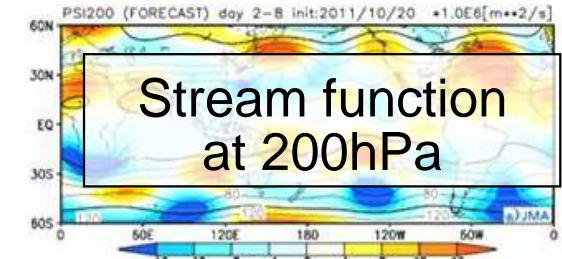
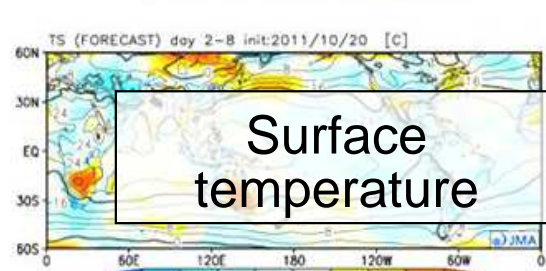
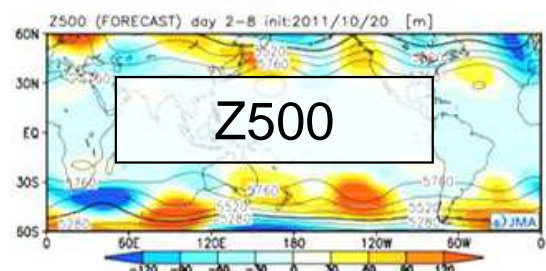
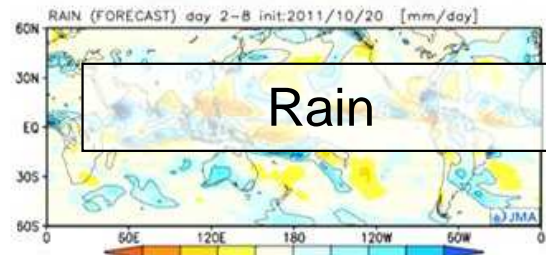
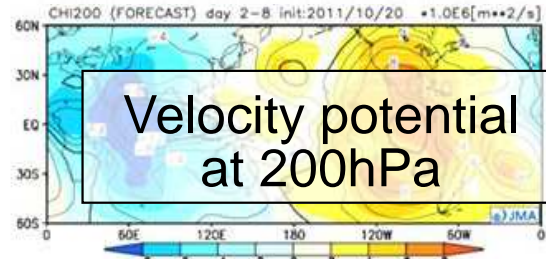
[Contour interval]
CHI200: 2x1.0E6m²/s
RAIN: 4mm/day
Z500: 125m
TS: 4C
PSI200: 20x1.0E6m²/s
PSI850: 5x1.0E6m²/s
PSEA: 4hPa

(Shaded patterns show anomalies.)

Forecast Period

- W-1, W-2
- W,3-4 (2-weeks mean)
- W1-4 (4-weeks mean)

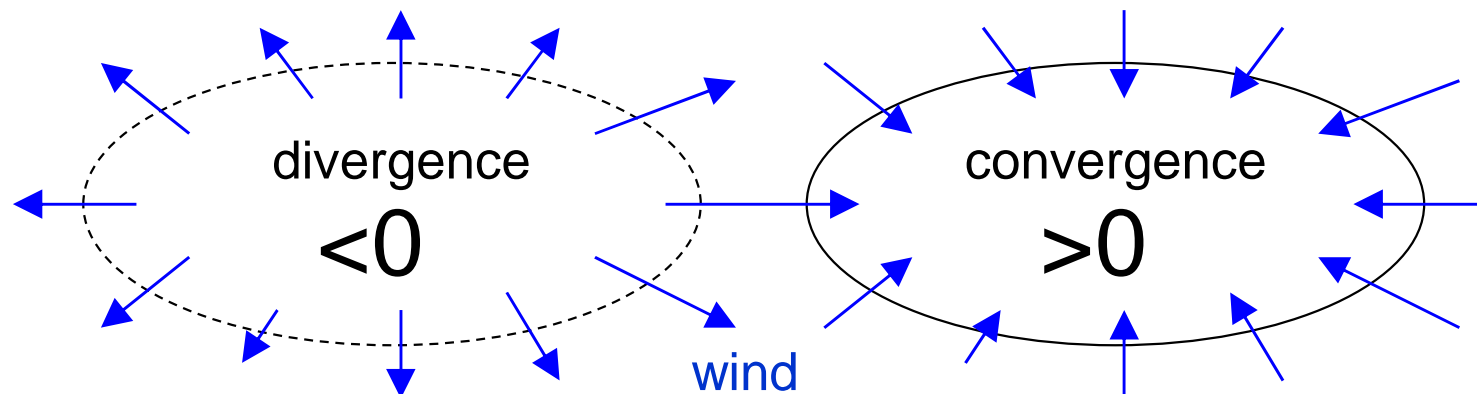
Initial date



SST anomaly
Boundary condition for the model

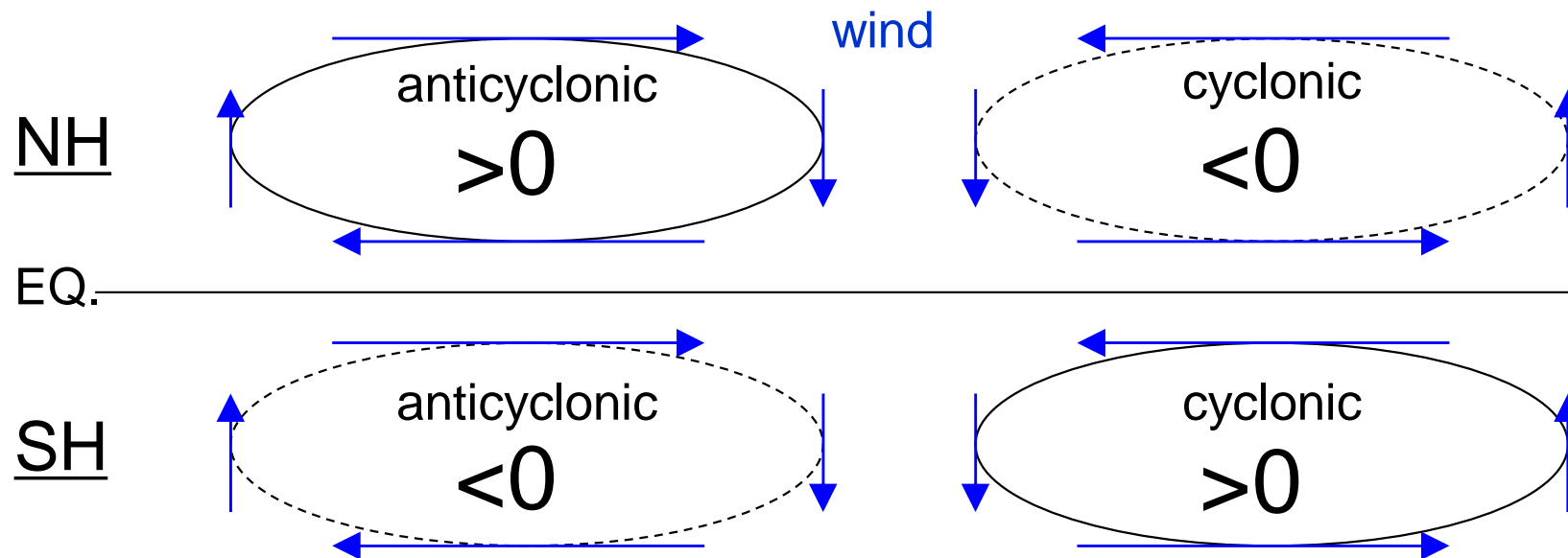
(Reference) Velocity potential (CHI)

- A **velocity potential** (hereafter CHI) indicates a large scale **divergence or convergence**.
- The maximum (minimum) portions of positive (negative) velocity potential indicate centers of large scale convergence (divergence).
- At the upper troposphere (e.g. 200hPa), divergence is considered to be related to an active convective area.



(Reference) Stream function (PSI)

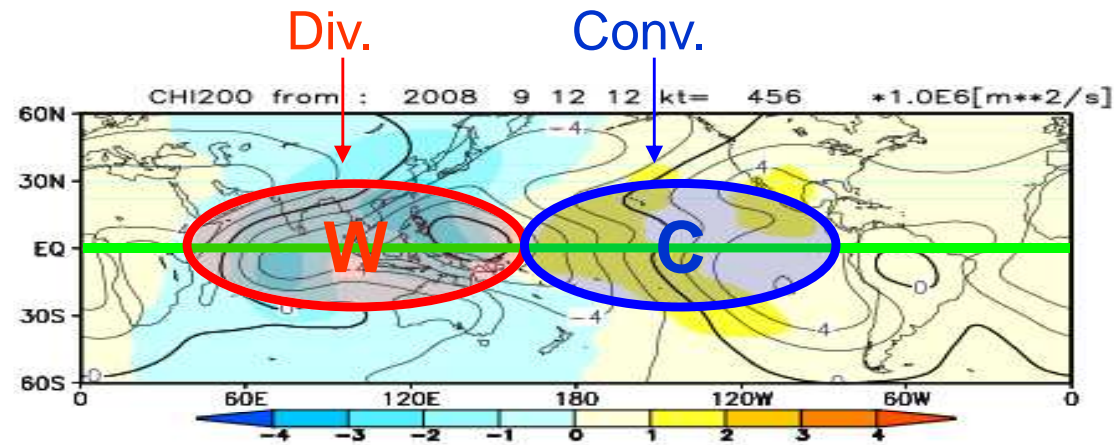
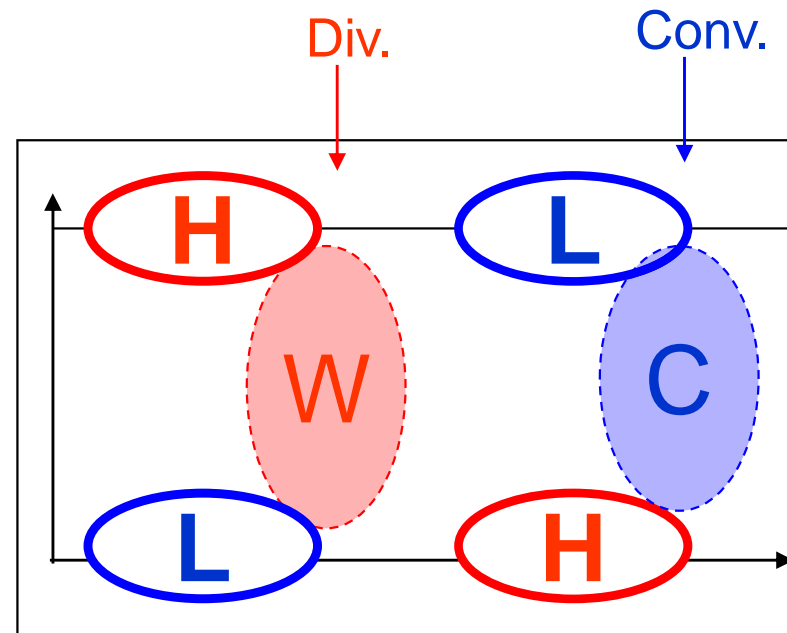
- A **stream function** (hereafter PSI) is an indicator for **non-divergent winds**.
- In an area with an anticyclonic circulation, the stream function is positive (negative) in the northern (southern) hemisphere.



(Reference) Response of circulation anomaly to large-scale convection

Upper troposphere

Lower troposphere



1-month EPS animation (Experimental product)

- New product , “**1-month Animation**”, begin to create in Nov. 2011.
- Predicted fields for each lead time is continuously referred in order to **understand variation processes of predicted fields**.

- Notice

Currently, this product is not identical with the forecast maps and the gridded datasets (GPVs).

- Ensemble size for ensemble mean is half (=25 members).
- forecasts with the initial date on Thursday only are used, while the formal products are produced using 50 members (25 members * 2 initial dates (Wednesday and Thursday)).

ID/ Password are required.

1-month EPS animation (Experimental product)

<http://ds.data.jma.go.jp/gmd/tcc/tcc/gpv/model/Anime.1mE.experiment/anime.e.php>

ID/ Password are required.

Animation of the JMA One-month EPS (7-days running mean)

NOTICE (Experimental Product)
This product is not identical with the formal products (e.g. Weekly forecast maps, gridded datasets (GPVs)).
Ensemble size for ensemble mean is half (=25 members) and only forecasts with the initial date on Thursday are used, while the formal products are produced using 50 members (25 members * 2 initial dates (Wednesday and Thursday)).

Initial date: 2011.10.20 Forecast lead time: Day -11

Setting for Animation
Oldest (lead Day -11) [-1 day] [Initial] [+1 day] Termination (lead Day +27) Animation: [Start] [Stop] << [Slow] >> [Fast]

week-1 week-2 week-3 week-4

Parameter: Z500 (NH)

10:6-10:12 JMA One-month Prediction(ESBL)

Contour: Forecast (or Analysis) of 500 hPa height (Contour interval is 30 m.)
Shading: Forecast (or Analysis) of 500 hPa height anomaly. Vector: Wave activity flux of 200 hPa (Unit is m^2/s^2 .)

Data sources:
Forecast: Ensemble mean of the JMA one-month EPS
Analysis: JRA-25/JCDAS (except for OLR), CPC/NOAA Analysis for OLR

Parameters

- Z500 (NH)
- T850 (NH)
- SLP(NH)
- CHI200 (Tropics)
- PSI200 (Tropics)
- PSI850 (Tropics)
- Rain anomaly (Tropics)
- U200 (Tropics)
- Wind vector anomaly (Tropics)
- Surface temperature (Tropics)

Initial date

Forecast Period

Setting for animation (Start, Stop)

Parameters

- Z500 (NH)
- T850 (NH)
- SLP(NH)
- CHI200 (Tropics)
- PSI200 (Tropics)
- PSI850 (Tropics)
- Rain anomaly (Tropics)
- U200 (Tropics)
- Wind vector anomaly (Tropics)
- Surface temperature (Tropics)

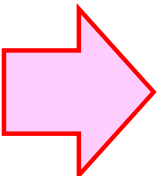
Surface Air Temperature (60N-60S) (17 Oct 2011)

NEW (17 Oct 2011)

Download GPC Long-range Forecast (LRF) Products

- ▶ Download Grid Point Value (GPV) File (Only registered NMHSs can access this page)
- ▶ Application

- When receiving an e-mail entitled "[JDDS/JMA] Your Password will expire in a few days" from JDDS_admin (JDDS_admin@data.jma.go.jp), you are kindly requested to change your password at <http://ds.data.jma.go.jp/changepasswd/>. Please note that the password should be at least eight characters.
- If you have any questions about ID and/or password, please e-mail to: tcc@met.kishou.go.jp



1-month EPS animation

気象庁 Japan Meteorological Agency

Tokyo Climate Center (WMO Regional Climate Center)

HOME > Download GPV

Download GPV files

Notice

- Animation of One-month Model Prediction is experimental and not identical with the formal products (e.g. Weekly forecast maps, gridded datasets (GPVs)).
- TCC starts providing daily GPV data (ensemble mean) of One-month Forecasting on 2 September 2011. The provision of weekly data (ensemble mean) will terminate in December 2011.
- Replacement of JMA's 1-month forecasting model
The 1-month forecasting model will be replaced in March 2011. The major difference is that the horizontal grid system is changed from the Gaussian grid to the reduced Gaussian grid, which is the same framework as the Global Spectral Model (GSM) for short-range forecast. The GPV data format remains unchanged by the replacement.
- TCC provides GPV data for long-range forecast through TCC website, which has been made available to registered National Meteorological and Services (NMHSs). A warning e-mail message titled "[JDDS/JMA] Your password will

Main Products

NWP Model Prediction

- 1-month (04 Nov 2011)
 - ▶ Weekly Statistics
 - ▶ Daily Statistics **NEW**
 - ▶ All Members
- 3-month (17 Oct 2011)
 - ▶ Statistics
 - ▶ All Members
- 7-month (17 Oct 2011)
 - ▶ Statistics
 - ▶ All Members

Hindcast GPV Data

- 1-month
 - ▶ Daily data
- 3-month
 - ▶ Monthly mean data
- 7-month
 - ▶ Monthly mean data

Statistical Downscaling for Three-month and Warm/Cold Season Forecasts

- ▶ Indices and GPV **NEW** (20 Oct 2011)

Animation of 1-month Model Prediction (Experimental Product) **NEW**

- ▶ 7-days running mean

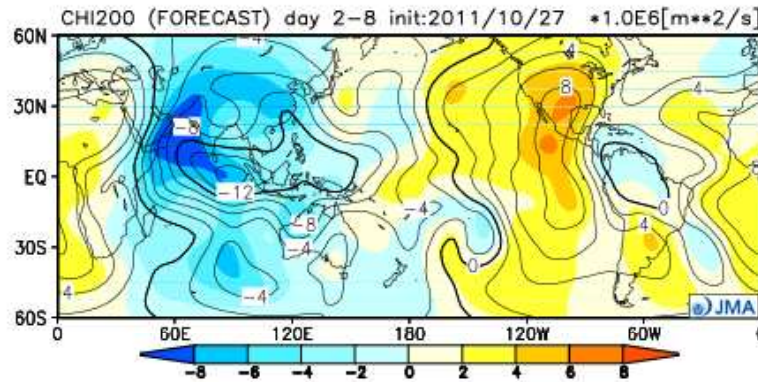
Tips

- ▶ Visualization with GrADS
- ▶ Q&A

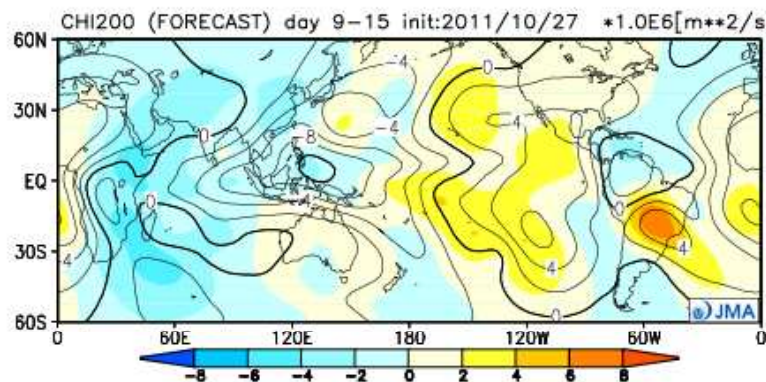
CHI200 anomaly in the forecast map (Tropical map)

Initial date: 27 Oct 2011

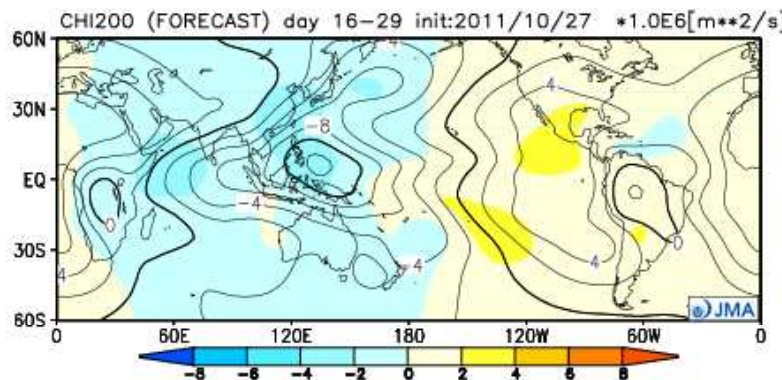
Week-1



Week-2

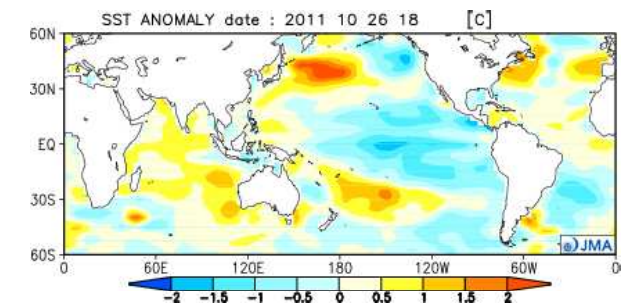


Week-3 and 4
(2-weeks mean)



- Propagation of MJO becomes unclear and active convection predicted the Indian Ocean, where SST anomaly is positive.

