RCOF Review 2017

[Regional Climate Outlook Forum]

Status Report (Survey) on EASCOF

Annotated Outline

Specific Climate features of concerned region

The salient features of the seasonal climate of the region (rainy season, dry season), indicating the sources of seasonal predictability (ENSO for example); does a baseline study exist on climate variability in the region and its major forces? Include references to important recent peer-reviewed publications on the subject, along with a brief summary outlining the key messages on the current status of scientific knowledge relevant to seasonal forecasting for the region of interest.

- EASCOF region encompasses various territories including continental, insular and peninsular countries, separated by the Sea of Japan and the East China Sea. In its winter season (November to March), East Asia is under the influence of the East Asian winter monsoon (EAWM). The intensity of EAWM affects the temperature and precipitation variations over eastern China, the Korean Peninsula, Japan and the surrounding region.
- The winter climate in the region features very cold conditions, especially in Mongolia and northern China. Besides, a large area of northern East Asia is covered with snow.
- These characteristics of winter climate in the region are closely related to both the intensity and extension of the Siberian High, a continental cold high pressure system, and the Aleutian Low, as key factors for the East Asian winter monsoon. The Siberian High is likely to be linked to the Arctic Oscillation (AO) (Shengping He et al., 2016) and the sea ice extent in the arctic ocean (Inoue et al., 2012), with relatively low predictabilities. The Aleutian Low is also related to these variations and is closely linked to AO (James E. Overland et al., 1998), the El Niño/ Southern Oscillation (Horel, J. D., and J. M. Wallace, 1981) and its related variation in the tropics (Megan E. Linkin et al., 2007), which has relatively high predictability.

  (Reference)

  Shengping Hea, Yongqi Gaoa, Fei Lia, Huijun Wanga, Yanchun Hea, 2016: Impact of Arctic Oscillation on the East Asian climate: A review, Earth-Science Reviews

  Huang W, Wang B, Wright JS, Chen R, 2016: On the Non-Stationary Relationship between the Siberian High and Arctic Oscillation. PLoS ONE 11(6): e0158122.

  Inoue, J., M.E. Hori, and K. Takaya, 2012: The Role of Barents Sea Ice in the Wintertime Cyclone Track and Emergence of a Warm-Arctic Cold-Siberian Anomaly. J. Climate, 25, 2561–2568

  Overland, J.E., J.M. Adams, and N.A. Bond, 1999: Decadal Variability of the Aleutian Low and Its Relation to High-Latitude Circulation. J. Climate, 12, 1542–1548

  Horel, J.D. and J.M. Wallace, 1981: Planetary-Scale Atmospheric Phenomena Associated with the Southern Oscillation. Mon. Wea. Rev., 109, 813–829

  Linkin, M.E. and S. Nigam, 2008: The North Pacific Oscillation–West Pacific Teleconnection Pattern: Mature-Phase Structure and Winter Impacts. J. Climate, 21, 1979–1997

Highlight specific climate sensitive sectors in the region - like agriculture or water resources - mentioning impacts of seasonal climate variations on their activities, along with a brief outline of potential applications of seasonal forecasting products for decision making.

- Winter climate conditions have profound impacts on various sectors in East Asia such as agriculture, livestock, electric power industry and transportation facilities and services. For instance, severe cold conditions lead to the damage of agricultural production and livestock, and

also cause the increase in demand for energy and electric power supply. Heavy snowfall and freezing cause traffic jams, delays and cancellations of flights, collapses of facilities and houses, and high costs of ploughing. Less snowfall amounts could result in shortage of reservoir storage and river discharge in the following warm season.

