Tokyo Climate Center, Japan Meteorological Agency

TCC News

Summer 2020

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Climate Characteristics of Record-heavy Rain and Record-low Sunshine Durations in Japan in July 2020

TCC issued a press release regarding climate characteristics of Record-heavy Rain and Record-low Sunshine Durations in Japan in July 2020. An abstract of the press release and the download link for the full article are as follows.

- In July 2020, western to northeastern Japan experienced record-heavy rain and record-low sunshine durations.
- The month was characterized by a remarkable series of heavy rainfall events from western to eastern Japan from 3rd to 31st July. In some areas, monthly precipitation totals exceeded 2 to 2.4 times the climatological normal, making the period the wettest since 1946 when records began.
- These phenomena are attributed to a continued tendency for large amounts of water vapor to concentrate around western and eastern Japan from two major flows – one from the west along the Meiyu-Baiu front, which stagnated along mainland Japan due to delayed northward migration of the subtropical jet stream, and the other from the south along the periphery of the North Pacific Subtropical High, which extended southwestward of its climatological extent.
- A persistent upper-level trough over the Yellow Sea also caused an intensification of Meiyu-Baiu front activity with enhanced vertical upward flow over western and eastern Japan, resulting in prolonged heavy rain.
- The delayed northward migration of the subtropical jet stream and the southwestward expansion of the North Pacific Subtropical High may be attributable to higher-than-normal sea surface temperatures (SSTs) in the Indian Ocean and related inactivity of the Asian summer monsoon.

URL: https://ds.data.jma.go.jp/tcc/tcc/news/press_20200916.pdf

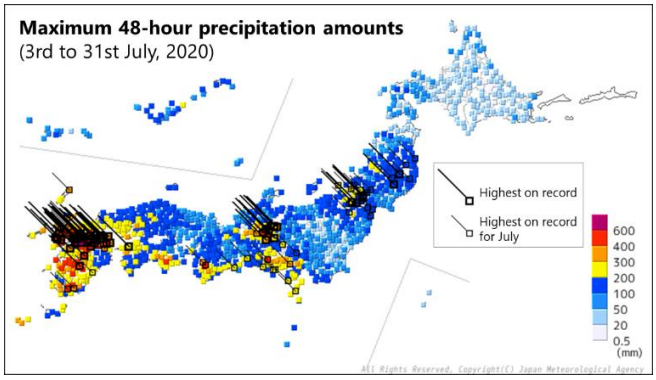

Figure 1-1. Maximum 48-hour precipitation amounts (3rd to 31st July, 2020)

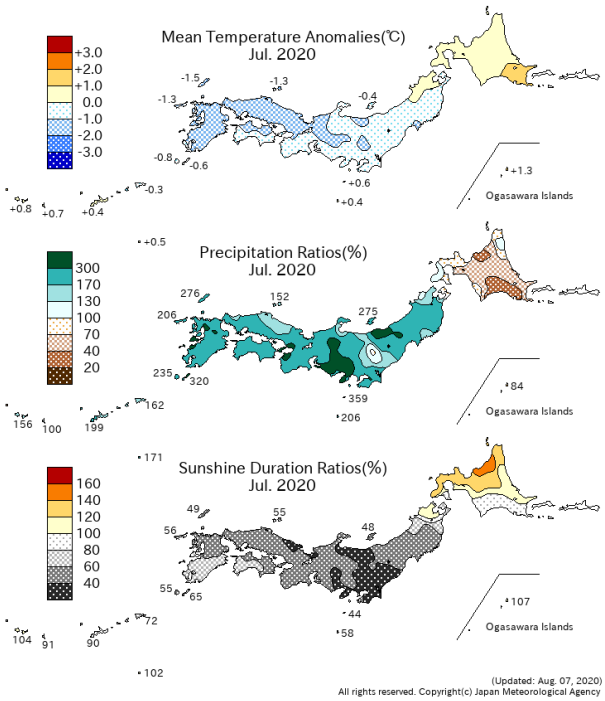

Figure 1-2. Mean temperature anomalies, precipitation ratios and sunshine duration ratios for July 2020.