SST anomaly as boundary condition
(constant during forecast period)

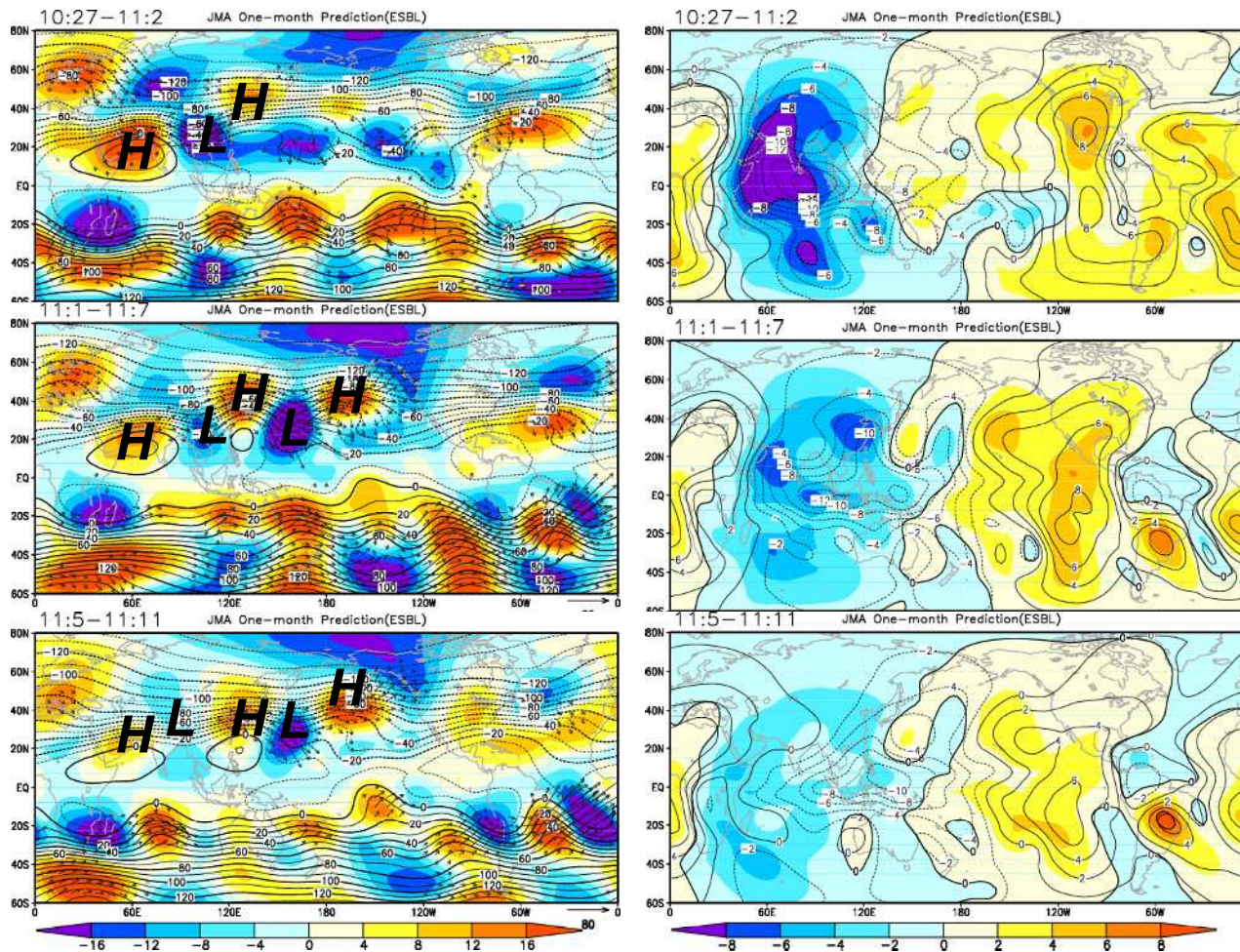


Influence of activated convection over Indian Ocean (Animation map)

Initial date: 27 Oct 2011

PSI200

CHI200

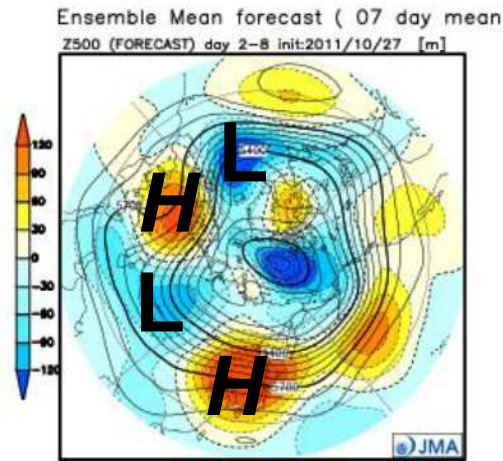


- Anti-cyclonic anomaly of 200hPa stream function (PSI200) is predicted over the Arabian Sea, reflecting with activated convection over Indian Ocean (CHI200).
- Propagation of Rossby wave packet along subtropical jet is found in subtropics over Asia.
 - Amplify “L” and “H” anomalies.

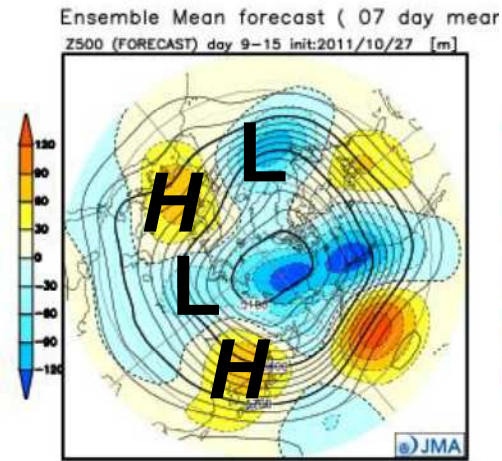
Z500 anomaly in the forecast map (NH map)

Initial date: 27 Oct 2011

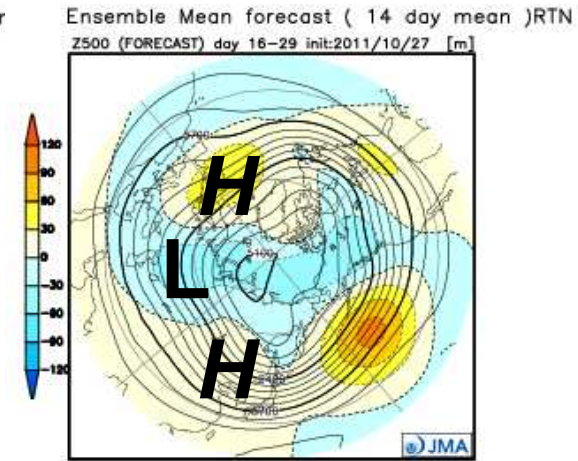
Week-1



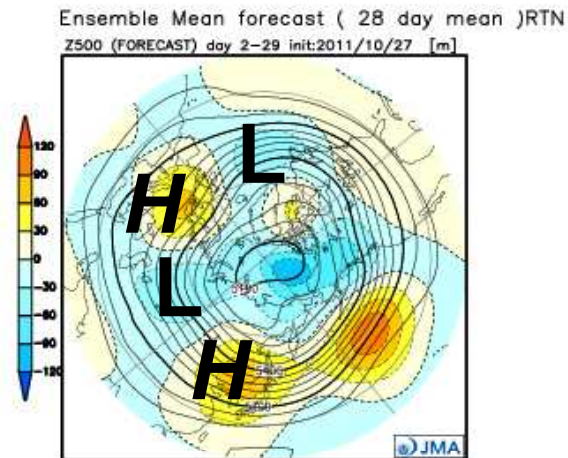
Week-2



Week-3 and 4



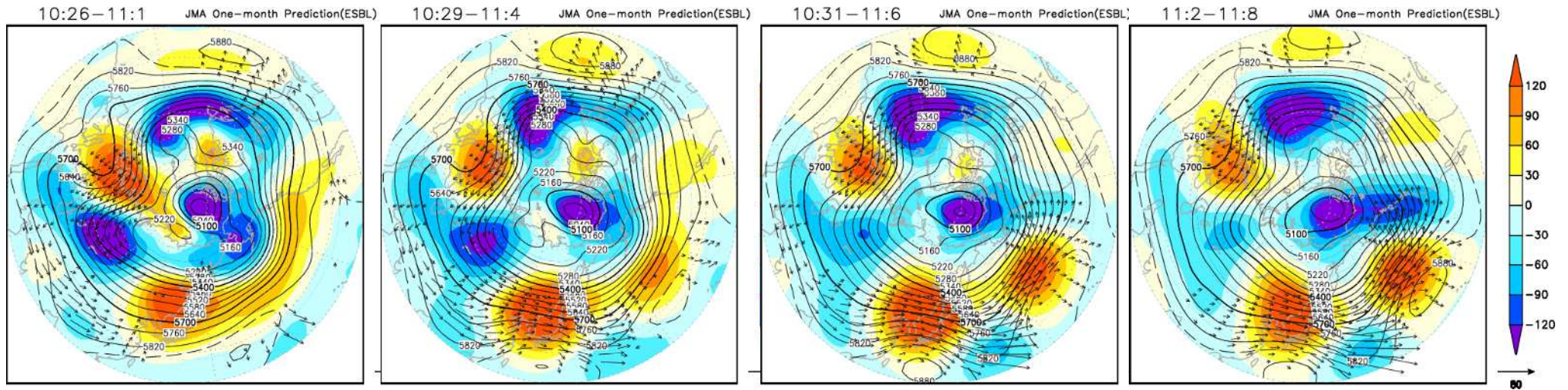
Week-1 to 4 (4 weeks average)



Z500 anomaly (NH map)

Initial: 27 Oct 2011

Initial date: 27 Oct 2011



- Propagation of Rossby wave packets along both polar- and subtropical jet stream are found.
- Those enhances positive anomaly of PSI200 over east Asia from the end of Oct. to the beginning of Nov.

Verification (Real-time)

<http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/verif/1mE/index.html>

Verification of one month forecast

Maps

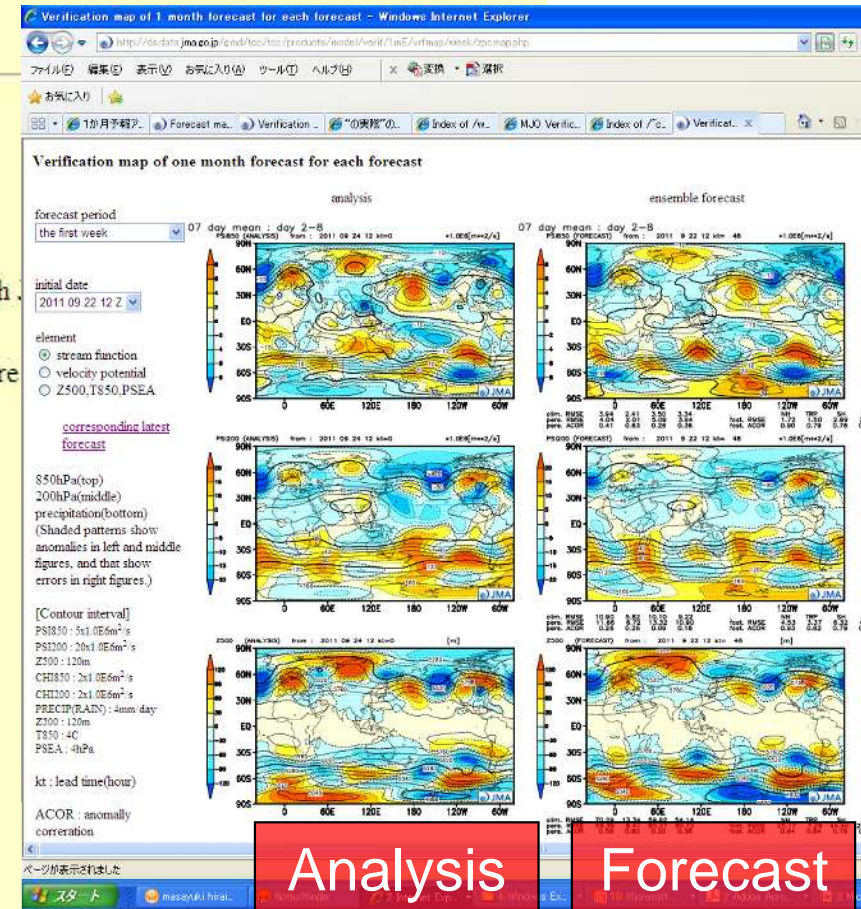
- Error maps for every forecast (updated every week)
 - [Z500, T850 and PSEA](#)
 - * Systemic error is removed. (Bias based on hindcast from 1979 to 2009.) After the initial date was May. 19 2011, Climatological normals were calculated with
 - [Stream Function and Velocity Potential](#)
 - * Model normals based on hindcast from 1979 to 2009. Climatological normals were
- [Reliability diagrams for each season](#)
- [ROC curves for each season](#)

Scores

- [Score in each season](#)
- [Score in each year](#)

- [Summary of verification in 2001](#)
- [Summary of verification in 2002](#)
- [Summary of verification in 2003](#)
- [Summary of verification in 2004](#)
- [Summary of verification in 2005](#)
- [Summary of verification in 2006](#)
- [Summary of verification in 2007](#)
- [Summary of verification in 2008](#)
- [Summary of verification in 2009](#)
- [Summary of verification in 2010](#)

Summarized
real-time
verification
scores



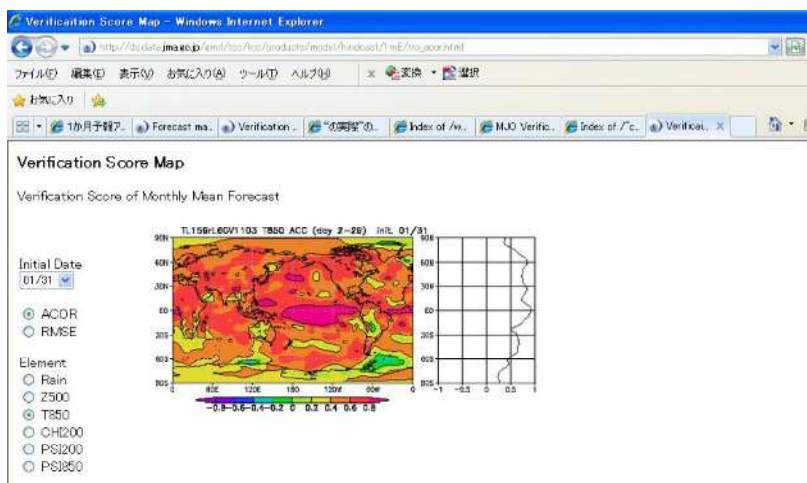
Verification (Hindcast)

<http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/hindcast/1mE/index.html>

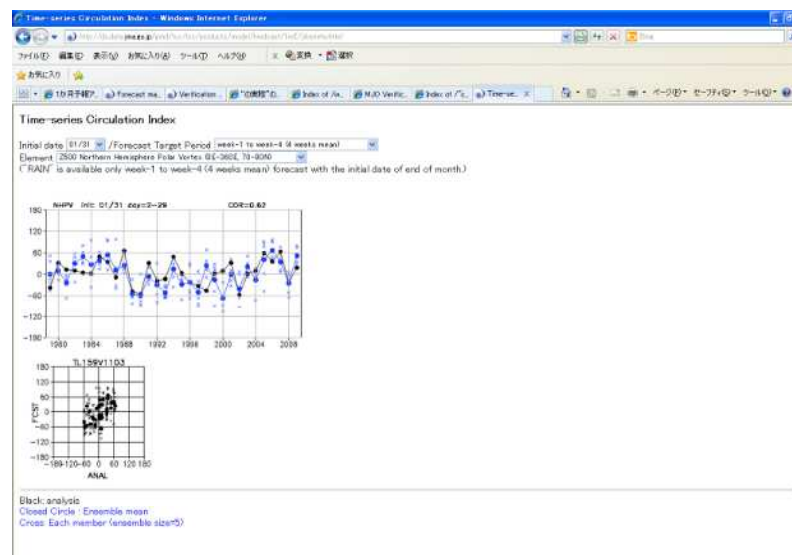
Verifications of One-month EPS fro

- Time-series Circulation Index
- Verification Score Maps
 - Variables to be Assessed: RAIN, Z500, T850, CHI200, PSI200, PSI850
 - Diagnostic Measures:
 - Anomaly Correlation(ACOR)
 - Root Mean Squared Error(RMSE)

Score map (Anomaly correlation)



Score of index



Calibrated probabilistic forecasts

<http://ds.data.jma.go.jp/tcc/tcc/products/guidancetst/>

Top page

The screenshot shows a web browser window displaying the TCC website. The page title is "One month probabilistic forecasts at station points." The main content is organized into sections: "introduction", "surface temperature", "precipitation", and "Download". Each section contains links to probabilistic forecasts for Japan and Southeast Asia. Callout boxes with arrows point to these links, providing descriptions of the forecast maps. A yellow box labeled "click" points to the "precipitation in Southeast Asia" link. A larger callout box at the bottom points to the "Download" section, which includes a link for "Download of sample source code".

