The Fifth Session of the East Asia winter Climate Outlook Forum (EASCOF-5)
Tokyo, Japan
8 – 10 November 2017

Contents

Executive summary

The Fifth Session of the East Asia winter Climate Outlook Forum (EASCOF-5) took place in Tokyo, Japan for the period from 8 to 10 November 2017. Experts from China, Japan, Mongolia and Republic of Korea participating in the Forum discussed outlook for winter 2017/2018 and summarized that the coming East Asian winter monsoon (EAWM) is likely to be weaker than normal. In addition, they reconfirmed that EASCOF-5 was a valuable opportunity for NMHSs in East Asia to exchange knowledges and experiences regarding understanding of climate system such as the East Asian monsoon and good practices for the engagement between producers and users of climate services.

1. Introduction

The Fifth Session of EASCOF (EASCOF-5) was held at the headquarters of the Japan Meteorological Agency in Tokyo, Japan for the period from 8 to 10 November 2017. More than 30 experts from China, Japan, Mongolia and Republic of Korea attended EASCOF-5, sharing recent understanding of phenomena related to seasonal prediction on the EAWM as well as discussing

seasonal outlook of the coming winter.

In session 1, experts from National Meteorological and Hydrological Services (NMHSs) of the four countries presented current status and future plan of seasonal forecasting service as well as perspective of climate services. In sessions 2 and 4, experts from NMHSs and research institutes gave presentations about state-of-the-art understanding and findings regarding climate systems related to EAWM including its predictability in terms of seasonal prediction. In session 3, to enhance use of climate information in user sectors, good practices for the engagement between producers and users of climate services were presented with invited speakers from research institutes in agrometeorological sectors. Following the reviews of recent climatic features in East Asia including those for summer 2017 in section 5 as well as development and verification of seasonal prediction system used in NMHSs in East Asia in section 6, seasonal outlooks for winter 2017/2018 were discussed in session 7 and summarized in session 8. In session 9, international and regional activities related to EASCOF and NMHSs in RA II were introduced and discussed, and finally, the place of the next EASCOF-6 was agreed among participating countries.

2. Review of recent climate conditions for East Asia

In summer 2017, a large part of East Asia experienced above-normal temperatures. In terms of precipitation, southeastern China, western China, the Sea of Japan side of Japan experienced above-normal precipitation, while some areas of the northern part of East Asia experienced below-normal precipitation.

In addition, overviews of climate conditions including characteristic climate events in 2017 were shared by participants from each country in East Asia. Reports from each country were summarized in Appendix I.

3. Current status and Outlook for ENSO

At present, La Niña-like conditions are seen in the tropical Pacific, with below-normal SSTs over the central-to-eastern equatorial Pacific and above-normal SSTs over the western tropical Pacific.

It is more likely that La Niña-like conditions will continue during the winter 2017/2018, while there is a possibility to be neutral conditions during the winter.

4. Outlook for 2017/2018 winter

4.1. East Asian Winter Monsoon and related atmospheric circulation

Summary: The East Asian Winter Monsoon is likely to be weaker than normal.

The prediction of EAWM in the winter 2017/2018 was discussed considering several expected phenomena which would influence EAWM and the Forum concluded that the EAWM is likely to be weaker than normal in the winter 2017/2018.

It is more likely that La Niña-like conditions will continue, so that more active convective activities and cyclonic anomalies in the lower troposphere are expected over the western tropical Pacific, which are closely related to expected stronger northeasterly near the surface over the southeastern part of East Asia and below-normal precipitation from South China to the sea south of Japan. Siberian High is likely to be weaker than normal which will cause weaker northwesterly near the surface and warmer temperature in the eastern part of China, while stronger northwesterly may be expected around the northern edge of East Asia, which could cause colder temperature over the area. It is noted that sea-ice condition over the Barents-Kara Sea seems to be an important element to consider the strength of the Siberian High. However, there is some uncertainty about the effect of the sea-ice condition over the Barents-Kara Sea on the Siberian High. Another point is that many dynamical seasonal prediction models considered at the Forum predicted positive Arctic Oscillation (AO)-like pattern, which could cause warmer temperature over East Asia, however, it should be recognized that skills of AO in the seasonal numerical models are limited with a large uncertainty. Finally, the recent trend of global warming is also important element to be considered. It is also mentioned that the intraseasonal variabilities are expected to be large due to several factors such as La Niña-like conditions and internal atmospheric variabilities.

