The 9th Session of the East Asia winter Climate Outlook Forum

Seoul, Republic of Korea

4 November 2021

Executive Summary

The 9th Session of the East Asia winter Climate Outlook Forum (EASCOF-9) was virtually held in Seoul, the Republic of Korea on 4 November 2021. This Forum was attended by long-range forecasters and climate experts from the China Meteorological Administration (CMA), the Japan Meteorological Agency (JMA), the National Agency for Meteorology and Environment Monitoring of Mongolia (NAMEM), the Korea Meteorological Administration (KMA), the APEC Climate Center (APCC), and WMO LC_LRFMME. Participants shared knowledge about seasonal prediction and discussed seasonal outlook for the winter 2021/2022.

1. Introduction

In line with the agreement at the Thirteenth Session of the Joint Meeting for Seasonal Prediction of the East Asian Winter Monsoon (EAWM), the East Asia winter Climate Outlook Forum (EASCOF) was established as a WMO sub-regional COF. The EASCOF has been held since 2013, hosted alternately by NAMEM, JMA and KMA.

The EASCOF-9 was held in Seoul, the Republic of Korea on 4 November 2021, attended by around 30 long-range forecasters, researchers and experts from CMA, JMA, NAMEM, KMA, APCC, and academia. The forum covered main seasonal topics, including the recent climate phenomena in East Asia, services and assessments of long-range forecasts in East Asia, research and development of climate variability related to the East Asia Winter Monsoon, ENSO activity and outlook, and seasonal climate outlook for the winter 2021/2022, by using statistical and dynamical models. It served as a good opportunity to share understanding of climate events and research results related to seasonal prediction on the EAWM, as well as discussing seasonal climate outlook for the winter 2021/2022.

2. Overview of 2021 Summer Climate

During the 2021 summer, the mean temperature was generally above normal over East Asia except for Mongolia and some regions experienced heat waves in July. The rainfall amount was above normal in most parts of China, Mongolia and from western to eastern Japan with extreme heavy rain, but was below normal in the Korean Peninsula with the later start of the Changma.

CMA: In the summer of 2021, the mean temperature over China was 21.7 ℃, which was +0.8°C higher than the normal. The high-temperature days was 9.1 days, 2.3 days more than the normal. In particular, the daily maximum temperature at 50 stations, such as Yunlong (42.6 ℃, June 4), Jilantai (41.9 ℃, July 9) and Wuhai (41.5 ℃, July 9), broke their highest-temperature records.

The summer precipitation was 334.1 mm, slightly more than the normal. In summer, there were 15 regional rainstorm processes affecting China, and record-breaking extreme heavy precipitation occurred in Henan province. Three typhoons landed in China, and the number of landfalls was less than the normal. The regional periodic meteorological drought is obvious, and the drought in the southern and northern parts was concurrent. Strong convection weathers occurred frequently in many places, and some areas suffered tornadoes.

JMA: In mid-August 2021, areas from western to eastern Japan experienced record-heavy rain. According to the analysis of TCC and its Advisory Panel on Extreme Climatic Events, the primary factors 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.

KMA: 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.

In late June, a blocking event developed from East Siberia to South Korea, blocking the northward movement of the Northern Pacific Subtropical High (NPSH). 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 NPSH 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 of heat wave days in July. With active convections in the tropical Western Pacific and the East Indian Ocean in August, the NPSH developed 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 NPSH.

NAMEM: Last summer, precipitation was above normal (+27%) 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.

3. Outlook for Winter 2021/22

The East Asia Winter Monsoon during the 2021/22 winter is expected to be stronger than normal. Although each of the regions has different features, overall the temperature and precipitation are projected to be below normal.

CMA: Based on the dynamical and statistical model, the East Asia Winter Monsoon (standardized Sea Level Pressure averaged from 40-60N, 80-120E) would be stronger than normal, but intra-seasonal variation is expected to be strong. Air temperatures in winter may be colder than normal in most parts of China, except Southwestern China. Precipitation in winter will be above normal in Northern China, but near or below normal in Southern China.

La Niña conditions is likely to re-emerge in late autumn and winter, and will induce a stronger winter monsoon, a deeper East Asian trough, an anomalous low-level cyclone around the Philippines as well as weakened western Pacific Subtropical High.