One month probabilistic forecasts at station points.

introduction

surface temperature

Probabilistic forecasts of surface temperature in Japan

Probabilistic forecasts of surface temperature in Southeast Asia

precipitation

Probabilistic forecasts of precipitation in Japan

Probabilistic forecasts of precipitation in Southeast Asia

click

Download

Download of sample source code

back

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ページが表示されました

インターネット

<probabilistic forecast map in Japan>
temperature

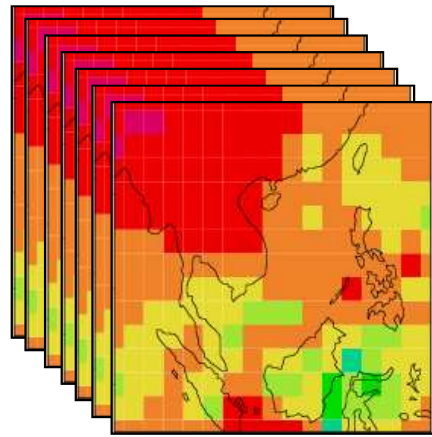
<probabilistic forecast map in Southeast Asia>
temperature

<Probabilistic forecast map in Japan>
precipitation

<Probabilistic forecast map in Southeast Asia>
precipitation

<Download>
Download GPV data and sample program download

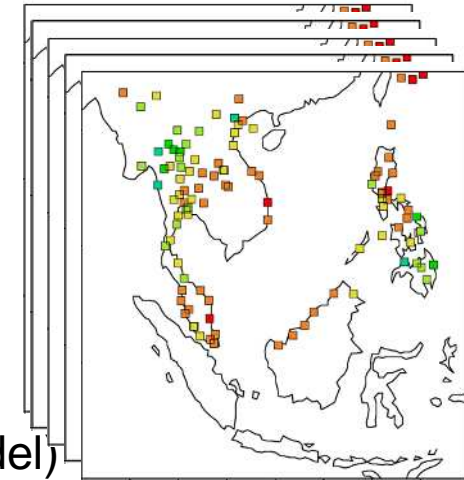
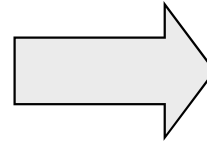
Probabilistic one-month forecast system



Direct model output

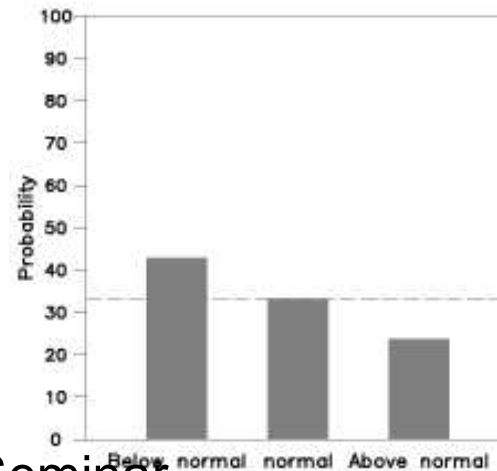
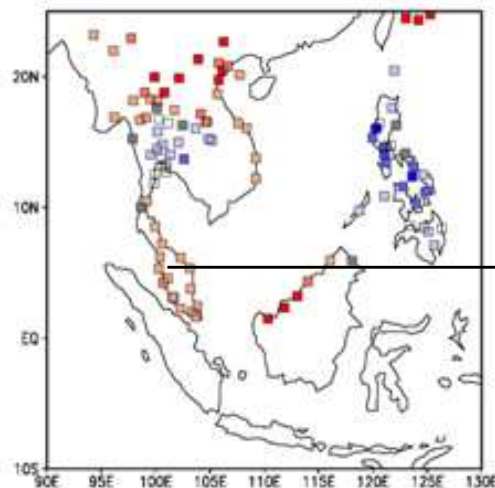
Statistical downscale

- 50 members result
- T(surface) or Rain
 - Wind 850 hPa
 - MJO index
 - NINO.3 SST (boundary condition for model)
 - Topography (constant)



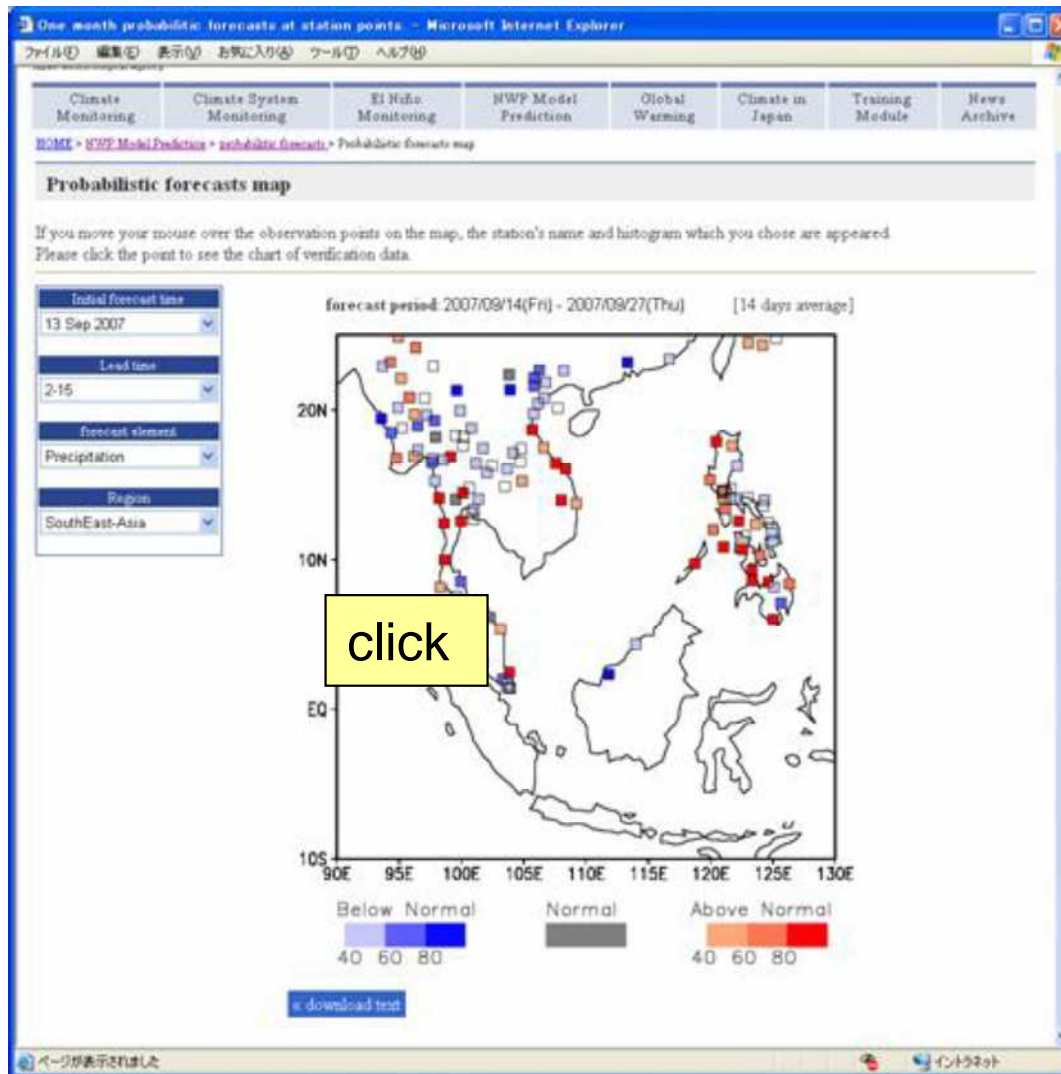
Downscale to station data

Create probability charts



Web page of probabilistic one-month forecast

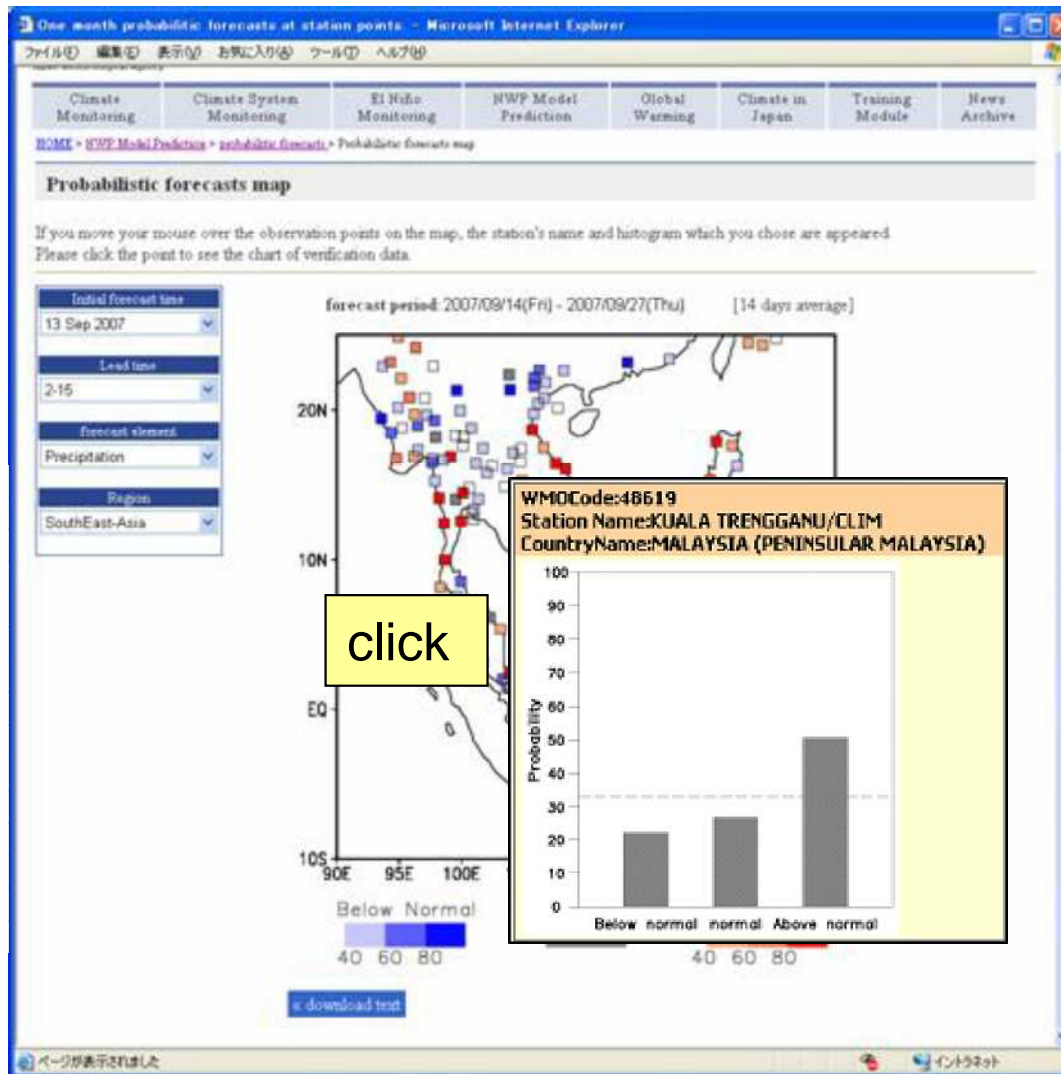
Probability map page



- Forecast Period
 - Day 2-8, 3-9, 4-10, ..., 23-29 (7-days average)
- Parameter
 - Surface temperature
 - Precipitation

Web page of probabilistic one-month forecast

Probability map page



- Forecast Period
 - Day 2-8, 3-9, 4-10, ..., 23-29 (7-days average)
- Parameter
 - Surface temperature
 - Precipitation

“Latest Product” of 4/7-month EPS

4-month EPS

Three-month Prediction

- ▶ Three-month Prediction (17 Oct 2011)
- ▶ Z500, T850 & SLP (Northern Hemisphere) (17 Oct 2011)
- ▶ Stream Function, Velocity Potential & Surface Air Temperature (60N-60S) (17 Oct 2011)

Forecast maps

▶ Verification (14 Oct 2011)

Verification (Real-time)

▶ Hindcast

Verification (Hindcast)

▶ Probabilistic Forecast and Verification (17 Oct 2011)

Calibrated probabilistic forecasts

Warm/Cold Season Prediction

- ▶ Warm/Cold Season Prediction (17 Oct 2011)
- ▶ Z500, T850 & SLP (Northern Hemisphere) (17 Oct 2011)
- ▶ Stream Function, Velocity Potential & Surface Air Temperature (60N-60S) (17 Oct 2011)

7-month EPS

Forecast maps

▶ Hindcast

▶ Probabilistic Forecast and Verification **NEW** (17 Oct 2011)

Calibrated probabilistic forecasts

Probabilistic forecast of 4/7 month EPS

<http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/probfcst/4mE/index.html>

<http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/probfcst/7mE/index.html>

- Tercile probability forecasts for **3-month-averaged** surface temperature, precipitation and sea surface temperature based on MOS technique (Model Output Statistics), that is one of the statistical downscaling technique.
- Probability forecast will be updated **around 20th every month**.

Probability Forecasts - Windows Internet Explorer

http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/probfcst/7mE/index.html

Probability Forecasts

Tokyo Climate Center

Probability Forecast (Warm/Cold Season Prediction)

Probability forecast will be updated around 20th of **February, March, April, September and October**.

Introduction

Japan Meteorological Agency (JMA) has started tercile probability forecast for 3-month-averaged surface temperature and precipitation over the global in April 2005. The Probability forecast for Warm/Cold Season Prediction has been started in September 2011. The Model Output Statistics (MOS) technique based on the 30 years hindcast is used to generate the probability forecasts. The [Ordered Probit model](#) is used as the statistical tool of the MOS. The thresholds of tercile are determined so that the climatological chance of occurrence for each category is 33.3 % for the [hindcast](#) period from 1979 to 2008. The specification of the numerical prediction model is described at [Model Outline \(Power, Steam\)](#).

Warm/Cold Season Outlook

- [Probability Forecast for Global](#)
- [Probability Forecast for Asia](#)

Verification

The verification of these probability forecast is performed in cross-validation mode. It has to be noted that sample size of these verification is not enough to obtain a statistically significance.

- [Global maps of scores \(BSS, ROCA\)](#)
- [Reliability diagram and ROC curves for region](#)

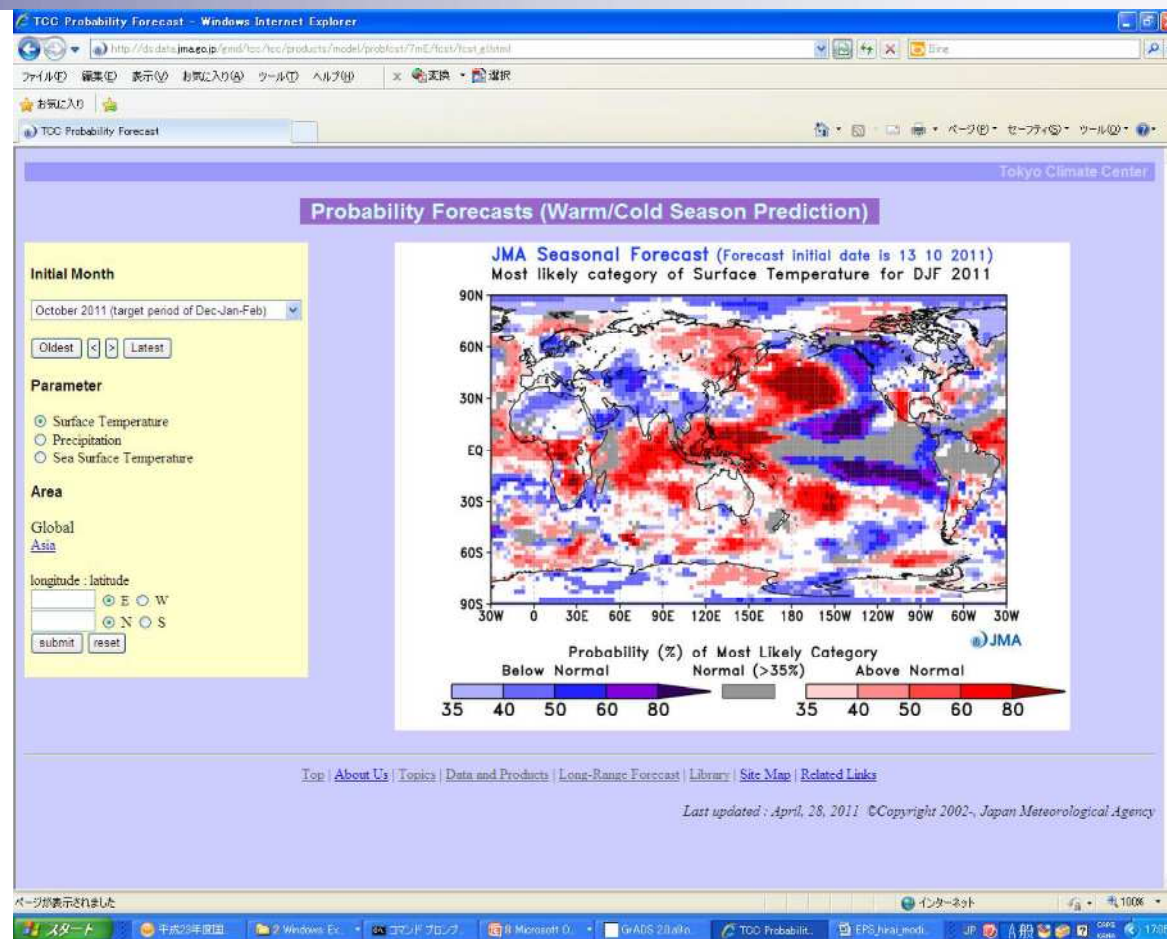
[Top](#) | [About Us](#) | [Topics](#) | [Data and Products](#) | [Long-Range Forecast](#) | [Library](#) | [Site Map](#) | [Related Links](#)

インターネット 100%

スタート 平成23年度 2 Windows Ex... ex コマンド プロンプ... Microsoft O... GrADS 2.0.69... Probability For... EPS_hrai_modi... JP A 般 CIPS KISHI 17:04

Probabilistic forecast of 4/7 month EPS

- Forecast Period
 - Once a month
 - Three month average
- Parameter
 - Surface temperature
 - Precipitation
 - Sea Surface Temperature
- Area
 - Global
 - Asia



Shading denotes the probability of most likely category.

Gridded dataset (Grid Point Values; GPVs)

<http://ds.data.jma.go.jp/gmd/tcc/tcc/gpv/index.html>

ID/ Password are required.

- 1-month EPS
 - Operational system data
 - Daily data on statistics (ensemble mean and anomaly)
 - Daily data on individual ensemble members
 - Hindcast data
 - Daily data on individual ensemble members
- 4/7 month EPS
 - Operational system data
 - Monthly data on ensemble statistics (ensemble mean, anomaly and spread)
 - Monthly data on individual ensemble members (forecast and anomaly)
 - Hindcast data
 - Monthly data on individual ensemble members (forecast and anomaly)
- For more details, please refer to the text of this seminar (WORD file).

First step guide for usage of the gridded dataset (Grid Point Values; GPVs)

- Download the gridded dataset
- Viewer: Grid Analysis and Display System (GrADS) from COLA/IGES

Example:

Ensemble mean data of 1-month EPS (using Windows PC)

In case of Linux machine, please refer to the document (Item 4; Using Grid Point Value Data Provided on the TCC Website)

Processes

(1) Preparation

- Installing the tools
 - GrADS (Viewer)
 - Wgrib2 (encoder)

Example:
Ensemble mean data of 1-month EPS
Initial date: 27 Oct 2011
Element: Z500 and its anomaly

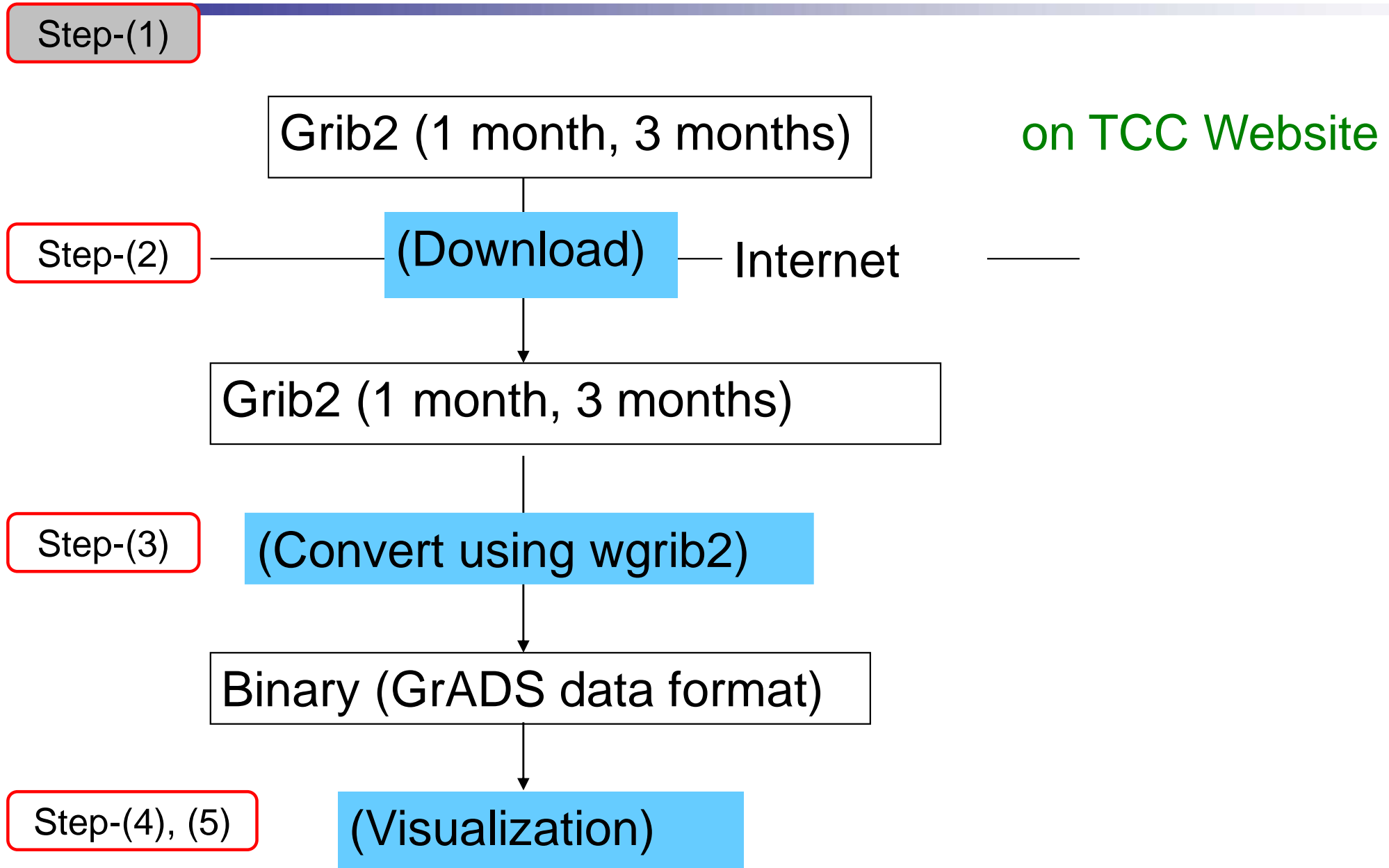
(2) Download the gridded dataset (GPV)

