The Ninth Session of East Asia winter Climate Outlook Forum

Agenda, Abstracts, List of participants

4 November 2021

Seoul, Republic of Korea(Online)

Korea Meteorological Administration

The Ninth Session of the East Asia Winter Climate Outlook Forum

(The 9th EASCOF)

4 November 2021, Seoul, Republic of Korea(Online)

Agenda

Am (10:00-12:10 KST) , 4 November 2021

Opening Session :

(Chair: : Juyoun Lim, KMA)

10:00-10:10 Welcome Address

Mi-Seon Lee, Director General, Climate Science Bureau (KMA)

Section I : Key Note

(Chair: Juyoun Lim, KMA)

10:10-10:50 QBO influence on East Asia winter climate
(Seok-Woo Son, professor, Seoul National University)

Section II : Overview of Recent Climate and Extremes

(Chair: HuiJeong Son, KMA)

10:50-11:10 Climate Events and Impacts over China in 2021
(Yingxian ZHANG, CMA, China)

11:10-11:30 Recent TCC operational activities
(WAKAMATSU Shunya, JMA, Japan)
Climate characteristics and factors behind record-heavy rain in Japan in August 2021
(SATO Hirotaka, JMA, Japan)

11:30-11:50 Post-analysis of summer climate over South Korea 2021
(Hoseong Hwang, KMA, Korea)

11:50-12:10 Review of 2021 summer climate over Mongolia
(Tergel Shijirtuyaa, NAMEM, Mongolia)

Pm (14:00-16:20 KST) , 4 November 2021

Section III : Seasonal Climate Outlook for Winter 2021/2022

(Chair: YeiSook Lee, KMA)

14:00-14:20 Seasonal climate outlook for winter 2021/2022 over China (Zhi Rong, CMA, China)

14:20-14:40 Seasonal outlook for winter 2021/2022 over Japan (HIRAI Masayuki, JMA, Japan)

14:40-15:00 Seasonal climate outlook for winter 2021/2022 over Korea (HuiJeong Son, KMA, Korea)

15:00-15:20 Cold seasonal outlook for winter 2021/2022 over Mongolia (Jargalan Bayaraa, NAMEM, Mongolia)

15:20-15:30 Break Time

Section IV : Discussion and summary of the outlook for winter 2021/2022

(Chair: Kyungsuk Cho, KMA)

15:30-16:10 Discussion and Summary

Closing Session :

16:10-16:20 Closing remarks
Kyungsuk Cho, Director, Climate Prediction Division (KMA)

Section I : Key Note

QBO influence on East Asia winter climate

Seok-Woo Son
Seoul National University

Abstract

The Quasi-Biennial Oscillation (QBO) in the stratosphere is known to affect the tropospheric circulation by modulating the Madden-Julian Oscillation (MJO), the Asia-Pacific jet (APJ), and the polar vortex. Such influences are briefly overviewed in this talk in the context of QBO impacts on East Asian winter climate through the QBO-MJO connection and the QBO-APJ connection.

The MJO is stronger and more persistent when the QBO is in its eastly phase (QBO-E) at 50 hPa. This QBO-MJO connection affects the MJO-induced precipitation anomaly in East Asia. During QBO-E, MJO-induced vertical motion near coastlines of East Asia is amplified by a stronger upper-level circulation. Moisture transport from the subtropics is also enhanced with a stronger low-level circulation. This causes much larger MJO precipitation anomalies over East Asia during QBO-E than during QBO westerly (QBO-W) winters.

The 70-hPa QBO is negatively correlated with the surface air temperature over the western North Pacific in February and March. Cold temperature anomaly during QBO-W is mediated by the APJ. During QBO-W, a horseshoe-shaped zonal wind anomaly forms in the upper troposphere and lower stratosphere and is connected to the equatorward shift of the APJ. This equatorward jet shift is accompanied by a cyclonic circulation anomaly in the subtropical North Pacific and an anticyclonic circulation anomaly in northern Eurasia in the troposphere. The resultant temperature advection brings cold air to East Asia and the western North Pacific.

Climate Events and Impacts over China in 2021

Yingxian ZHANG
National Climate Center, China Meteorological Administration

Abstract

Abstract: Since the beginning of this year (up to 15th October), the average temperature in China was 12.8℃, 1.1℃ higher than the normal of 1981-2010 (11.7℃), ranking the warmest since 1961. In February, March, June, July, and September, the national average temperature of each month remained on the high level, among which it ranking the top in February and September since 1961. The average precipitation in China was 622.2 mm, 6.3% more than the normal (585.5 mm). Except in January, March, April, and June, the precipitation in other months was above normal.