Through the discussion about the prediction of EAWM, it is recognized that there are a lot of EAWM definitions and recognition of the EAWM definition seems to be different among participants in the Forum. For example, some experts considered the strength of EAWM using anomalies of temperatures, others using anomalies of winds or sea level pressures, while these definitions are related with each other. In addition, there may be some difficulty to describe a whole EAWM condition by a single wording. So, finally, the Forum recognized that more appropriate way to describe the EAWM condition would be investigated, for example, to describe atmospheric circulation patterns or temperatures directly. In addition to the strength of EAWM, more details of atmospheric general circulations should be taken into consideration, or to divide the area of EAWM into some areas which have common features regarding atmospheric circulation patterns or temperatures.

4.2. Temperature and precipitation

Summarized outlooks are shown in Figure 4.1.

a) Temperature b) Precipitation

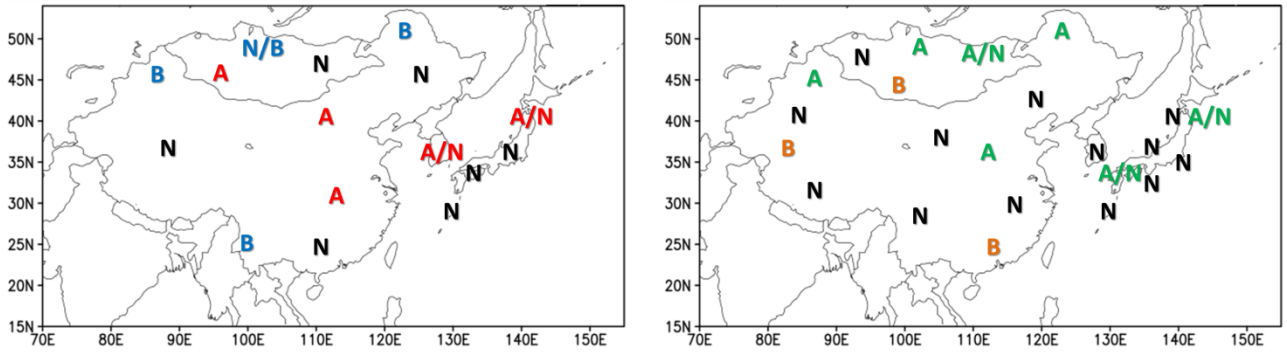

Figure 4.1 Outlooks of (a)temperature and (b)precipitation for winter 2017/2018 (December 2017 – February 2018)

A: probability of above-normal category is 50% or more (e.g., above-normal: 50%; normal: 30%; below-normal: 20%), or most likely category is above normal (deterministic forecast)

A/N: probabilities of above-normal and normal categories are both 40% (i.e., above-normal: 40%; normal: 40%; below-normal: 20%), or most likely category is above-normal or normal (deterministic forecast)

N: probability of normal category is 40% or more and above those of the other categories (e.g., above-normal: 30%; normal: 40%; below-normal: 30%), or most likely category is normal (deterministic forecast)

N/B: probabilities of below-normal and normal categories are both 40% (i.e., above-normal: 20%; normal: 40%; below-normal: 40%), or most likely category is below-normal or normal (deterministic forecast).