JMA: The seasonal EPS of JMA (JMA/MRI-CPS2) predicts that the East Asia Winter Monsoon is stronger than normal over the southern part of East Asia, including western Japan and Okinawa/Amami, which brings below-normal temperature in these regions and above-normal precipitation/snowfall in the Sea of Japan side of western Japan. Meanwhile, the winter monsoon is expected to be near-normal in northern and eastern Japan.

In northern Japan, precipitation is expected to be within the normal range but the probability is slightly in favor of wet winter (40% above normal), in consideration of more frequent passage of low pressure systems in the vicinity.

KMA: The dynamical model (GloSea5) shows that the East Asia Winter Monsoon is likely to be stronger than normal. Temperatures are likely to be above normal, and rainfall below normal. However, the tendency of overestimating temperatures and zonal patterns of anomalous geopotential height at 500hPa indicates the possibility that during the early winter, the Siberian High occasionally extends toward the Korean Peninsula and impacts on cold air outbreak over East Asia compared to normal.

La Niña is likely to be maintained during the upcoming winter. Statistically, Korea has experienced below-normal conditions for winter temperatures.

Less-than-normal sea ice over the Laptev Sea and the Barents-Kara Sea is expected to be accompanied by below-normal temperature over South Korea. On the whole, temperatures and precipitation over South Korea are expected to be below normal for the following winter season with strong intra-seasonal variation.

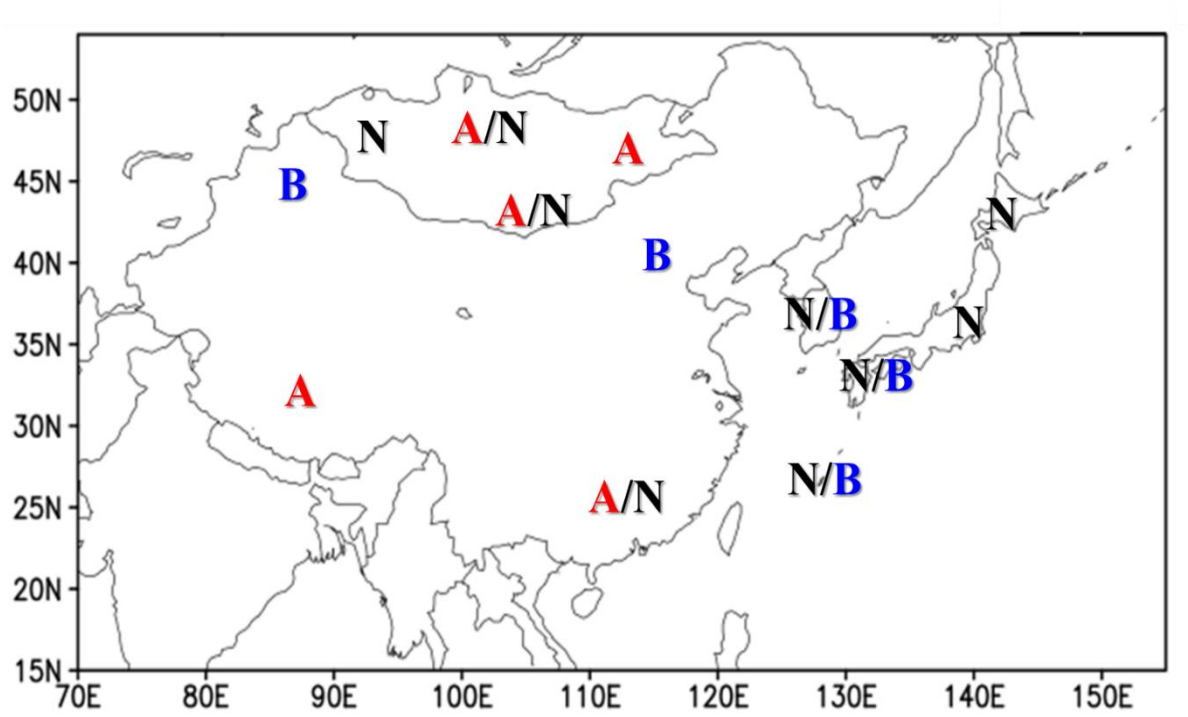
NAMEM: According to the results of MME, positive geopotential height anomalies at 500hPa are expected over Eurasia, resulting in warmer than normal air temperature and near–below normal for precipitation, especially in the eastern part of Mongolia.