There have been 34 heavy rainfall events in China since the beginning of this year (up to 15th October). Since this year (up to 15th October), 19 tropical cyclones have generated in the western North Pacific and the South China Sea, which was 1.5 less than the climatology of 1981-2010 (20.5). 6 tropical cyclones made landfall over China, and was 0.8 less than the normal (6.8). Severe typhoon In-Fa has the greatest impact on China due to its slow moving speed, long detention time over land, large accumulated rainfall and wide range of influence. The mean high temperature days in China was 12.0 days, which was the second highest since 1961, and only less than that in 2017. The meteorological drought presented regional and periodic characteristics. The severe convection weather processes were frequent and brought serious loss in several regions.

Recent TCC operational activities
Climate characteristics and factors behind record-heavy rain in Japan in August 2021

WAKAMATSU Shunya[1], SATO Hirotaka[2]
[1,2] Scientific Officer, Tokyo Climate Center, Japan Meteorological Agency

Abstract

The Tokyo Climate Center (TCC) provides a variety of climate-related products. Following a brief overview of our recent activities on improving products, such as the launch of Indian Ocean Dipole (IOD) monitoring website and changing the normal period to 1991 – 2020, our analysis on record-heavy rain in Japan in August 2021 will be presented as follows.

In mid-August 2021, areas from western to eastern Japan experienced record-heavy rain. This presentation will introduce the primary factors of this extreme rainfall event. According to the analysis of TCC and its Advisory Panel on Extreme Climatic Events, they are thought to be as follows:

- A stationary front was strengthened by a significant north-south gradient of temperature in the lower troposphere between the Okhotsk High to the north of Japan and the southward shifted North Pacific Subtropical High (NPSH) expanding to the south of Japan. Such an atmospheric condition is quite unusual for mid-summer but rather likely seen in the early-summer rainy season, known as the Baiu, in eastern and western Japan.
- A continuous confluence of water vapor from continental China and along the margin of the NPSH also contributed to widespread continuous heavy rainfall.
- The southward shift of the NPSH that caused a large amount of water vapor flow into western and eastern Japan was related to an overall southward shift of the subtropical jet stream (STJ) over East Asia in the upper troposphere.
- Furthermore, significant southward meandering of STJ to the west of Japan is considered to produce favorable conditions for updraft occurrence and persistent rainfall from western to eastern Japan.
- The overall southward shift of the STJ over East Asia was likely affected by sea surface temperature anomalies in the tropical Indian Ocean and related anomalies in convective activity over the Asian summer monsoon region.

Besides this heavy rain event, the recent climate conditions after August will also be reviewed, which would provide a basis of the seasonal outlook for the coming winter.

Post-Analysis of Summer Climate Over South Korea 2021

HWANG Hoseong, IM Gyosoon, KIM Miju, and KIM Jeongsik,
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Abstract

In 2021, the summer-mean temperature in South Korea was 24.2℃, which was 0.5℃ above the normal. The precipitation during this summer was recorded at 612.8mm, less than the normal of 622.7－790.5mm. The mean temperature for July was 26.0℃, 1.4℃ above the normal. The precipitation for June and July was below the normal of 91.6mm (27.5%ile) and 233.8mm (26.0%ile), respectively.

The 2021 summer climate in South Korea showed two characteristics. First, the Changma recorded the third shortest season on record since 1973. It lasted 17 days in the central part of South Korea, which is below the normal of 31.5 days. Second, July had below-normal rainfall and more heat waves. The number of heat wave days in July was 8.1 days, which is above the normal of 4.1 days. It rained frequently in August with 16.4 rainy days, which is above the normal of 13.8 days.

As the North Pacific High (NPH) slowly moved northward to the Korean Peninsula in June, the 2021 Changma started on July 3, which is later than the normal date of June 25. In July, as the NPH rapidly expanded to the Peninsula, the Changma was retreated on July 19, which is earlier than the normal date of July 26.

In late June, a Rex-type blocking event developed from East Siberia to South Korea, blocking the northward movement of the NPH. It was not until early July that this blocking was retreated and the Changma began later than the normal.

From mid-July, the Tibetan High(TH) and the NPH expanded widely to the northeastward of South Korea, leading to early heat waves. This resulted in the fifth highest maximum temperature and the fifth biggest number heat wave days in July. The Arctic Oscillation Index for July was the third highest in the past 30 years. This is considered to have effect on the expansion of the TH and NPH to the northeastward of South Korea.