(3) Conversion of TCC-GRIB files into [GrADS data file](#) using wgrib2

(4) Edit the [GrADS control file](#)

(5) Visualization using GrADS

Flow chart for handling gridded dataset



Processes

(1) Preparation

- Installing the tools
 - GrADS (Viewer)
 - Wgrib2 (encoder)

Example:
Ensemble mean data of 1-month EPS
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(2) Download the gridded dataset (GPV)

(3) Conversion of TCC-GRIB files into GrADS data file using wgrib2

(4) Edit the GrADS control file

(5) Visualization using GrADS

Preparation

Install tools (OpenGrADS)

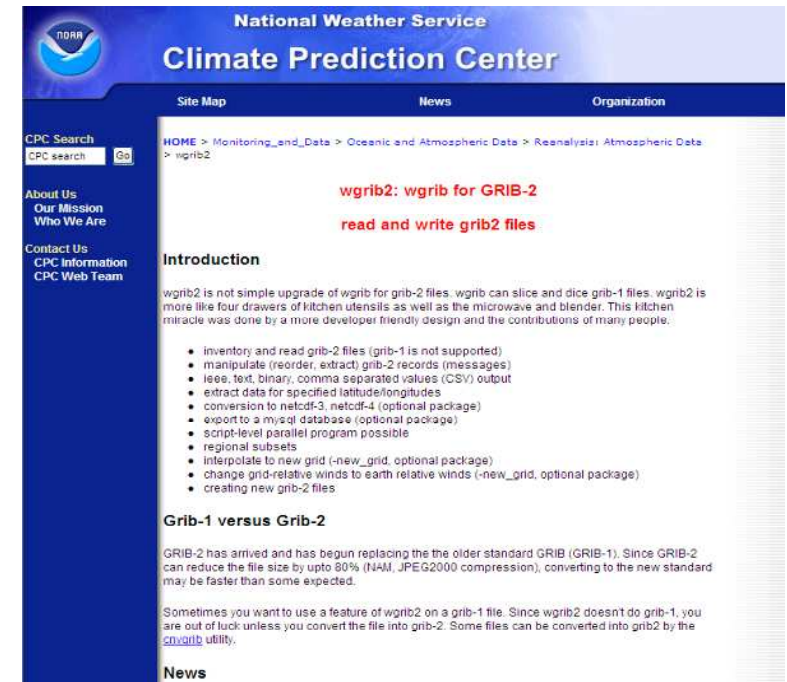
- COLA/IGES in the US provides a Windows version of **GrADS**.
- US-based company [SourceForge, Inc.](#) has developed and provides an extension version of GrADS based on the original GrADS program from COLA/IGES called “**OpenGrADS**”.
- For download of “OpenGrADS” ...
 - **visit to <http://sourceforge.net/projects/opengrads/>.**
 - Click on the banner “**Download**” and save the file to the desired directory.

Preparation

Install tools (Wgrib2)

- All grid point data on the TCC website are provided in GRIB2 format.
- To handle or decode the GRIB2 files, the program “wgrib2” is useful.

Download page of wgrib2;
<http://www.cpc.ncep.noaa.gov/products/wesley/wgrib2/>



- For Windows, as wgrib2 is also packaged with OpenGrADS, there is no need to install wgrib2 separately as there is for Linux.

Download of OpenGrADS (1)

(Top page of OpenGrADS)

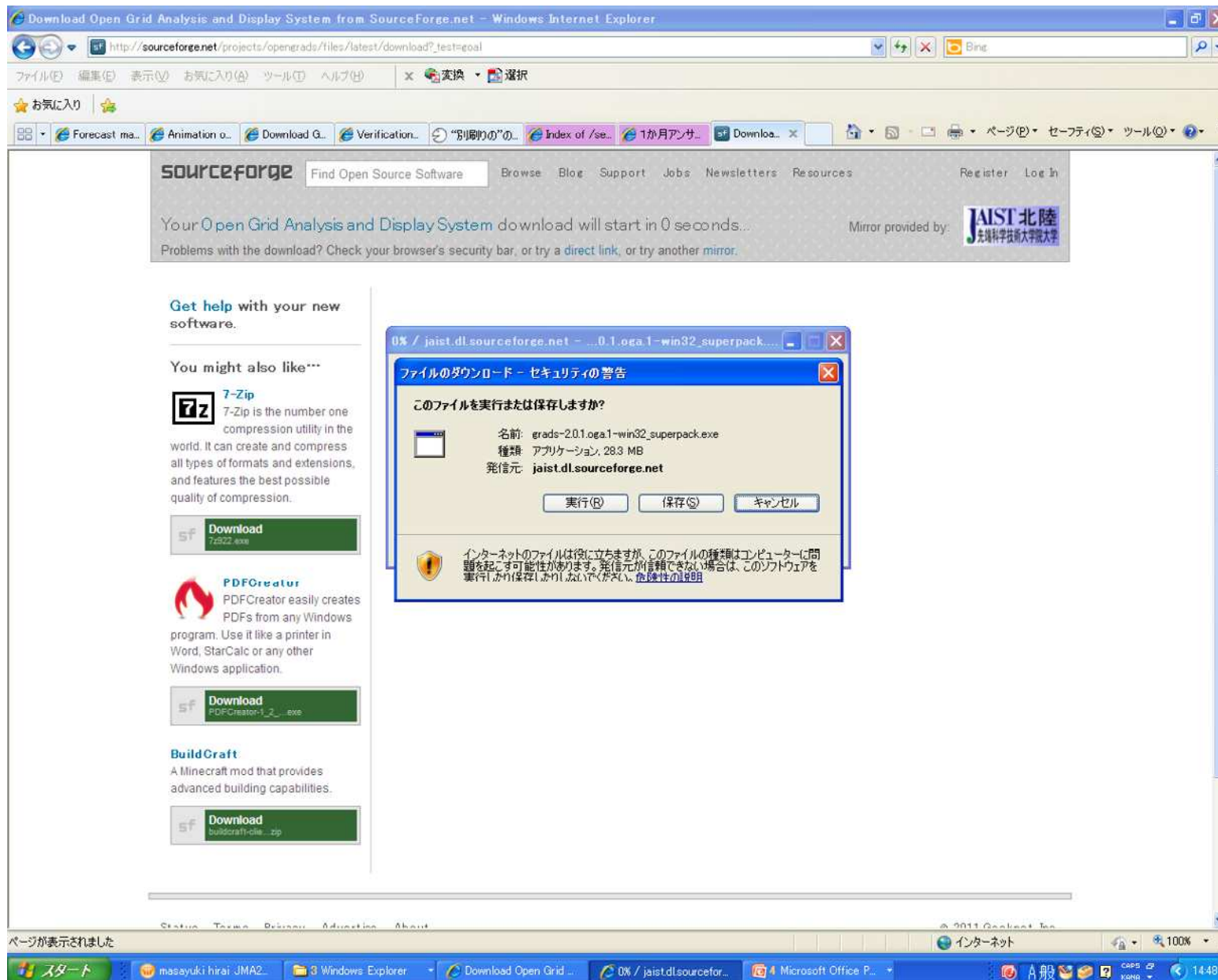
<http://sourceforge.net/projects/opengrads/>

The screenshot shows the SourceForge project page for OpenGrADS. The page layout includes a navigation bar at the top with 'SOURCEFORGE' and search options. Below the navigation bar, the project name 'Open Grid Analysis and Display System' is displayed, along with the authors 'dasilva, mike_fiorino'. A description states 'OpenGrADS provides extensions and interfaces for GrADS'. There are statistics for '17 Recommendations' and '414 Downloads (This Week)'. A 'Download' button is highlighted with a red circle and a red arrow pointing from the text 'Download for install of OpenGrADS'. The 'Additional Project Details' section on the right lists 'Last Update' (1 day ago), 'Platform(s) Available', 'Categories' (Earth Sciences, Visualization), 'Registered' (2006-03-06), 'License' (GNU General Public License (GPL)), 'Languages' (English), and 'Intended Audience' (Education, End Users/Desktop, Engineering, Government, Science/Research). The 'Description' section explains that GrADS is an interactive desktop tool for earth science data, and the 'Features' section lists 'Extends GrADS with dynamic user defined extensions' and 'Provides a collection of user defined commands and functions'.

Download
for install of
OpenGrADS

Download of OpenGrADS (2)

(Start of download)



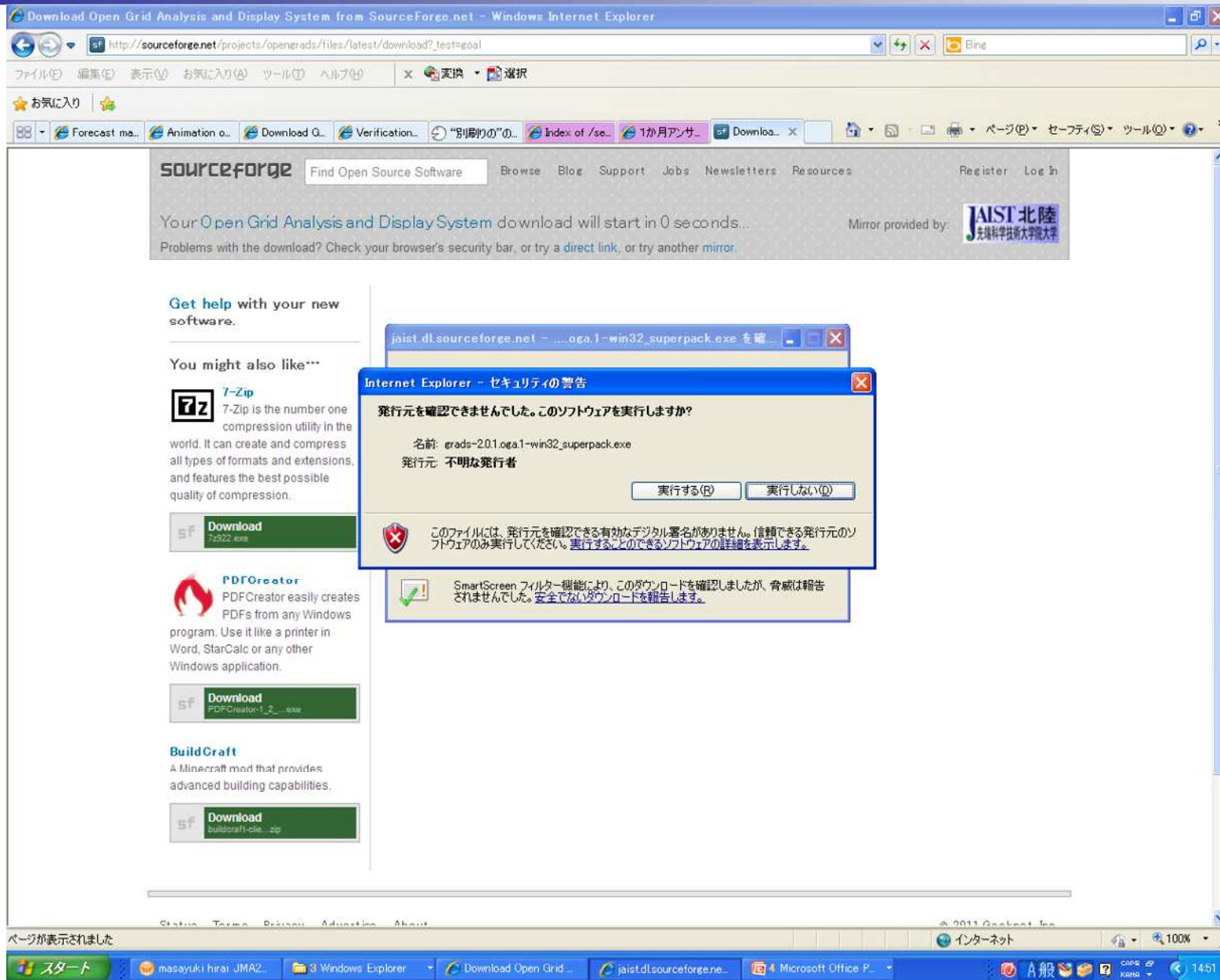
Download of OpenGrADS (3)

(download (underway))

The screenshot shows a Windows Internet Explorer browser window with the address bar displaying `http://sourceforge.net/projects/opengrads/files/latest/download?test=goal`. The page content includes the SourceForge logo, navigation links, and a message: "Your Open Grid Analysis and Display System download will start in 0 seconds...". A download progress dialog box is open, showing the file `oja1-win32_superpack.exe` being downloaded from `jaist.dl.sourceforge.net`. The dialog box displays a progress bar, estimated remaining time of 3 seconds, download speed of 2.63 MB/s, and a SmartScreen security warning: "SmartScreen フィルター機能により、このダウンロードを確認しましたが、脅威は報告されませんでした。安全でないダウンロードを報告します。". The Windows taskbar at the bottom shows the Start button, several open applications (masayuki hirai, JMA2, Windows Explorer, Download Open Grid, Microsoft Office P...), and the system tray with the time 14:50.

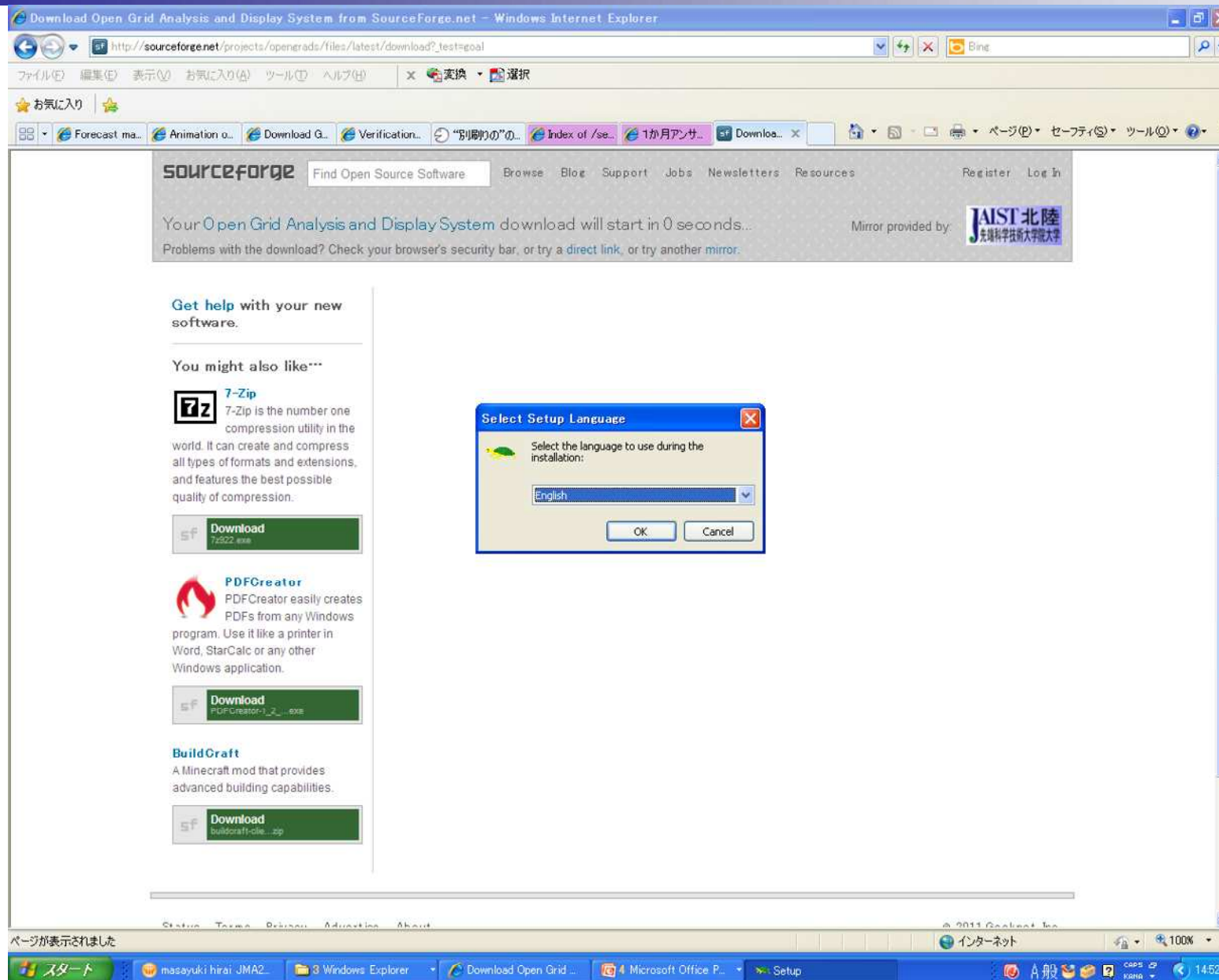
Download of OpenGrADS (3)

(Confirmation screen of install)



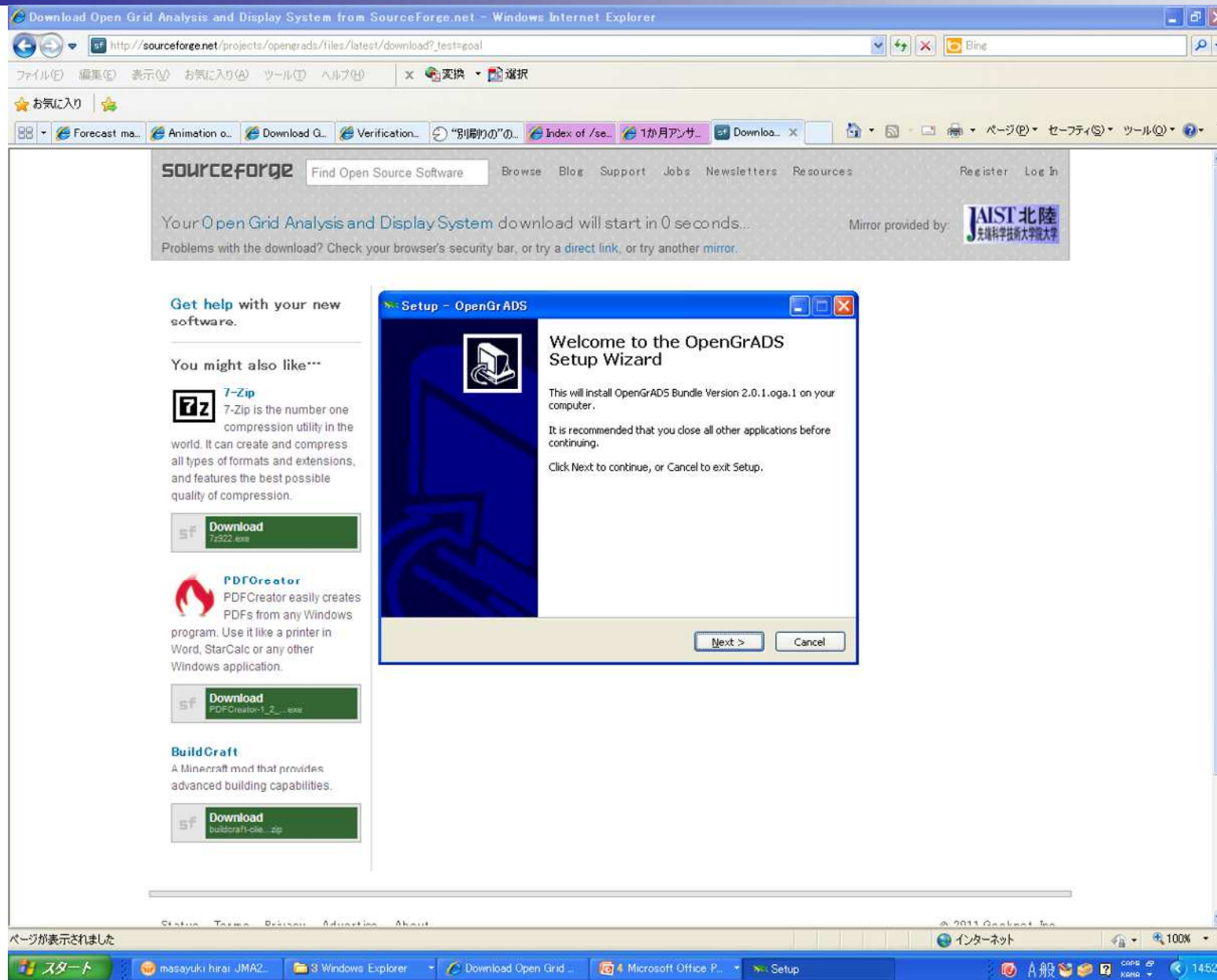
Download of OpenGrADS (3)

(Install (selecting language))



Download of OpenGrADS (3)

(Start setup wizard screen for install)



Download of OpenGrADS (3) (License agreement for install)

Download Open Grid Analysis and Display System from SourceForge.net - Windows Internet Explorer

http://sourceforge.net/projects/opengrads/files/latest/download?_test=goal

SourceForge Find Open Source Software

Your Open Grid Analysis and Display System download will start in 0 seconds...

