One-month forecasting
(Lecture and Exercise)

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Japan Meteorological Agency (JMA)

Content

2 Dec.	Introduction of the forecast products on TCC Web • Forecast maps • Guidance tool	lecture
	Explanation of the exercise	lecture
	Example of constructing one-month forecast	lecture
3 to 6 Dec.	Generating one-month forecast for your own region - Preparation of the presentation	exercise
7 Dec.	Presentation by participants	**presentation!**

➢ Please keep in mind that toward the end of the seminar, you will be requested to **make a brief presentation** on one-month forecast for your own region.

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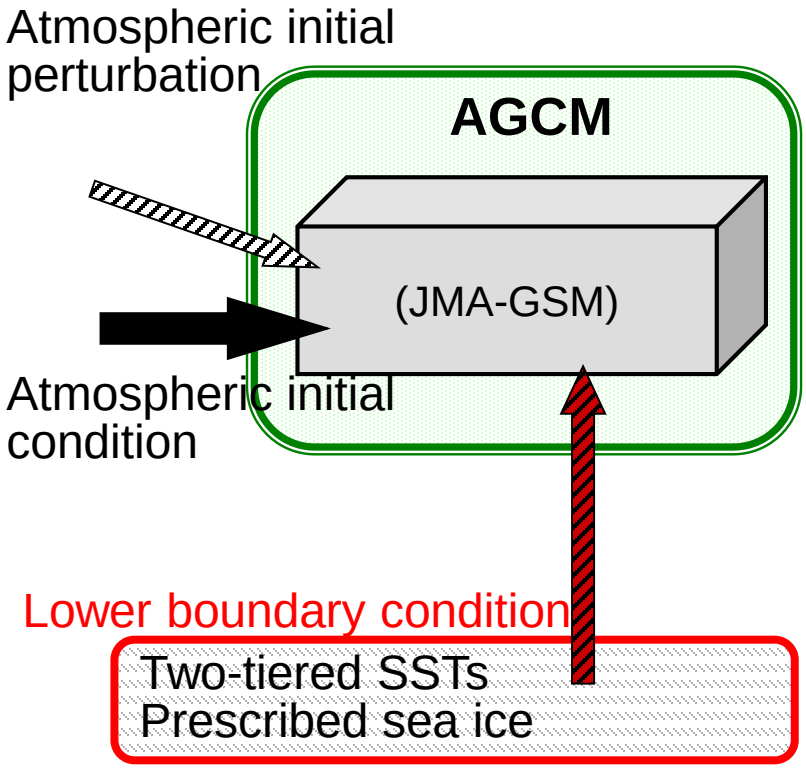
Operational global NWP models at JMA

	Main target	Integration range Horizontal resolution
Global Spectral Model (GSM)	•Short-range forecasting	up to 11 days about 20km
Global EPS	•Typhoon information •One-week forecast •Two-week temperature forecast •One-month forecast	34 days about 40 km (up to day-18), about 55 km (after day-18)
Seasonal EPS (JMA/MRI-CPS2)	•Seasonal forecast •El Niño outlook	7months about 110 km (atmosphere) 1.0º longitude, 0.3º–0.5º, latitude (ocean)

Specification of Global EPS

One-month forecasting

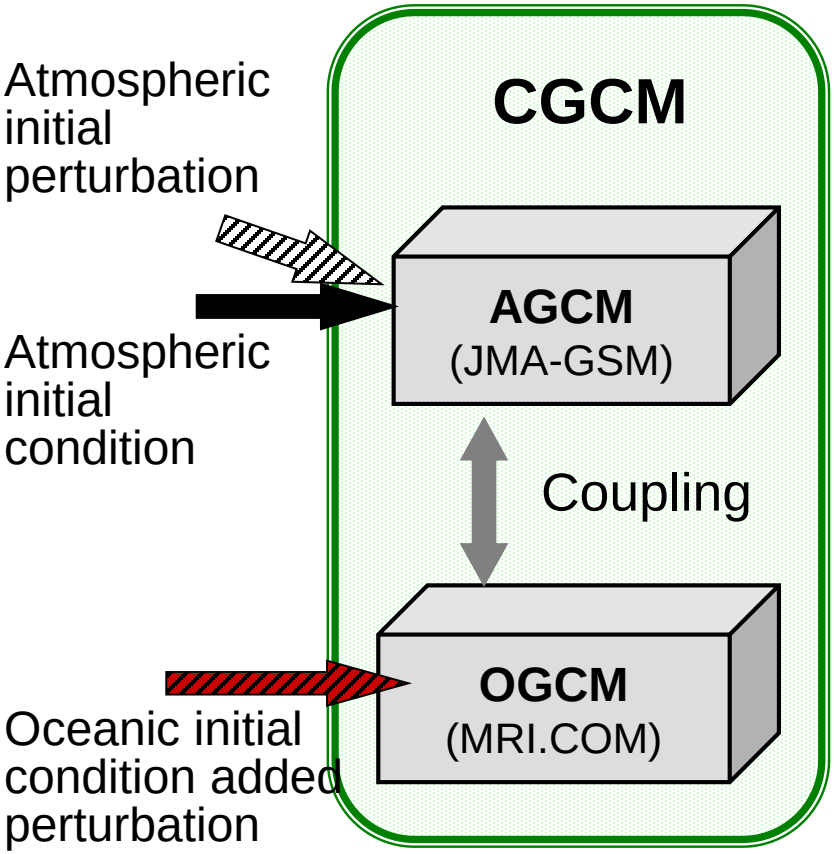


Two-tiered SSTs;
- (Up to Day-11) Persisted anomaly with daily climatological SST
- (After that) Relaxed to the ensemble-mean SST operationally predicted by JMA's coupled Seasonal EPS in tropics

Model	AGCM H: (up to day-18) about 40 km (TL479), (after day-18) about 55 km (TL319) V: 128 levels (up to 0.01 hPa)
Forecast range	34 days
SST	Two-tiered SSTs with the operational seasonal EPS
Sea ice	Prescribed sea ice distribution estimated using initial anomaly and climatology
Ensemble size	50
Freq. of model product creation	Once a week

Specification of Seasonal EPS

(JMA/MRI-CPS2)



Model	CGCM H: about 110 km (TL159) V: 60 levels (up to 0.1 hPa)
Forecast range	7 months
SST	One-tier method
Sea ice	Interactive sea ice model
Ensemble size	51
Freq. of model product creation	Once a month (around 20th of every month)

TCC Website (Top page)

➢ https://ds.data.jma.go.jp/tcc/tcc/index.html

気象庁 Japan Meteorological Agency

Tokyo Climate Center
WMO Regional Climate Center in RA II (Asia)

WMO

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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 | Links

HOME

What are WMO RCCs

WMO RCCs are centres of excellence...

RCC Functions

Operational Activities for Long-range Forecasting

Operational Activities for Climate Monitoring

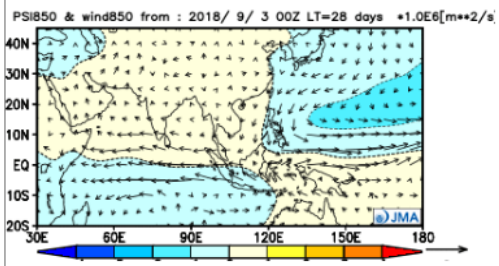
Operational Data Services, to support operational LRF and climate monitoring

Training in the use of operational RCC products and services

Latest Updates

World Climate	Updated: 14 September 2018
Climate System Monitoring	Updated 14 September 2018
El Niño Monitoring	Updated: 10 September 2018
Monthly Discussion	Updated: 25 September 2018

Monthly Discussion on Seasonal Climate Outlook No.55 is issued on 25 September 2018.

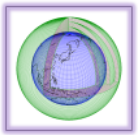


Ensemble forecast for stream function and wind vector at

Main Products

iTacs

iTacs, Interactive Tool for Analysis of the Climate System, is a web-based application to assist NMHSs to analyses extreme climate events and to monitor climate status.

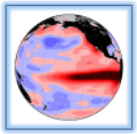


GPC Tokyo

Products of long-range forecast from Global Producing Center (GPC) Tokyo are available. These products are based on JMA's ensemble prediction system.

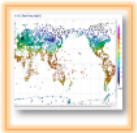
Monthly Discussion on Seasonal Climate Outlook

This is intended to assist NMHSs in the Asia-Pacific region in interpreting GPC Tokyo's three-month prediction and warm/cold season prediction products.



El Niño Monitoring

"El Niño Outlook" consists of a diagnosis of current condition and prediction of El Niño/Southern Oscillation. This is issued every month around 10th.



ClimatView

The ClimatView tool enables viewing and downloading of monthly world climate data, including monthly temperature/precipitation statistics and 30-year climate normals.

TCC News

TCC News, a quarterly newsletter from Tokyo Climate Center, acquaints with significant climate disasters and

What's New

RSS

30 August 2018 NEW

- TCC News No. 53 (Summer 2018: PDF)
  - Upgrade of JMA's Supercomputer System
  - Primary Factors behind the Heavy Rain Event of July 2018 and the Subsequent Heatwave in Japan from Mid-July Onward
  - Sea Ice in the Sea of Okhotsk in the 2017/2018 Winter Season
  - Kosa (Aeolian dust) Events over Japan in January-June 2018
  - TCC Experts Visit the Philippines

22 August 2018 NEW

- Press release: Primary Factors behind the Heavy Rain Event of July 2018 and the Subsequent Heatwave in Japan from Mid-July Onward

1 June 2018

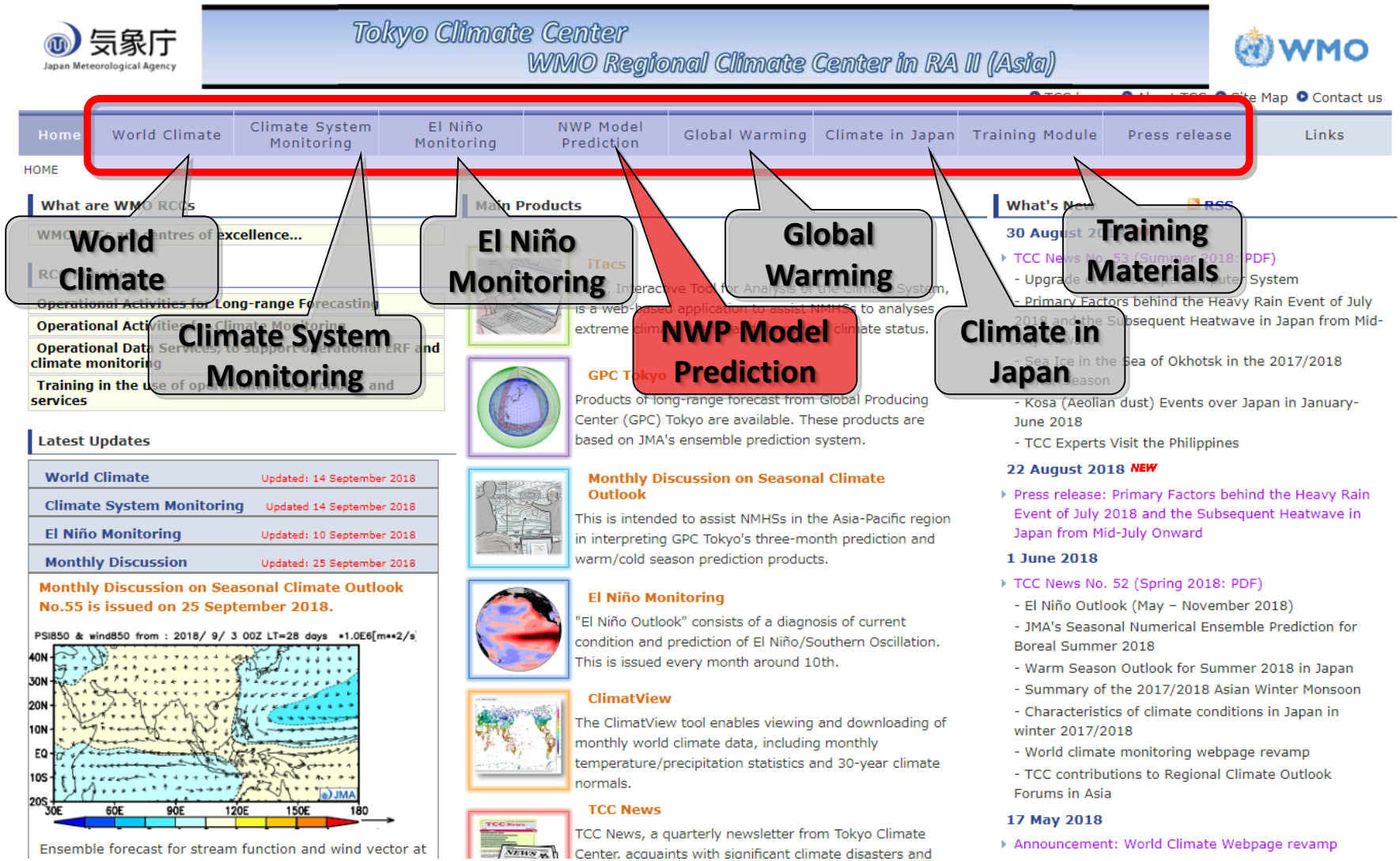
- TCC News No. 52 (Spring 2018: PDF)
  - El Niño Outlook (May – November 2018)
  - JMA's Seasonal Numerical Ensemble Prediction for Boreal Summer 2018
  - Warm Season Outlook for Summer 2018 in Japan
  - Summary of the 2017/2018 Asian Winter Monsoon
  - Characteristics of climate conditions in Japan in winter 2017/2018
  - World climate monitoring webpage revamp
  - TCC contributions to Regional Climate Outlook Forums in Asia

17 May 2018

- Announcement: World Climate Webpage revamp

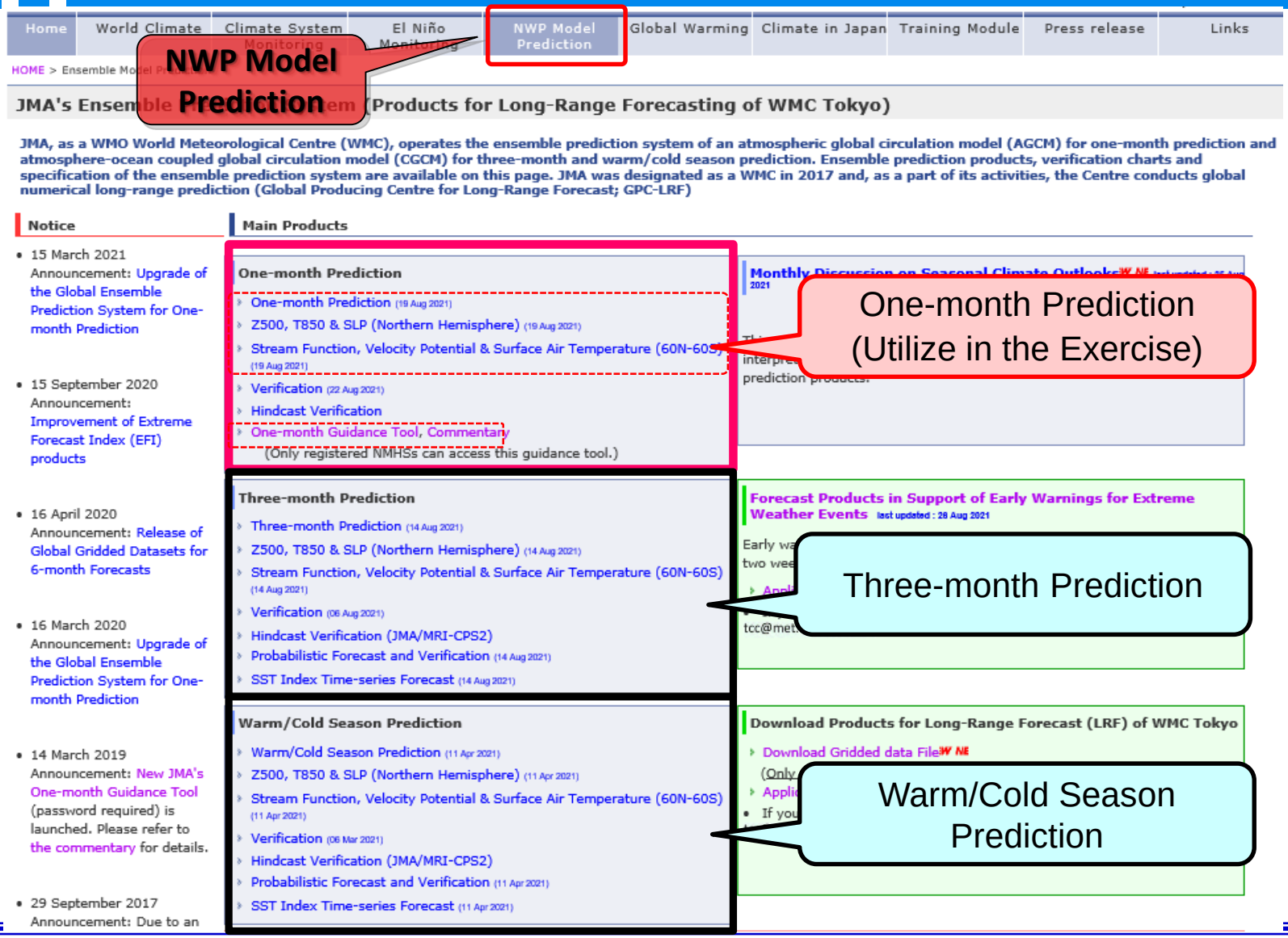
TCC Website (Top page)