With the development of the pressure ridges near the Ural Mountains and East Siberia in August, the heat wave for August receded early, mainly due to the influence of a pressure trough accompanied by cold air.

With active convections in the tropical Western Pacific and East Indian Ocean in August, the NPH developed to more westward than the normal. As a result, it rained frequently in South Korea influenced by a stationary front, low pressure and a typhoon that moved along the edge of the NPH.

Review of 2021 Summer Climate over Mongolia

Tergel Shijirtuyaa
Research Division of General Circulation and Long-Range Prediction
Information and Research Institute of Meteorology, Hydrology and Environment

Abstract

The last summer, precipitation was above-normal in Mongolia. In the earlier summer, below-normal precipitation occurred in the southwestern half of the country and above-normal precipitation for most of the country in mid and late summer. In July, above-normal precipitation was observed most of Mongolia by an intense upper-level ridge near the Sakhalin and sea of Okhotsk. In August, heavy rainfall events were observed due to dominant positive (negative) geopotential height anomalies at 500 hPa over Europe and East Siberia (Manchurian Plain). During those heavy rainfall events in August, the monthly precipitation record of the country has been broken since 1979 in Mongolia. In July and August, record-breaking precipitation events have occurred at most of the stations in Mongolia.

The surface air temperature was near-normal for the last summer. At the end of the season, a cold wave lasted more than ten days for all over the country that dropped the surface air temperature by 3-8°C colder than the climate means. The cold wave occurred due to the opposite phase of the omega-shaped pattern in Eurasia.

Seasonal Climate Outlook for Winter 2021/2022 over China

Zhi Rong, Zheng Zhihai
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Abstract

Dynamical models and statistical analyses will be discussed focusing on East Asian Winter Monsoon (EAWM), seasonal temperature and precipitation outlook for 2021/2022 winter over China.

Based on dynamical models and statistical analyses, we predict a normal to strong EAWM in the coming winter. Air temperatures will be colder than normal over most central to eastern China. Winter precipitation will be below normal over most southern parts of China. However, more precipitation tends to occur over northern parts of China, especially North China and eastern of Northwest China.

Sea surface temperature anomaly over the tropical eastern Pacific is one of the most important external-forcing factors for the climate prediction in this winter. Most of dynamical and statistical models predict that an weak La nina event is likely to be developed in the coming winter and will induce a normal to strong winter monsoon, a deeper East Asian trough, an anomalous low-level cyclone around the Philippines, as well as an weakened northwestern Pacific subtropical high. It is worth noting that the sea ice concentration (SIC) over the Arctic in September is an uncertain factor. After removing the linear trend of the SIC, the slightly higher SIC over the Barents-Kara Sea would result in a weak Siberia High in winter.

Seasonal outlook for winter 2021/2022 over Japan

HIRAI Masayuki
Senior Forecaster, Tokyo Climate Center, Japan Meteorological Agency

Abstract

JMA issued its outlook for the coming winter (December − February) over Japan in September and updated it in October based on output from its seasonal Ensemble Prediction System (EPS). The following outlook is based on the EPS products with the initial month of September.

1. Outlook summary

● In western Japan and Okinawa/Amami, winter monsoon is expected to be stronger than normal, which brings below-normal temperature. On the Sea of Japan side of western Japan, seasonal precipitation and snow amount are expected to be above-normal.

● In northern and eastern Japan, winter monsoon is expected to be near-normal, which brings near-normal temperatures.

2. Grounds for outlook

(1) Outlook on oceanic conditions

The sea surface temperatures (SSTs) over the equatorial Pacific are predicted to be below-normal from central to eastern part and to be above-normal in the western part, indicating La Niña–like conditions. Although NINO.3-SST index is predicted to be below -0.5°C early to mid-winter, there is some uncertainty about whether JMA's definition of La Niña event (5-month moving average below -0.5°C for 6 consecutive months) will be satisfied. In the El Niño outlook issued on 11 October, JMA estimated that La Niña event is more likely to emerge during this autumn and the coming winter (60%) than ENSO-neutral conditions continue.

(2) Outlook on atmospheric circulation fields

Corresponding to the expected SST anomalies in the tropics, convective activities over the tropics are predicted to be enhanced from the Bay of Bengal to around the Philippines.

