Monthly Discussion on Seasonal Climate Outlooks (No. 94)

(24 December 2021)

Tokyo Climate Center (TCC)
Japan Meteorological Agency (JMA)
Notes:

- The present monthly discussion is intended to assist National Meteorological and Hydrological Services (NMHSs) in WMO RA II (Asia) in interpreting WMC Tokyo’s seasonal prediction products. It does not constitute an official forecast for any nation. Seasonal outlooks for individual countries should be obtained from the relevant NMHS.

- Seasonal predictions are based on a JMA’s Seasonal Ensemble Prediction System (EPS), which is based on the coupled atmosphere-ocean general circulation model (CGCM).

- JMA provides three-month prediction products around the 20th of every month with warm-season (Jun. – Aug.) prediction products in February, March and April, and with cold-season (Dec. – Feb.) prediction products in September and October.

1. Summary and Discussion

**ENSO**

- Patterns in the atmosphere and ocean indicate La Niña conditions continue in the equatorial Pacific.
- La Niña conditions are more likely to continue (60%) until the end of boreal winter than not to continue (40%). La Niña conditions are likely to dissipate by the end of boreal spring (80%).

**Prediction for January-February-March 2022 (JFM 2022)**

- In the upper troposphere, large-scale divergence anomalies are predicted over Southeast Asia, while large-scale convergence anomalies are predicted near the date line in the equatorial Pacific.
- A high probability of above-normal precipitation is predicted in the central Southeast Asia. A high probability of below-normal precipitation is predicted near the date line in the equatorial Pacific.
- A high probability of above-normal temperatures is predicted from the Middle East to the western tropical Indian Ocean, from eastern Southeast Asia to the western tropical North Pacific and in part of East Asia. A high probability of below-normal temperatures is predicted over the central equatorial Pacific.
2. Latest State of the Climate System

November 2021
### <November 2021> Extreme Climate Events

#### Map

![Map of Extreme Climate Events](https://ds.data.jma.go.jp/tcc/tcc/products/climate/monthly/index.html)

**Legend:**
- Warm
- Cold
- Wet
- Dry
- Tropical Cyclone
- Disaster

#### List of Events

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Warm</td>
<td>From the western part of Eastern Siberia to Hokkaido region of Japan</td>
</tr>
<tr>
<td>2</td>
<td>Cold</td>
<td>From central to northwestern China</td>
</tr>
<tr>
<td>3</td>
<td>Wet</td>
<td>Southern Indonesia</td>
</tr>
<tr>
<td>4</td>
<td>Heavy Rain</td>
<td>From southern India to Sri Lanka</td>
</tr>
<tr>
<td>5</td>
<td>Wet</td>
<td>Western Russia</td>
</tr>
<tr>
<td>6</td>
<td>Warm</td>
<td>From the northwestern Middle East to the northeastern part of Africa</td>
</tr>
<tr>
<td>7</td>
<td>Wet</td>
<td>From southern Europe to the northwestern part of Northern Africa</td>
</tr>
<tr>
<td>8</td>
<td>Dry</td>
<td>Western Europe</td>
</tr>
<tr>
<td>9</td>
<td>Warm</td>
<td>Western Africa</td>
</tr>
<tr>
<td>10</td>
<td>Warm</td>
<td>Southeastern Canada</td>
</tr>
<tr>
<td>11</td>
<td>Dry</td>
<td>In and around the eastern USA</td>
</tr>
<tr>
<td>12</td>
<td>Warm</td>
<td>In and around the southwestern USA</td>
</tr>
<tr>
<td>13</td>
<td>Dry</td>
<td>The western USA</td>
</tr>
<tr>
<td>14</td>
<td>Wet</td>
<td>From western Canada to the northwestern USA</td>
</tr>
<tr>
<td>15</td>
<td>Cold</td>
<td>Around the Bering Strait</td>
</tr>
<tr>
<td>16</td>
<td>Heavy Rain</td>
<td>Colombia</td>
</tr>
<tr>
<td>17</td>
<td>Warm</td>
<td>From northern New Zealand to northeastern Australia</td>
</tr>
<tr>
<td>18</td>
<td>Wet</td>
<td>Southeastern Australia</td>
</tr>
<tr>
<td>19</td>
<td>Cold</td>
<td>Southwestern Australia</td>
</tr>
</tbody>
</table>

---

<November 2021> Temperature

- Monthly mean temperatures were extremely high from the western part of Eastern Siberia to Hokkaido region of Japan, from the northwestern Middle East to the northeastern part of Northern Africa, in Western Africa, in southeastern Canada, in and around the southwestern USA, and from northern New Zealand to northeastern Australia.

- Monthly mean temperatures were extremely low from central to northwestern China, around the Bering Strait, and in southwestern Australia.