- https://ds.data.jma.go.jp/tcc/tcc/index.html



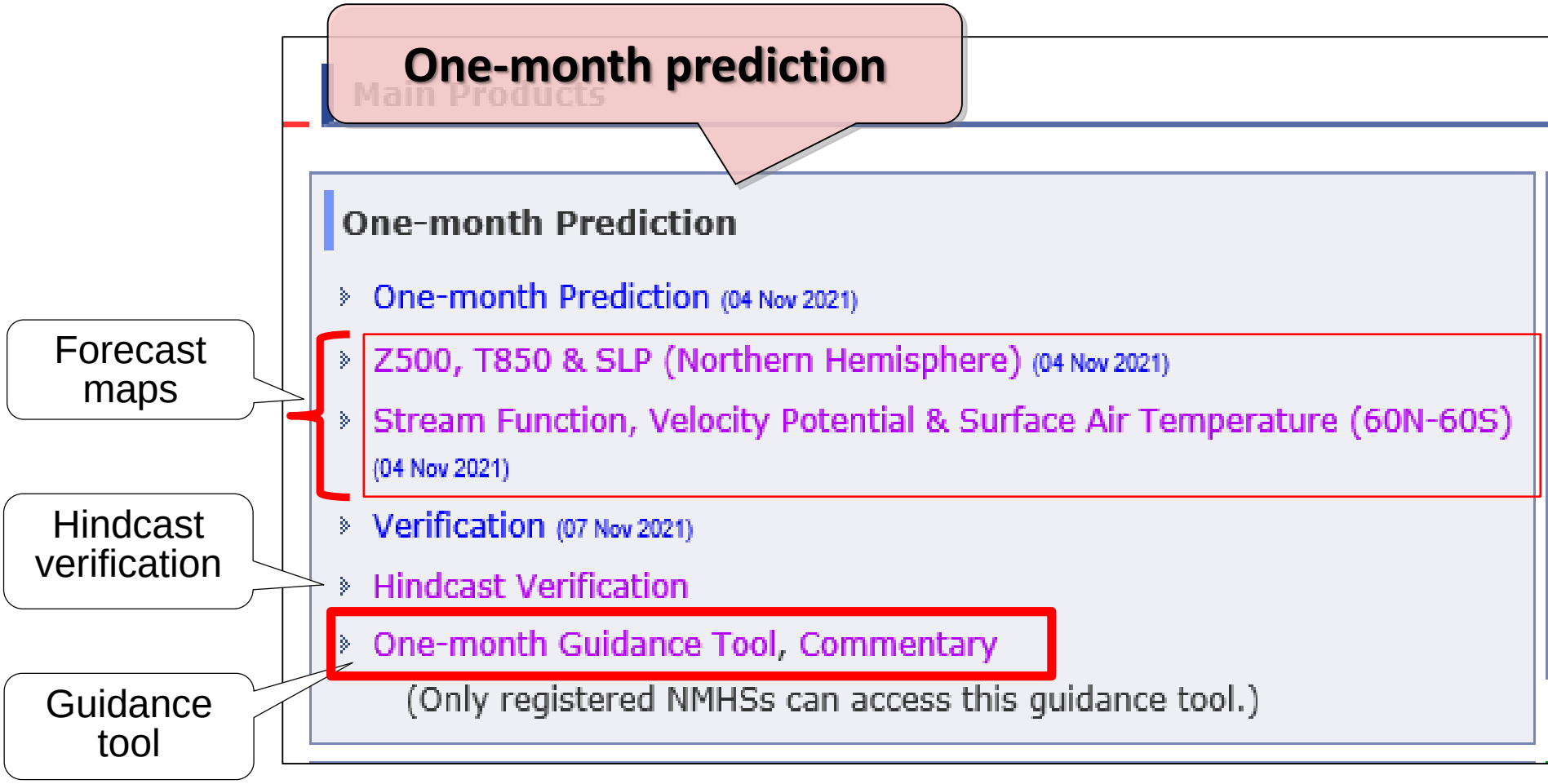
TCC Website
(NWP model prediction)

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



TCC website
(Focusing on one-month prediction)

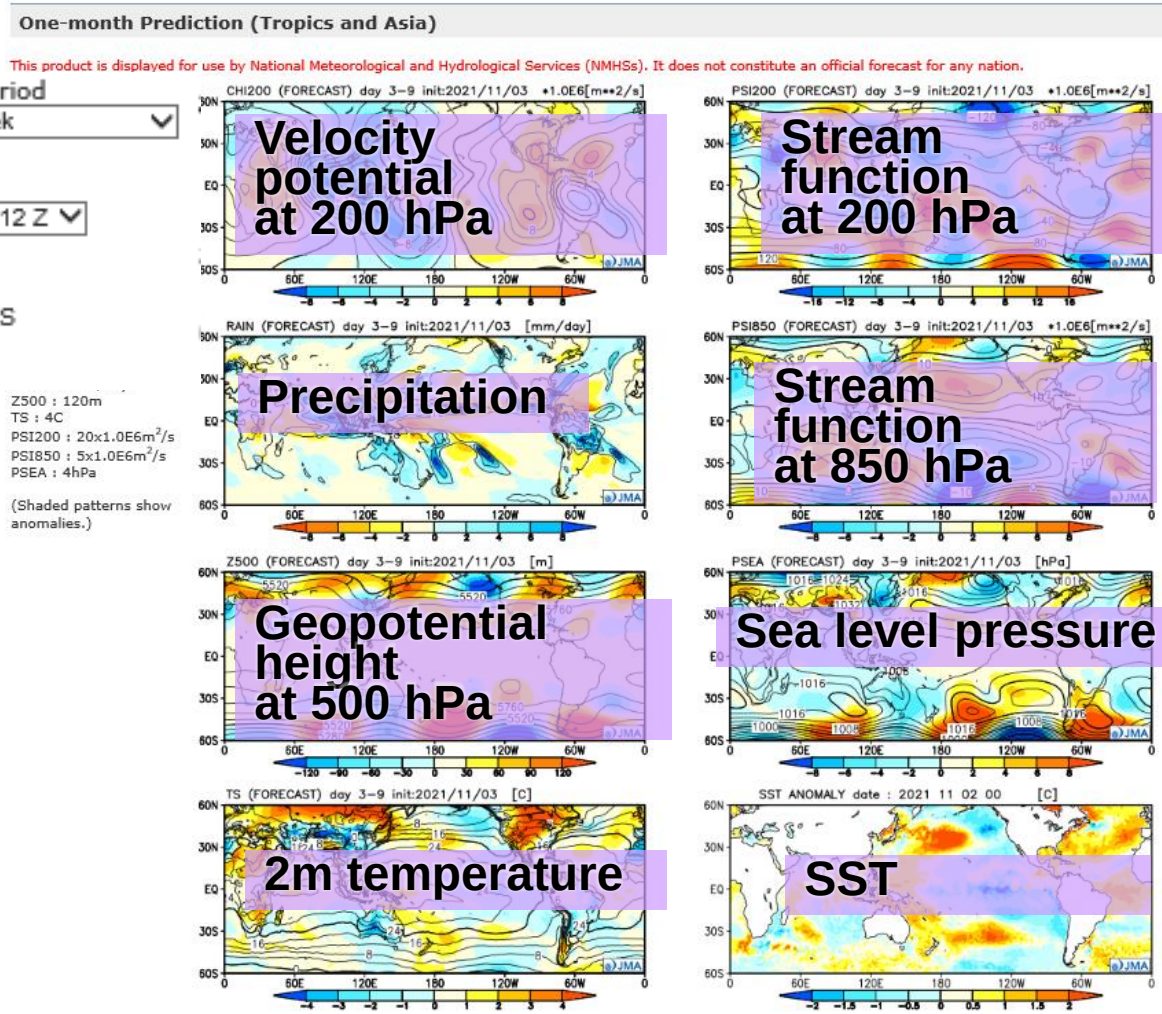
- https://ds.data.jma.go.jp/tcc/tcc/index.html



Forecast Maps
(Latitude/Longitude projection, for tropics)

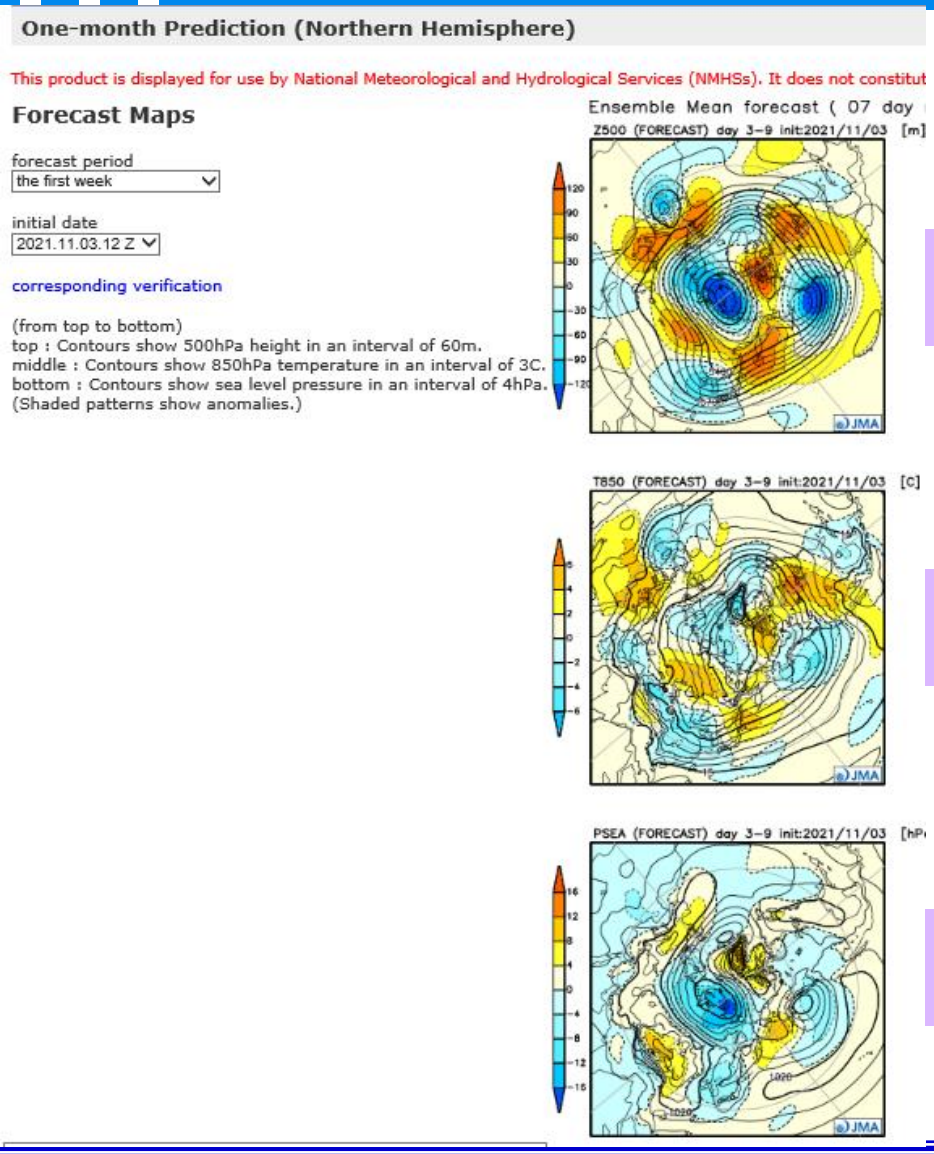
➢ https://ds.data.jma.go.jp/tcc/tcc/products/model/map/1mE/map1/zpcmap.php

- ✓ Forecast period
  1st week: Day 3-9
  2nd week: Day 10-16
  3rd & 4th week: Day 17-30
  28 days mean: Day 3-30
- ✓ Initial date
- ✓ Area (60N-60S/ Asia)
- ✓ Ensemble mean
- ✓ **Contour: forecast value**
- ✓ **Shading: Anomaly**



Forecast Maps (Northern Hemisphere)

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



Geopotential height at 500 hPa

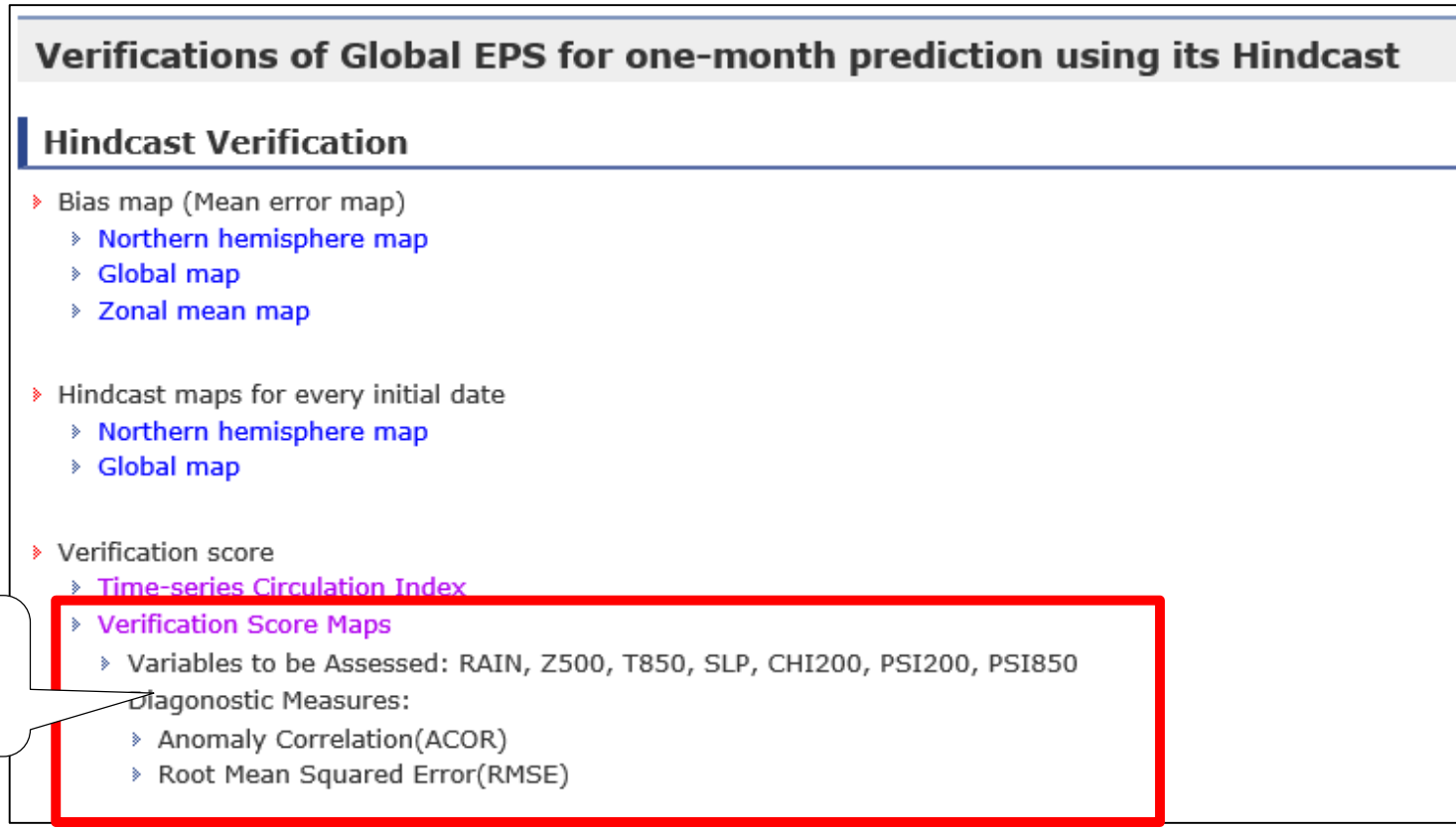
Temperature at 850hPa

Sea level pressure

Hindcast verification

➢ https://ds.data.jma.go.jp/tcc/tcc/products/model/hindcast/1mE.GEPS2103/index.html

- It is important to utilize prediction outputs taking into account of prediction skill especially for long-term forecasting.
- In this exercise, we are going to refer to the verification score maps with the hindcast.