The base line period for the normal is 1981 –2010

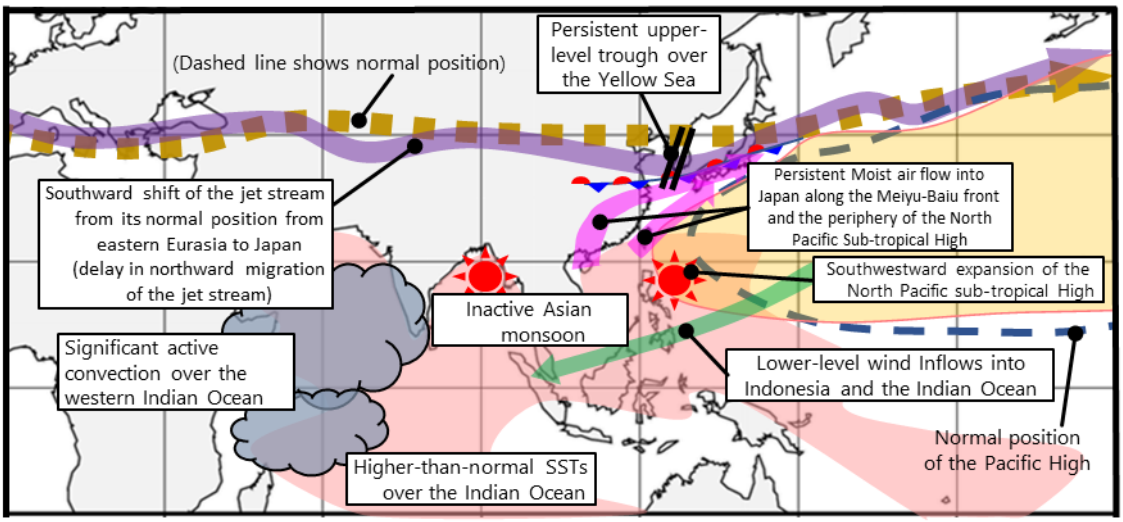

Figure 1-3. Atmospheric circulation conditions associated with the climate extremes observed in July 2020

(OIKAWA Yoshinori and MOCHIZUKI Yasushi, Tokyo Climate Center)

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TCC's forecasting gridded dataset FAQ

As part of the Japan Meteorological Agency's WMO World Meteorological Centre (WMC) duties, JMA operates ensemble prediction systems based on an atmospheric global circulation model (AGCM) for one-month prediction and an atmosphere-ocean coupled global circulation model (CGCM) for prediction covering periods up to six months. These are available online via the Tokyo Climate Center (TCC) website. This article provides answers to frequently asked questions TCC receives regarding these forecasting gridded datasets from National Met Service experts and others, such as information on elements highlighted, initial dates and automatic dataset downloading.

*Note: Access to products on the TCC website is exclusive to National Meteorological and Hydrological Services. Eligible parties should access the TCC request page at https://ds.data.jma.go.jp/tcc/tcc/products/model/Application.html.

Information provided

As of September 2020, TCC provides the following forecasting gridded datasets at https://ds.data.jma.go.jp/tcc/tcc/gpv/index.html:

- One-month forecast
  - Horizontal resolutions: 1.25 and 2.5 degrees
    - ✧ As provision of lower-resolution 2.5-degree data will be terminated by 2021 or thereafter, TCC recommends the use of 1.25-degree data.
  - Ensemble statistics[1] (ensemble mean values and its anomaly from model climatology) [link]
    - ✧ Ensemble size: 50
    - ✧ Update frequency: every Thursday
    - ✧ Initial day: 00 UTC of every Wednesday
    - ✧ Forecast time: second day from the initial day and up to 32 days ahead
    - ✧ Format: GRIB2
    - ✧ Elements:

Name of the elements	Levels (hPa)
Sea level pressure*1 and the anomaly [Pa]	-
Daily mean precipitation and the anomaly [mm day-1] Day field: 00 UTC-00 UTC	-
Temperature*1 and the anomaly [K]	Surface, 850, 700
Relative Humidity [%]	850
Geo-potential height*1 and the anomaly [m]	500, 100
Wind (u, v) [m s-1]	850, 200
Stream function and the anomaly [m2 s-1]	850, 200
Velocity potential and the anomaly [m2 s-1]	200

*Climatology was calculated from hindcast experiment (1981-2010).

[1] Shown as "Statistics" on the index page.

*1 The geo-potential height, sea level pressure and temperature are calibrated by subtracting systematic error from direct model output.

- ✧ Dataset files are provided per element.

➢ Individual ensemble members [link]

- ✧ Ensemble size: 50
- ✧ Update frequency: every Thursday
- ✧ Initial days: 00 and 12 UTC of every Tuesday and Wednesday
- ✧ Forecast time: from the base time and up to 33 days ahead
- ✧ Format: GRIB2
- ✧ Elements:

Name of the elements	Levels (hPa)
Sea level pressure*1 [Pa]	-
Daily mean precipitation [mm day-1] Day field: 00 UTC-00 UTC	-
Temperature*1 [K]	Surface, 1000, 850, 700, 500, 300, 200, 100
Relative Humidity [%]	1000, 850, 700, 500, 300
Geo-potential height*1 [m]	1000, 850, 700, 500, 300, 200, 100
Wind (u, v) [m s-1]	1000, 850, 700, 500, 300, 200, 100
Stream function [m2 s-1]	850, 200
Velocity potential [m2 s-1]	200

*1 The geopotential height, sea level pressure and temperature are calibrated by subtracting systematic error from direct model output.

- ✧ Dataset files are provided per element.

➢ Datasets of systematic error [link]

- ✧ Initial days: every 15th and days of the end of the months
- ✧ Format: GrADS (the binary data filled with 4-byte real numbers)
- ✧ Elements:

Name of the elements	Levels (hPa)
Sea level pressure*1 [Pa]	-
Temperature*1 [K]	Surface, 1000, 850, 700, 500, 300, 200, 100
Geo-potential height*1 [m]	1000, 850, 700, 500, 300, 200, 100

➢ Hindcast (reforecast) dataset [link]

- ✧ Ensemble size: 13
- ✧ Hindcast periods: Jan 1981 to Dec 2019
- ✧ Initial days: every 15th and days of the end of the month
- ✧ Format: GRIB2
- ✧ Elements:

Name of the elements	Levels (hPa)
Sea level pressure*1 [Pa]	-
Daily mean precipitation [mm day-1]	-

Day field: 00 UTC-00 UTC	
Temperature*1 [K]	Surface, 1000, 850, 700, 500, 300, 200, 100
Relative Humidity [%]	1000, 850, 700, 500, 300
Geo-potential height*1 [m]	1000, 850, 700, 500, 300, 200, 100
Wind (u, v) [m s-1]	1000, 850, 700, 500, 300, 200, 100
Stream function [m2 s-1]	850, 200
Velocity potential [m2 s-1]	200

- Six-month forecast
  - Since September 2020, TCC has provided three-month, warm-/cold-season and six-month prediction seasonal forecasting datasets. However, the Center plans to migrate to only six-month forecast data and terminate provision of three-month and warm-/cold-season prediction datasets by the end of 2021. Accordingly, the use of six-month forecast data is advised.
  - Ensemble statistics[2] (ensemble mean values, anomaly from model climatology and its standard deviation) [link]
    - Ensemble size: 51
    - Horizontal resolution: 2.5 degree
    - Update frequency: every 5 days
      - 13 members are calculated every 5 days. Ensemble statistics calculated from latest 51 members.
    - Forecast period: next month to up to 6 months
    - Format: GRIB2
    - Duration of ensemble mean: one-month mean and three-month mean
    - Elements:

Name of the elements	Levels (hPa)
Sea level pressure*1 [Pa]	-
Daily mean precipitation [mm day-1] Day field: 00 UTC-00 UTC	-
Temperature*1 [K]	Surface, 850
Geo-potential height*1 [m]	500
Wind (u, v) [m s-1]	850, 200
Stream function [m2 s-1]	850, 200
Sea surface temperature [K]	-

    - Dataset files are provided per element.
  - Individual ensemble members [link]
    - Ensemble size: 13
    - Horizontal resolution: 2.5 degree
    - Update frequency: every 5 days
    - Forecast period: next month to up to 6 months

[2] Shown as "Statistics" on the index page.

- Format: GRIB2
- Relationship between individual ensemble members (described here) and ensemble statistics calculated 51 members (described above) are depicted in the following figure.

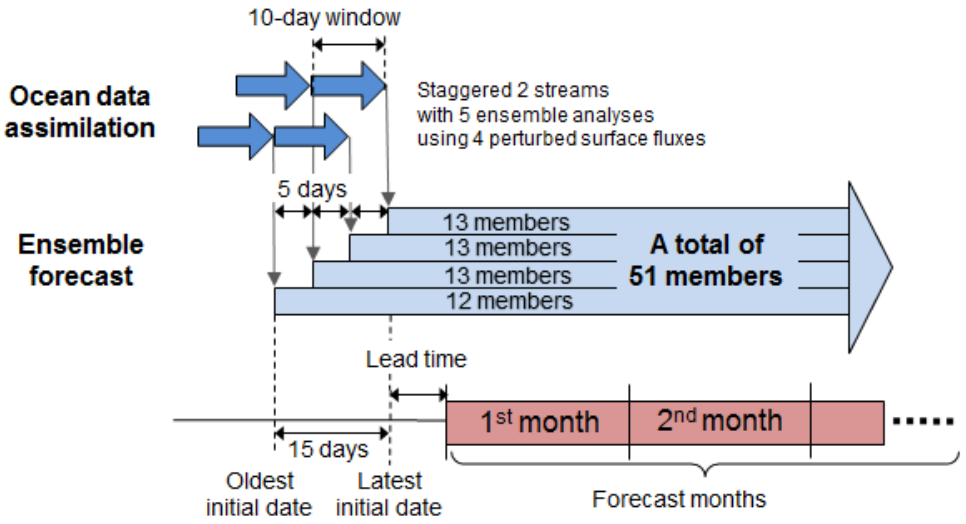

Figure 2-1. Schematic figure of ensemble configurations of operational suite.

- Elements:

Name of the elements	Levels (hPa)
Sea level pressure*1 [Pa]	-
Daily mean precipitation [mm day-1] Day field: 00 UTC-00 UTC	-
Temperature*1 [K]	Surface, 850, 500, 200
Geo-potential height*1 [m]	1000, 850, 500, 300, 200, 100
Wind (u, v) [m s-1]	850, 500, 200
Relative Humidity [%]	850
Stream function [m2 s-1]	850, 500, 200
Sea surface temperature [K]	-

- Dataset files are provided per element.

➢ Datasets of systematic error [link]

- Initial days: every 5 days
- Format: GrADS (binary data filled with 4-byte real numbers)
- Elements:

Name of the elements	Levels (hPa)
Sea level pressure*1 [Pa]	-
Temperature*1 [K]	Surface, 850, 500, 200
Geo-potential height*1 [m]	850, 500, 300, 200, 100
Sea surface temperature	-

- Hindcast (reforecast) dataset
  - Ensemble size:
  - Hindcast periods: Jan 1981 to Dec 2019
  - Initial days: every 15th and days of the end of the month
  - Format: GRIB2
  - Elements:

Name of the elements	Levels (hPa)
Sea level pressure*1 [Pa]	-
Temperature*1 [K]	Surface, 850, 500, 200
Geo-potential height*1 [m]	850, 500, 300, 200, 100
Sea surface temperature	-
Daily mean precipitation [mm day-1] Day field: 00 UTC-00 UTC	-
Wind (u, v) [m s-1]	850, 500, 200
Specific Humidity [kg kg-1]	850
Relative Humidity [%]	

  - Corresponding table between lead time (month) and initial date

Target Month / Initial Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12-Dec, 27-Dec	0	1	2	3	4	5	6					
16-Jan, 31-Jan		0	1	2	3	4	5	6				
10-Feb, 25-Feb			0	1	2	3	4	5	6			
12-Mar, 27-Mar				0	1	2	3	4	5	6		
11-Apr, 26-Apr					0	1	2	3	4	5	6	
16-May, 31-May						0	1	2	3	4	5	6
15-Jun, 30-Jun	6						0	1	2	3	4	5
15-Jul, 30-Jul	5	6						0	1	2	3	4
14-Aug, 29-Aug	4	5	6						0	1	2	3
13-Sep, 28-Sep	3	4	5	6						0	1	2
13-Oct, 28-Oct	2	3	4	5	6						0	1
12-Nov, 27-Nov	1	2	3	4	5	6						0

Figure 2-2. Corresponding table between leadtime (month) and initial date

Post-download data viewing

TCC provides prediction datasets in GRIB2 and GrADS (the binary data filled with 4-byte real numbers) formats. GRIB2 datasets can generally be decompressed using the "wgrib2" command and viewed via GrADS. For more details on download, installation and command application, see the brief instructions on the TCC webpage at https://ds.data.jma.go.jp/tcc/tcc/products/model/tips/QandA.html (password protected).

Automatic data downloads

The Linux "wget" command can be used to download data automatically. For instance, the following command line enables download of daily ensemble statistics on one-month forecast data for 100-hPa geopotential height anomaly with a 1.25-degree resolution:

```
wget --no-check-certificate --http-user="USERNAME" --http-passwd="PASSWORD"
https://ds.data.jma.go.jp/tcc/tcc/gpv/model/1mE.Grib2/GPV_1DAY_125/20200715/JMAGEPS_1p25deg_20200715_p100_Pahh_fcst_em.grb2
```

Here, USERNAME and PASSWORD are as provided by TCC after registration. Combining this command line with a scheduler such as “cron” will allow automatic download of TCC gridded datasets. IT staff within user organizations should be able to provide support for this. IDs and passwords should be stored with appropriate security.

Links

Outline of the operational Ensemble Prediction Systems for one-month and seasonal prediction
https://ds.data.jma.go.jp/tcc/tcc/products/model/outline/index.html
Description of JMA's Global Ensemble Prediction System for one-month prediction
https://ds.data.jma.go.jp/tcc/tcc/products/model/outline/extended.html
Description of JMA's Seasonal Ensemble Prediction System (JMA/MRI-CPS2)
http://ds.data.jma.go.jp/tcc/tcc/products/model/outline/cps2_description.html
Application for Long-range Forecast Products from WMC Tokyo
http://ds.data.jma.go.jp/tcc/tcc/products/model/Application.html

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You can also find the latest newsletter from Japan International Cooperation Agency (JICA).
JICA’s World (July 2020)
https://www.jica.go.jp/english/publications/j-world/2007.html
JICA’s World is the quarterly magazine published by JICA. It introduces various cooperation projects and partners along with the featured theme. The latest issue features “Ensuring Basic Human Rights: A World in Which Everyone Can Shine”.

Any comments or inquiry on this newsletter and/or the TCC website would be much appreciated.
Please e-mail to tcc@met.kishou.go.jp.
(Editors: Mochizuki Yasushi
and Tsuji Kazuaki)

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