The 3rd session of
East Asia winter Climate Outlook Forum

3 – 5 November 2015

Seoul, Republic of Korea

Korea Meteorological Administration

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3–5 November 2015, Seoul, Korea

Agenda

Tuesday, 3 November

10:00 – 10:30 Registration

Opening Session:

Chairperson : CHO Kyungsuk, KMA

10:30 – 10:50 Opening/Welcome Address

- Welcome Address
  (KIM Seong-Kyoun, Director General of Climate Science bureau, KMA)
- Group photo

10: 50 – 11:00 Coffee Break

Session 1: Overview of 2015 East Asian Summer Monsoon

Chairperson : CHEN Lijuan, CMA

11: 00- 11:50

- East Asian Summer Monsoon Activities and Its Impacts on China's Climate in 2015 **(**XIANG Yang, CMA) (25min)
- Overview of 2015 Summer Climate over South Korea (YIM So-Young, KMA) (25min)

11: 50 – 13:30 Lunch

Session 2: ENSO current status and outlook

Chairperson : NARUI Akio, JMA

13: 30- 15:00

- ENSO Current Status and Outlook (SHAO Xie, CMA) (30min)
- The ongoing El Niño event and its impact over East Asia in August 2015 **(**TANAKA Motohiro, JMA) (30min)
- Prediction skills of ENSO and the East Asian Winter Monsoon in the BCC_CSM1.1m model (CHENG Yanjie, CMA) (30min)

15: 00 – 15:30 Coffee Break

15: 30- 17:00

- Understanding El Nino's influence on East Asian climate (YEH Sang-Wook, Hanyang University/ Korea) (30min)
- How fast will be the phase-transition of 15/16 El Nino? (HAM Yoo-Geun, Chonnam National University/ Korea) (30min)
- Discussion of Session 2 (30min)

17: 00 – 18:00 Coffee Break

18: 00 – 20:00 Welcome Dinner

Wednesday, 4 November

Session 3: Understanding of the East Asian Winter Monsoon

Chairperson : PUREVJAV Gomboluudev, NAMEM

9:30 – 12:00

- Impact of Sudden Stratospheric Warming on the Surface Air Temperature in East Asia (SON Seok-Woo, Seoul National University/ Korea**)** (30min)
- JMA's New Seasonal Ensemble Prediction System (JMA/MRI-CPS2) (MATSUKAWA Chihiro, JMA) (30min)
- Two distinct influences of Arctic warming on cold winters over North America and East Asia (JEONG Jee-Hoon, Chonnam National Univ./Korea) (30min)
- Seasonal prediction of winter 2015 using CNU/KOPRI dynamic seasonal prediction system(Baek-Min Kim, Korea Polar Research Institute/Korea)(30min)

12:00 – 13:30 Lunch

Session 4: Seasonal outlook for winter 2015/16

Chairperson : YIM So-Young, KMA

13:30 – 15:00

- Seasonal Outlook of the 2015/2016 Winter over China (CHEN Lijuan, CMA) (30min)
- Cold Season Outlook for Winter 2015/2016 over Japan (NARUI Akio, JMA) (30min)
- Summer climate and seasonal outlook for winter 2015/2016 in Mongolia (PUREVJAV Gomboluudev, NAMEM) (30min)

15: 00 – 15:30 Coffee Break

15:30 – 17:00

- Climate Outlook For Winter 2015 over Korea (LEE Hyunsoo, KMA) (30min)
- Seasonal Climate Prediction for the Winter 2015/16 (KRYJOV Vladimir, APEC Climate Center) (30min)
- Discussion of Session 4 (30min)

Thursday, 5 November

Session 5: Discussion and Summary

Chairperson : KIM Hyun-kyung, KMA

9:30 – 10:30 Discussion

10: 30 – 11:00 Coffee Break

11: 00 – 12:00 Summery

12: 00 – 13:30 Lunch

Abstract

Session 1: Overview of 2015 East Asian Summer Monsoon

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East Asian Summer Monsoon Activities and Its Impacts on China's Climate in 2015