B: probability of below-normal category is 50% or less (e.g., above-normal: 20%; normal: 30%; below-normal: 50%), or most likely category is below normal (deterministic forecast)

5. Exchange of knowledges and experiences among NMHSs in East Asia

5.1. Climate variations associated with the East Asian monsoon

To estimate current conditions of East Asian monsoon as well as to interpret its predictions produced by numerical models, it is important to deepen our knowledges about climate variations and dynamics associated with the East Asian monsoon based on the latest climate sciences. EASCOF is a good opportunity to share and exchange knowledges and experiences among participants from NMHSs in East Asia, and in this occasion, the Forum invited researchers from research communities and had valuable time to learn exclusive studies a lot.

Dr. Masato Mori (University of Tokyo, Japan) gave his talk about the role of Arctic sea-ice decline on cold winters in recent Eurasia, detecting the signature of Eurasian cold winters excited by Arctic sea-ice decline in the Barents-Kara Sea and finding that the sea-ice reduction acts to increase the occurrence frequency of cold winter in the central Eurasia, though model bias can cause diverse conclusions among modelling studies about estimation of sea-ice effect to the atmospheric conditions. Dr. Shunsuke Noguchi (Meteorological Research Institute (MRI)/JMA) gave his talk about the predictability of the Polar-night Jet Oscillation (PJO) and its impact on the

skill of tropospheric forecasts using extended-range ensemble datasets by JMA, showing characteristics of predictability variations during both weaker and stronger events of the stratospheric polar vortex and presenting some signals which improved forecast skills in the troposphere after the setup of anomalous events in the stratosphere. Mr. Yuhei Takaya (MRI/JMA) provided overview of the seasonal predictability of the EAWM with focusing on the temperature variability of the EAWM and descripting predictabilities of EAWM by JMA/MRI Coupled Prediction System (JMA/MRI-CPS). Mr. Kazuto Takemura (JMA) provided his provisional result to estimate influence of enhanced convection over Southeast Asia on blocking ridge and Siberia High in winter during La Nina. Dr. Baek-Min Kim (Korea Polar Research Institute, Korea) provided an improved method to detect Kamchatka blockings in winter, which should make a large impact on the climate conditions in East Asia.

The Forum expressed its sincere thanks to the speakers for pursuing their studies regarding East Asian monsoon and sharing their knowledges with participants in the Forum. It should be emphasized that knowledges shared by the speakers and discussions with researchers would be useful for the participants to discuss the current conditions and predictions of EAWM at the Forum.

5.2. Good practices for the engagement between producers and users of climate services

To enhance utilization of climate information and services in East Asian countries, engagement between producers and users of climate services is one of crucial issues to be accelerated, in order to understand and meet user needs and requirements, which is in line with the User Interface Platform (UIP) under the Global Framework for Climate Services (GFCS). In this regard, a session entitled “Good practices for the engagement between producers and users of climate services” was organized at the Forum, including two invited speakers from agrometeorological community who provided talks about their efforts how to utilize climate information and services in their professional fields. It is noted that the session was chaired by Dr. Tosiyuki Nakaegawa (MRI/JMA), who was a co-lead of the Expert Team on Sector-specific Climate Indices (ET-SCI) under WMO Commission for Climatology (CCl).

Dr. Toshichika Iizumi (Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization (NARO), Japan) gave a talk introducing an overview and initial results of a joint research to assess the prediction skill of statistical crop yield models using seasonal predictions including temperature and precipitation based on a multi-model ensemble (MME) technique, and development of a crop forecast information services towards operational use in the future. Dr. Iizumi stressed that seasonal crop forecasting would offer useful information particularly for national and international food agencies to monitor global crop production and respond better to anticipated shocks due to climate extremes. Dr. Hiromitsu Kanno (NARO, Japan) provided a talk

