The Seventh Session of the East Asia winter Climate Outlook Forum

Ulaanbaatar, Mongolia

10 November 2022

Executive Summary

The Tenth Session of the East Asia winter Climate Outlook Forum (EASCOF-10) was held in Ulaanbaatar, Mongolia on 10 November 2022. This Forum was joined by long-range forecasters and climate experts from the China Meteorological Administration (CMA), the Japan Meteorological Agency (JMA), the Korea Meteorological Administration (KMA) and the National Agency for Meteorology and Environment Monitoring of Mongolia (NAMEM). Participants shared knowledge about seasonal prediction and discussed seasonal outlook for the winter 2022/2023.

It was summarized that the upcoming East Asia Winter Monsoon is likely to be largely weaker than normal but for parts of Japan.

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-10 was held in Ulaanbaatar, Mongolia on 10 November 2022, attended by around 45 long-range forecasters, researchers and experts from CMA, JMA, KMA, NAMEM, and National University of Mongolia. The forum covered main seasonal topics, including the recent climate phenomena in East Asia, services of long-range forecasts in East Asia, research and development of climate variations related to the East Asia Winter Monsoon, ENSO activity and outlook, and seasonal climate outlook for the winter 2022/2023, 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 2022/2023.

2. Overview of 2020 Summer Climate

CMA: In Jan and Feb, seven processes of snow and rain affected China, especially South China. In Jun, Southern China suffered heavy rainstorms inducing Pearl river basin floods. In July, the severe floods occurred in Songliao River basin due to the abnormal precipitation in Northeast China. During the summer, record breaking heatwave affected China. The drought over Yangtze River Basin and its south lasted long from summer to autumn and continue by now. In the first there quarters, the total number of tropical cyclones landings was less than normal. The initial landing was late but strong. Muifa on Sep 14th -16th landed four times in 4 provinces including Zhejiang, Shanghai, Shandong and Liaoning, successively. However, many indices of disaster loss drop apparently compared with that of the last 5 years.

JMA: In summer 2022, Japan experienced a large fluctuation of weather conditions, some of which have socioeconomic impacts even involving human lives.
From late June to early July, extreme hot days were observed throughout Japan. The highest temperatures since 1946 were recorded in western and eastern Japan for late June, and in northern Japan for early July. During this period high pressure system developed both in upper and surface levels, forming a "double high system", which has been known to bring extreme hot condition in summer Japan. Formation of this double high system was attributable to two teleconnection patterns, so called Silk Road pattern and Pacific Japan (PJ) pattern.
In mid-July, extreme heavy rains eventually occurred in widely scattered areas in Japan. A blocking high developed in Far East Siberia possibly caused these events through high potential vorticity intrusion over Japan. Catastrophic disaster in Pakistan was possibly related to the formation of the blocking high.
In early to mid- August, a stationary rainband like Meiyu/Baiu front stagnated across northern Japan wherein the record-breaking precipitations were observed and associated river flood caused severe damages. During this period, an upper level trough from Siberia to northern Japan remained stagnant over weeks in relation to a long-lasting upper level anti-cyclone that brought heat wave and drought over China. As a result, at the surface level, stationary front formed in between northern trough and southern subtropical high. Anomalously hot sea surface temperature in the Sea of Japan, which was 2nd highest since 1961, possibly supported to transport huge amount of water vapor into northern Japan.

KMA: The main feature of 2022 summer temperature is high temperatures in early summer. From late June to early July, the subtropical high stretched more westward than normal, allowing hot and humid winds frequently blew along its edge.
Accordingly, the mean temperature from late June to early July was the highest on record at 26.4℃, 3.5℃ above the normal, since 1973.
During the same period, convection activity was much stronger than the normal around India. The strong convection of the northwest Indian Ocean is highly related to high temperatures and southern winds over Korea.
This summer, South Korea had a lot of rainfall even after the end of Changma. As a stationary front anchored over the central region, heavy rainfall occured for four days from August 8 to 11. NPSH (North Pacific subtropical high) was developed in the south of Korea, while cold air stayed for several days in the north of Korea due to the influence of ridges around the Ural Mountains and Kamchatka. As a result, hot and cold air met in the central region, causing heavy rain for four days.
From June to September 2022, 16 typhoons occurred in the northwest Pacific and five of them affected South Korea. When Typhoon Hinnamnor moved northward to South Korea, it brought heavy rain from September 5 to 6 affected by the strong convergence of water vapor and a cold trough in the upper level. When two typhoons, Muifa and Nanmadol, moved northward in mid-September, the temperature during this period was the highest ever as warm air flowed into South Korea.