In the upper troposphere, anti-cyclonic circulation anomalies are predicted over the southern part of China and over the mid-latitude North Pacific, and cyclonic anomalies in between centered over Japan, suggesting southward meandering of the subtropical jet stream over Japan. In the 500-hPa height field over high latitudes, positive anomalies are predicted west of Baikal, and negative anomalies are predicted around the northern part of Japan, in association with northward and southward meandering of the polar jet stream, respectively.

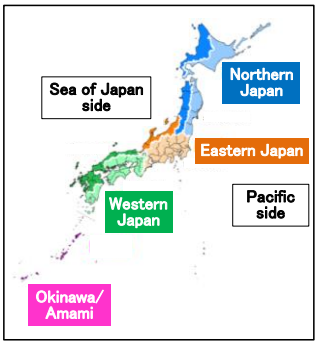
Relating to the expected upper circulation fields, the Siberian high is predicted to expand southeastward toward the western and southern part of Japan (i.e., western Japan and Okinawa/Amami). Meanwhile, negative anomalies of sea level pressure (SLP) are predicted over and around northern Japan.

In consideration of the circulation anomalies discussed above, winter monsoon is expected to be stronger than normal over western Japan and Okinawa/Amami, leading to below-normal temperatures in these regions and above-normal precipitation/snowfall in the Sea of Japan side of western Japan. In northern Japan, slightly wetter-than-normal conditions are expected,

Table Outlook for winter (DJF) 2021/2022 tercile probabilities in Japan.

		Temperature			Precipitation		
Category		−	0	+	−	0	+
Northern Japan	Sea of Japan side	30	30	**40**	30	30	**40**
	Pacific side				30	30	**40**
Eastern Japan	Sea of Japan side	**40**	30	30	30	30	**40**
	Pacific side				40	30	**30**
Western Japan	Sea of Japan side	**40**	**40**	20	20	40	**40**
	Pacific side				40	40	**20**
Okinawa/Amami		**40**	**40**	20	40	**40**	20

(Category − : Below normal
0 : Near normal
+ : above normal)



Seasonal Climate Outlook for Winter 2021/2022 over Korea

SON Huijeong, JEONG Hyeri, GONG Yeonji, WON Youjin and CHO kyungsuk
Climate Prediction Division, Korea Meteorological Administration

Abstract

The Korea Meteorological Administration (KMA) releases the seasonal outlook on 23rd November. The seasonal outlook of winter 2021 over Korea will be presented based on the KMA's operational climate prediction system, GloSea5 (Global Seasonal Forecasting System ver.5) and MME results from the WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble (WMO LC-LRFMME), as well as impacts of essential climate indices. The preliminary results show that the temperature will be below-normal in the first half of winter and near-normal in the second half over Korea. In terms of precipitation, it is predicted below-normal or near-normal.

Some climate indices related in winter season over Korea are showing a negative phase but some of them are not recently. In October, SST anomalies in the Nino 3.4 region were cooler than normal and it is close to weak La Niña condition. Although the Arctic sea ice over Barents–Kara and the Laptev Sea is currently at an average level, it will be variable during winter season. Also, it will be considered that negative phase of the Arctic Oscillation seems to attribute the dry and cold winter with the easterly phase of the quasi-biennial oscillation.

Detailed analysis results of numerical and statistical models will be presented.

Cold Seasonal Outlook for winter 2021/2022 over Mongolia

Jargalan Bayaraa and Akhmyet-Ali Khamshybai
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Information and Research Institute of Meteorology, Hydrology and Environment

Abstract

IRIMHE issued its outlook for the coming winter (DJF) in September 2021 and updated in this October.

Generally, were used results of six kinds of the dynamical model named by the Tokyo Climate Center (TCC), European Centre for Medium-Range Weather Forecasts (ECMWF), United Kingdom Meteorological Office (UKMO), The Euro-Mediterranean Center on Climate Change (CMCC), METEO–France (METEO) and German Meteorological Service (DWD) and also outputs of a coupled general circulation model at NAMEM was performed with initial condition of Sep, 2021 for coming winter outlook.

Additionally, from this year we conducted new approach genetic algorithm-based weighted ensemble method for predicting monthly outlook using above dynamical outputs.

As a results, the polar vortex and Uralian ridge are expected to be weaker than normal during the December. Therefore, air temperature is would be warmer than normal over most of area in Mongolia. However, below normal temperature expected the western area of Mongolia, while rest of areas will be relatively normal in January. In terms of precipitation, expected to be near the normal tendencies over the Mongolia. Overall, detailed analysis results of numerical and statistical models will be presented.

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List of participants

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