Verification score map

Verification score map (Hindcast)

Initial date.
In this exercise,
11/30 (30 Nov.)

ACOR
(anomaly correlation)

Select parameter

Select forecast lead time

Verification Score Map

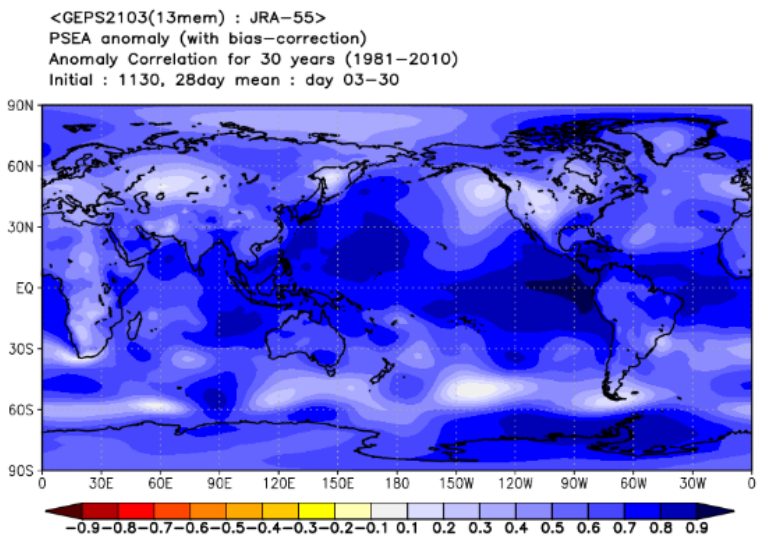
Note: "RAIN" is available only week-1 to 4 (4 weeks mean) forecast with the initial date of end of month.

Initial date: 11/30

- (•) ACOR
- ( ) RMSE

Element:
- ( ) CHI200
- ( ) PSI200
- ( ) PSI850
- ( ) RAIN
- ( ) Z500
- ( ) T850
- (•) SLP

Lead time:
- (•) week-1 to 4 (4 weeks mean) (day-3 to 30)
- ( ) the first week (day-3 to 9)
- ( ) the second week (day-10 to 16)
- ( ) the third and fourth week (2 weeks mean) (day-17 to 30)



(Notice)
"RAIN" is available only week-1 to 4 (4 weeks mean forecast) with the initial date of end of month..

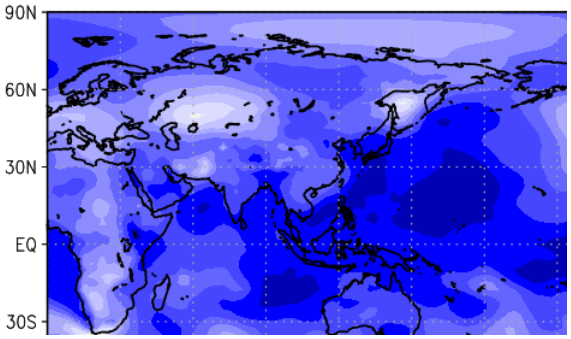
Example of the score
(anomaly correlation for SLP)

Initial date:
11/30

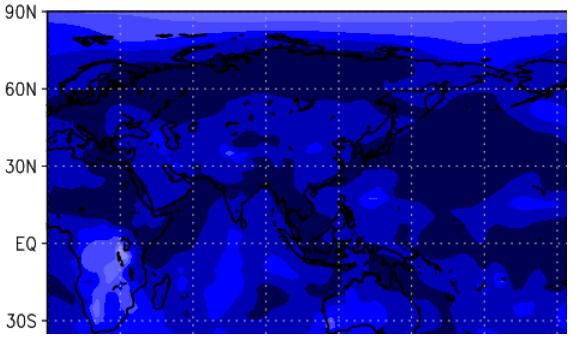
- (•) ACOR
- ( ) RMSE

Element:
- ( ) CHI200
- ( ) PSI200
- ( ) PSI850
- ( ) RAIN
- ( ) Z500
- ( ) T850
- (•) SLP

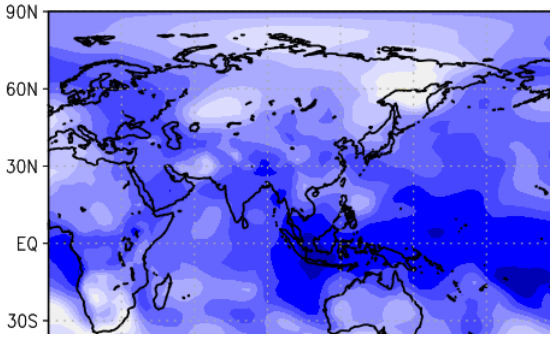
week-1 to 4



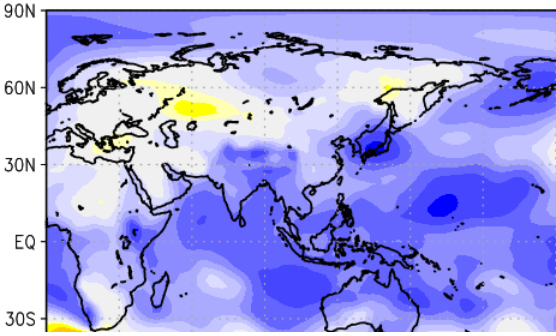
week-1

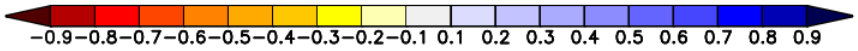


week-2



week-3 to -4





◆ Anomaly correlation map,
blue color indicates positive correlation (high prediction skill).

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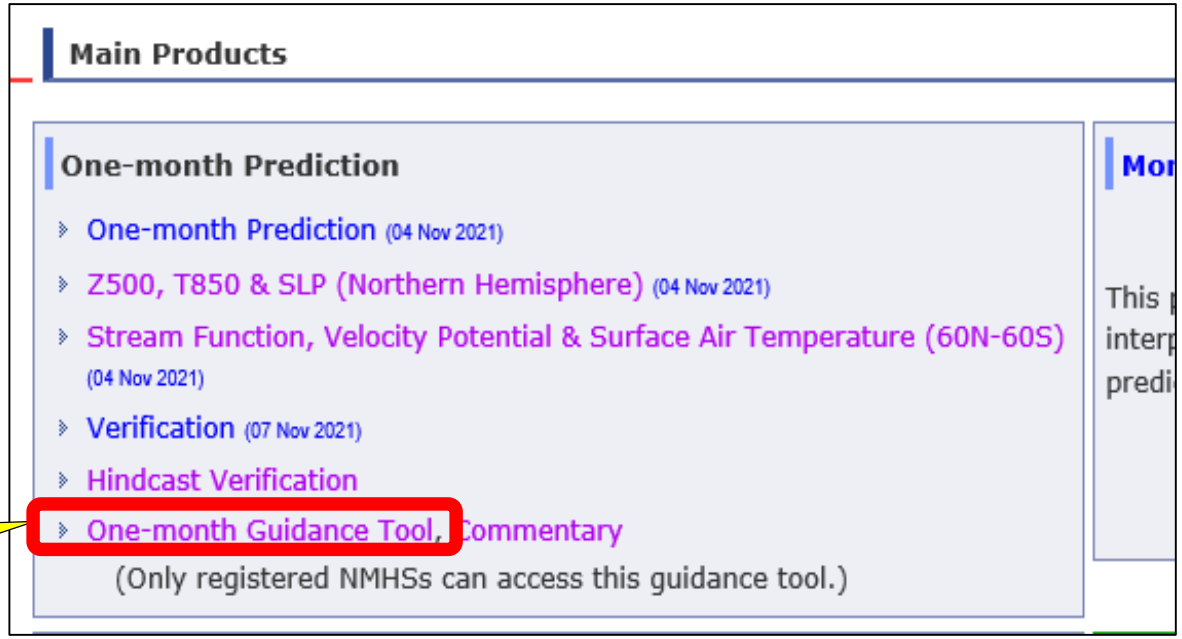
7 Dec.	Presentation by participants	**presentation!**

One-month guidance tool (on TCC web)

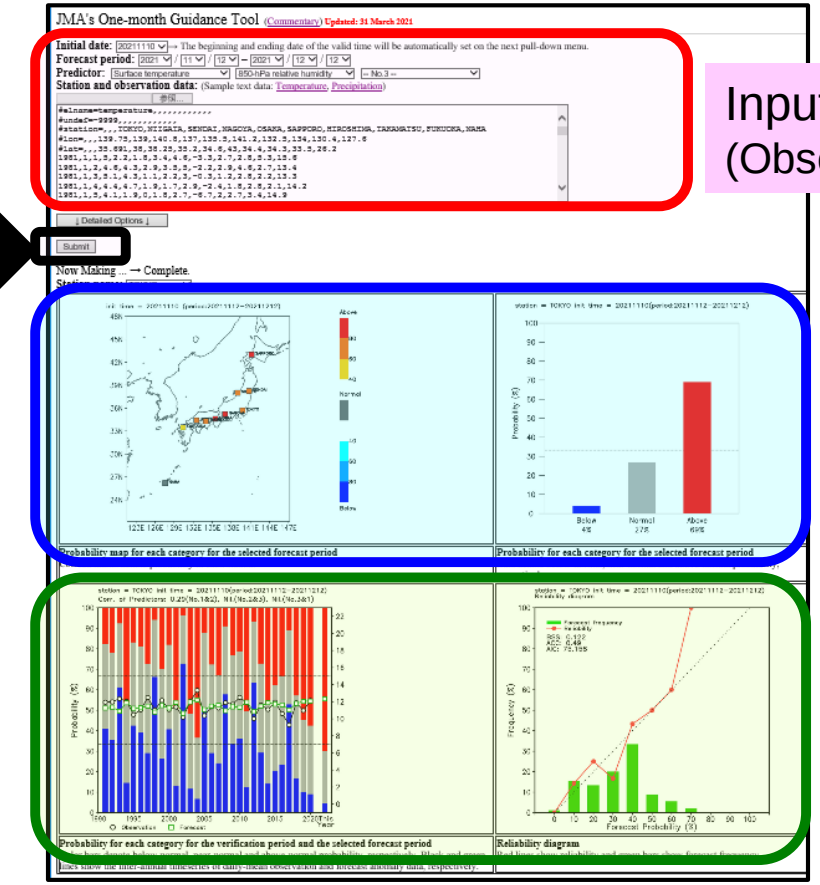
➢ https://extreme.kishou.go.jp/cgi-bin/simple_guidance/index.cgi

- Web-based Application tool operated in JMA's virtual server system.
- The users does **NOT required** any browser plug-ins and update of the tool.



Whole image of the guidance tool

- Set the observational data and some parameters, and the tercile probabilities and verification results are automatically displayed.



"Submit" button

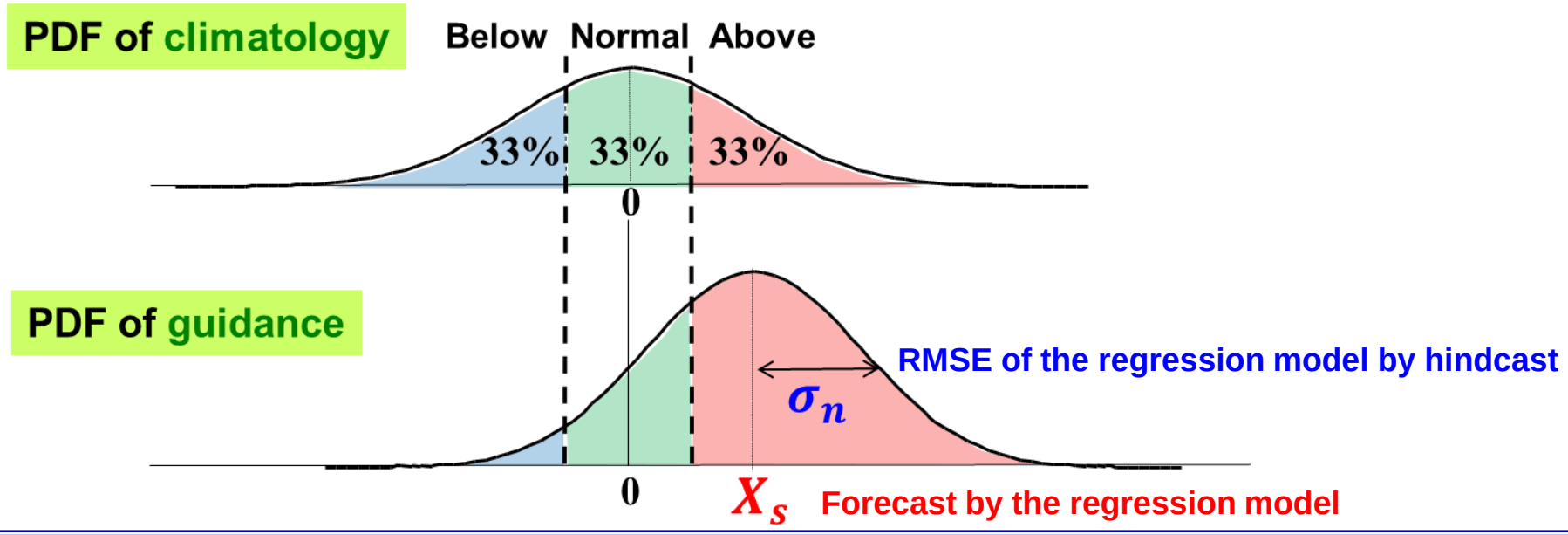
Input by users
(Observational data and some parameters)

Output
(Tercile probabilities)

Output
(Verification of the guidance)

Specifications of guidance calculations

- Threshold of the tercile categories;
  automatically calculated based on the past observation data during the verification period for years
- Prediction method;
  multi-regression (up to 3 elements)
- Estimation of uncertainty;
  assuming PDF of a normal distribution with the forecast error (RMSE) of the past cases (hindcast)



Workflow of the guidance tool

1. (Preparation)
   1. Create the past observation file (csv format)
      - Need to prepare by users

Thank you for sending us climate data in your region!

2. (Calculation using the guidance tool)
   1. Set data
      - initial date, forecast target period and observation data
   2. Produce guidance and get the outputs
      - Select “predictor” and check the verification (automatically output)
      - Get the outputs (tercile probabilities)

1. Preparation

(1) Observation data (example)

The format of the observation file is "CSV".