NAMEM: During the last summer, the southwestern part of Mongolia was 1-2°C warmer than the mean and the precipitation was 30-70% less, and in other areas (Central, Eastern, Gobi) the

air temperature was close to the mean, and the precipitation was 30-150% more than the mean. In June, a positive anomaly at 500 hPa geopotential height over the southwestern part of Mongolia was observed. As a result, extreme hot days (+40°C) were observed in the southwestern part of Mongolia, ranking the third hottest year on record, and the driest month on record for the western province. Especially in the last half of the month, the surface air temperature was warmer than the mean in Mongolia and the absolute maximum temperature was broken 2-7 times in 46 stations (out of 137 stations) mainly over western Mongolia.
In July, cold weather conditions dominated over northern Mongolia for most of the time due to a middle latitude trough in Central Siberia. The air temperature was fallen by 2-4°C (sometimes p to 5°C) than the mean in northern Mongolia.
In August, the upper-level trough was located in Central and Eastern Siberia which brought more precipitation in the central and eastern parts of Mongolia and cold temperatures in the north-eastern part of Mongolia.

3. Current Status and Outlook of ENSO

Current Status

JMA: The Tokyo Climate Center (TCC) disseminates El Niño Outlook up to 6 months ahead on a monthly basis. According to the latest outlook issued on 11th Oct., the sea surface temperatures for the NINO.3 region in September was still below normal with a deviation of -0.9ºC. Over the central equatorial Pacific, convective activity was suppressed and easterly winds in the lower troposphere were stronger than normal. These patterns in the atmosphere and ocean, overall consistent with features commonly seen in past La Niña events, indicate that La Niña conditions remain in place.

ENSO outlook

JMA: JMA's seasonal ensemble prediction system predicts that the enhanced atmosphere-ocean interaction will maintain stronger easterly winds over the equatorial Pacific and keep the NINO.3 SST index below -0.5ºC until early boreal winter. Subsequently, subsurface warm water in the western equatorial Pacific is predicted to start to propagate eastward and contribute to increasing SSTs over the NINO.3 region. SSTs in the western Pacific and around the Maritime Continent will continue to be above or near normal. In summary, the ongoing La Niña conditions are very likely (90%) to continue until early boreal winter, and likely (60%) to continue towards the end of the winter.

4. Outlook for Winter 2022/23

East Asia Winter Monsoon is likely to be largely weaker than normal but for parts of Japan.

CMA: Dynamical models and statistical analyses will be discussed focusing on East Asian Winter Monsoon (EAWM), seasonal temperature and precipitation outlook for 2022/2023 winter over China.

Based on dynamical models and statistical analyses, we predict a normal to week EAWM in the coming winter. The Eurasian mid high latitude circulation will be dominated by zonal circulation, while the East Asia trough will be normal, the Ural blocking high will be slightly stronger, the Siberian high will be weaker, and the northwestern Pacific subtropical high will also be weaker.
Air temperatures will be normal or warmer over the most of China. The precipitation in most regions of China will be less than normal in winter. However, more precipitation tends to occur over northern parts of China, especially northern of Northeast China and the middle 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 the La Nina event will last until the winter of 2022/2023. The sea ice concentration (SIC) over the Arctic in September is slightly higher over the Barents-Kara Sea after removing the linear trend which would result in a weak Siberia High in winter.

KMA: The Korea Meteorological Administration (KMA) releases the seasonal outlook on 23rd November. The seasonal outlook of winter 2022/23 over Korea will be presented based on the KMA's operational climate prediction system, Global Seasonal Forecasting System version 6 (GloSea6) and Multi-Model Ensemble (MME) resulting from the WMO Lead Centre for Long-Range Forecast MME (WMO LC-LRFMME), as well as impacts of essential climate indices. The results show that the temperature will be near normal and the precipitation will be below normal over Korea. La Niña events are likely to continue during the coming winter becoming the first "triple-dip" La Niña of the 21st century.
Recently, Barents–Kara sea ice is less than normal, which is expected to last through the winter. Also, it could contribute to anticyclonic circulation over Northeast Europe and continental high over the Siberia and East Asia. Therefore, cold spell in early winter might occur over the Korean Peninsula. Nowadays, the snow cover on the Tibetan Plateau is above normal. However, it will be variable during the winter.