XIANG Yang
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Abstract

China is located in the world's most famous monsoon area - the East Asian Monsoon (EAM) area, and monsoon area accounts for approximately 60% of the area of mainland China. East Asian Summer Monsoon (EASM) has an important influence on the climate and environment of China. The previous studies have shown that there are obvious temporal-spatial variations in EASM. Also, there exists a significant quasi-biennial oscillation with a characteristic of meridional tripole pattern distribution in the interannual variations of EASM system, and a significant weakening trend in the interdecadal variations of this system from the late 1970s, which is particularly obvious in North China. On the fifth pentad of May in 2015, the onset of South China Sea Summer Monsoon (SCSSM) occurred over the northern part of South China Sea, which was slightly late and of weak intensity compared with an average year. Then it advanced northward slowly and contracted during flood season (JJA) in this year. Under its influence, the precipitation was less than normal in North China and more than normal in South China. Heavy precipitation was frequent, and rainstorm and flood disasters were severe in some parts of South China during flood season. However, drought appeared in the eastern part of North China, Northwest China and the central part of Inner Mongolia in late summer. El Nino event may be one of the possible reasons for the weakening of EASM.

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Overview of 2015 Summer Climate over South Korea

So-Young Yim, Eun-Mi Kim, Su-Jeong Kim, Hyun-kyung Kim
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Abstract

South Korea experienced near-normal temperature and below-normal rainfall in 2015. The summer mean temperature over South Korea was 23.7℃, which was the almost same as normal (+0.1℃, 1981~2010 average). The June, July, and August temperature anomalies were +0.5℃, -0.1℃ and +0.1℃, respectively. On the other hand, the summer mean precipitation (387mm) ratio to normal (723mm) was 54%, which was recorded as the 3rd lowest rainfall since 1973. The June, July, and August precipitation ratios to normal were 62%, 62% and 42%, respectively.

2015 Changma started on June 24 and ended on July 29. The Changma period was the almost same as normal, however, the Changma rainfall was below normal. The North Pacific High was zonally extended rather than meridional direction during the pre-Changma period. Thus, the rainfall front was mainly located along the latitude 30N over the ocean. During post-Changma period, the rainfall front was not able to be activated because of weak North Pacific high and typhoon activities. The information detailed will be presented.

Session 2: ENSO current status and outlook

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ENSO Current Status and Outlook

SHAO Xie, LIU Yanju, ZHOU Bing, LIU Changzheng, YANG Mingzhu
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Abstract

The latest El Niño event which started in May 2014 has lasted for 20 months up to October 2015, and it is still developing. This event has become into a strong El Niño event with the longest duration since 1951 based on the monitoring of Beijing Climate Center (BCC). As the response to the sea surface warming in the Central-Eastern Pacific, convections have been greatly suppressed around the western e quatorial Pacific, and the Walker circulation have been weakened since May 2015. Inf urther, China experienced an abnormal warm winter (2014/2015) and the precipitation in North China was less than normal under the influence of the El Niño event. Based on the prediction of BCC, El Niño will keep increasing and arrive its peak during boreal winter of 2015-2016. It will continue until the spring of 2016, most likely forming an extremely strong El Niño event.

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The ongoing El Niño event and its impact over East Asia in August 2015

Motohiro TANAKA
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Abstract

East Asia experienced anomalous climate conditions in August 2015, such as light precipitation in Mongolia, northern China to the Korean Peninsula, and heavy rainfall events in southern China and Western Japan.

These events were caused by the stationary front located from southern China to the main island of Japan and the persistent southwesterly moist air flow toward the front, accompanied with the southward shift of the subtropical jet stream compared to the normal position and southward meandering of the jet stream to west of Japan.