Line.1: #elname={temperature or precipitation}
2: #undef={undefined value}
3: #station=,,,{station name}
4: #lon=,,,{longitude of the obs. point}
5: #lat=,,,{latitude of the obs. point}

(The other words are NOT available)

(Up to 10 stations)

After line.6: time series of observation value
{Year},{Month},{Day},{Observational value}

<Example>

```
#elname=temperature,,,
#undef=-9999,,,
#station=,,,TOKYO,NIIGATA,SENDAI,NAGOYA,OSAKA,SAPPORO,HIROSHIMA,TAKAMATSU,FUKUOKA,NAHA
#lon=,,,140,139,140.8,137,135.5,141.2,132.5,134,130.4,127.6
#lat=,,,35,38,38.25,35.2,34.6,43,34.4,34.3,33.5,26.2
1981,1,1,5,2.2,1.8,3.4,4.6,-3.3,2.7,2.8,5.3,15.6
1981,1,2,4.6,4.3,2.9,3.5,5,-2.2,2.9,4.6,2.7,13.4
1981,1,3,5.1,4.3,1.1,2.2,3,-0.3,1.2,2.8,2.2,13.3
```

1. Preparation
(2) Observation data (Supplement)

- File format;
  - CSV (comma-separated values)
- Element;
  - Daily temperature or daily precipitation
- Period;
  - As a minimum, daily data covering the verification period (from 1 January 1991 to 31 January 2021 by default) are required.
- Observation data;
  - Maximum 10 stations (possible to calculate simultaneously)
  - Embed undefined value for missing data.
  - Station name should be just one-word
    (In case of more than two-words, connect with hyphen "-".)

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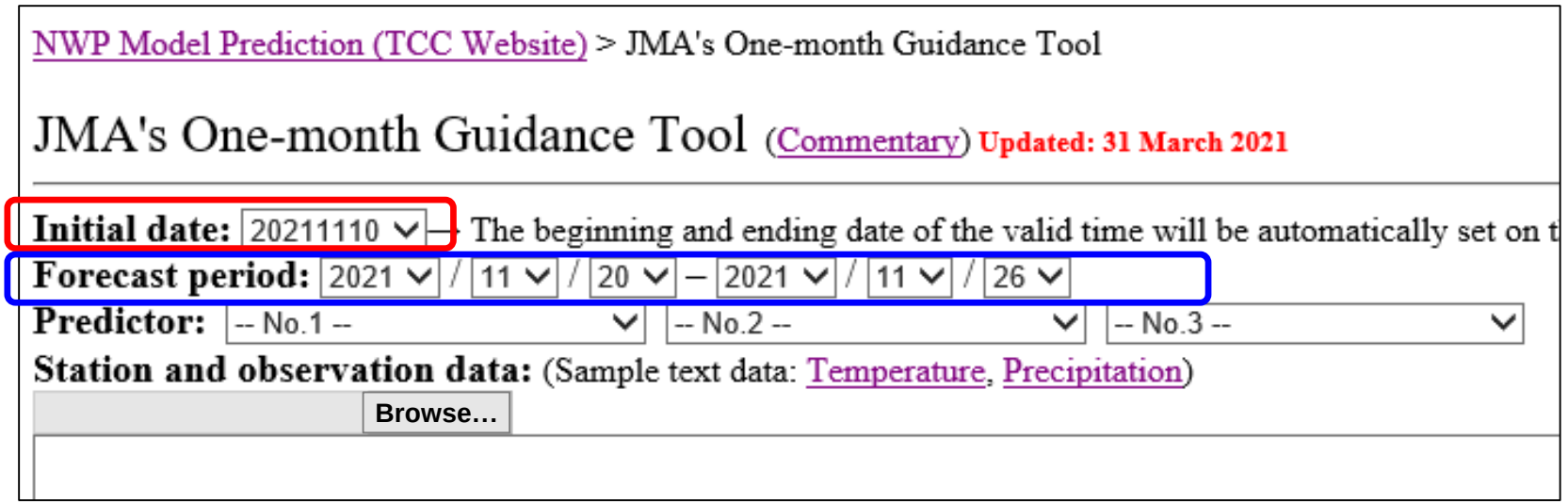
2.1. Set data

(1) Setting the initial date and the target period

➢ https://extreme.kishou.go.jp/cgi-bin/simple_guidance/index.cgi



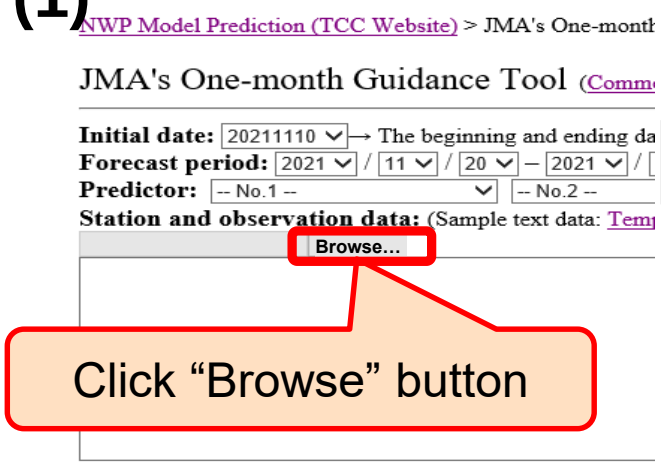
1. Initial date
   (Select “Initial date” from a pull-down menu)
2. Forecast period
   (Select “Forecast period” within the forecast range from a pull-down menu.)

✓ In the above example, the initial date is 10 Nov. and the forecast target period is 20 to 26 Nov. 2018 (2nd week).

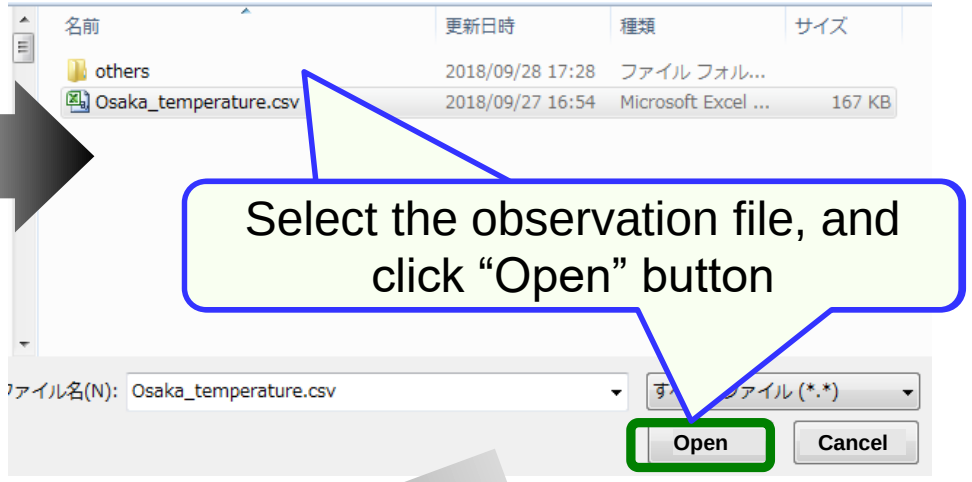
2.1. Set data

(2) Setting the observation data

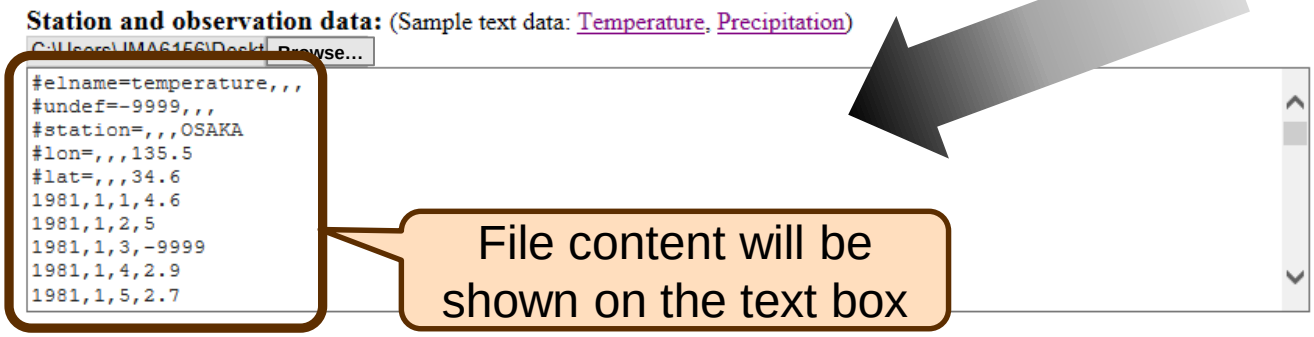
(1)



(2)



(3)



2.1. Set data

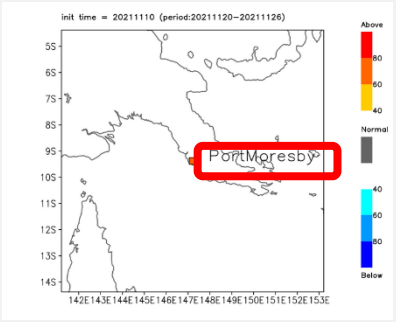
(3) (Optional) Detailed options

↓ Detailed Options ↓

Verification period: 1991 – 2020
Character size of station name: 0.09
Normalization of precipitation data: 0.25 → Power of 0.25 is default. Power of 1 denotes non-normalization.

↑ Close Detailed Options ↑

- Verification period
  - Users can adjust verification period so as not to choose inappropriate period during which most of the data are missing.
  - Unless there is no particular reason, it should be recommended to leave the verification period as the default (30-year period from 1991 to 2020).
- Character size of station name for the probabilities map
- Normalization of Precipitation
  - NOT need to modify basically
  - Parameter for normalization of precipitation
    (→ For details, please refer to the next slide.)



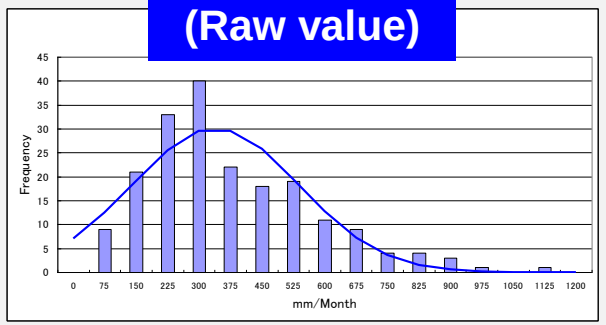
2.1. Set data

(4) [Tips] Normalization of Precipitation

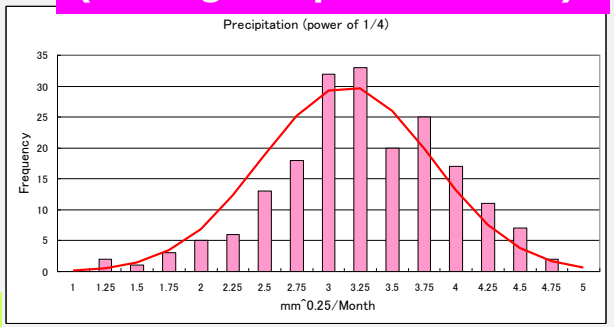
- Temperature is generally approximated by a normal distribution.
- Meanwhile, precipitation doesn't represent a normal distribution, and it's usually approximated by a gamma distribution.
- To approximate by a normal distribution, the guidance tool performs a normalization of precipitation data by its power of 1/4 to calculate the guidance forecast.

Ex. Precipitation over Japan

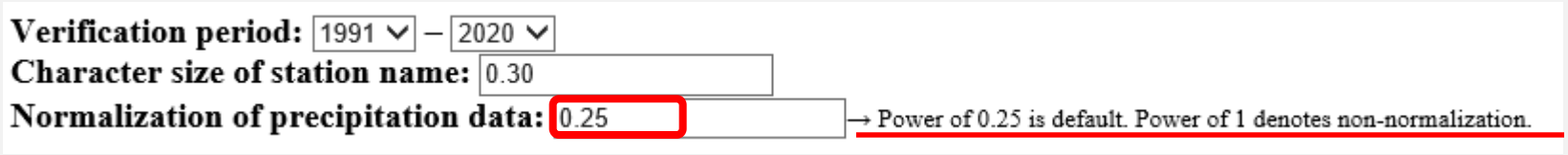
(Raw value)



(Taking the power of 1/4)



✓ If the parameter changing from **0.25** (i.e., 1/4) to **1.0**, precipitation data will be non-normalized.



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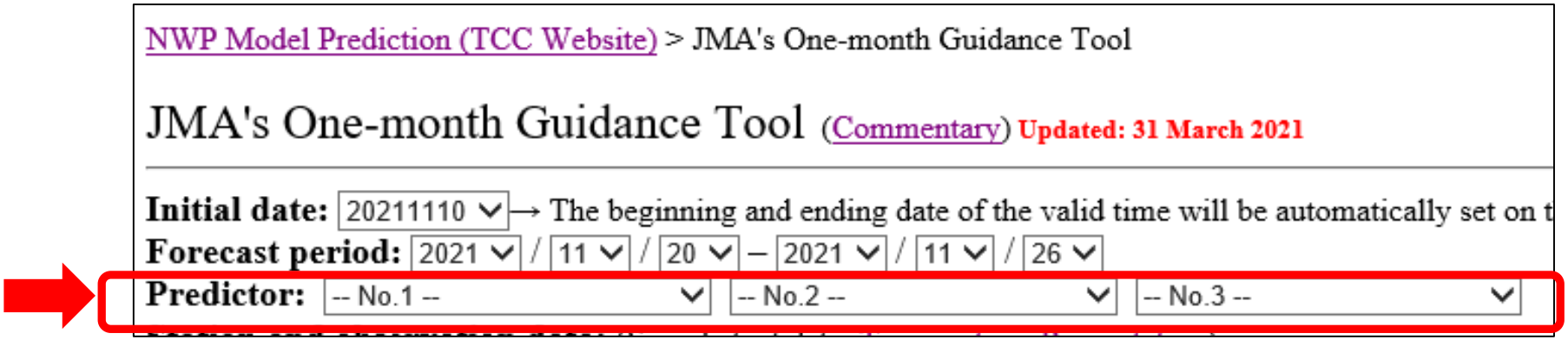
        - Select “predictor” and check the verification (automatically output)
        - Get the outputs (tercile probabilities)

2.2. Produce guidance and get the outputs

(1) Select “Predictor”

- Select “**Predictor**” elements from the pull-down menu.
  - Users can select up to three predictors from the left (No.1~3).

✓ The users need to find better combination of predictors, confirming the prediction skill (as shown below)



(Hint) Recommended combination of predictors (1)

☐ For ***Temperature*** forecast,

- One predictor is recommended to be set **temperatures** (850hPa, 700hPa or surface temperatures).

  "**850-hPa temperature**" is recommended for the first time.

  ✓ At first, I recommend to select 850-hPa temperature only (one-predictor) and to check up the forecast skill as a basic performance of the model.

- Other predictors are selected except for temperature, such as wind or lower relative humidity.

  ✓ To prevent the "multicollinearity" problem, poorly correlated predictors are recommended to be selected.

For example;

o "*850-hPa temp.*" and "*850-hPa meridional wind*"

x "*850-hPa temp.*" and "700-*hPa temp.*"

(Hint) Recommended combination of predictors (2)

For ***Precipitation*** forecast,

- One predictor is recommended to be set to be set as "Rainfall".
  - ✓ At first, I recommend to select rainfall only (one-predictor) and to check up the forecast skill as a basic performance of the model.