Mirror provided by: JAIST 北陸 先端科学技術大学院大学

Get help with your new software.

You might also like...

7-Zip 7-Zip is the number one compression utility in the world. It can create and compress all types of formats and extensions, and features the best possible quality of compression.

PDFCreator PDFCreator easily creates PDFs from any Windows program. Use it like a printer in Word, StarCalc or any other Windows application.

BuildCraft A Minecraft mod that provides advanced building capabilities.

Setup - OpenGrADS

License Agreement

Please read the following important information before continuing.

Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.

The Grid Analysis and Display System (GrADS)

Copyright (C) 1988-2011 by Brian Doty and the Institute of Global Environment and Society (IGES).

The Center for Ocean-Land-Atmosphere Studies (COLA) is the center within IGES where GrADS is developed and maintained.

The copyright holders can be contacted at:
COLA/IGES

I accept the agreement

I do not accept the agreement

< Back Next > Cancel

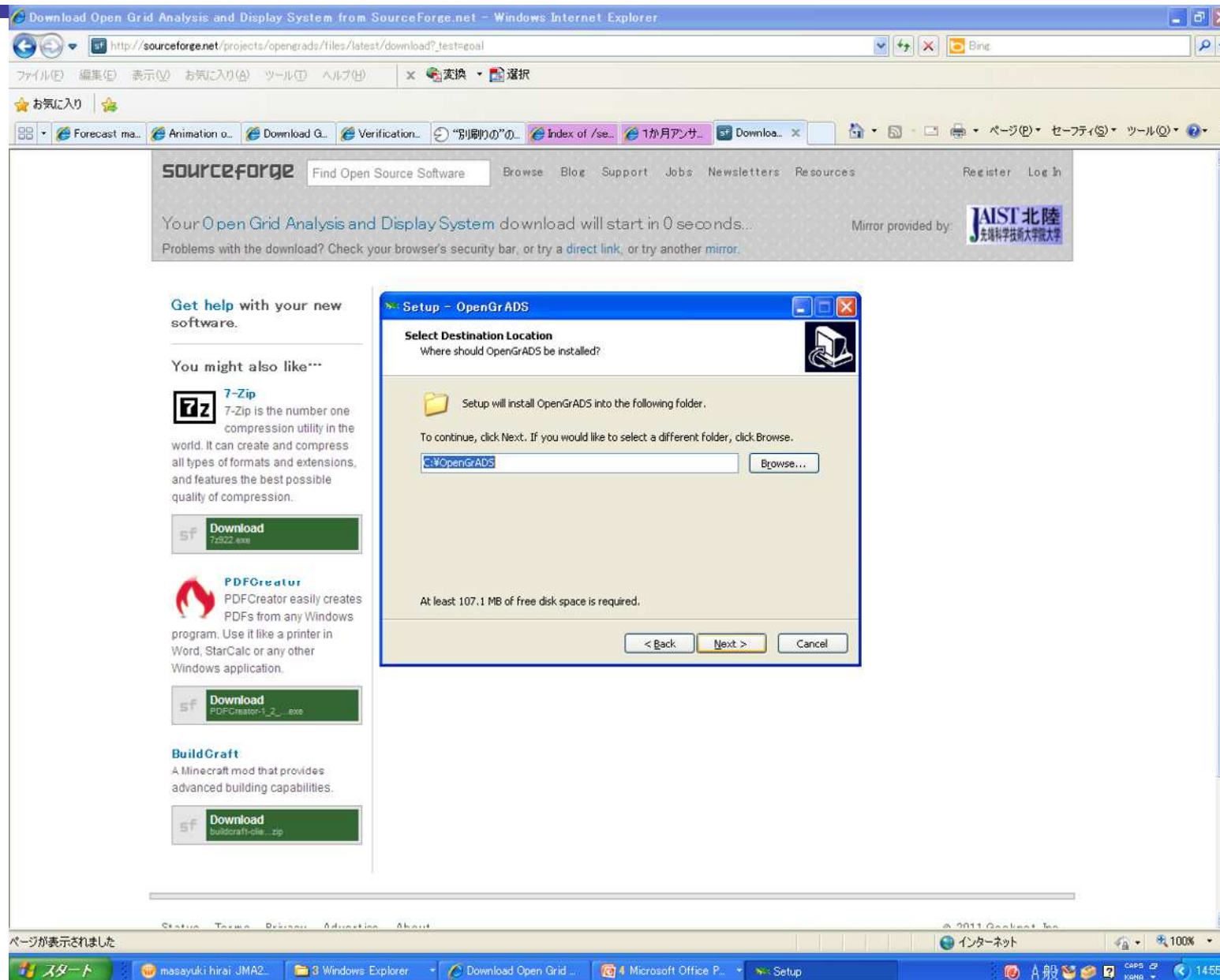
Check (I accept the agreement)

ページが表示されました

スタート masayuki hirai JMA2... 3 Windows Explorer Download Open Grid... 4 Microsoft Office P... Setup インターネット 100% 14:53

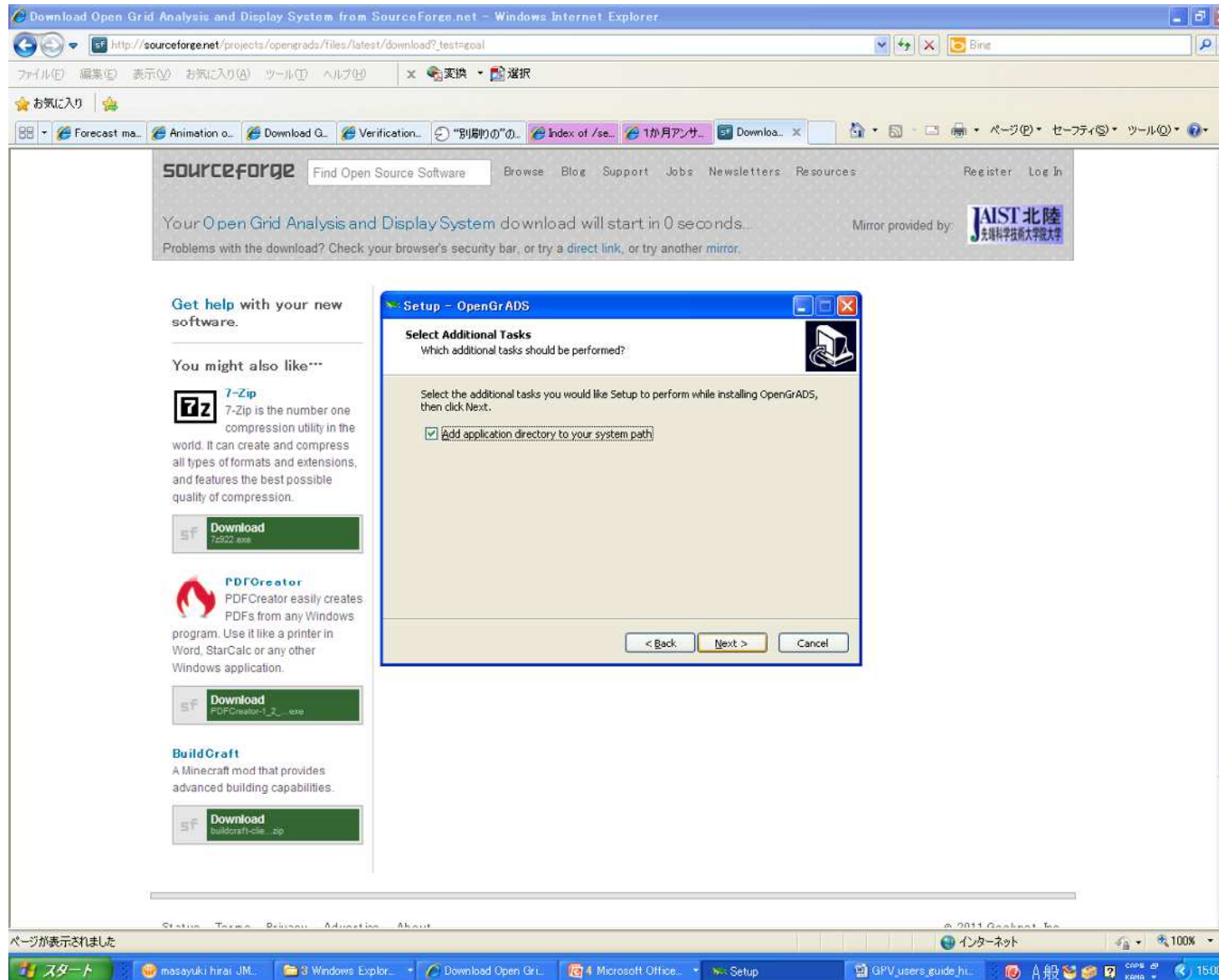
Download of OpenGrADS (3)

(Folder name for install)



Download of OpenGrADS (3)

(Add path to the system path)



Download of OpenGrADS (3)

(Ready to install)

The screenshot shows a Windows Internet Explorer browser window with the address bar displaying `http://sourceforge.net/projects/opengrads/files/latest/download?test=goal`. The page content includes the SourceForge logo, navigation links, and a message: "Your Open Grid Analysis and Display System download will start in 0 seconds...". A mirror provided by JAIST 北陸 (JAIST Hokuriku) is also mentioned. Below this, there are recommendations for other software like 7-Zip, PDFCreator, and BuildCraft, each with a "Download" button.

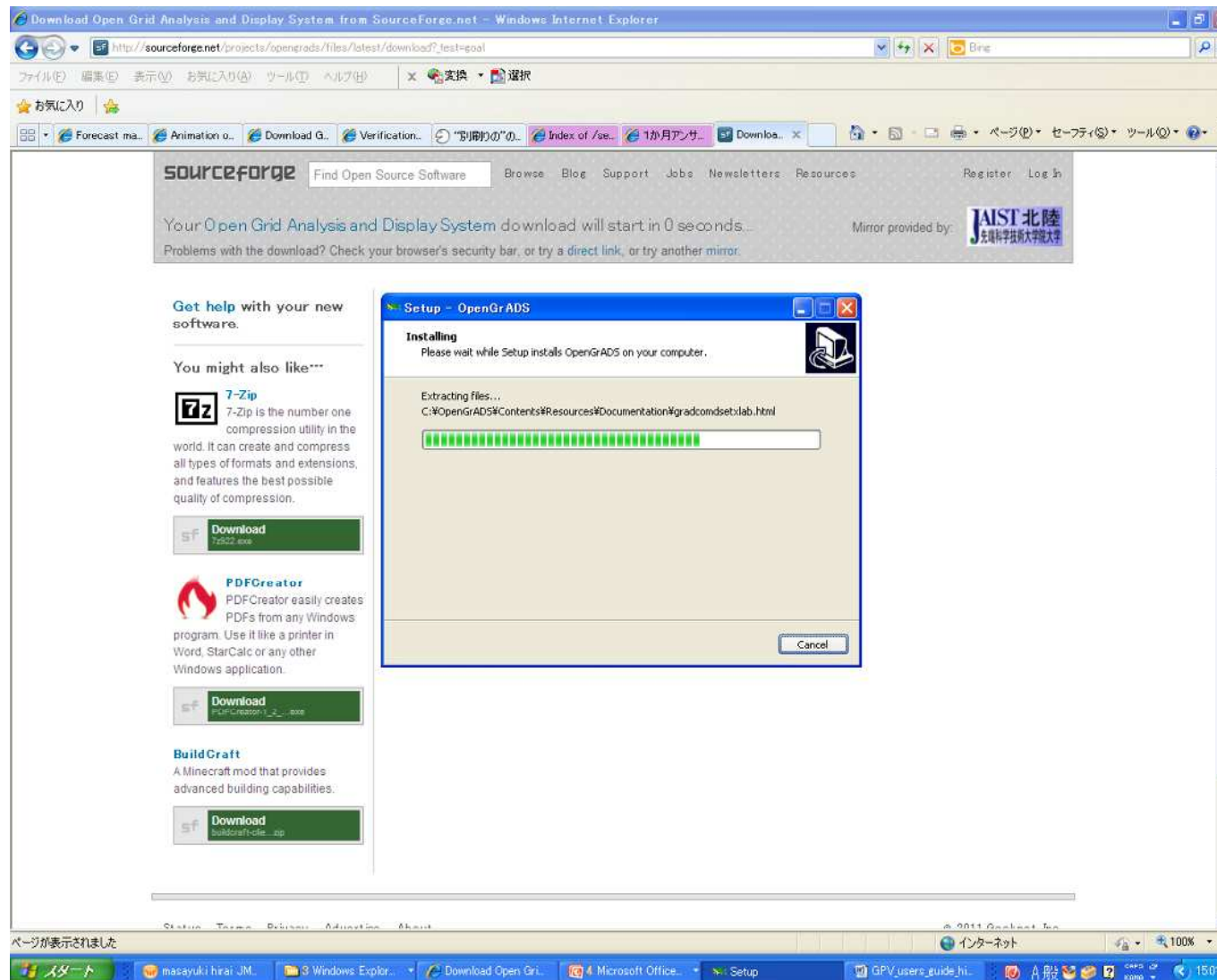
Overlaid on the browser is a "Setup - OpenGrADS" window. The window title is "Setup - OpenGrADS" and the main heading is "Ready to Install". The text inside the window reads: "Setup is now ready to begin installing OpenGrADS on your computer." Below this, it says: "Click Install to continue with the installation, or click Back if you want to review or change any settings." The configuration options are:

- Destination location: C:\OpenGrADS
- Start Menu folder: OpenGrADS 2.0
- Additional tasks: Add application directory to your system path

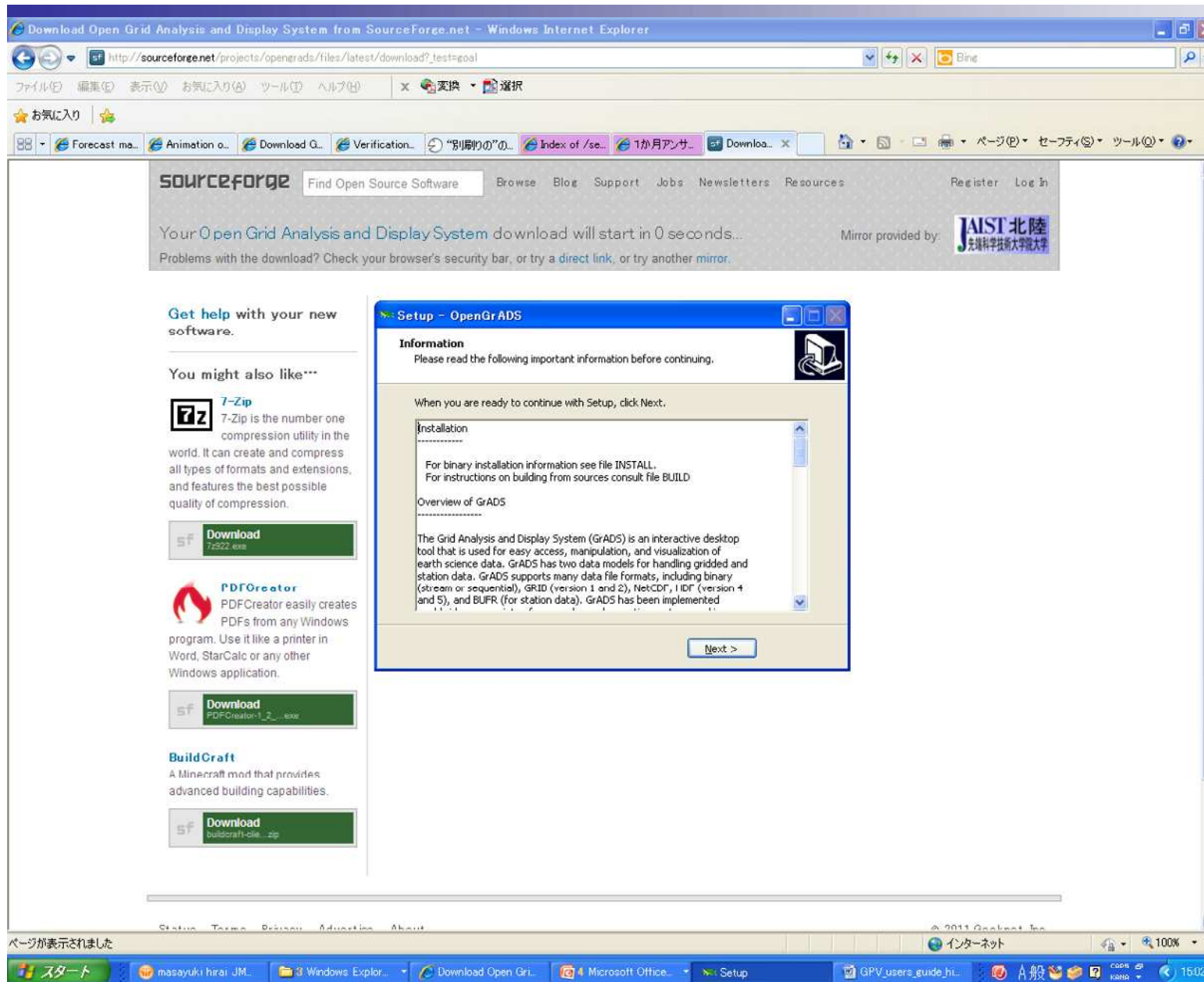
At the bottom of the window are three buttons: "< Back", "Install", and "Cancel".