The possible factors underlying these anomalous conditions of the jet stream is that the convective activity was significantly suppressed over a large part of the Asian summer monsoon region in association with the SST anomaly patterns (above normal in the central-eastern Pacific and Indian Ocean, and below normal in the western Pacific). These characteristics of atmospheric and oceanographic conditions are similar to ones typically observed in El Niño events, which are detected by the composite analysis based on the past El Niño events.

Moreover, the wave packet propagation of the stationary Rossby wave over the northern part of Eurasian Continent was also important for the meandering of the jet stream which corresponded to the deep trough over west of Japan in the upper troposphere.

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Prediction skills of ENSO and the East Asian Winter Monsoon in the BCC_CSM1.1m model

Yanjie Cheng, Tongwen Wu, Xiangwen Liu, Xiaoyun Liang
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Abstract

ENSO prediction skill in coupled climate model is significantly influenced by initial SST conditions. In this study, ensemble ENSO hindcasts for the time period of 1991-2014 are conducted by the coupled model BCC_CSM1.1m using two initial perturbation methods respectively, the singular vector (SV) and lag averaged forecast (LAF) method. The deterministic and probabilistic ENSO prediction skills are compared between two methods. Using the SV method, correlation, RMSE, and the Brier skill score of ENSO events are improved significantly when the model starts from March and May. Meanwhile, the correlation skill of 2m air temperature and the 500hPa geopotential height are both improved over the most areas of China in summer. Winter Monsoon seasonal prediction results from the BCC model for the 2015 winter will be provided at the conference.

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Understanding El Nino's influence on East Asian climate

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Abstract

The East Asian monsoon (EAM) is one of the most active and impactful components of the global climate system, and its variability is dominant on both interannual and decadal timescales. On the other hand, it is well known that the variability of EAM is closely associated with the ENSO variability. There is no doubt that the EAM is largely influenced by ENSO during both summer and winter, respectively. Currently, an El Nino event is developing and most climate models are expecting a large amplitude of El Nino in the following winter. In this study, we examine the state of EAM in winter in 2015 and summer in 2016 using a composite analysis and an EOF analysis, respectively. In particular, our analysis indicates that a decaying of El Nino and the warming of Indian Ocean is able to cause an increase in the rainfall anomaly over East Asia in during summer. On the other hand, it is found that the East Asian winter monsoon is significantly influenced by the in phase/out-of-phase relationship of ENSO-PDO linear relationship.

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How fast will be the phase-transition of 15/16 El Nino?

Yoo-Geun Ham
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Abstract

In this talk, the transition speed of 2015/16 El Nino events will be discussed. It will be shown that the future evolution of SST anomalies outside of the equatorial Pacific will be the key to predict the future El Nino transition. The recent Indian Ocean, North Tropical Atlantic ocean warming during the 2015/16 El Nino mature phase act to lead the fast transition of El Nino, therefore, the subsequent La Nina events is expected at the end of 2016. On the other hand, the abnormal SST warming over the eastern north Pacific can induce the persistent equatorial westerly, therefore, it can slow down the speed of the phase-transition of 2015/16 El Nino event. The statistical prediction using multiple linear regression with pre-cursors outside of the equatorial Pacific (i.e. Indian Ocean, Atlantic, North Pacific), the Nino3.4 index during JJA of 2016 shows weak negative.

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Impact of Sudden Stratospheric Warming on the Surface Air Temperature in East Asia

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Abstract

The sudden stratospheric warming (SSW), which is characterized by an abrupt increase of polar stratospheric temperature by several tens of degrees in a week, has been known to affect tropospheric weather and climate on sub-seasonal time scale in the boreal winter. Such downward coupling has been often examined in North Atlantic and Europe, but rarely examined in East Asia. In this study, by applying the two definitions of SSW to the reanalysis data, the possible impacts of the SSW events on the surface air temperature (SAT) and tropospheric circulation in East Asia are analyzed. It is found that Eurasian continent, including Siberia and the Northeast Asia, tends to experience anomalously cold SAT for up to thirty days after the SSW events. The resulting SAT anomalies largely resemble those associated with negative Artic Oscillation. However, over East Asia, SSW-related SAT change is weak and not statistically significant. Only during the extreme SSW events when the downward coupling between the stratosphere and troposphere is strong, East Asia exhibits significantly cold SAT anomalies. This relationship is presented by grouping SSW events into those followed by cold SAT anomalies over East Asia and those by warm anomalies for varying threshold values of the SSW events.