JMA: According to the latest Tokyo Climate Center El Niño Outlook, the ongoing L a Niña event is very likely to persist at least until early winter (90%) and likely tow ards the end of the winter (60%). JMA's seasonal ensemble prediction system predicts that convective activity in the equatorial Pacific, in response to equatorial SST anomal ies associated with the La Niña conditions, will be enhanced (suppressed) over the M aritime Continent (over the western Indian Ocean and the central to eastern equatorial Pacific). This pattern of convective activity anomalies induces a Rossby wave train al ong the subtropical jet stream in the upper troposphere across the southern part of Eu rasia, with anti-cyclonic circulation anomalies over southern China and cyclonic circul ation anomalies over the Arabian Peninsula and Japan. In relation to this upper-level wave pattern, the Siberian High is predicted to intensify in its southeastern extent and bring stronger than normal northwest monsoon to western to eastern Japan.

Based on these large-scale circulation anomalies, temperatures are predicted to be near or below normal for western and eastern Japan, while near normal for the rest of the

country. Precipitation is predicted to be above or near normal for the Sea of Japan si de of eastern Japan, near or below normal for the Pacific side of western to eastern Japan and Okinawa/Amami, while near normal for the rest of the country.

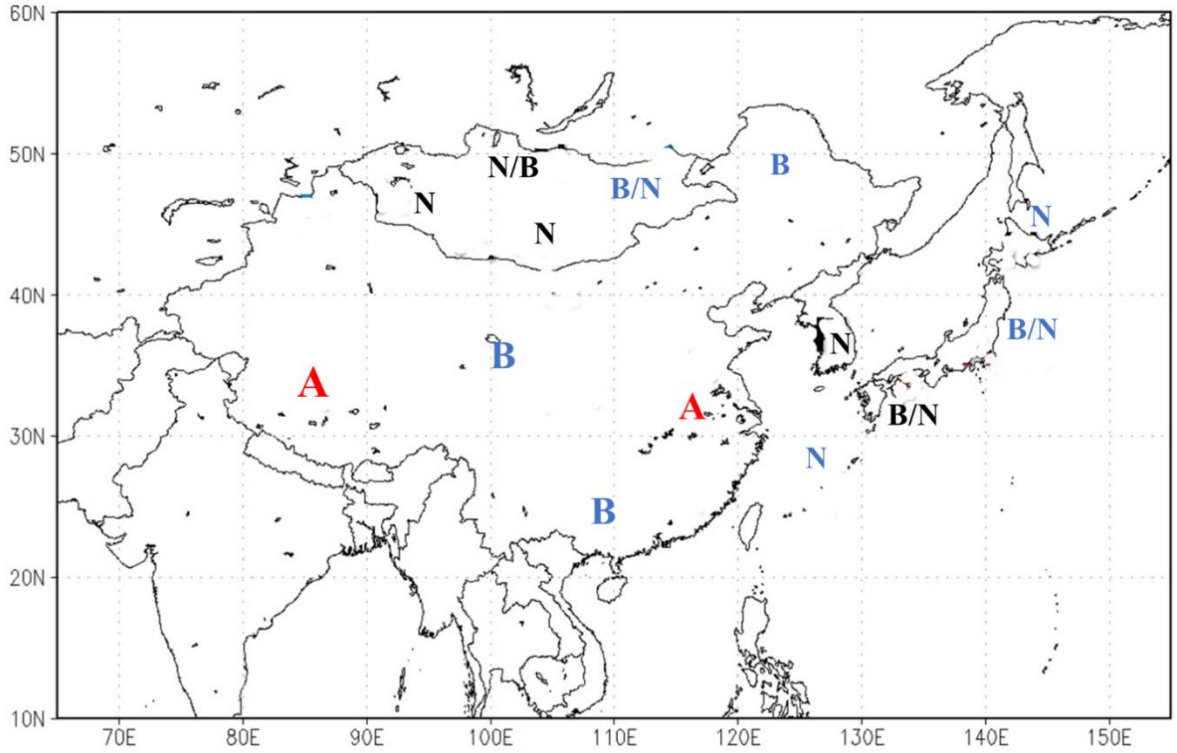
NAMEM: According to Multi-model ensemble prediction, the Siberian high (SH) will be weaker than normal in coming winter. The Uralian ridge expected to be slightly stronger, but which extends northwest toward Pole.