Download of OpenGrADS (3)

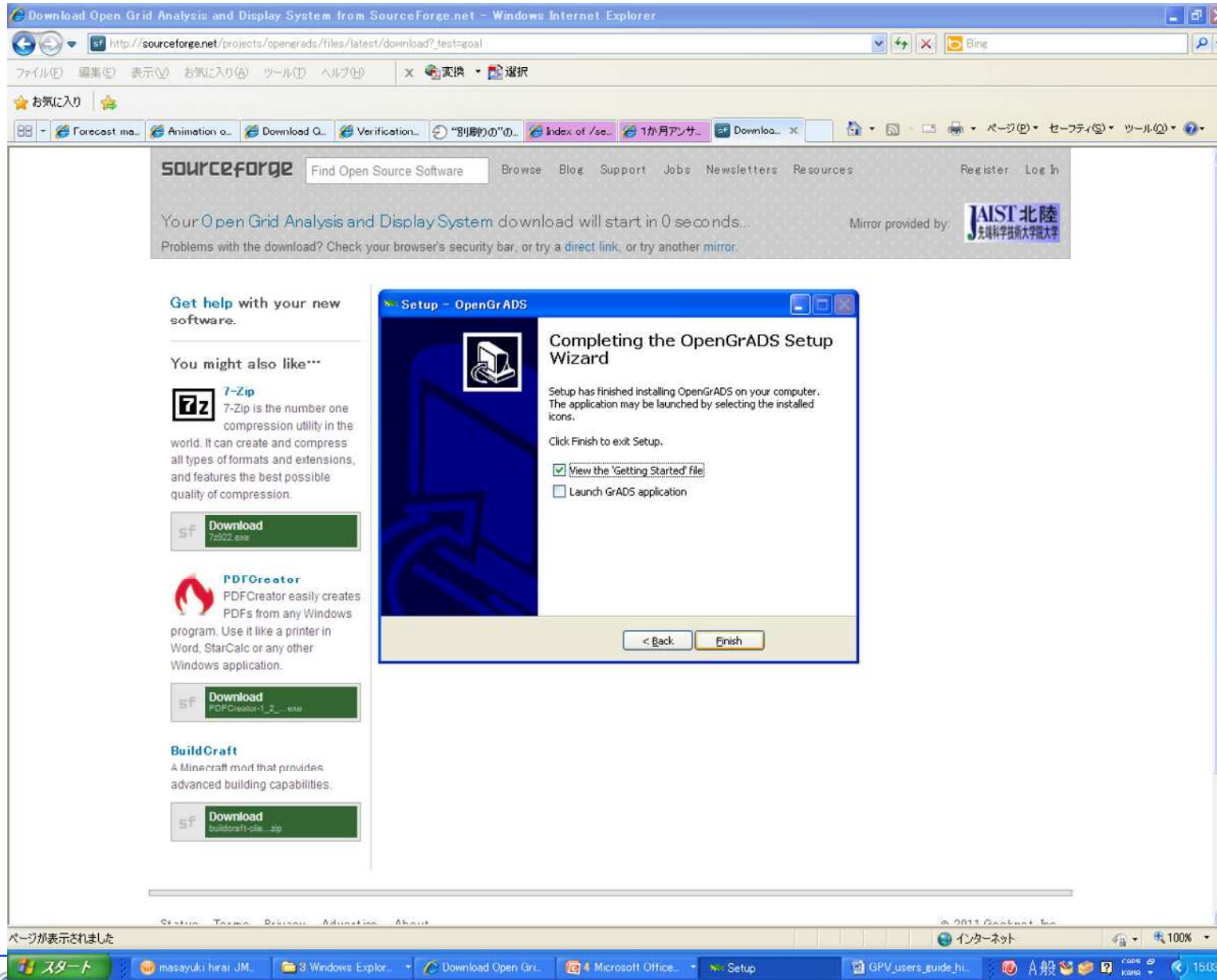
(Install (underway))



Download of OpenGrADS (3) (Information of Grads displays.)



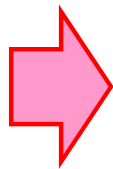
Download of OpenGrADS (3) (Install finishes.)



Start-up of GrADS



CLICK
(OpenGrADS)



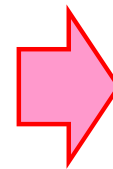
```
OpenGrADS
Starting X server under D:\OPENGR\1\Contents\Resources\Xming
Starting OPENGR.T under D:\OPENGR\1\Contents\Cywin\Versions\2010GA1.1\1686 ...

Grid Analysis and Display System (GrADS) Version 2.0.1.0ga.1
Copyright (c) 1988-2011 by Brian Doty and the
Institute for Global Environment and Society (IGES)
GrADS comes with ABSOLUTELY NO WARRANTY
See file COPYRIGHT for more information

Loading user defined extensions table <C:\cydrive/c/OPENGR/1/Contents/Cywin/Versions/2010GA1.1/1686/grads.tbl> ... ok.
landscape mode? ('n' for portrait):
```

Opening message of
GrADS

Push "Return" key



```
GrADS 2.0.1.0ga.1
Starting X server under D:\OPENGR\1\Contents\Resources\Xming
Starting OPENGR.T under D:\OPENGR\1\Contents\Cywin\Versions\2010GA1.1\1686 ...

Grid Analysis and Display System (GrADS) Version 2.0.1.0ga.1
Copyright (c) 1988-2011 by Brian Doty and the
Institute for Global Environment and Society (IGES)
GrADS comes with ABSOLUTELY NO WARRANTY
See file COPYRIGHT for more information

Loading user defined extensions table <C:\cydrive/c/OPENGR/1/Contents/Cywin/Versions/2010GA1.1/1686/grads.tbl> ... ok.
landscape mode? ('n' for portrait):
```

Two windows open.

Input command
"quit" for exit GrADS.

Processes

(1) Preparation

- Installing the tools
 - GrADS (Viewer)
 - Wgrib2 (encoder)

Example:
Ensemble mean data of 1-month EPS
Initial date: 27 Oct 2011
Element: Z500 and its anomaly

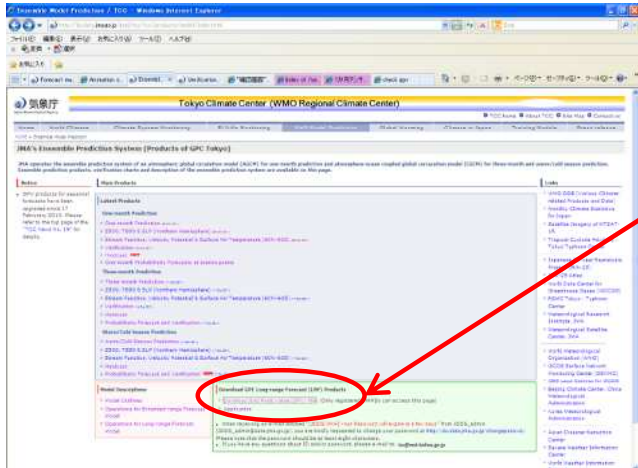
(2) Download the gridded dataset (GPV)

(3) Conversion of TCC-GRIB files into GrADS data file using wgrib2

(4) Edit the GrADS control file

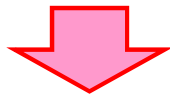
(5) Visualization using GrADS

Download page of the gridded datasets



Download Grid Point Value (GPV)
 (Only registered NMHSs can access this page)

NWP Model Prediction
 “1-month/ Daily Statistics” are referred in this case.



Main Products

<p>NWP Model Prediction</p> <p>1-month (28 Oct 2011)</p> <ul style="list-style-type: none"> Weekly Statistics Daily Statistics NEW All Members <p>3-month (17 Oct 2011)</p> <ul style="list-style-type: none"> Statistics All Members <p>7-month (17 Oct 2011)</p> <ul style="list-style-type: none"> Statistics All Members 	<p>Hindcast GPV Data</p> <p>1-month</p> <ul style="list-style-type: none"> Daily data <p>3-month</p> <ul style="list-style-type: none"> Monthly mean data <p>7-month</p> <ul style="list-style-type: none"> Monthly mean data
---	---

GPV of one - month Ensemble Forecast - Windows Internet Explorer

http://ds.data.jma.go.jp/eqmd/tcc/eqpv/model/1mE.Grib2/1mE_ens1D_grib2.html

Download Grid point 1 day anomaly value (GPV_1DAY) data (1mE_GPV.yyyyymmdd; 201108-present).

Each file is located in a folder named as 'yyyymmdd', which indicates year (four-digit, yyyy) and month (two-digit, mm) and day (two-digit, dd) of an initial time. Each file name is referred to in the 'File description' of the following 'Data description'.

- History of GPV data
- WGRIB2 to read GPV in GRIB2 format : [for Linux](#) [for windows](#)

Data description

- Contents

Contents	Level(hPa)	Area	Initial Time and Forecast Time
Ensemble mean of 50 members	Sea level pressure * and the anomaly [Pa]	---	Global, 2.5°×2.5° (144×73)
	Rainfall amount and the anomaly [kg m ⁻² day ⁻¹]	---	
	Day field: 00 UTC-00 UTC		
	Temperature * and the anomaly [K]	850,700,surf	
	Relative Humidity [%]	850	
	Geo-potential height * and the anomaly [m]	500,100	
	Wind (u, v) [m s ⁻¹]	850,200	
	Stream function and the anomaly [m ² s ⁻¹]	850,200	
Velocity potential and the anomaly [m ² s ⁻¹]	200		

* The geopotential height, sea level pressure, temperature are calibrated by subtracting systematic error from direct model output.
 * Climatology was calculated from hindcast experiment (1979-2009).

- Format : Gridded numerical values encoded in GRIB2, which is referred to in the "FM92 - GRIB Edition 2" on the WMO website (<http://www.wmo.int/pages/prog/www/WMOCodes.html>)
- Bit Size: 16
- Template number for section 4: 4.12 (Refer to the 80th page in the "Manual on codes on the WMO website": ftp://www.wmo.int/Documents/MediaPublic/Publications/CodesManual_WMO_no_306/WMO306_Vol_12_2010_en.pdf)
- In addition to "FM 92 - GRIB Edition 2", some local parameters are used in this product as shown below.

Code Table 4.2 Parameter number by product discipline and parameter category

Product Discipline 0: Meteorological products, Parameter Category 1: Moisture

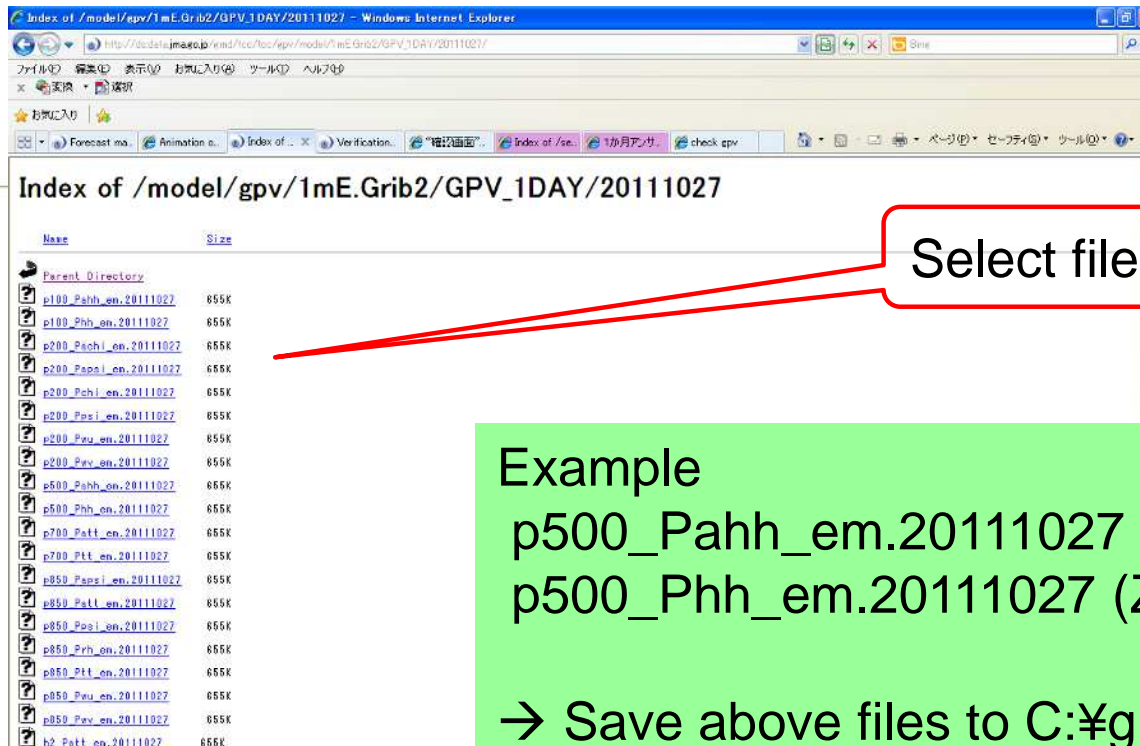
Number	Parameter	Units
--------	-----------	-------

“Download”

Index of /model/gpv/1mE.Grib2/GPV_1DAY

Name
Parent Directory
20111027/
20111020/
20111013/
20111006/
20110929/
20110922/
20110915/
20110908/
20110901/
20110825/

Select initial date



Index of /model/gpv/1mE.Grib2/GPV_1DAY/20111027

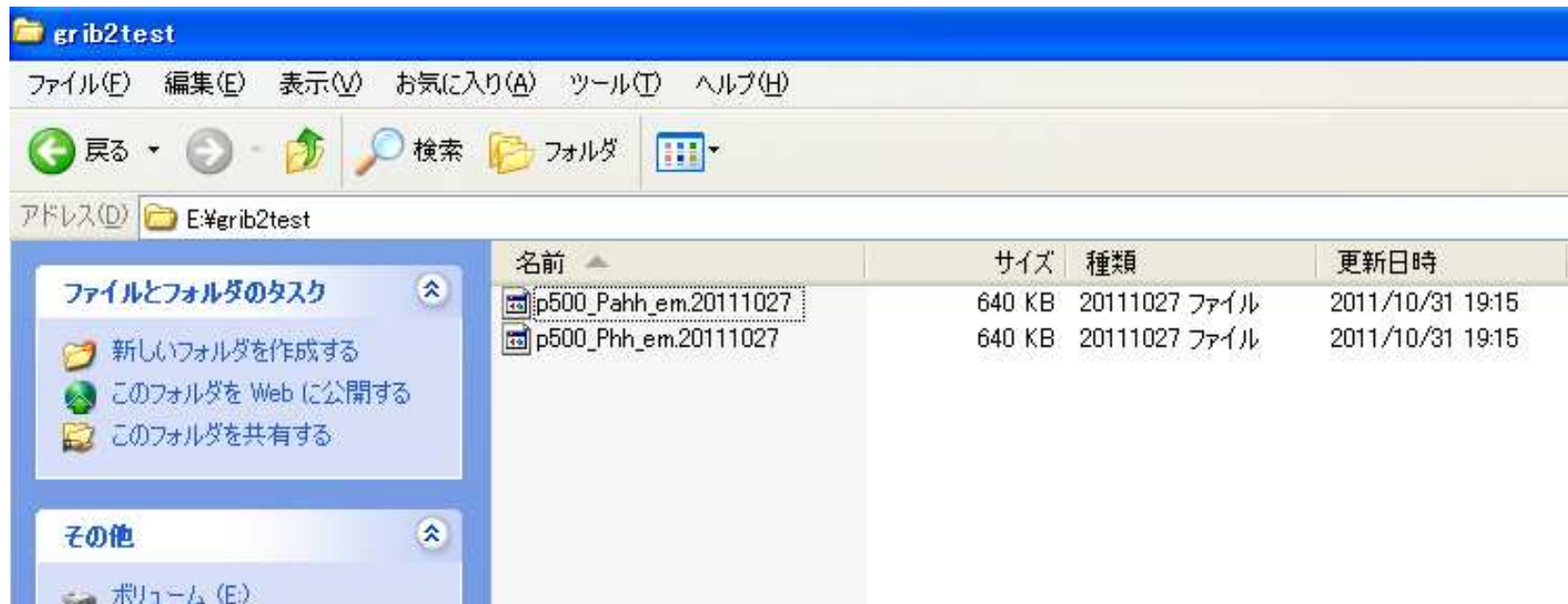
Name	Size
Parent Directory	
p100_Pahh_em.20111027	655K
p100_Ph_h_em.20111027	655K
p200_Pschi_em.20111027	655K
p200_Pspsi_em.20111027	655K
p200_Pchi_em.20111027	655K
p200_Ppsi_em.20111027	655K
p200_Psu_em.20111027	655K
p200_Psv_em.20111027	655K
p500_Pahh_em.20111027	655K
p500_Ph_h_em.20111027	655K
p700_Patt_em.20111027	655K
p700_Ptt_em.20111027	655K
p850_Pspsi_em.20111027	655K
p850_Pstt_em.20111027	655K
p850_Ppsi_em.20111027	655K
p850_Prb_em.20111027	655K
p850_Ptt_em.20111027	655K
p850_Psu_em.20111027	655K
p850_Psv_em.20111027	655K
h2_Patt_em.20111027	655K

Select file name

Example

p500_Pahh_em.20111027 (Z500 anomaly)
p500_Ph_h_em.20111027 (Z500)

→ Save above files to C:¥grib2test



- p500_Pahh_em.20111027 (Z500 anomaly)
- p500_Ph_h_em.20111027 (Z500)

Save above files to C:\grib2test

Processes

(1) Preparation

- Installing the tools
 - GrADS (Viewer)
 - Wgrib2 (encoder)

Example:
Ensemble mean data of 1-month EPS
Initial date: 27 Oct 2011
Element: Z500 and its anomaly

(2) Download the gridded dataset (GPV)

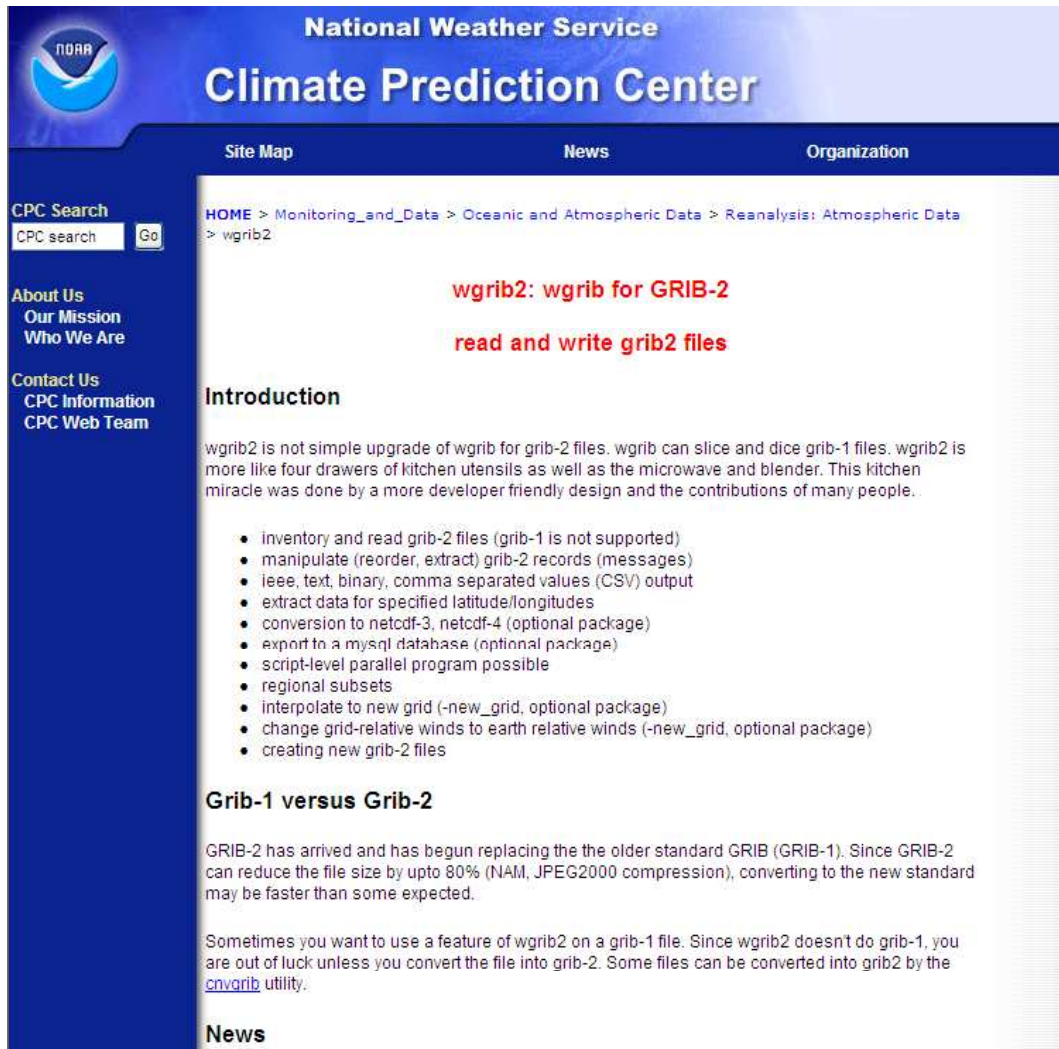
(3) Conversion of TCC-GRIB files into GrADS data file using wgrib2

(4) Edit the GrADS control file

(5) Visualization using GrADS

Conversion from GRIB2 to GrADS data file using wgrib2

<http://www.cpc.ncep.noaa.gov/products/wesley/wgrib2/>



The screenshot shows the National Weather Service Climate Prediction Center website. The page title is "National Weather Service Climate Prediction Center". The main content area is titled "wgrib2: wgrib for GRIB-2" and "read and write grib2 files". It includes an "Introduction" section and a list of features.