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JMA's New Seasonal Ensemble Prediction System (JMA/MRI-CPS2)

Chihiro Matsukawa, Yuhei Takaya, Satoko Matsueda, Hiroyuki Sugimoto, Ichiro Ishikawa, Tamaki Yasuda, Yosuke Fujii, Takahiro Toyoda, Shoji Hirahara, Hirotoshi Mori, Noriyuki Adachi, Ryoji Nagasawa, Akihiko Shimpo and Tomoaki Ose
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Abstract

The Japan Meteorological Agency (JMA) has upgraded the seasonal ensemble prediction system in June 2015. The outline of upgrade in new operational forecast system (JMA/MRI-CPS2) is as follows: 1) increase of horizontal and vertical resolution in atmospheric model (TL159L60) and oceanic model; 2) introduction of interactive sea-ice model and expansion of the oceanic model into a global domain with the tri-polar grid; 3) new initial conditions for atmosphere and land surface from a JMA new reanalysis (JRA-55), and ocean from a new ocean data assimilation system (MOVE/MRI.COM-G2); 4) more sophisticated description of greenhouse gases (6 gases prescribed with RCP4.5 scenario); 5) introduction of a stochastic physics scheme for better representation of model uncertainty; and lots of improvements in physics parameterization both in atmospheric and oceanic models. The verification results using the re-forecast for 36 years from 1979 to 2014 indicate that the sea-ice model represents its interannual variability and reduction trend in the Arctic region. It is also suggested that the introduction of sea-ice model contributes to the improvement of prediction skill for 2-m temperature over the Arctic region. The land initialization with JRA-55 and better description of greenhouse gases contribute to improvement of the prediction skill and the warming trend of 2-m temperature over land, respectively. The MV-EOF analysis shows the feature of East Asian Winter Monsoon circulation associated with convective activity in the tropics seen in the reanalysis can be well reproduced in the model. The overall performance and prediction skill of SST associated with El Niño-Southern Oscillation, 2-m temperature and precipitation are improved

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Two distinct influences of Arctic warming on cold winters over North America and East Asia

Jee-Hoon Jeong[1], Jong-Seong Kug[2], Yeon-Soo Jang[2], Baek-Min Kim[3], Chris K. Folland[4,5], Seung-Ki Min[1], Seok-Woo Son[6]

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Abstract

East Asia and North America experienced cold winters in recent years but were poorly predicted by dynamical models. Based on observational analyses and extensive climate model results, we identified that the harsh winters were associated with warm conditions over the Arctic Ocean; cold winter temperatures in East Asia and North America followed warm temperatures in the Barents-Kara Sea and East Siberian-Chukchi Sea region by a week or two, respectively. Each regional warming over the Arctic Ocean is accompanied by the local development of an anomalous anticyclone and the downstream development of a mid-latitude trough. The resulting northerly flow of cold air provides favourable conditions for severe winters in East Asia or North America. These links between Arctic and mid-latitude weather are also robustly found in idealized climate model experiments and CMIP5 multi-model simulations. Operational seasonal prediction models participated in CHFP have the ability to capture this arctic-multitudes connection. This understanding may help to improve the seasonal prediction of winter weather in these regions.