The air temperature is likely to be near normal and precipitation is likely to be higher than normal in the western part of Mongolia due to the weak Siberian high and the strong Uralian ridge, especially over northern Uralian mountains.

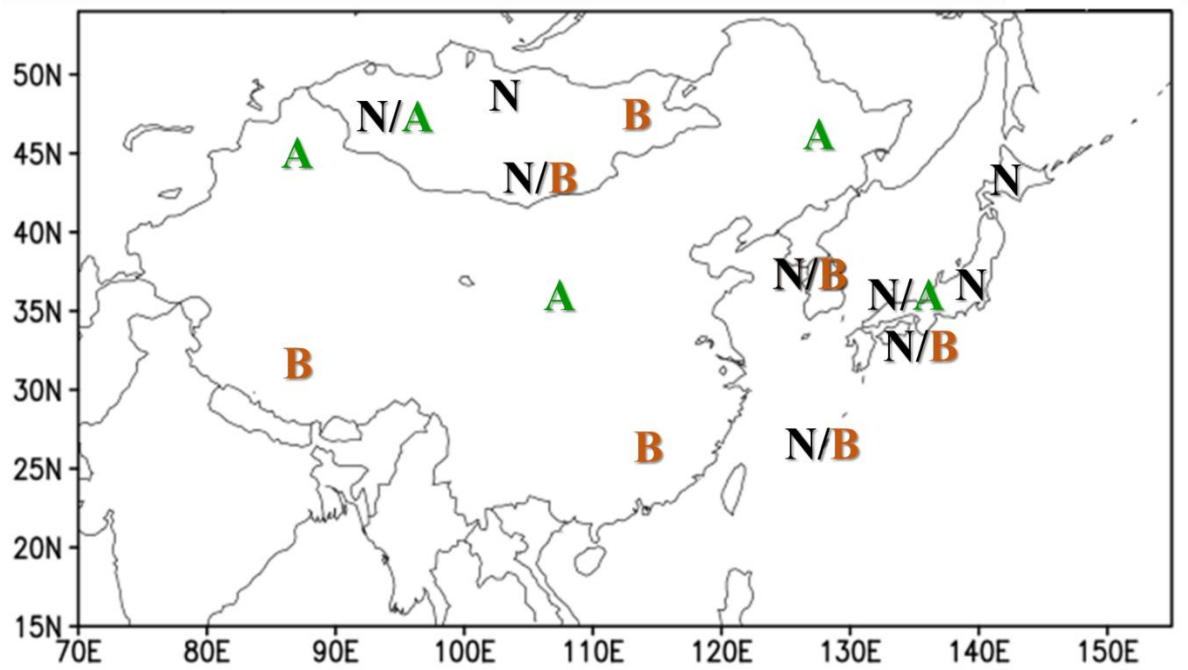
The Siberian high is slightly stronger in January, therefore, the air temperature in the southwestern part of Mongolia will be colder, precipitation will be higher/near normal over Altai mountains ranges.

Summarized prediction

Temperature



Precipitation



ENSO outlook

At present, it seems likely that La Niña-like conditions will occur in the equatorial Pacific based on NINO.3/3.4-SST index. It is likely that a La Niña event will emerge during the winter 2021/2022.

CMA: Based on the dynamical and statistical methods, there is a possibility that a weak-moderate La Niña event is likely to emerge in late autumn and winter.

JMA: 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. JMA estimated that La Niña event is more likely to emerge during this autumn and the coming winter (60%) than ENSO-neutral conditions continue, in the El Niño outlook issued on 11 October. However, regardless of whether the exact definition of La Niña is eventually met or not, La Niña-like conditions are very likely to last through the months ahead and key to constructing forecasts for the winter.

KMA: Based on the dynamical and statistical methods, there is a possibility that La Niña could develop in late autumn in 2021. It may continue through the spring of 2022, but uncertainty exists.

NAMEM: *(No comment)*

4. Next Session

The place of the EASCOF-10: The session was pleased to note that NAMEM will host the EASCOF-10 in 2022. The time and venue will be determined later.