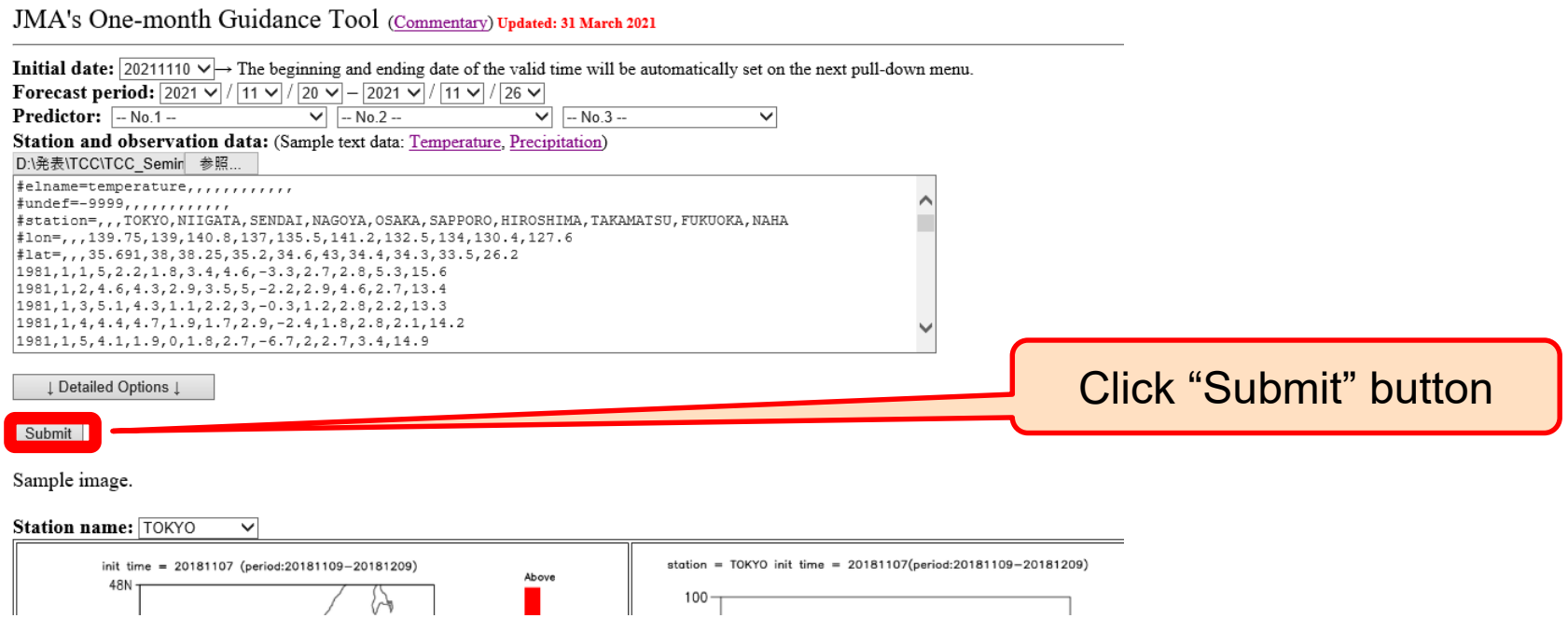
- Other predictors are selected depending on locality, such as the lower-tropospheric wind to consider terrain conditions.

For example;
- "Rainfall" and "850-hPa meridional wind"
- "Rainfall" and "850-hPa zonal wind"

2.2. Produce guidance and get the outputs

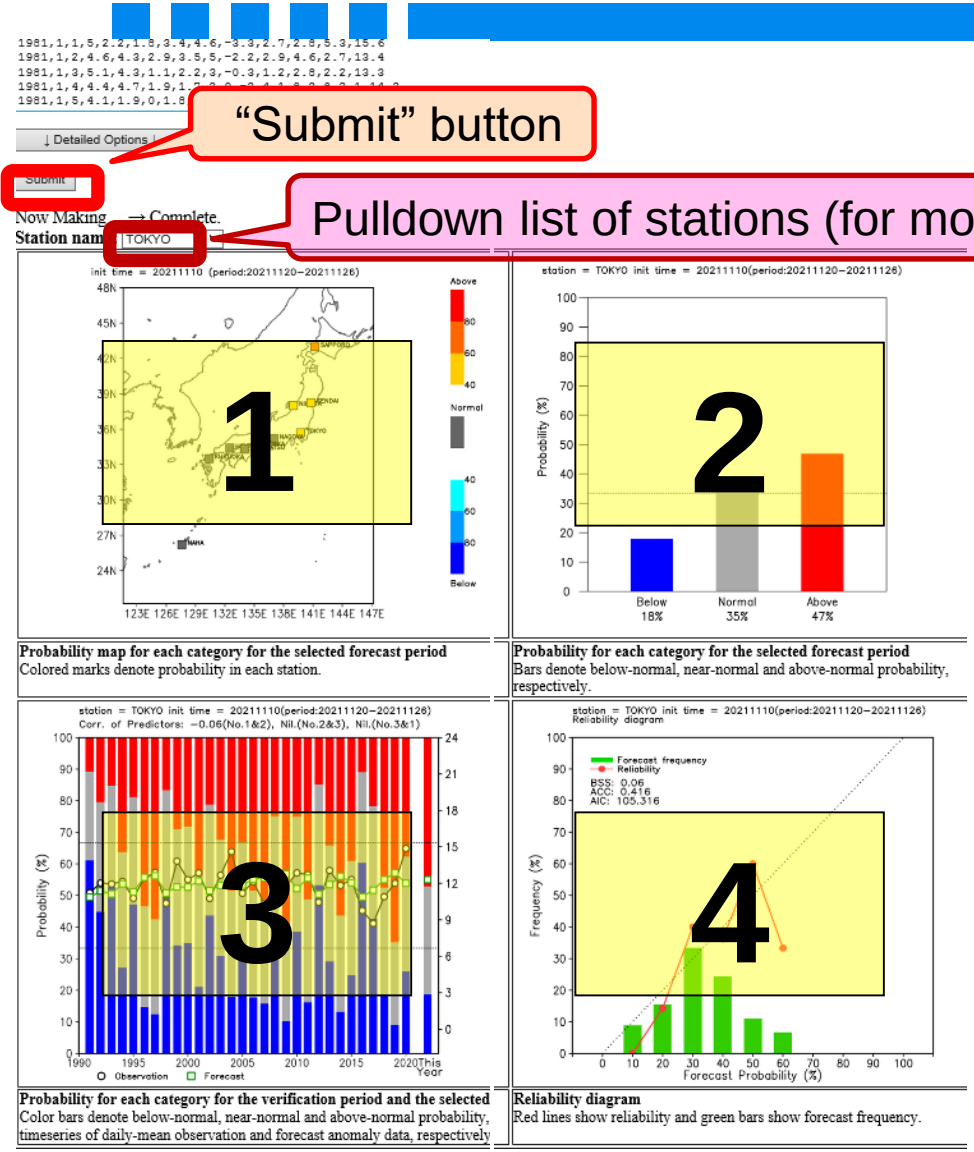
(2) Execute calculation of guidance

- Click “Submit” button, and calculate the guidance automatically.
  - ➢ After a short time, the tercile probabilities and forecast skill are output (as illustrated below)



2.2. Produce guidance and get the outputs

(3) Output of the guidance tool



After click the "submit" button, the following 4 charts are displayed.

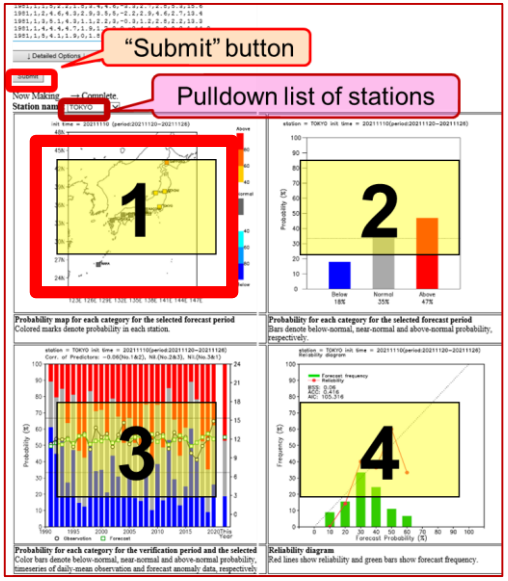
1. Color-coded probability map
2. Tercile probability forecast for the station
3. Inter-annual time series of tercile probability during the verification period
4. Verification scores and the reliability diagram

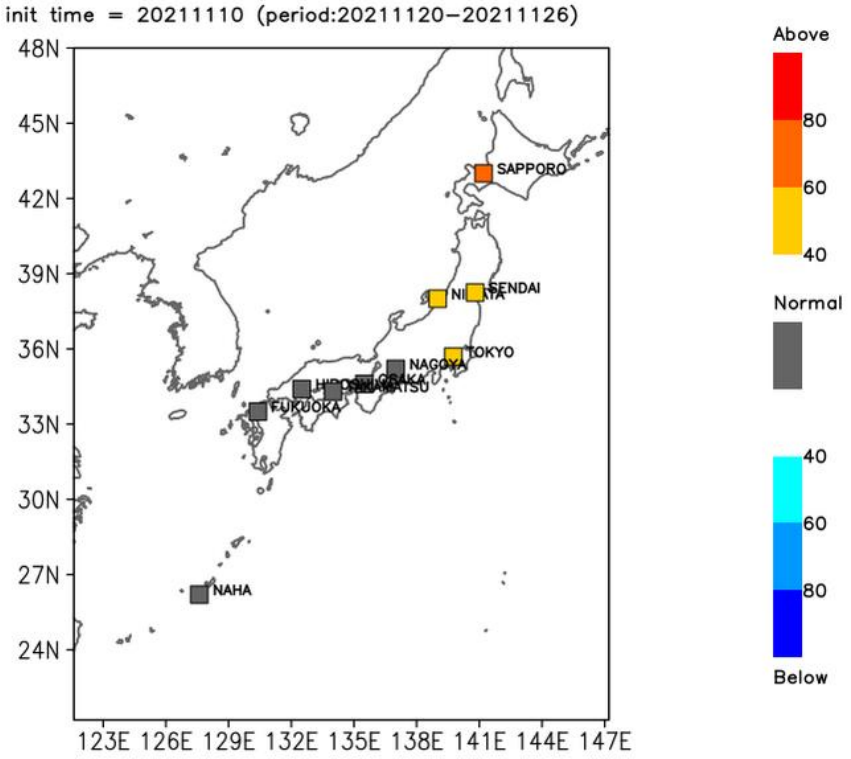
2.2. Produce guidance and get the outputs

Output-1; Color-coded probability map

1. Color-coded probability map (upper left)

- Illustrate the most–likely category and probability for all station on a map



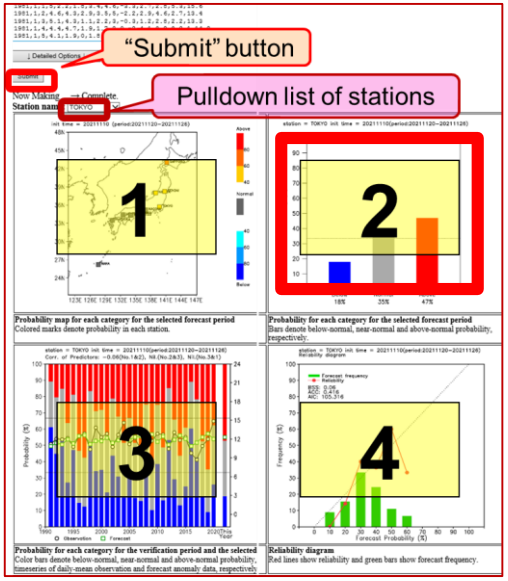


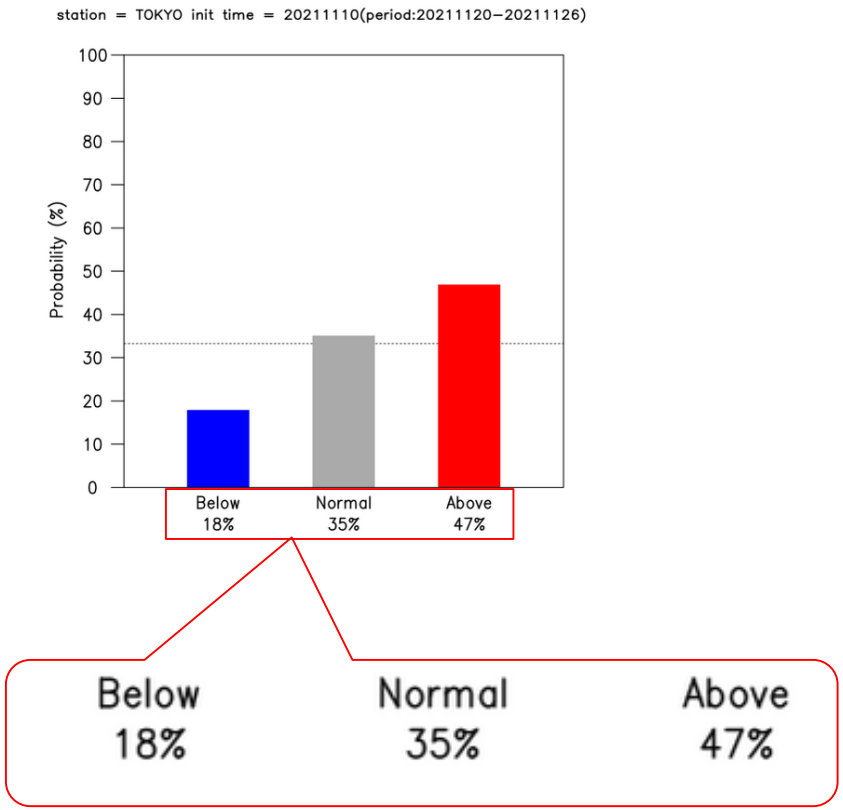
2.2. Produce guidance and get the outputs

Output-2; Tercile probability forecast for the station

2. Tercile probability forecast at the station (upper right)

- Illustrate the tercile probabilities for the selected station



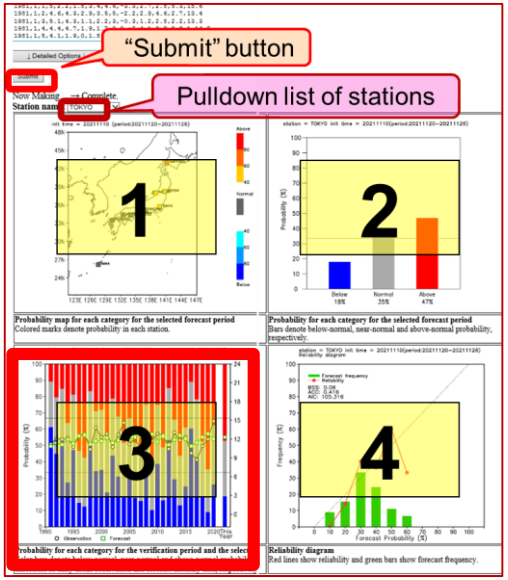


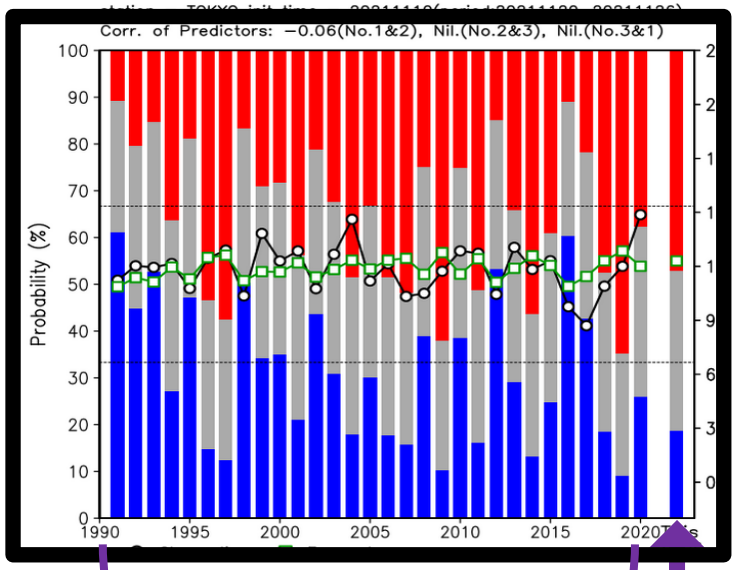
2.2. Produce guidance and get the outputs

Output-3; Inter-annual time series of tercile probability

3. Inter-annual time series of tercile probability during the verification period (below left)

✓ Check up past prediction result for the noticeable year.