about an early warning system based on the 1 km square mesh size, which was developed by NARO in collaboration with JMA, to reduce the agricultural damage by cool weather in Tohoku District of northern Japan. Dr. Kanno also mentioned about an on-going activity to develop a new agricultural alert and expert regional assistant system which were planned to cover all over Japan and include a lot of meteorological elements adding to temperature and precipitation. In addition to these invited speakers, experts from four NMHSs in East Asia presented some good practices in their countries to enhance utilization of climate information and services in terms of not only for agrometeorological sector but also other sectors, for example, energy sector. At the end of the session, Dr. Nakaegawa, chair of the session, summarized that presentations and discussions at the session were very fruitful, and useful for not only the participants in the Forum but also people who were interested in UIP, so that Dr. Nakaegawa recommended that the final report of the Forum should include a summary of this session, put the final report on the dedicated website for the Forum, and be shared to WMO Secretariat to contribute to the enhancement of UIP in the world. The forum agreed with him and this section was set up in this final report.

5.3. Development and verification of seasonal prediction system

It is essential for not only forecasters but also users to understand predictive skills and uncertainties of numerical seasonal prediction system when they produce and use predictions from the system. So, a session was set up to discuss current situation of development and verification for the seasonal prediction systems used for countries in East Asia, including BCC and JMA. From the presentations, it is noted that Dr. Jee-Hoon Jeong (Chonnam National University, Korea) introduced his study to investigate the skill of EAWM using hindcast and forecast MME datasets from dynamical seasonal prediction models compiled by APEC Climate Center (APCC), as well as Climatological Historical Forecast Project (CHFP) which is an activity under the World Climate Research Program (WCRP) Working Group on Subseasonal to Interdecadal Prediction (WGSIP).

5.4. International and regional activities related to EASCOF and NMHSs in East Asia

A session was conducted to share international and regional activities related to the Forum and NMHSs in East Asia, which is in WMO RA II, with participants in the Forum. Mr. Kiyotoshi Takahashi, the chair of RA II Working Group on Climate Services (WGCS) introduced its structure established at the sixteenth session of RA II (RA II-16) held in Abu Dhabi, United Arab Emirates (UAE) in February 2017 and addressed future challenges which should be considered by WGCS. Mr. Yasushi Mochizuki introduced an overview of the WMO International Workshop on Global Review of Regional Climate Outlook Forums held in Guayaquil, Ecuador in September 2017, and shared key topics, gaps and challenges to be considered by RCOFs in the world during the next

decade. Dr. Tamaki Yasuda (MRI/JMA), a member of WCRP WGSIP, introduced WGSIP's aims, research goals, CHFP which is a multi-model and multi-institutional experimental framework for sub-seasonal-to-decadal climate prediction system, and ongoing core projects such as LRFTIP, SNOWGRACE and Teleconnection.

The Forum welcomed these presentations and expressed thanks to presenters, because these information are very informative and useful to consider future direction of EASCOF and climate services by NMHSs in East Asia. The Forum invited the participants to bring these information back to each NMHS and to take it into consideration in the future.

6. Other issues

- EASCOF-5 materials such as presentations, summary and participants list will be available on the dedicated website.
- As a WMO sub-regional COF, this EASCOF-5 activity will be reported to the WMO by the JMA as soon as possible after circulation to all participants.
- Date and place of the EASCOF-6: The Forum was pleased to note that KMA would host the EASCOF-6 in autumn 2018. The time and venue will be determined later on.

Appendix I

Review of recent climate conditions for East Asia

CMA: This year, the most remarkable climate characteristic is warm. Up to now (October 20, 2017), Mean surface air temperature over China is 12.56°C, which is 0.92°C above normal (10.75, average from 1981-2010). In winter 2016/17, it was the warmest winter since 1961. Surface air temperature averaged over China in winter 2016/17 was -1.41°C, with 1.94°C above normal (-3.35°C). In spring 2017, the earliest heat wave was happen in north China since 2005. In summer 2017, we had experienced strong heat wave process both the north and south China.

The mean precipitation over China is 613.61mm, which is 4.0% above normal. But frequent rainstorm processes with long duration or local high intensity cause severe flooding this summer.