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Seasonal prediction of winter 2015 using CNU/KOPRI dynamic seasonal prediction system

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Abstract

Changes in cryospheric conditions such as Arctic sea-ice and snow cover in the northern high-latitude can significantly alter the large-scale atmospheric circulations. Recently, there have been large efforts for understanding the link between atmosphere and cryospheric surface conditions. Although a number of modeling and observational studies have suggested various mechanisms about the linkage, still diverse results are obtained with different models and different observational data (reanalyses). As an effort toward understanding the link, Chonnam National University (CNU) and Korea Polar Research Institute (KOPRI) designed a dynamical seasonal prediction system specialized for northern winter forecasts. We use NCAR CAM5 as atmospheric component of our dynamical forecast system. We devised initialization codes for atmosphere, surface conditions such as snow and soil moisture. Especially, model snow depth is initialized. Arctic sea-ice condition and SST during the winter-time are statistically predicted using S-EOF technique and used as a boundary condition for the forecast. Local SST where a significant changes of sea-ice fraction occurs has been treated with special care using statistical relation between sea-ice fraction and local SST since the two variables are tightly linked in the Arctic Ocean. In this talk, we introduce the newly developed seasonal prediction system and discuss the seasonal forecast results of winter 2015.

Session 4: Seasonal Outlook for winter 2015/16

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Seasonal Outlook of the 2015/2016 Winter over China

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Abstract

Based on dynamical models and statistical analyses, we predict a weak East Asian winter monsoon in the coming 2015/2016 winter. Air temperatures will be warmer than normal in most China, especially over north-central China. However, Northeast China may be slightly colder than normal. Winter precipitation will be below normal over most northern parts of China, especially in eastern Northwest China and western North China. However, more precipitation tends to occur over most southern parts of China, especially south of the middle and lower reaches of the Yangtze River valley.

Sea surface temperature anomaly (SSTA) over the tropical eastern Pacific is one of the most important external-forcing factors for the climate prediction in this winter. A strong El Nino event is developing and will reach its peak in the coming winter. It has exerted significant impacts on the climate anomaly during past months. And in the following winter, it will induce a weak winter monsoon, a shallower East Asian trough, an anomalous low-level anticyclone around the Philippines, as well as an intensified northwestern Pacific subtropical high with its high ridge extending more westward and southward. The other two important factors are the Sea Ice concentration (SIC) over the Arctic in September and the SSTA dipole mode over the tropical Indian Ocean (TIOD) in autumn. After removing the linear trend of the SIC, the slightly less SIC over the Barents-Kara Sea would result in a weak Siberia High in winter. The strong positive TIOD may intensify the India-Burma trough in winter, causing more moisture flux from the Bay of Bengal to southern and southwestern China.

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Cold Season Outlook for Winter 2015/2016 over Japan

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Abstract

The Japan Meteorological Agency (JMA) issued its outlook for the coming winter (December 2015 – February 2016) over Japan in September and updated it in October. The presentation will illustrate the outlook updated on 23 October 2015.

According to the outlook, temperatures are expected to be above-normal in eastern and western Japan and Okinawa/Amami and to be near-normal range in northern Japan. Cold season precipitation amounts are expected to be above-normal on the Pacific side of eastern and western Japan and Okinawa/Amami, and to be near- or above-normal on the Sea of Japan side of western Japan, and to be near-normal range over the northern Japan.

The outline of outlook background is as follows.

* Sea surface temperatures are expected to be above-normal from the west of dateline to the eastern part of the equatorial Pacific. El Niño conditions will continue during this winter.

* Convections over the tropics are expected to be more active than normal from the west of dateline to the eastern part of the equatorial Pacific, while more inactive than normal from the Indian Ocean to the Maritime continent.

* A subtropical jet stream is expected to shift southward over the Eurasian continent, in association with inactive convections from the Indian Ocean to the Maritime continent. Accordingly, southwestward anomalies of the upper flow are expected around west of Japan, which would enhance the impact of low pressure around the region.

* Considering all, north-westerly monsoon is expected to be near-normal in northern Japan and to be weaker than normal in eastern and western Japan and Okinawa/Amami.