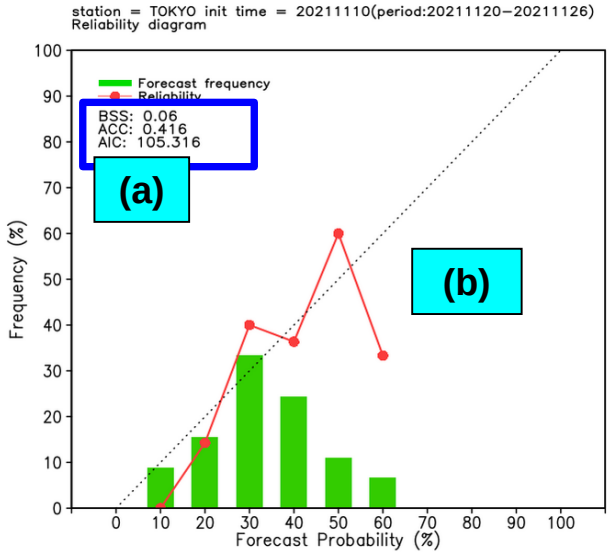


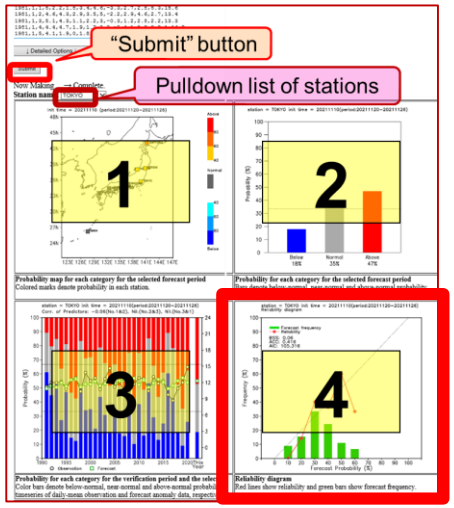


Colored-bars: Tercile probability
: Anomaly of daily-mean obs.
: Anomaly of daily-mean forecast

2.2. Produce guidance and get the outputs

Output-4; Verification scores and the reliability diagram





4. <u>Verification scores and the reliability diagram</u> (below right)

(a) Check up the verification scores
- ACC (Anomaly correlation coefficient)
- BSS (Brior skill score)

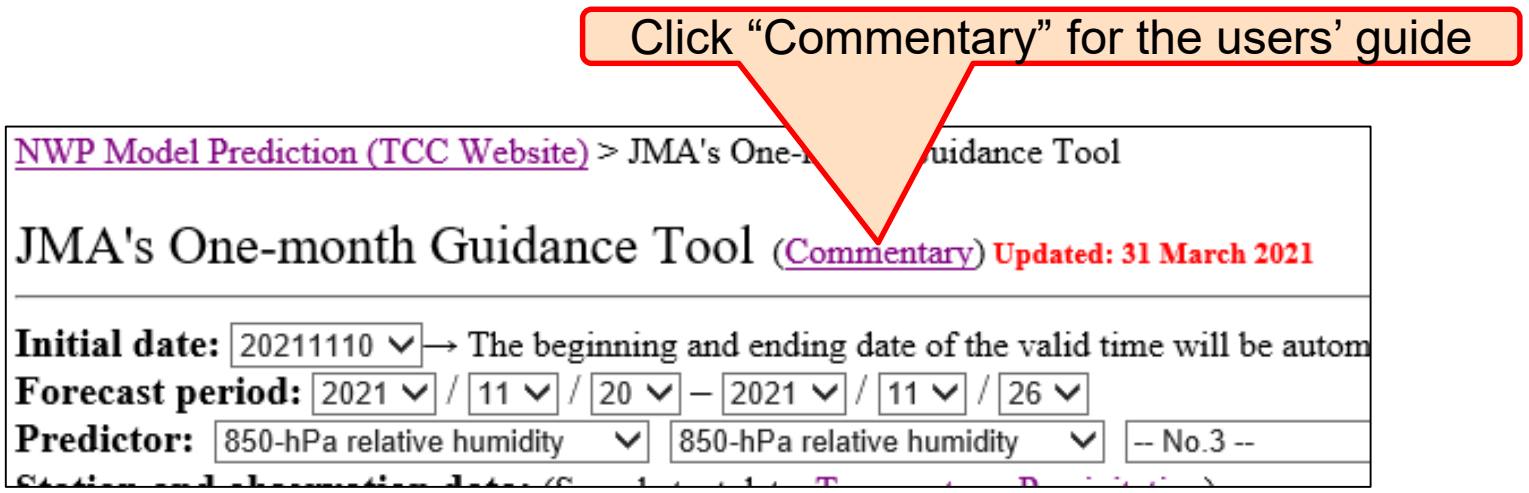
BSS: 0.06
ACC: 0.416
AIC: 105.316

- ACC is the most important score (as an indicator of the skill of tendency forecasting)
- Nextly, BSS (the skill of probabilistic forecasting)

(b) Check up the reliability diagram
- ✓ Whether the reliability curve has a positive slope
- ✓ How much does the reliability curve fit to 45˚line (perfect reliability)

Users' Guide

- *Online user guides* are also available for more details on the guidance tool.
  - ✓ https://extreme.kishou.go.jp/tool/simple_guidance/help/
- If you have any questions for the guidance tool, please feel free to ask the TCC staffs.



Content

2 Dec.	Introduction of the forecast products on TCC Web • Forecast maps • Guidance tool	lecture
	Explanation of the exercise	lecture
	Example of constructing one-month forecast	lecture
3 to 6 Dec.	Generating one-month forecast for your own region - Preparation of the presentation	exercise
7 Dec.	Presentation by participants	**presentation!**

Outline of the exercise

Goal:

- Making One-month forecast using the model and the guidance

Model's initial date: 24 Nov. 2021

Forecast period:

- 27 Nov. - 24 Dec. 2021 (4 weeks mean)

Forecast target:

- Tercile probabilities of mean temperature and total precipitation

Presentation Session

- 7 Dec. 2021 Tuesday
- **8 min.** per person (5min. talk + 3 min. QA)
  - Presentation order: Reverse alphabetical order of region name.
    - 14:00-15:00 (UTC+9) **V**iet Nam – Nepal
    - 16:00-17:00 (UTC+9) **M**ongolia – **B**angladesh

Please upload your presentation material to the designated storage by 6 Dec. at 17:00.

Points of your presentations

◆ **Please use the TEMPLATE for creating the presentation file.**

- Forecasting materials
- Evaluate the model forecast map (focused on your region) ***(one-slide)***

Due to time limitation for presentation, please illustrate briefly focus on your region.
(Skip explanation of the global circulation, although it is essential for forecasting.)

  - Results of the guidance ***(one-slide)***
    - Illustrate the result of the guidance, selection of predictors and verification scores (i.e., ACC, BSS).
- Discussion and conclusion (final forecast) ***(one-slide)***
    - Is the guidance consistent with the model results?
    - Consider the necessity of modification of the guidance probabilities.
    - Consider backgrounds your final forecast (the reason of warm(cold) or wet (dry) tendencies).

➢ Present the tercile probabilities as your conclusion.

Tercile probabilities

For simplifying, probabilities should be allocated with **10% unit**.

Above normal

Near normal

Below normal

Note

- ✓ Not considered a dipole pattern (ex. 40:20:40), because of the assumption of normal distribution.
- ➢ In such case, probabilities should be close to climatological probability (i.e. 33:33:33), considering large uncertainty.

Content

2 Dec.	Introduction of the forecast products on TCC Web • Forecast maps • Guidance tool	lecture
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7 Dec.	Presentation by participants	**presentation!**

Setting the example of one-month forecast

Same as the exercise

- Initial time of the model; 24 Nov 2021 (Wed.)
- Forecast target period; 27 Nov. to 24 Dec. (4 weeks mean)

- Forecast element; Temperature, Precipitation
- Forecast point; Fukuoka (130.4˚E, 33.5˚N)

Western Japan

■ Workflow of constructing forecast

1. Evaluate the forecast maps
2. Creating the guidance
3. Decide the forecast

■ Workflow of constructing forecast

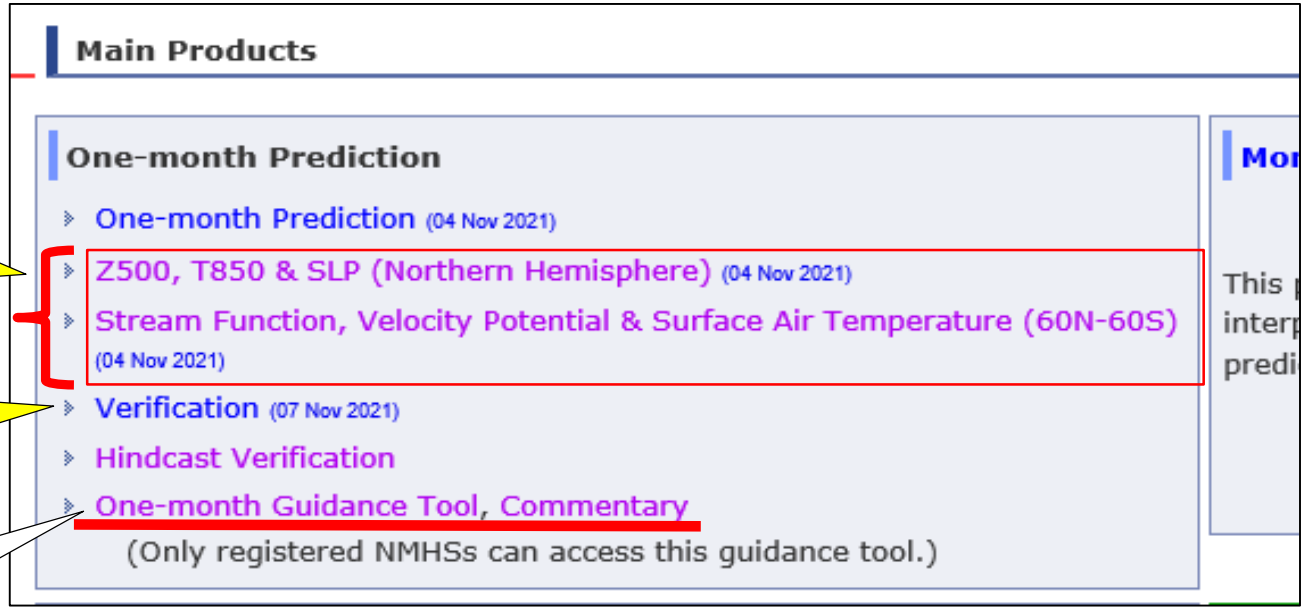
1. Evaluate the forecast maps
2. Cr[illegible]g the guidance
3. [illegible]recast

- The presentation of the exercise will skip illustration and explanation about general circulation field of the forecast map.
- Thereupon, here, we will look check up the general circulation field.

Forecast maps

Hindcast verification

Guidance tool



Model forecast maps (1) SST, Precipitation

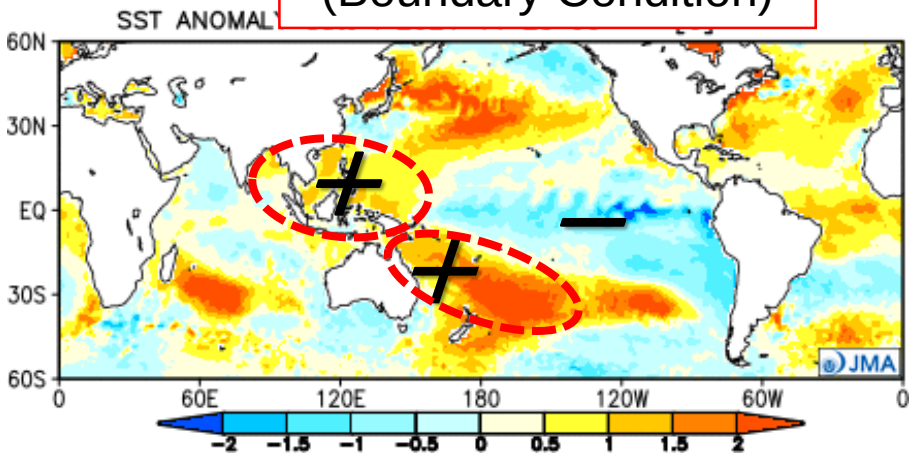
Forecast Maps

forecast period
28 days mean

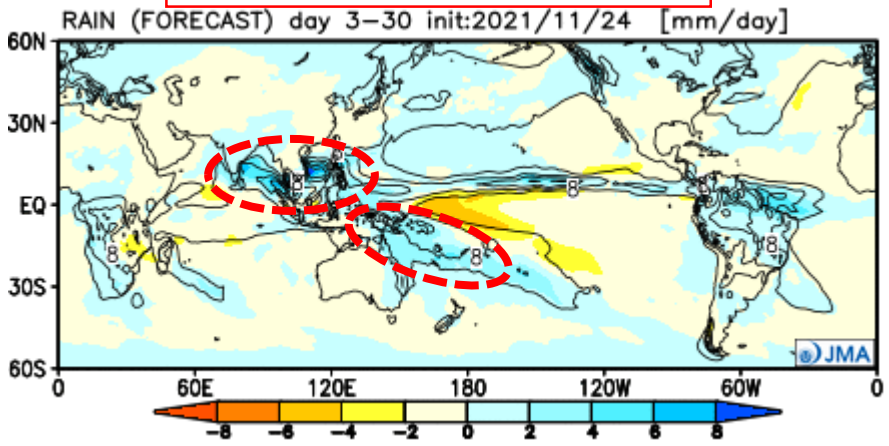
Week-1 to -4

initial date
2021.11.24.12 Z

Prescribed SST (Boundary Condition)



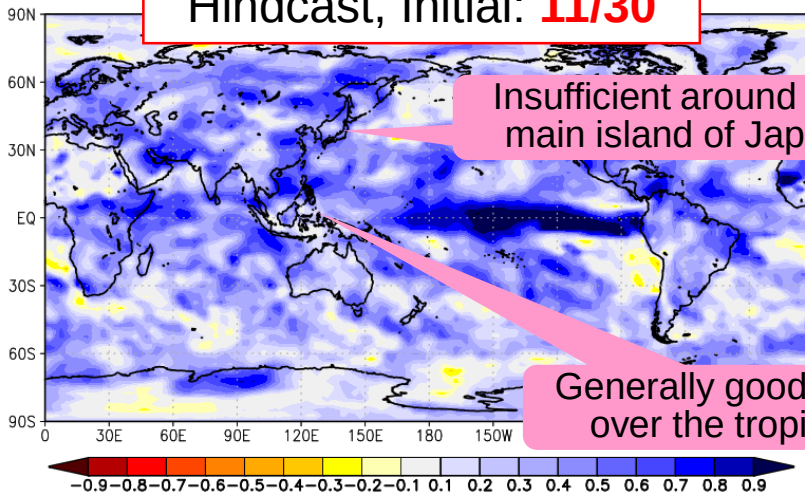
Precipitation



La Niña – like pattern +
Positive SST anomalies
- from the Bay of Bengal to the western North Pacific Sea
- western South Pacific

Above normal precipitation
- from the Southeast Asia to the east of the Philippines
- western South Pacific