<World Climate Chart (Monthly)> [https://ds.data.jma.go.jp/tcc/tcc/products/climate/climfig/?tm=monthly](https://ds.data.jma.go.jp/tcc/tcc/products/climate/climfig/?tm=monthly)
Precipitation

- Monthly precipitation amounts were extremely high from the southwestern part of Eastern Siberia to Hokkaido region of Japan, in southern Indonesia, in Western Russia, from southern Europe to the northwestern part of Northern Africa, from western Canada to the northwestern USA, and in southeastern Australia.

- Monthly precipitation amounts were extremely low in western Europe, in and around the eastern USA, in the western USA, and around the Bering Strait.

[World Climate Chart (Monthly)](https://ds.data.jma.go.jp/tcc/tcc/products/climate/climfig/?tm=monthly)
In the equatorial Pacific, remarkably positive SST anomalies were observed west of 145°E, and negative SST anomalies were observed east of 160°E, in particular with remarkably negative anomalies near the date line.

In the North Pacific, remarkably positive SST anomalies were observed in the central part and the western tropical region, and remarkably negative SST anomalies were observed in the Gulf of Alaska.

In the Indian Ocean, remarkably positive SST anomalies were observed in the Bay of Bengal, and remarkably negative SST anomalies were observed in the northwestern tropical Indian Ocean.

Monthly mean SST anomaly (°C)

The contours and shading show sea surface temperature anomalies at intervals of 0.5°C. The gray shading indicates maximum coverage of sea ice. The baseline period for climatological normal is from 1991 to 2020.

• Patterns in the atmosphere and ocean indicate La Niña conditions continue in the equatorial Pacific.

• The NINO.3 SST was below normal with a deviation of -0.9°C.

• The Southern Oscillation Index (SOI) value was +1.3.

• The area-averaged SST in the tropical western Pacific (NINO.WEST) region was above normal.

• The area-averaged SST in the tropical Indian Ocean (IOBW) region was below normal.

Monthly values (thin lines) and five-month running means (thick lines). The shading indicates El Niño (red) and La Niña (blue) events.

Convective activity in the Tropics

- Convective activity was enhanced from southern India to the southern Indochina Peninsula and from the southeastern tropical Indian Ocean to the west of New Guinea, and suppressed from the western to central equatorial Pacific.
• The active phase of equatorial intraseasonal oscillation was seen from the eastern Indian Ocean to the Maritime Continent, and the eastward propagation was unclear.

Time-longitude cross section of seven-day running mean velocity potential anomalies at 200-hPa (5°S – 5°N)

MJO diagram

https://ds.data.jma.go.jp/tcc/tcc/products/clisys/mjo/moni_mjo.html
<November 2021> Upper-level Circulation

- In the upper troposphere, anti-cyclonic circulation anomalies straddling the equator were seen from the tropical Indian Ocean to the Maritime Continent, and cyclonic circulation anomalies straddling the equator were seen around the date line in the tropical Pacific. A wave train along the subtropical jet stream was seen from the anti-cyclonic circulation anomalies over India to cyclonic circulation anomalies over Japan.

**Monthly mean Stream function and its anomalies at 200-hPa**
Contour: stream function (10⁶m²/s)
Shading: stream function anomalies (10⁶m²/s)
“H” and “L” indicate the centers of anti-cyclonic and cyclonic circulations, respectively.

**Monthly mean Velocity potential, Divergent wind vector and Velocity potential anomalies at 200-hPa**
Contour: velocity potential (10⁶m²/s)
Vector: divergent wind vector (m/s)
Shading: velocity potential anomalies (10⁶m²/s)
“D” and “C” indicate the centers of large-scale divergence and convergence anomalies, respectively.

<Animation Maps (Global Area)> [https://ds.data.jma.go.jp/tcc/tcc/products/clisys/anim/anim_tp.html](https://ds.data.jma.go.jp/tcc/tcc/products/clisys/anim/anim_tp.html)
<November 2021> Low-level Circulation

- In the lower troposphere, cyclonic circulation anomalies straddling the equator were seen over the tropical Indian Ocean, and anti-cyclonic circulation anomalies straddling the equator were seen from the western to central tropical Pacific.
- In the sea level pressure field, in the equatorial area, positive anomalies were seen from near the date line to South America, and negative anomalies were seen from the Atlantic via the Indian Ocean to the Maritime Continent.

Monthly mean Stream function and its anomalies at 850-hPa
Contour: stream function (10$^6$m$^2$/s)
Shading: stream function anomalies (10$^6$m$^2$/s)
“H” and “L” indicate the centers of anti-cyclonic and cyclonic circulations, respectively.

Monthly mean Sea level pressure anomalies and Surface wind vector anomalies
Contour&shading: sea level pressure anomalies (hPa)
Vector: surface wind vector anomalies (m/s)
“H” and “L” indicate the centers of anti-cyclonic and cyclonic anomalies, respectively.

<Animation Maps (Global Area)> [https://ds.data.jma.go.jp/tcc/tcc/products/clisys/anim/anim_tp.html](https://ds.data.jma.go.jp/tcc/tcc/products/clisys/anim/anim_tp.html)
In the 500-hPa height field, a wave train was dominant from North America via the North Atlantic to the Mediterranean Sea, with positive anomalies over the western USA and to the west of the UK. Over northern Eurasia, while negative height anomalies were seen from western Russia to Western Siberia towards which a tropospheric polar vortex shifted, significantly positive anomalies were seen over Eastern Siberia.