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Summer climate and seasonal outlook for winter 2015/2016 in Mongolia

Purevjav Gomboluudev and Amarsaikhan Davaadorj
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Abstract

In 2015 summer, mean temperature over Mongolia was 18.5^{o}C, which is above normal (1981-2010), especially northern and central part of the country, where agricultural region located. The June, July and August temperature anomalies were 0.0^{o}C, 1.5^{o}C and 2.1^{o}C as respectively. Furthermore, the summer precipitation was near normal 121.5mm. The monthly precipitation ratios were 149%, 80% and 89% for the June, July and August, respectively.

Blocking is persisted in eastern part of Mongolia until mid summer. Therefore, positive pressure anomaly dominated over country and precipitation was below normal, especially central and eastern part of Mongolia.

June precipitation in agriculture region was 21% of normal and temperature anomaly was 1.4^{o}C above normal during growing season. Consequently, especially crop yield has been reduced by nearly 50%.

Consideration all statistic and global model output, 2015/2016 winter outlook is issued subjectively. Initial result indicated that winter temperature is expected to be **near normal** and precipitation will be **normal and above normal** almost whole country.

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Climate Outlook for Winter 2015 over Korea

LEE Hyunsoo, Cho Hee-Young, PARK Jeongwon, LEE Seongeun, and KIM Hyun-kyung,

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Abstract

The Korea Meteorological Administration (KMA) has been operationally running the GloSea5 (Global Seasonal Forecasting System ver.5) since 2014. Based on GloSea5, KMA has been producing probabilistic long-range forecasts including 1-month, 3-month forecasts. They are available on the KMA web site (www.kma.go.kr). The model results of KMA and the WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble (WMO LC-LRFMME) will be presented.

Currently, a strong El Niño is present in the tropical Pacific Ocean. The majority of international climate outlook models suggest that the 2015-16 El Niño is likely to maintain strong intensity exceeding 2° Celsius above average over the east-central tropical Pacific, potentially placing this El Niño event among the four strongest events since 1950 (1972-73, 1982-83, 1997-98). This El Niño features the Eastern Pacific type, so we are interested in 1982-83 and 1997-98 events. The overall characteristics for 2 cases will be discussed.

Besides the El Niño, we are monitoring the snow-cover and Arctic sea-ice extent for wintertime forecast. More snow-cover over the Eurasian continent and its fast progress in the fall are significantly related to below-normal temperature for early winter. Severe winters across East Asia are associated with anomalous warmth in the Barents-Kara Sea region. Also, low sea-ice over the Laptev Sea for previous October is accompanied by the below-normal temperature for December over Korea.

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Seasonal Climate Prediction for the Winter 2015/16

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Abstract

APCC has issued on a monthly basis with a one month lead a 3-month rolling forecast since 2007 and a 6-month rolling forecasts since 2013. Currently, 17 climate centers and research institutes participate in the APCC operational MME prediction providing ensembles of global forecast fields, with 6-month climate simulations being performed by seven climate models. WMO LC-MME performs computation of 3- and 6-month rolling forecasts similarly to APCC but comprising the forecasts from the WMO GPCs.

In our talk, we discuss the MME-forecast anomalies of SST and circulation strongly affecting the wintertime climate system of East Asia as well as we present the APCC and WMO LC MME forecasts of temperature and precipitation over East Asia.

For the forthcoming winter 2015/16, APCC's and WMO LC's MMEs predict a further development of the strong El-Nino episode, with the mature phase being achieved in the last quarter of 2015.

There is an enhanced probability for above normal temperature over East Asia in the winter 2015/16. Probability for above normal precipitation is slightly enhanced in the northern regions of East Asia. Meanwhile, no forecast signal is distinct for the southern regions.

The presented seasonal outlook for winter 2015/2016 is based on the model simulations initiated with condition of late September – early October, 2015, a two month lead. When October initialization applied, prediction may need some slight corrections.

Session 5: Discussion and Summary