ACC (precipitation)
Hindcast, Initial: **11/30**

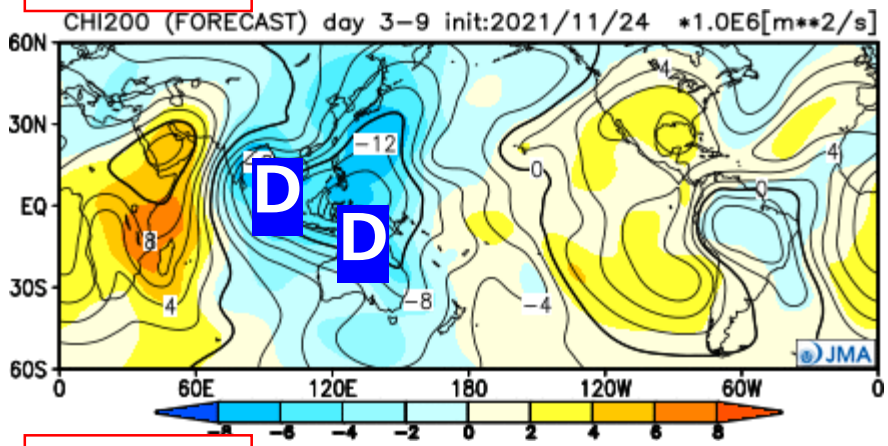


Insufficient around the main island of Japan

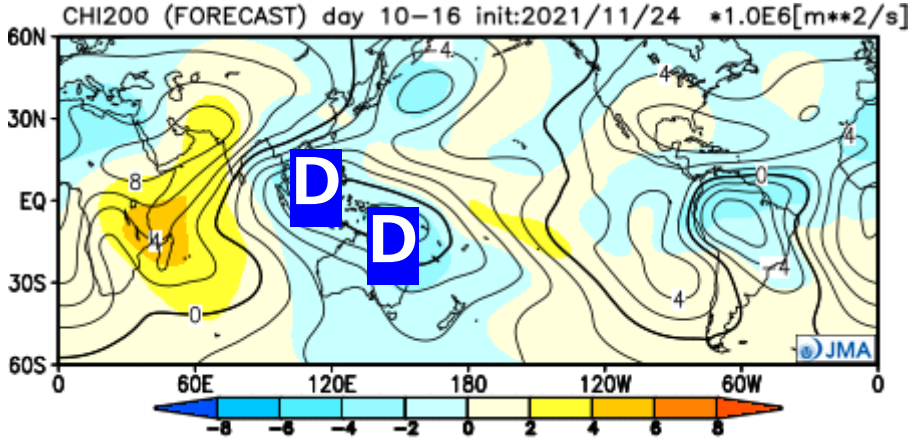
Generally good skill over the tropics

Model forecast maps
(2) MJO (Velocity Potential at 200hPa)

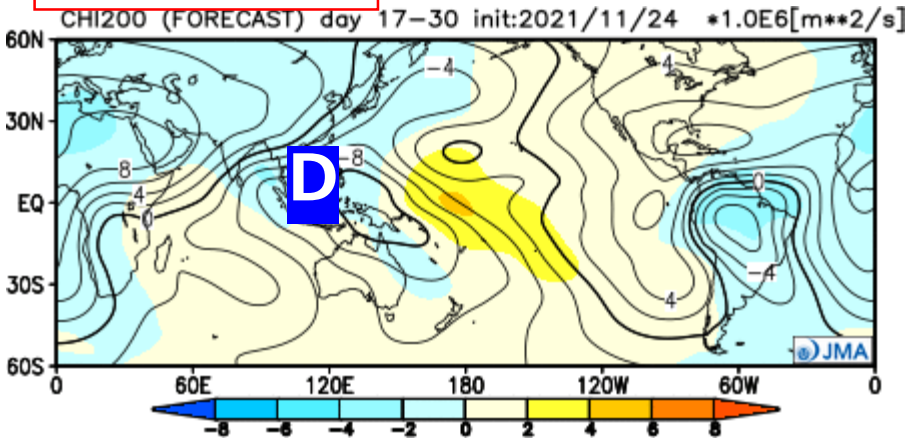
Week-1



Week-2



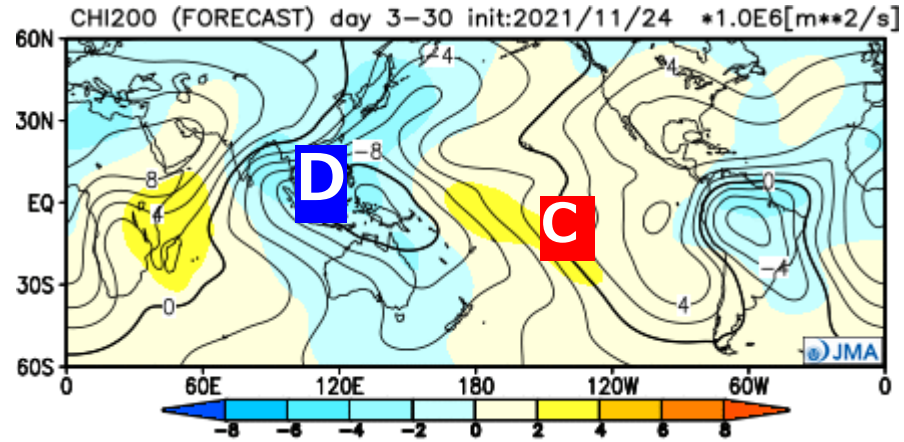
Week-3 to -4



- As the base, **enhanced convective activities** (i.e., upper divergent anomalies) are predicted around Southeast Asia throughout the forecast period, consistent with the La Niña – like SST pattern.
- Overlapping the above, up to around week-2, convection is predicted to be enhanced in western South Pacific.

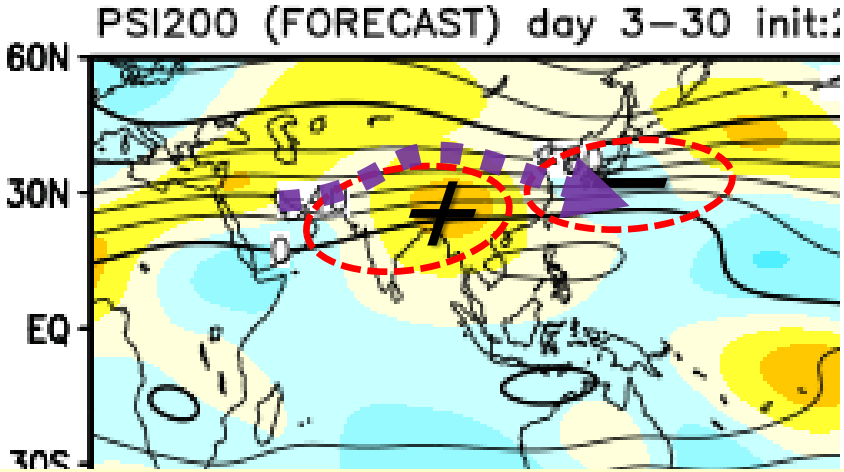
Model forecast maps
(3) Upper circulation fields over the Tropics

200 hPa velocity potential



- **Enhanced convections** is expected over the South East Asia, (i.e., upper divergent anomalies)

200 hPa stream function



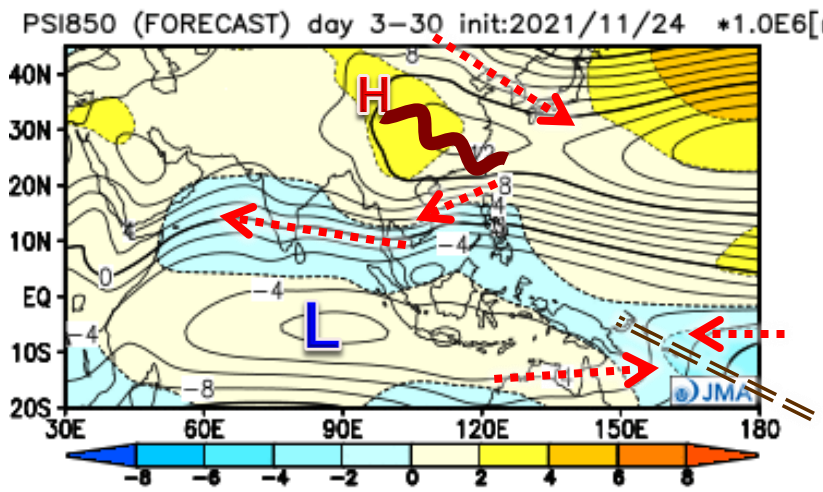
- The wave train along the subtropical jet stream

(Upper anti-cyclonic circulation anomalies over south of Tibet and cyclonic anomalies over Japan.)

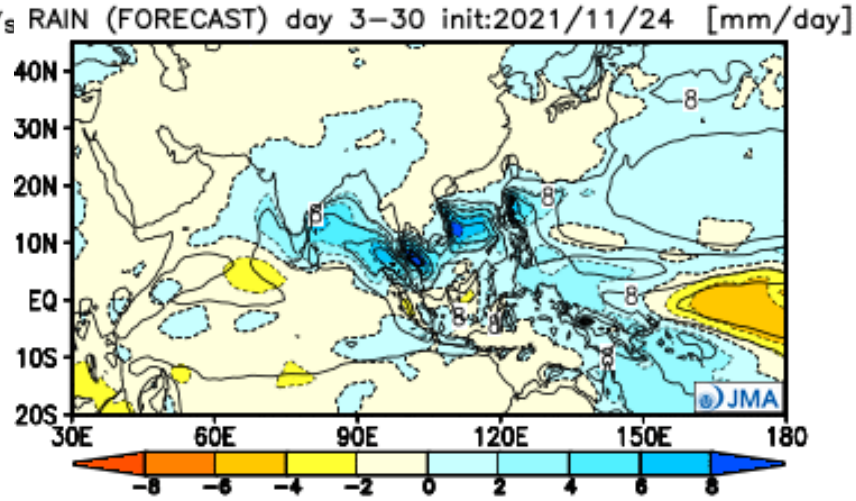
- From southeast to east Asia, upper **northwesterly flow** is expected to be enhanced, which might favor strong winter monsoon.

Model forecast maps
(4) Lower circulation fields over the Tropics 1

850 hPa stream function



Precipitation



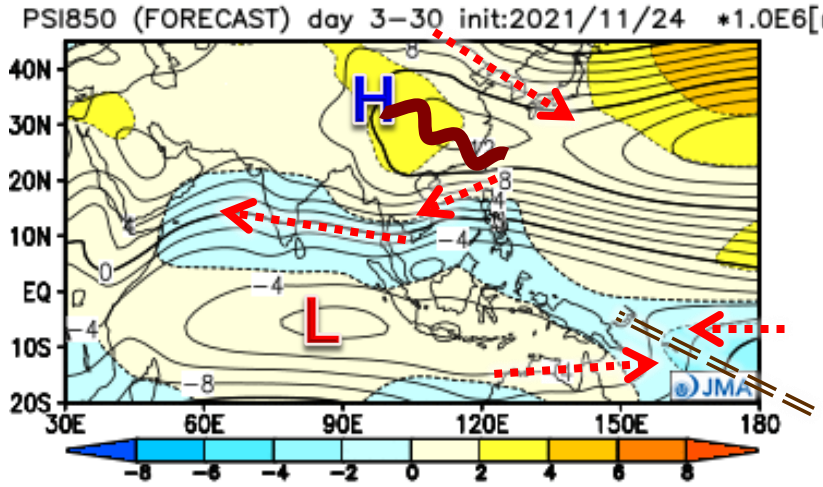
- From South Asia to Southeast Asia, **lower cyclonic anomalies** are predicted, in association with active convections over this region.

This is only from the large-scale viewpoint.

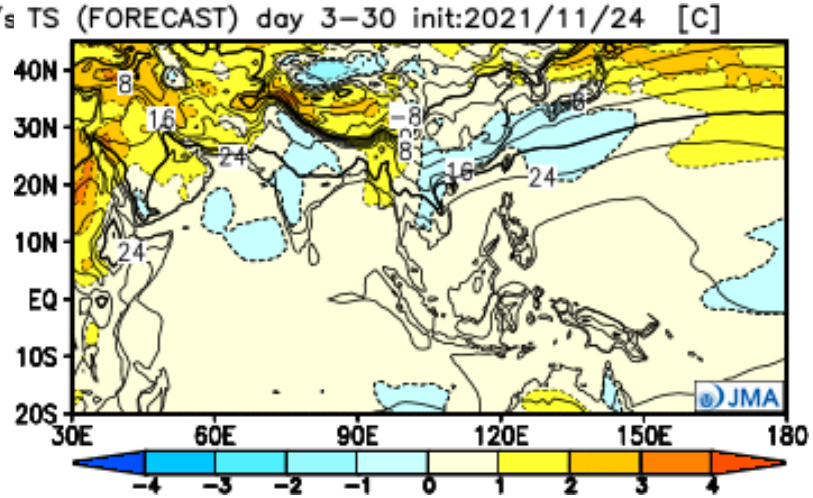
- **Please consider the regional climate influence of the lower wind anomalies.**

Model forecast maps
(5) Lower circulation fields over the Tropics 2

850 hPa stream function



Surface temperature



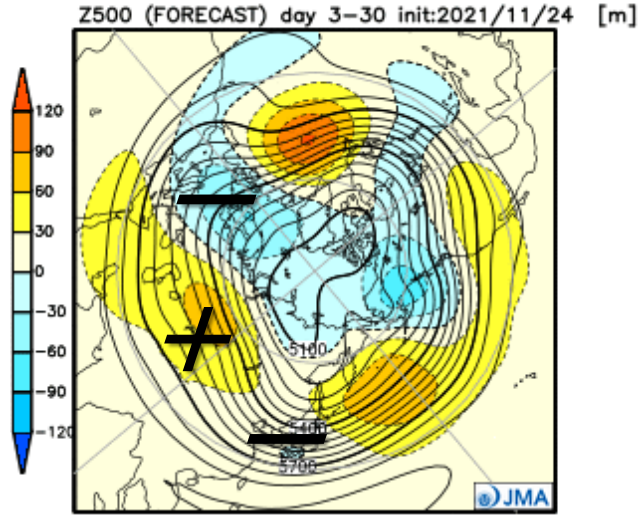
- The Siberian High is expected to expand southward toward southern part of East Asia, which may relating with the meanderings of the jet stream partly .
- These tendencies bring low temperatures from Southeast Asia to southern part of East Asia.

This is only from the large-scale viewpoint.

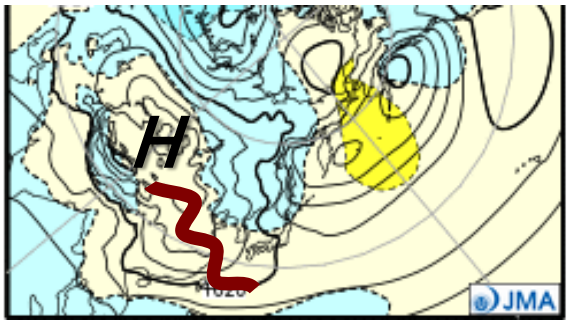
➢ **Please consider regionally scale situations in the exercise.**

Model forecast maps
(6) Mid-high latitudes

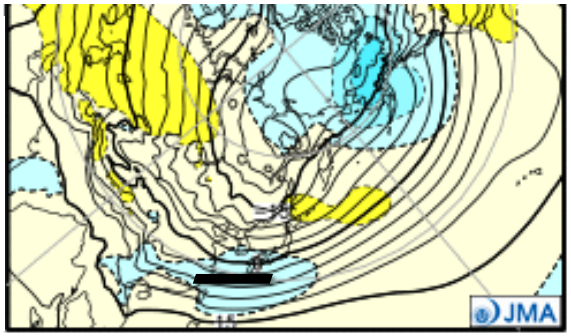
500 hPa geopotential height



Sea level pressure



850 hPa temperature

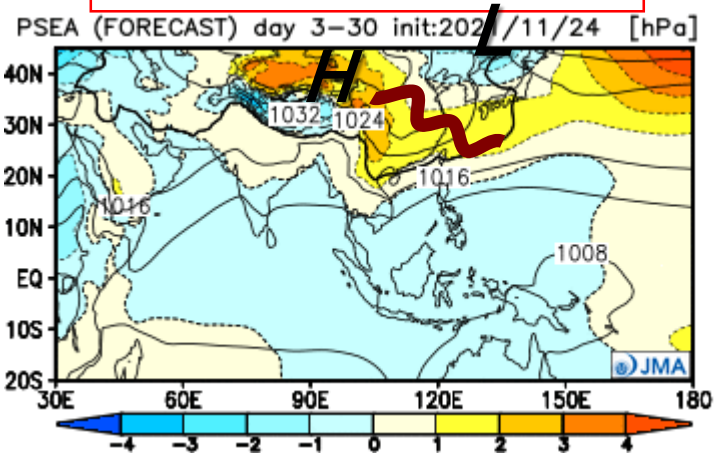


- In association with **the meanderings of the polar jet stream** (left figure), the **Siberian High** is predicted to be **stronger than normal** over the continent interior and to be **expanded southeastward** toward the south part of East Asia, which brings **low temperatures** around the regions.