Eight typhoons landed in China up to now, which is 1 more than normal. Special feature of typhoon activities this year shows in the following aspects; generate time is close, landing position is similar, and the impact is high. Typhoon Hato was the strongest typhoon landed in Pearl River Delta and caused huge damage in South China, especially in Macao.

JMA: SSTs were above normal in the western equatorial Pacific in this summer and below normal in the central and eastern parts after August. Easterly winds in the lower troposphere were stronger than normal over the central equatorial Pacific. The convective activity over the Maritime Continent was enhanced through the summer monsoon season. These characteristics were similar to La Niña event and pre La Niña event composite.

Meanwhile, from early to mid-August, convective activity was particularly inactive over and around the Philippines. During the same period, the Pacific High did not extend to mainland Japan as usual and shifted southward of its normal position, corresponding to the negative Pacific – Japan (PJ) pattern (Nitta 1987; Kosaka and Nakamura 2010). In addition, the Okhotsk High, which brought cool wet northeasterly flows to the Pacific side of northern and eastern Japan, has persisted since the end of July. Both phenomena caused significantly below normal sunshine duration on the Pacific side of northern and eastern Japan.

In Okinawa/Amami of southwestern Japan, monthly mean temperature was the highest on record for August and tied with 2014 as the highest on record of September since 1946. To the south of Japan, the Pacific High was stronger than normal after July. Such extremely high temperature was considered to be caused by warm air advection in the lower troposphere, adiabatic heating by downward flow, and high SST.

KMA: South Korea experienced above-normal temperature and slightly below-normal rainfall in 2017 summer. The summer-mean temperature over South Korea was 24.5°C, which was +0.9°C higher than 1981-2010 average. In particular, extreme temperatures were observed during the period from late-June through late-July. During this period, South Korea was strongly influenced by the western North Pacific subtropical High (WNPSH) that extended more to the northwest compared to the normal position and got supplies of hot and moist airs by the southwesterly along the flank of WNPSH.

The summertime rainfall (609.7mm) ratio to normal (723.2mm) over South Korea was 84%. The June, July, and August rainfall ratios were 38%, 103%, and 88%, respectively. 2017 Changma started on June 24 and ended on July 29 and the Changma rainfall was slightly below normal (291.7mm, normal: 356.1mm). The characteristics of 2017 Changma are as follows: 1) Changma onset and retreat were later than normal. 2) The events of heavy rainfall were concentrated on the central part of South Korea. 3) Large spatial difference of Changma rainfall between southern and central regions of South Korea was observed.

NAMEM: Mongolia experienced above normal temperature and normal precipitation in 2017 summer. The summer mean temperature over Mongolia was 19.2^{o}C, which was 1.9^{o}C above normal (1981-2010 average). The June, July and August temperature anomalies were 2.7^{o}C, 2.6^{o}C and 0.3^{o}C, respectively.

Furthermore, the summer total precipitation was 116 mm, which was of near normal. The monthly precipitation ratio was 60%, 57%, and 115% for the June, July and August, respectively.
June and July were the 1st warmest and the 3rd driest months since 1961, respectively. Also, record-breaking heat wave occurred in the late June. Due this dry and hot condition, forest and steppe wildfire frequently occurred during the summer, resulting huge economics loses. Beside, above normal dry condition started to be observed from the beginning of June and intensified up to late July almost all over the country. This caused extreme and moderate drought condition over 70% of the whole country.

References:

Kosaka, Y., and H. Nakamura, 2010: Mechanisms of meridional teleconnection observed between a summer monsoon system and a subtropical anticyclone. Part I: The Pacific-Japan pattern, *J. Climate*, **23**, 5085 – 5108.

Nitta, T., 1987: Convective activities in the tropical western Pacific and their impact on the Northern Hemisphere summer circulation. *J. Meteor. Soc. Japan*, **65**, 373 – 390.