• Temperatures at 850-hPa were above normal from Central to Eastern Siberia, and below normal over Alaska.

• In the sea level pressure field, negative anomalies were seen over a wide area from Siberia to East Asia, and positive anomalies were seen over the Bering Sea and to the west of the UK.

<Monthly Mean Figures> https://ds.data.jma.go.jp/tcc/tcc/products/clisys/figures/db_hist_mon_tcc.html
3. Three-month Predictions

January – February – March 2022
(JFM 2022)

(Initial date for the Seasonal EPS: 7 December 2021)
La Niña conditions are more likely to continue (60%) until the end of boreal winter than not to continue (40%). La Niña conditions are likely to dissipate by the end of boreal spring (80%).

The NINO.WEST SST is likely to be above or near normal until boreal spring.

The IOBW SST is likely to be below or near normal until boreal spring.

Verification based on hindcast

(See “Explanatory Notes (2)” for the definition of the SST indices.)
In the 200-hPa velocity potential field, negative (large-scale divergence) anomalies are predicted over Southeast Asia, while positive (large-scale convergence) anomalies are predicted near the date line in the equatorial Pacific.

In the 200-hPa stream function field, anti-cyclonic circulation anomalies straddling the equator are predicted from the tropical Atlantic via the Indian Ocean to the Maritime Continent, and cyclonic circulation anomalies straddling the equator are predicted over the central tropical Pacific.

Verification based on hindcast
In the 850-hPa stream function field, cyclonic circulation anomalies are predicted from the northeastern tropical Indian Ocean to the southern South China Sea, and anti-cyclonic circulation anomalies are predicted around the date line in the tropical South Pacific.

In the sea level pressure field, negative anomalies are predicted from the tropical Indian Ocean to the western tropical North Pacific.

Above-normal precipitation is predicted in and around Southeast Asia, and below-normal precipitation is predicted over the western equatorial Pacific.
<JFM 2022> Northern Hemisphere circulation

- In the 500-hPa height field, negative anomalies are predicted over northern North America, and positive anomalies are predicted over the Northern Hemisphere mid-latitudes, in particular with remarkably positive anomalies to the south of the Aleutian Islands.

- In the 850-hPa temperature field, negative anomalies are predicted over northwestern North America, and positive anomalies are predicted from northern Eurasia via the mid-latitude North Pacific to the USA.

- In the sea level pressure field, negative anomalies are predicted over the northern polar region, and the Aleutian Low is predicted to be weaker than normal.

A high probability of above-normal precipitation is predicted in the central Southeast Asia.
A high probability of below-normal precipitation is predicted near the date line in the equatorial Pacific.

Verification based on hindcast
A high probability of above-normal temperatures is predicted from the Middle East to the western tropical Indian Ocean, from eastern Southeast Asia to the western tropical North Pacific and in part of East Asia.

A high probability of below-normal temperatures is predicted over the central equatorial Pacific.

Verification based on hindcast
Latest state of the climate system

- Extreme climate events and surface climate conditions are based on CLIMAT messages. For details, see https://ds.data.jma.go.jp/tcc/tcc/products/climate/index.html
- SST products are based on COBE-SST data. For details, see https://ds.data.jma.go.jp/tcc/tcc/products/elnino/index.html
- Atmospheric circulation products are based on JRA-55 data: https://jra.kishou.go.jp/JRA-55/index_en.html For details, see https://ds.data.jma.go.jp/tcc/tcc/products/clisys/index.html
- The base period for the normal is 1991 – 2020.

Three-month predictions and warm/cold season predictions

- Products are generated using JMA’s seasonal EPS which is based on the CGCM. For details, see https://ds.data.jma.go.jp/tcc/tcc/products/model/index.html
- Unless otherwise noted, atmospheric circulation prediction products are based on the ensemble mean, and anomalies are deviations from the 1981 – 2010 average for hindcasts.

Contact: tcc@met.kishou.go.jp
SST monitoring indices (NINO.3, NINO.WEST and IOBW)

• The SST baseline for NINO.3 region (5°S – 5°N, 150°W – 90°W) is defined as a monthly average over a sliding 30-year period (e.g., 1991 – 2020 for 2021). The thresholds of above the baseline, near the baseline, and below the baseline categories are +0.5 and -0.5.

• The SST baselines for the NINO.WEST region (Eq. – 15°N, 130°E – 150°E) and the IOBW region (20°S – 20°N, 40°E – 100°E) are defined as linear extrapolations with respect to a sliding 30-year period in order to remove the effects of significant long-term warming trends observed in these regions. The thresholds of above the baseline, near the baseline, and below the baseline categories are +0.15 and -0.15.

Contact: tcc@met.kishou.go.jp
Names of world regions
WMO Regional Association regions

Reference: WMO General Regulations