Introduction

wgrib2 is not simple upgrade of wgrib for grib-2 files. wgrib can slice and dice grib-1 files. wgrib2 is more like four drawers of kitchen utensils as well as the microwave and blender. This kitchen miracle was done by a more developer friendly design and the contributions of many people.

- inventory and read grib-2 files (grib-1 is not supported)
- manipulate (reorder, extract) grib-2 records (messages)
- ieee, text, binary, comma separated values (CSV) output
- extract data for specified latitude/longitudes
- conversion to netcdf-3, netcdf-4 (optional package)
- export to a mysql database (optional package)
- script-level parallel program possible
- regional subsets
- interpolate to new grid (-new_grid, optional package)
- change grid-relative winds to earth relative winds (-new_grid, optional package)
- creating new grib-2 files

Grib-1 versus Grib-2

GRIB-2 has arrived and has begun replacing the the older standard GRIB (GRIB-1). Since GRIB-2 can reduce the file size by upto 80% (NAM, JPEG2000 compression), converting to the new standard may be faster than some expected.

Sometimes you want to use a feature of wgrib2 on a grib-1 file. Since wgrib2 doesn't do grib-1, you are out of luck unless you convert the file into grib-2. Some files can be converted into grib2 by the [convgrib](#) utility.

- All gridded dataset (GPV) on the TCC website are provided in GRIB2 format.

- To handle the GRIB2 files, the program “wgrib2” is useful.

For referring to wgrib2 options

- wgrib2 (-h)

```
C:\>wgrib2
wgrib2 v0.1.7.8e 2/2009 Wesley Ebisuzaki, Jaakko Hyvri, Kristian Nilssen, Karl Pfeiffer, Manfred Schwarb, Arlindo da
Silva, Niklas Sondell, Sergey Varlamov
-0xSec      inv  X      Hex dump of section X (0..8)
-MM         inv          month
-N_ens      inv          number of ensemble members
-RT         inv          Reference Time
-Sec0       inv          contents of section0
-Sec3       inv          contents of section 3 (Grid Definition Section)
-Sec4       inv          Sec 4 values (Product definition section)
-Sec5       inv          Sec 5 values (Data representation section)
-Sec6       inv          show bit-map section
-Sec_len    inv          length of various grib sections
-T          inv          time YYYYMMDDHHMMSS
-V          inv          diagnostic output
-VT         inv          verf time = reference_time + forecast_time (YYYYMMDDHHMMSS)
-YY         inv          year
-bitmap     inv          bitmap mode
-center     inv          center
-ctl_ens    inv          ens info for grads
-ctl_inv    inv          ctl inventory dump (for g2ctl/GrADS)
-disc       inv          discipline (code table 0.0)
-domain     inv          max limit for n/s/e/w
-ens        inv          ensemble information
-ftime      inv          forecast time
-grid       inv          grid definition
-ij         inv  X Y      value of field at grid(X,Y) X=1,..,nx Y=1,..,ny
-ijlat     inv  X Y      lat,lon and grid value at grid(X,Y) X=1,..,nx Y=1,..,ny
-ilat     inv  X          lat,lon and grid value at Xth grid point, X=1,..,npnts
```

also referred on the wgrib2 website.

<http://www.cpc.ncep.noaa.gov/products/wesley/wgrib2/>

Survey girb2 file

- wgrib2 (grib2 file)

```
cd /d C:\grib2test
C:\grib2test>wgrib2 p500_Pahh_em.20111027
```

```
1.1:0:d=2011102700:var discipline=0 master_table=4 parmcat=3 parm=9:500
mb:2 day-(2 day+24 hour ave@6 hour fcst,missing=0:ens-mean
```

```
1.2:0:d=2011102700:var discipline=0 master_table=4 parmcat=3 parm=9:500
mb:3 day-(3 day+24 hour ave@6 hour fcst,missing=0:ens-mean
```

```
1.3:0:d=2011102700:var discipline=0 master_table=4 parmcat=3 parm=9:500
mb:4 day-(4 day+24 hour ave@6 hour fcst,missing=0:ens-mean
```

```
1.30:0:d=2011102700:var discipline=0 master_table=4 parmcat=3 parm=9:500
mb:31 day-(31 day+24 hour ave@6 hour fcst,missing=0:ens-mean
```

```
1.31:0:d=2011102700:var discipline=0 master_table=4 parmcat=3 parm=9:500
mb:32 day-(32 day+24 hour ave@6 hour fcst,missing=0:ens-mean
```

- Initial date is 27 Oct 2011 (2011102700).
- 31 records are included.

Record-1; Day-2

Record-2; Day-3

Record-3; Day-4

...

Record-30; Day-31

Record-31; Day-32

Convert girb2 to binary

- **wgrib2 (*grib2_file*) -no_header -bin (*output_file*)**

```
wgrib2 p500_Phh_em.20111027 -no_header -bin z500.dat  
wgrib2 p500_Pahh_em.20111027 -no_header -bin z500_anomaly.dat
```

C:\%grib2test>ls -l

total 3832

```
-rwx----- 1 USERID mkgroup 654709 2011-10-31 19:15 p500_Pahh_em.20111027  
-rwx----- 1 USERID mkgroup 654709 2011-10-31 19:15 p500_Phh_em.20111027  
-rwx----- 1 USERID mkgroup 1303488 2011-10-31 19:34 z500.dat  
-rwx----- 1 USERID mkgroup 1303488 2011-10-31 19:34 z500_anomaly.dat
```

GRIB2

GrADS data
(created using
wgrib2)

Processes

(1) Preparation

- Installing the tools
 - GrADS (Viewer)
 - Wgrib2 (encoder)

Example:
Ensemble mean data of 1-month EPS
Initial date: 27 Oct 2011
Element: Z500 and its anomaly

(2) Download the gridded dataset (GPV)

(3) Conversion of TCC-GRIB files into GrADS data file using wgrib2

(4) Edit the GrADS control file

(5) Visualization using GrADS

Basic format of the GrADS control file

```
dset ^${ grads data filename }
undef (UNDEF value)9.999e+20
xdef (num. of grids along X-axis) linear (start) (increment)
ydef (num. of grids along Y-axis) linear (start) (increment)
zdef (num. of vertical levels) levels (list of levels)
tdef (num. of time steps) linear (starting time) (increment)
vars (num. of parameters)
(parameter_name) 0 0 (remarks)
endvars
```

C:\¥grib2test¥z500.ctl

```
dset ^z500.dat
undef 9.999e+20
xdef 144 linear 0 2.5
ydef 73 linear -90 2.5
zdef 1 levels 500
tdef 7 linear 29Oct2011 1dy
vars 1
z500 0 0 z500
endvars
```

C:\¥grib2test¥z500_anomaly.ctl

```
dset ^z500_anomaly.dat
undef 9.999e+20
xdef 144 linear 0 2.5
ydef 73 linear -90 2.5
zdef 1 levels 500
tdef 7 linear 29Oct2011 1dy
vars 1
z500 0 0 z500
endvars
```

Processes

(1) Preparation

- Installing the tools
 - GrADS (Viewer)
 - Wgrib2 (encoder)

Example:
Ensemble mean data of 1-month EPS
Initial date: 27 Oct 2011
Element: Z500 and its anomaly

(2) Download the gridded dataset (GPV)

(3) Conversion of TCC-GRIB files into GrADS data file using wgrib2

(4) Edit the GrADS control file

(5) Visualization using GrADS

Visualization (1)

Startup GrADS on the “Command Prompt”

C:¥grib2test>grads

Starting X server under C:¥OPENGR~1¥Contents¥Resources¥Xming

Starting grads under C:¥OPENGR~1¥Contents¥Cygwin¥Versions¥20A9OG~1.1¥i686 ...

Grid Analysis and Display System (GrADS) Version 2.0.a9.oga.1

Copyright (c) 1988-2010 by Brian Doty and the

Institute for Global Environment and Society (IGES)

GrADS comes with ABSOLUTELY NO WARRANTY

See file COPYRIGHT for more information

Config: v2.0.a9.oga.1 little-endian readline printim grib2 netcdf hdf4-sds hdf5 opendap-grids, stn athena geotiff shapefile

Issue 'q config' command for more detailed configuration information Loading User Defined Extensions table

</cygdrive/c/OPENGR~1/Contents/Cygwin/Versions/20A9OG~1.1/i686/gex/udxt> ... ok.

Landscape mode? ('n' for portrait):

GX Package Initialization: Size = 11 8.5

cygwin warning:

MS-DOS style path detected: ¥Documents and Settings¥JMA2224/.Xauthority

Preferred POSIX equivalent is: /cygdrive/e/Documents and Settings/JMA2224/.Xauthority

CYGWIN environment variable option "nodosfilewarning" turns off this warning.

Consult the user's guide for more details about POSIX paths:

<http://cygwin.com/cygwin-ug-net/using.html#using-pathnames>

ga->

“Return” key

Waiting for command input

Visualization (2)

Open the grads control file

- open {grads control file}

```
ga-> open z500.ctl
```

```
Scanning description file: z500.ctl
```

```
Data file z500.dat is open as file 1
```

```
LON set to 0 360
```

```
LAT set to -90 90
```

```
LEV set to 1000 1000
```

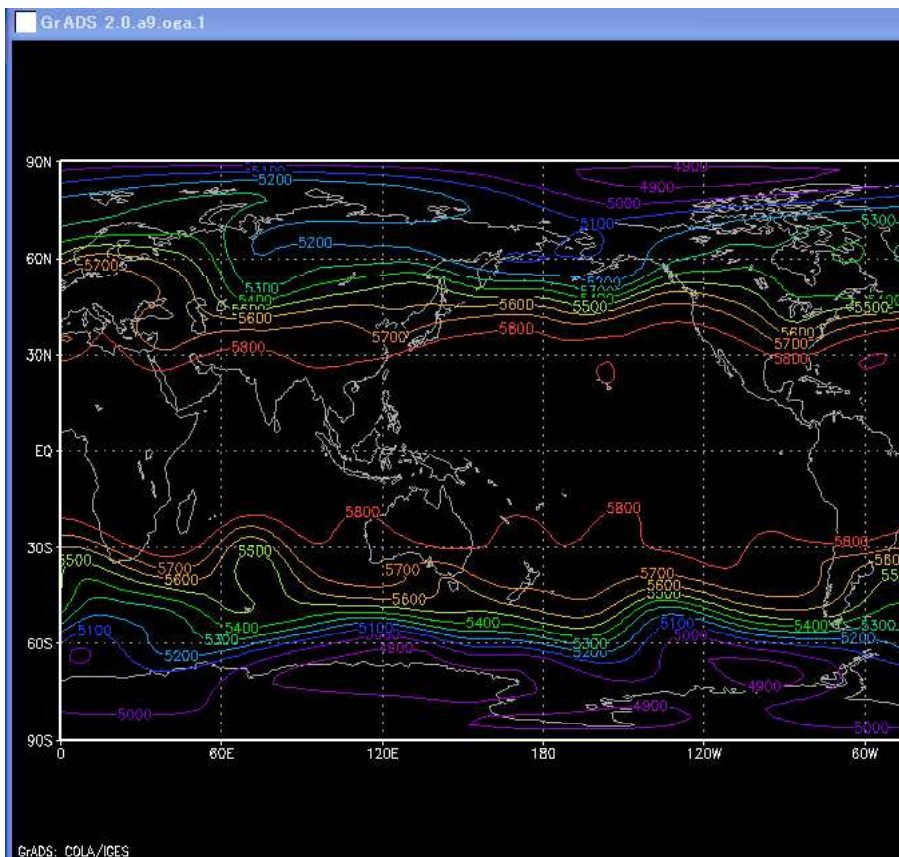
```
Time values set: 2011:10:29:0 2011:10:29:0
```

```
E set to 1 1
```

```
ga-> display z500
```

```
Contouring: 4900 to 5900 interval 100
```

```
ga->
```



```
Issue 'q config' command for more detailed configuration informat
Loading User Defined Extensions table </cygdrive/c/OPENGR~1/Conte
Landscape mode? ('n' for portrait):
GX Package Initialization: Size = 11 8.5
cygwin warning:
MS-DOS style path detected: %Documents and Settings%JMA2224/.Xau
Preferred POSIX equivalent is: /cygdrive/e/Documents and Setting
CYGWIN environment variable option "nodosfilewarning" turns off
Consult the user's guide for more details about POSIX paths:
http://cygwin.com/cygwin-ug-net/using.html#using-pathnames
ga-> open z500.ctl
Scanning description file: z500.ctl
Data file z500.dat is open as file 1
LON set to 0 360
LAT set to -90 90
LEV set to 1000 1000
Time values set: 2011:10:29:0 2011:10:29:0
E set to 1 1
ga-> d z500
Contouring: 4900 to 5900 interval 100
ga->
```

Visualization (3)

Draw week-1 forecast of Z500 and its anomaly

```
open z500.ctl  
open z500_anomaly.ctl
```

 } Open files

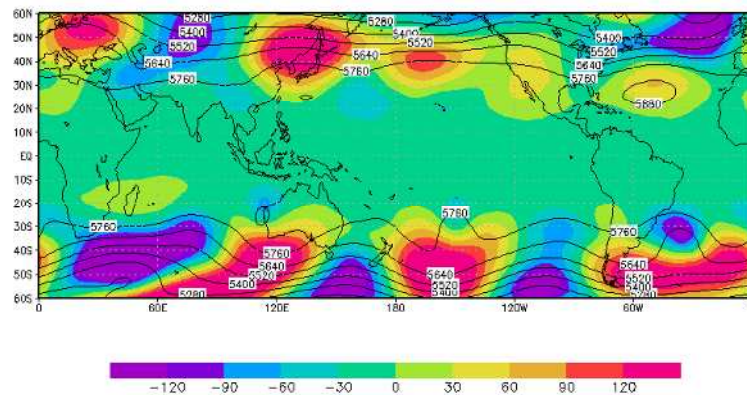
```
set gxout shaded  
set clevs -120 -90 -60 -30 0 30 60 90 120  
display ave(z500.2,t=1,t=7)  
run cbar.gs
```

 } Shading for z500 anomaly

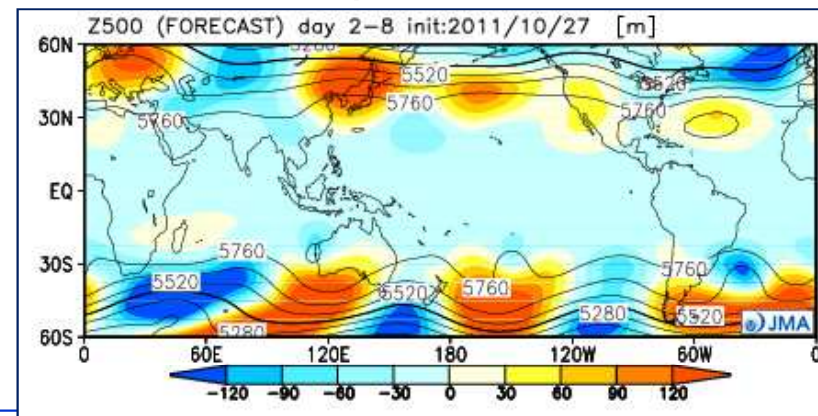
```
set gxout contour  
set cint 120  
display ave(z500.1,t=1,t=7)
```

 } contour for Z500

```
printim testing.png white
```

 → output image file (png format)

Forecast map on the TCC-web



For more details about GrADS...

<http://www.iges.org/grads/>

The screenshot shows the GrADS website homepage. At the top left is the COLA logo. To its right is the title "Grid Analysis and Display System (GrADS)" followed by a navigation menu with links: IGES, COLA, CREW, Weather Maps, GrADS, ELLFB, JAMES, Climate Dynamics PhD, What's New, Downloads, Documentation, Users Forum, and GDS. Below this is a section titled "Overview of GrADS" with three paragraphs of text. The first paragraph describes GrADS as an interactive desktop tool for earth science data. The second paragraph details its 5-Dimensional data environment. The third paragraph lists various graphical techniques. Below the overview is a section titled "Downloading the Software" with a paragraph about the GNU Public License. Underneath is a section titled "Documentation" with a paragraph about online documentation. At the bottom is a section titled "GrADS Users Forum" and another titled "What's New".

Download GrADS (for Linux machine)

Documentation

GrADS documentation page

<http://www.iges.org/grads/gadoc/>



GrADS Documentation

- IGES • COLA • CREW • Weather Maps • GrADS • ELLFB • JAMES • Climate Dynamics PhD •
- [What's New](#) • [Downloads](#) • [Documentation](#) • [Users Forum](#) • [GDS](#) •

Documentation Web Pages

The html version of the GrADS documentation has become the standard base documentation for GrADS. Follow the links below to the Users Guide, an introductory tutorial session, and an alphabetical subject index. Note the documentation is covered under the same [copyright](#) as the GrADS source code.

[The Users Guide](#)

The Users Guide is the fundamental document that provides information about how to use GrADS. The four main chapters are General Topics, Analysis Topics, Display Topics, and the GrADS Scripting Language.

[Tutorial](#)

The tutorial will give you a feeling for how to use the basic capabilities of GrADS. This sample session takes about 30 minutes to run through. It is highly recommended for new users. ([En Español](#).)

[Index](#)

The Index provides a quick and easy interface for checking the syntax and usage of any GrADS command or function. Subject headings from the User's Guide are also listed in the Index.

Download HTML Documentation

You can download a compressed tar file containing all the html source code. These can be useful to install on your local computer if you have a slow internet connection or if you travel often with a laptop.