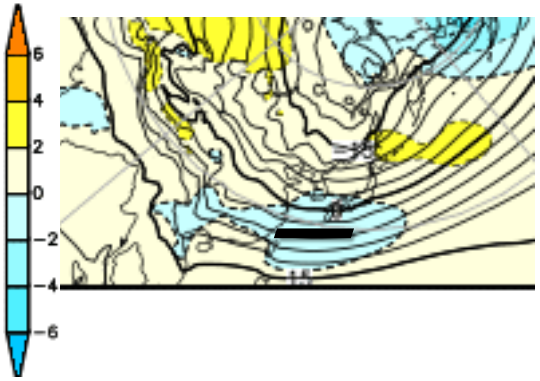
This is only from the large-scale viewpoint.
- **Please consider regionally scale situations in the exercise.**

Model forecast maps
(7) Around Japan

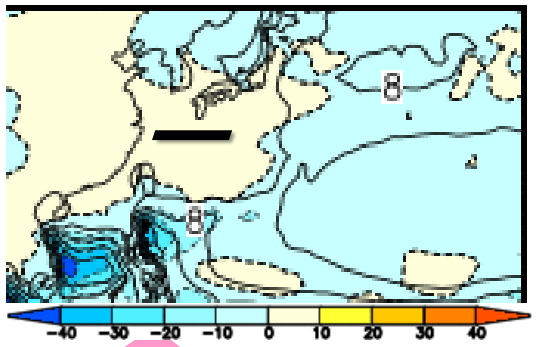
Sea level pressure



850hPa temperature



Precipitation

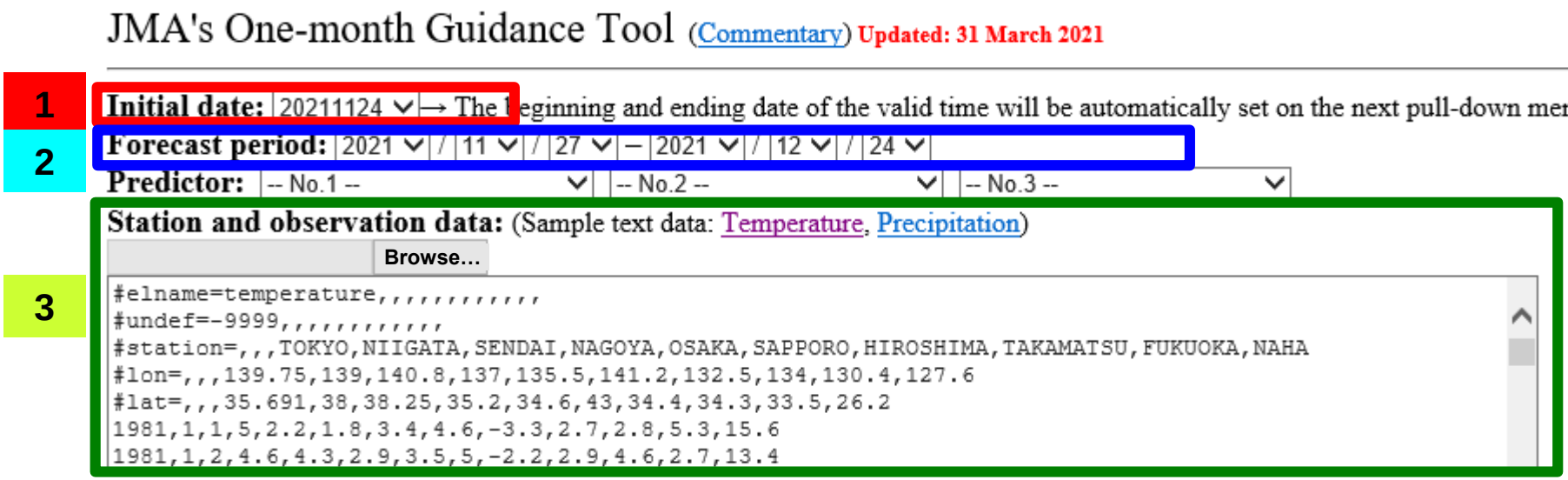


Need to consider insufficient skill around Japan (according to the verification of the hindcast)

- The model predicts strong winter monsoon pattern, including <u>southward expansion of the Siberian High.</u>
- In association with this, **below normal temperatures** and **below normal precipitation** over south part of Japan (including Fukuoka) are predicted.
- Although precipitation skill of precipitation is insufficient, <u>predicted dry tendencies are reliable</u> considering the southward expansion of the Siberian High.

- Workflow of constructing forecast
  1. Consider of the forecast maps
  2. Creating the guidance
  3. Decide the forecast

Setting of the guidance tool (Preparation of creating guidance)



① Setting the initial date (24 Nov 2021)
② Setting the forecast target period (27 Nov. to 24 Dec.)
③ Input the observation data

- Initial time of the model; 24 Nov 2021 (Wed.)
- Forecast target period; 27 Nov. to 24 Dec. (4 weeks mean)

Select the “predictor” (for temperature)

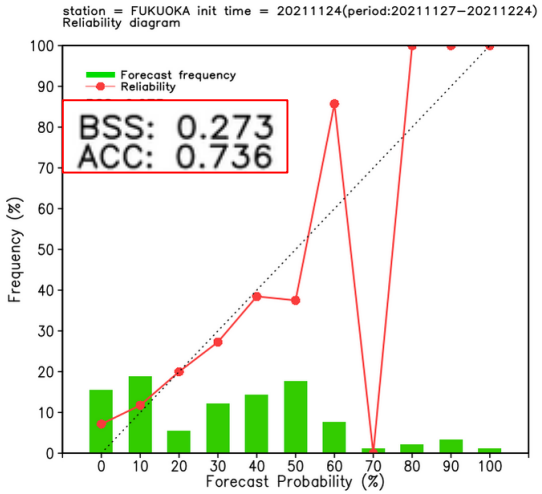
JMA's One-month Guidance Tool (Commentary) **Updated: 31 March 2021**

Initial date: 20211124 → The beginning and ending date of the valid time will be automatically set on the next pull-down menu.

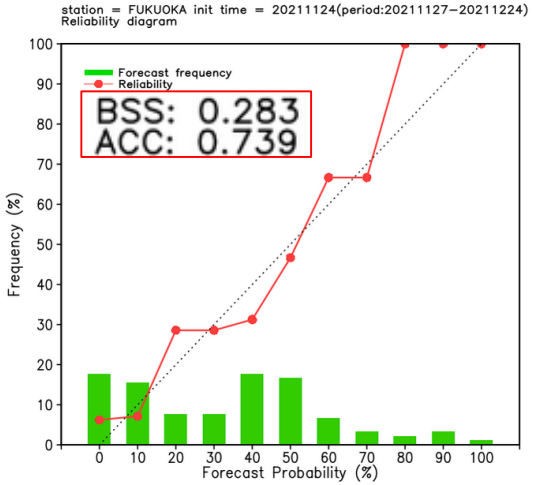
Forecast period: 2021 / 11 / 27 – 2021 / 12 / 24

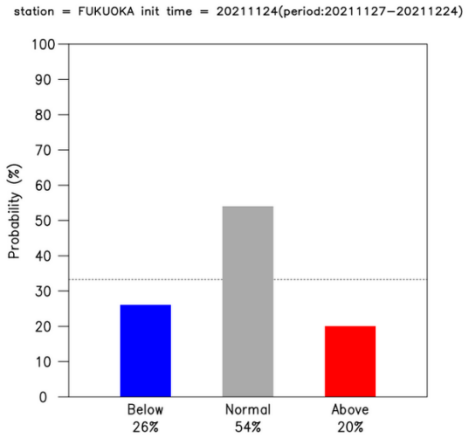
Predictor: 850-hPa temperature | 850-hPa meridional wind | -- No.3 --

Case-1;
“850-hPa temp.” only
(single regression)



Case-2;
“850-hPa temp.” and “850-hPa meridional wind”





- “850-hPa temp.” and “850-hPa meridional wind” are selected in the example.
- The guidance has fair verification scores (ACC and BSS) and generally reliable for below 60%.

Select the “predictor” (for precipitation)

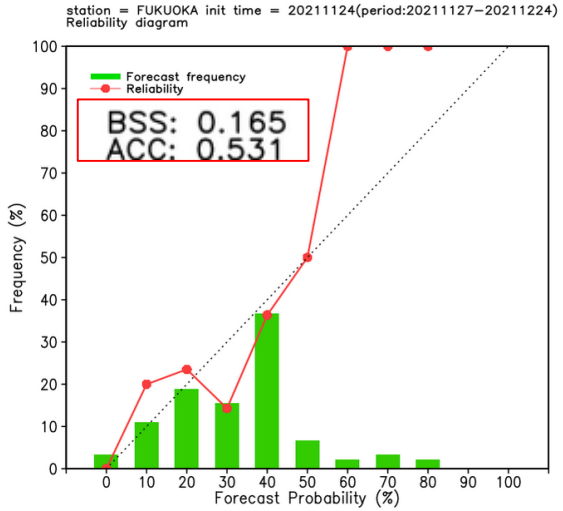
JMA's One-month Guidance Tool (Commentary) **Updated: 31 March 2021**

Initial date: 20211124 → The beginning and ending date of the valid time will be automatically set on the next pull-down menu.

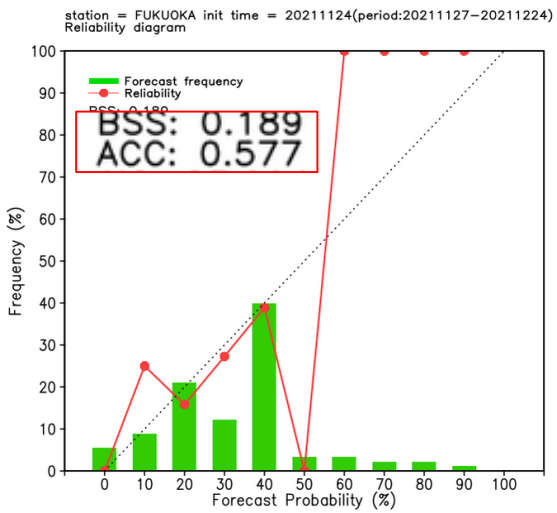
Forecast period: 2021 / 11 / 27 – 2021 / 12 / 24

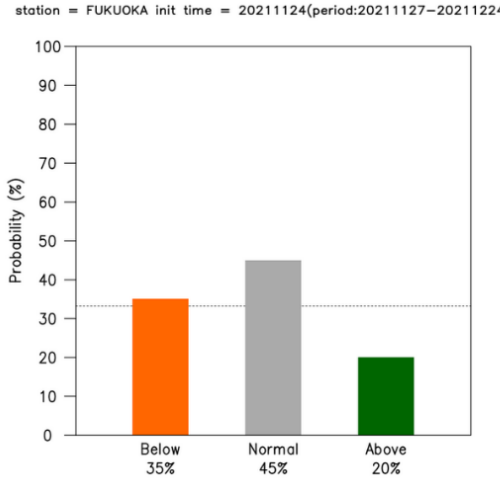
Predictor: Rainfall | 850-hPa zonal wind | -- No.3 --

Case-1;
“rainfall” only
(single regression)



Case-2;
“rainfall” and “850-hPa zonal wind”

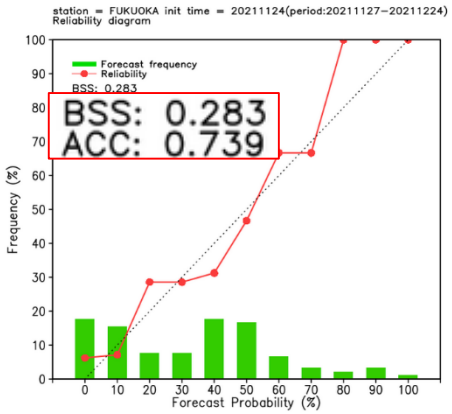


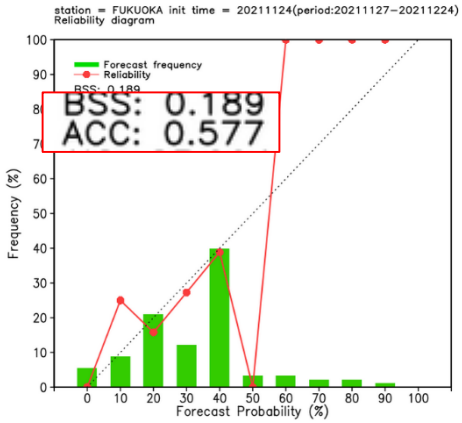


- “rainfall” and “850-hPa zonal wind” are selected in the example.
- The guidance has fair verification scores (ACC and BSS), but frequency of high probability (over 50%) is not so high.

Output of the guidance

	Temperature			Precipitation		
Predictors	850-hPa temperature 850-hPa meridional wind			Rainfall 850-hPa zonal wind		
Scores	ACC: 0.739		BSS: 0.283	ACC: 0.577		BSS: 0.189
Output (guidance)	B: 26%	N: 54%	A: 20%	B: 35%	N: 45%	A: 20%





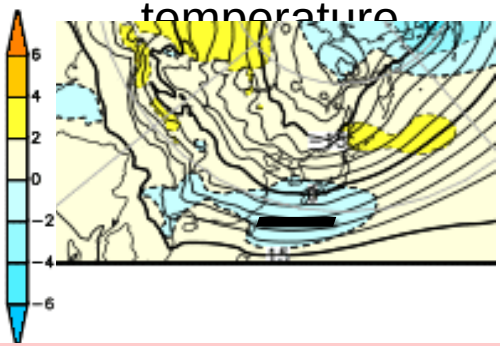
- ACCs for both temperature and precipitation are good.
- Reliability curves show that the skill of high probability (>60%) is a little poor.

- Workflow of constructing forecast
  1. Consider of the forecast maps
  2. Creating the guidance
  3. Decide the forecast

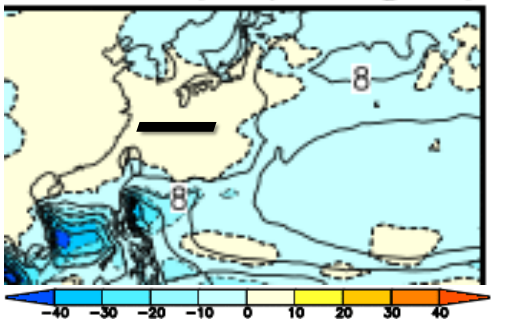
Consideration

	Temperature			Precipitation		
Output (guidance)	B: 26%	N: 54%	A: 20%	B: 35%	N: 45%	A: 20%

850hPa temperature



Precipitation



The user should consider **validity** of the guidance and modify the probability if necessary.

- Temperature
  - Guidance predicts near normal temperature, while the model predicts below normal.
  - Considering the southward expansion of the Siberian High, low temperature tendency predicted the model is more agreeable than the guidance.
    - ➢ Below normal probability is modified and increased to 40%.
- Precipitation
  - Both the model and the guidance predict below normal tendency.
    - ➢ Below normal tendency is expected (40%).

Conclusion

	Temperature			Precipitation		
	Below Normal	Near Normal	Above Normal	Below Normal	Near Normal	Above Normal
Fukuoka	40%	40%	20%	40%	40%	20%
(Model)	Negative anomaly			Negative anomaly		
(Guidance)	26%	54%	20%	35%	45%	20%

- The Siberian High is expected to southward toward south part of Japan. Low pressure systems are expected to inactive around the south part of Japan.
- Therefore, cold tendencies and dry tendencies are expected.

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