Air temperature would be near-normal over most of the area, however, below-normal in the eastern part of Mongolia, due to East Asian trough.

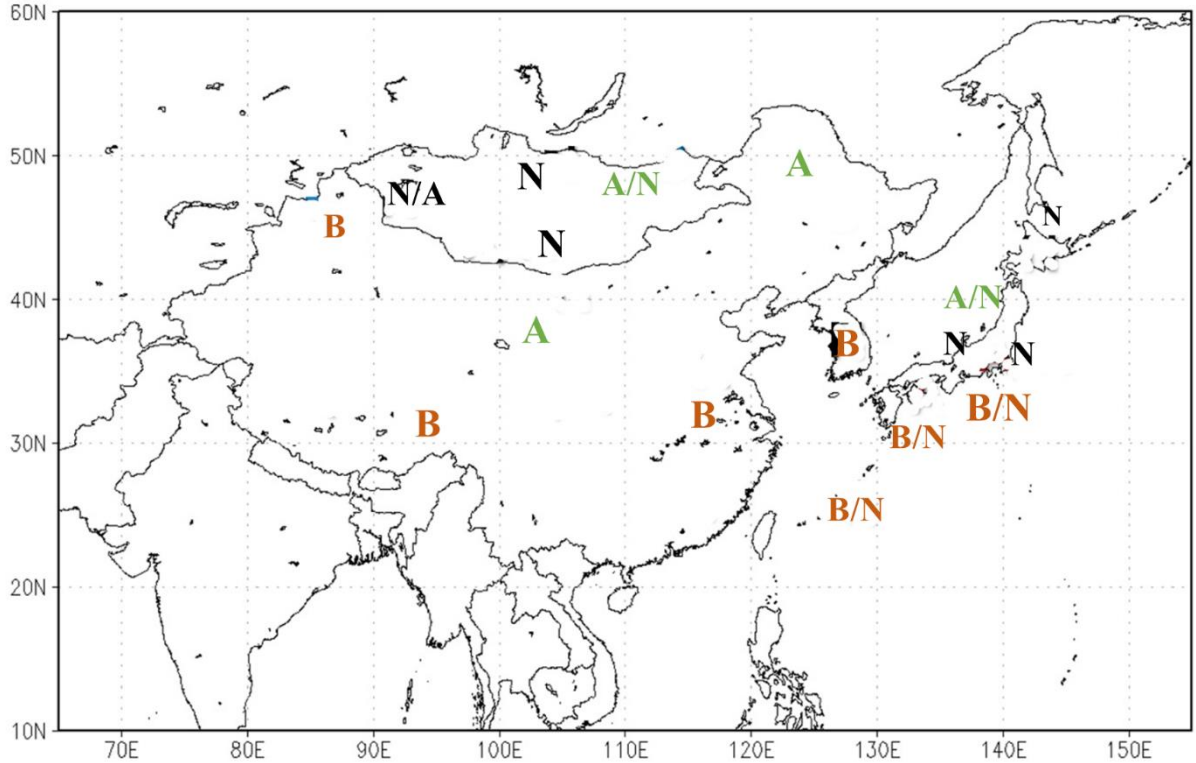
In terms of precipitation, we expect near-normal over central and Gobian regions, and above-normal over the eastern and over the southwestern region.

Summarized prediction

Temperature



Precipitation



5. Other Issues

5.1. All materials from the EASCOF-10 such as presentations, summary, and a list of participants will be available on the dedicated website.
5.2. As a WMO sub-regional COF, activities of the EASCOF-10 will be reported to the WMO by the NAMEM as soon as possible after the circulation to all participants.
5.3. The date and place of the EASCOF-11: The session was pleased to note that Japan will host the EASCOF-11 in November 2023. The time and venue will be determined later on.