- ftp://grads.iges.org/grads/gadoc_files.tar.gz

Download Hard Copy Documentation

If you simply *must* have a printable version of the documentation, you will have to settle for a version that is outdated and no longer supported. The following formats are available:

- [PDF](#)
- [Postscript \(G-Zipped and A4\)](#)
- [ASCII](#)
- [GrADS Commands Quick Reference Card](#)
- [Scripting Language Quick Reference Card](#)

Users guide

Tutorial

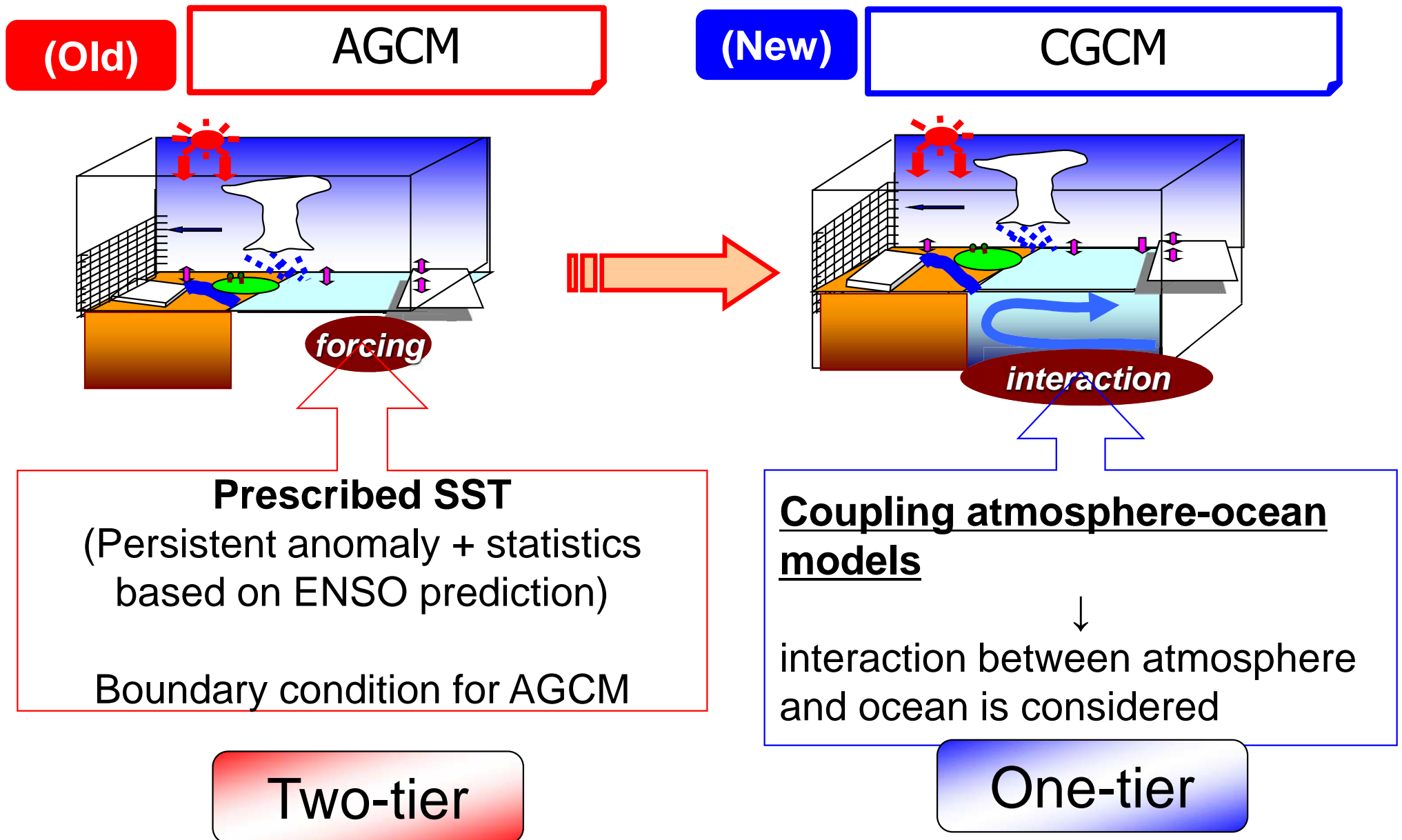
Index of command

Document (PDF file)
helpful! (though apply to
GrADS ver. 1.5)



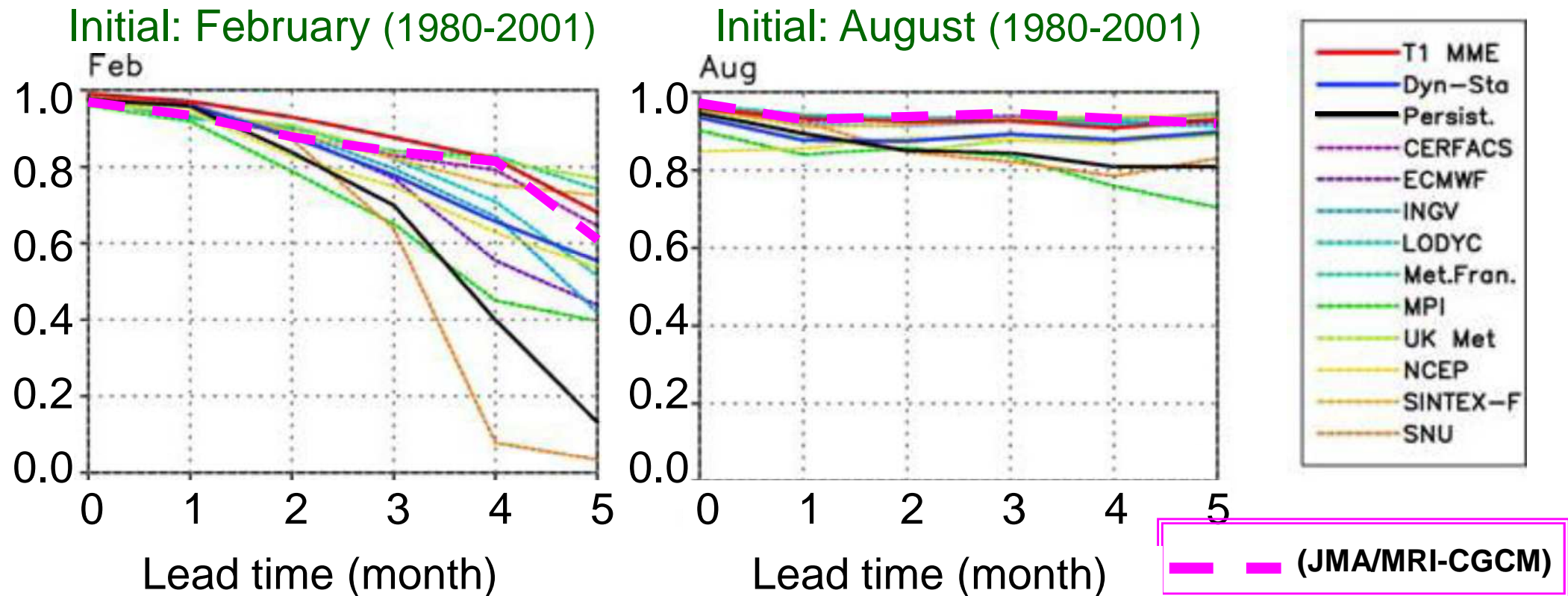
Backup

Implementation of CGCM to the 4/7 month EPS in Feb 2010



NINO.3.4 SST ACC: dependency on lead time

(quote from Fig. 8 of Jin et al. 2008)

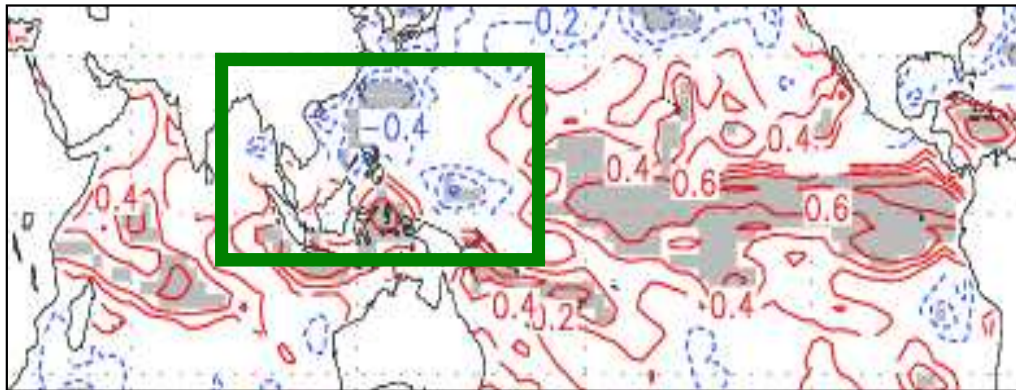


NINO.3.4 region: 120W-170W, 5S- 5N

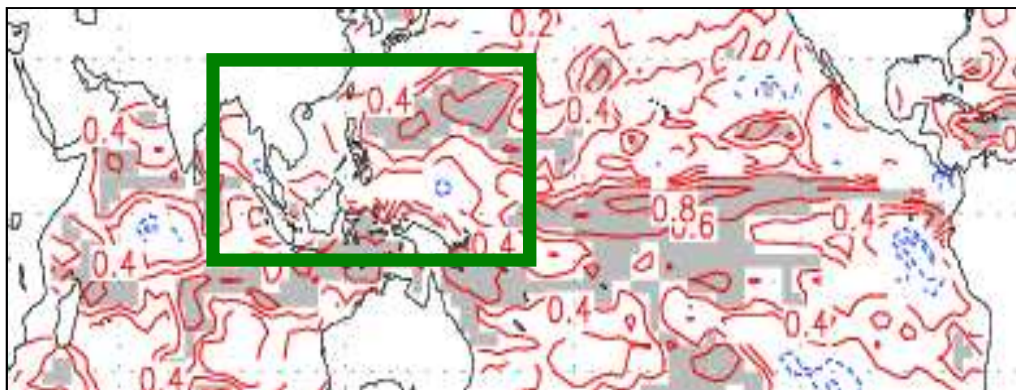
Jin E. K., James L. Kinter III, B. Wang, C.-K. Park, I.-S. Kang, B. P. Kirtman, J.-S. Kug, A. Kumar, J.-J. Luo, J. Schemm, J. Shukla and T. Yamagata, 2008: Current status of ENSO prediction skill in coupled ocean-atmosphere models. *Clim. Dyn.*, 31, 647-666.

Importance of air to sea interactions

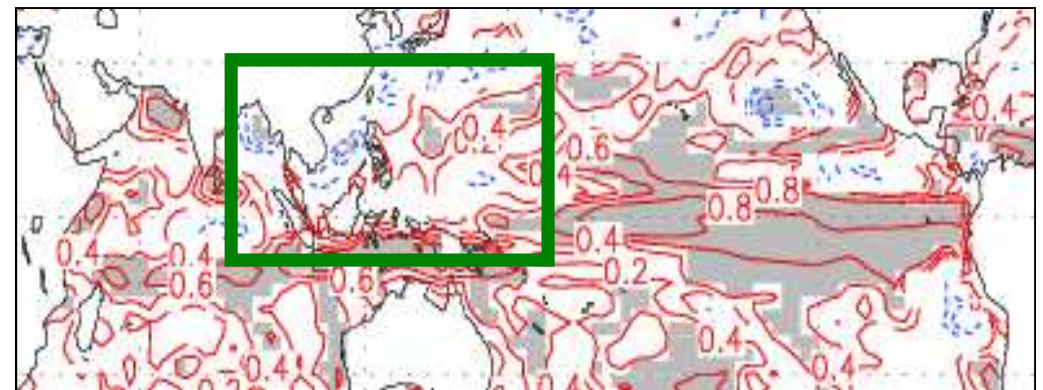
Analysis



AGCM



CGCM



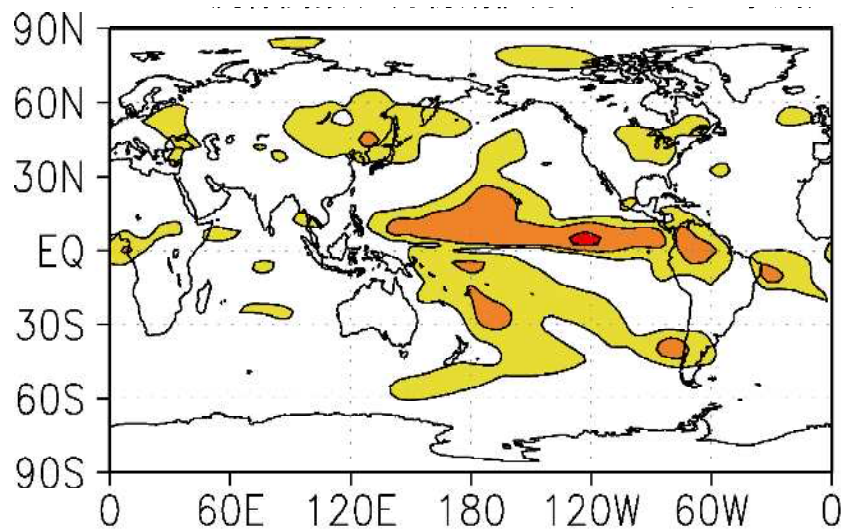
Correlation coefficient between precipitation and SST in JJA.
(initial month: May)

CGCM reduces the overestimated positive correlation coefficient in the Western North Pacific.

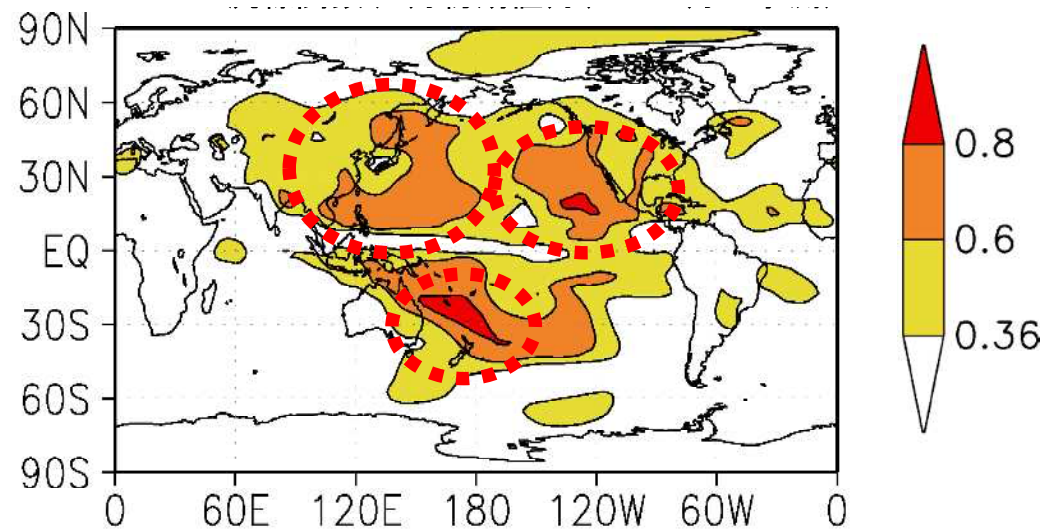
Improvement of large-scale circulation using CGCM

Anomaly Correlation of 850 hPa stream function in JJA
(initial month: Feb)

AGCM



CGCM



Improvement circulation
fields in tropics

Specifications of the 1-month EPS hindcast

	Hindcast	Operational system
Ensemble size	5 (5 BGM)	51 (9 BGMs & 6 days with 5-day LAF)
Forecast range	Lead time from 0 to 6 months as shown in the correspondence table below	(4-month EPS) Lead time from 1 to 3 as shown in the correspondence table below (7-month EPS) DJF (initial month of Oct.) JJA (initial months of Feb., Mar. and Apr.)
Initial date	24 initial dates a year (1st Jan., 16th Jan., 15th Feb., 2nd Mar., 17th Mar.,... 2nd Dec. and 17th Dec.	Once a month
Target period of hindcast	1979 – 2008	–

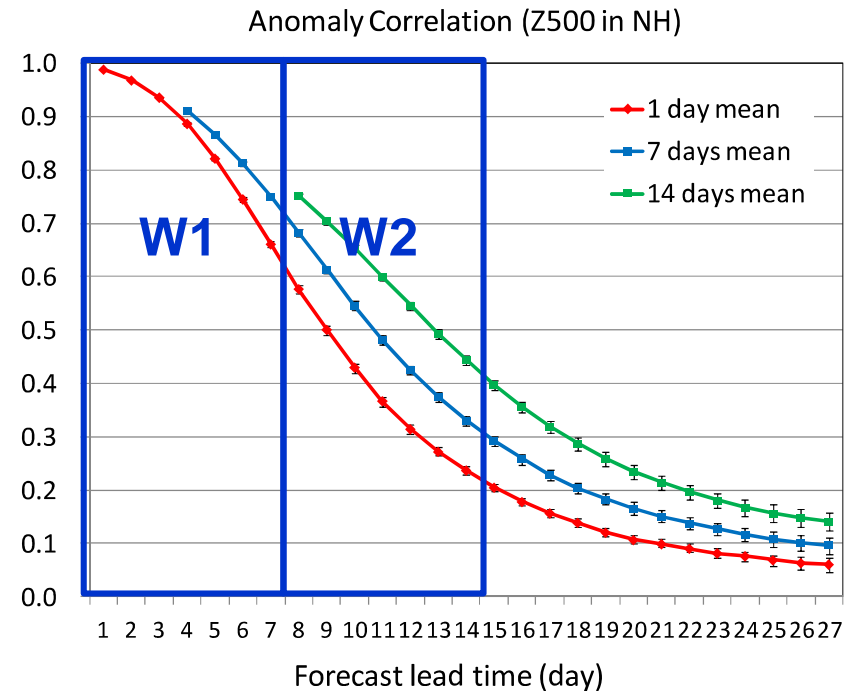
Correspondence between lead times (months) and initial dates

Target month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Initial date												
1-Jan, 17-Dec	0	1	2	3	4	5	6					
31-Jan, 16-Jan		0	1	2	3	4	5	6				
2-Mar, 15-Feb			0	1	2	3	4	5	6			
1-Apr, 17-Mar				0	1	2	3	4	5	6		
1-May, 16-Apr					0	1	2	3	4	5	6	
31-May, 16-May						0	1	2	3	4	5	6
30-Jun, 15-Jun	6						0	1	2	3	4	5
30-Jul, 15-Jul	5	6						0	1	2	3	4
29-Aug, 14-Aug	4	5	6						0	1	2	3
28-Sep, 13-Sep	3	4	5	6						0	1	2
28-Oct, 13-Oct	2	3	4	5	6						0	1
2-Dec, 17-Nov	1	2	3	4	5	6						0

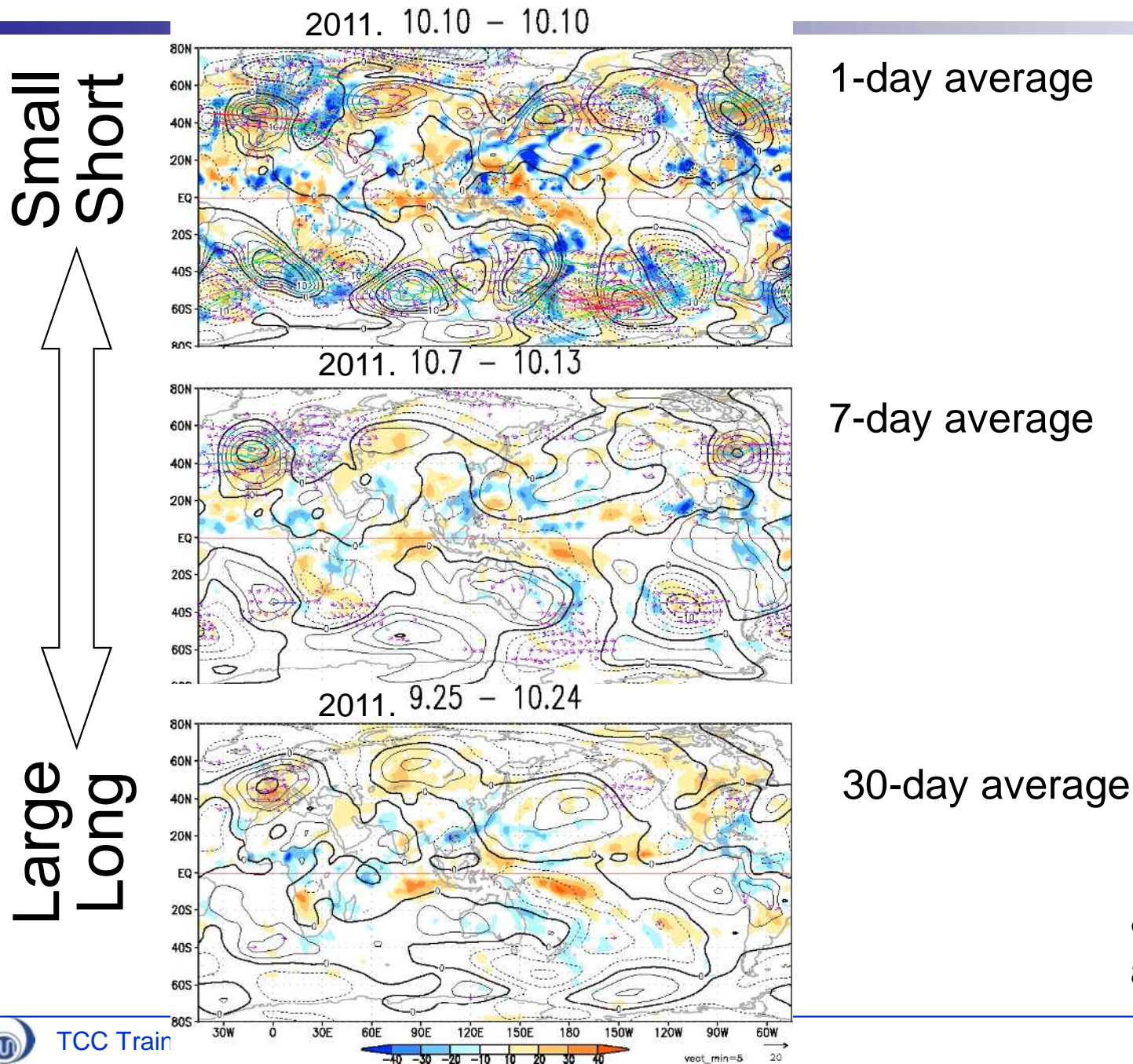
Average length dependency of prediction skill

•As average length is taken longer, decreasing rate of prediction skill is more gradually.)

-> **seasonal forecasting does not target daily variations. (ex. 1-month EPS of JMA targets 7-days average field .)**



(Example) Difference by time average



850hPa stream function anomaly (analysis)