The RCOF background

The RCOF details:

- *when/how it started (e.g. preceded by a scoping workshop);*
  - The first session of the EASCOF was organized in November 2013 as a WMO sub-Regional COF, as the successor to the Joint Meeting for Seasonal Prediction of the East Asian Winter Monsoon (hereafter, Joint Meeting) started in 2000 （1st Session of Joint Meeting for EAWM was held on 21-22 Nov 2000 hosted by CMA）.
- *coordinating institution(s) (e.g. RCC/RCC-network, an NMHS, a regional organization)*
  - Each session is coordinated alternately among Japan Meteorological Agency (JMA), Korea Meteorological Administration (KMA) and the National Agency for Meteorology and Environment Monitoring (NAMEM) of Mongolia.
- *sub-region/countries involved;*
  - China (the China Meteorological Administration (CMA)),
    - GPC-Beijing
    - RCC-Beijing (Beijing Climate Center)
  - Japan (JMA),
    - GPC-Tokyo
    - RCC-Tokyo (Tokyo Climate Center)
  - republic of Korea (KMA),
    - GPC-Seoul
    - LC-LRFMME
  - Mongolia (NAMEM)
- *collaborating partner institutions;*
  - None
- *typical frequency, target season(s), tentative dates of the session (physical, or online)*
  - frequency: once a year
  - target season: boreal winter season from December to February
  - tentative dates of the session: around the end of October to early November (physical meeting)

Note: Information already available in RCOF factsheets[1] published by WMO could be used, unless it needs to be updated.

The RCOF process

The RCOF implementation process, including the capacity development activities, the main forum structure, joint sessions with user involvement, sessions focused on specific sector(s), if any.

- The EASCOF consists of sessions for introduction of the seasonal prediction system operated by each participating organizations, climate monitoring (including reviews of the last Asian summer monsoon) and analyses of the climate system regarding winter monsoons, sharing of seasonal forecasts for the coming winter of participating countries and discussion for the consensus outlook.
- The 2011 session of predecessor of the EASCOF was jointly organized with the training seminar of

[1] RCOF Factsheets published by WMO available at: https://library.wmo.int/opac/doc_num.php?explnum_id=3191.

RCC-Tokyo.

- There were no sessions focused on specific sector so far.

The current methodology/approach adopted for preparing the seasonal predictions and consensus outlook, including the global/regional/national technical inputs for the process. Indicate whether real-time products from GPC-LRFs are routinely accessed and used.

- CMA, JMA and KMA operate dynamical seasonal prediction models and relevant statistical models developed by themselves and seasonal forecasts for each of three countries are issued based on their own prediction systems, while NAMEM issues its seasonal forecast for Mongolia mainly based on a statistical model developed by themselves. The consensus outlook is summarized based on the seasonal forecasts prepared by each NMHSs through discussion among forecasters and experts from participating countries.
- All the participating countries routinely access and use the real-time products from GPC-LRFs.
- In addition to the input from GPCs, BCC and TCC generally provide necessary information on how to interpret the GPC products to make a forecast and consensus outlook for NMHS in the region, as a role of RCC in East Asia. The both inputs from GPC and RCC, and the profound discussion among participating forecasters and experts during the session with the aim of making consensus outlook, surely also contribute to deepen understandings of the physical mechanisms and dynamics behind the consensus outlook.

Evaluation of the previous season's consensus outlook:

- *how is outlook skill evaluated, with which skill measures (verification metrics if any), and for what period, with what resulting skill score(s);*
- *how (or whether) is outlook skill communicated to users*

- The evaluation of forecast predictabilities based on results of hindcast experiments is of enormous importance for seasonal forecast.
- Each participating NMHS introduces such evaluation regarding its own forecast systems and also gives the evaluation for their own forecast to the previous season through diagnostic assessments and objective indices during the EASCOF sessions.
- On the other hand, there were no descriptions of the evaluation on the previous season's consensus outlook in the summary reports so far.

Further value addition and dissemination of outlooks to stakeholders at national scale, e.g., through National Climate Outlook Forums (NCOFs), or similar activities

- KMA hosts domestic expert meeting for seasonal climate outlook every three months. KMA shares the consensus outlooks of EASCOF with domestic experts and determines final forecast through further discussion.
- The products in terms of winter outlook of monsoon intensity, temperature anomalies, etc., from EASCOF were domestically disseminated to support the national and provincial seasonal forecast in China.

Information updates between RCOF events, e.g., through a Climate Watch, monthly updates of forecasts etc., including through the operations of Regional Climate Centres (RCCs) and its dissemination to stakeholders

- Consensus outlooks of EASCOF have not been updated so far.

Provision of climatological information together with the outlook (for context and information)

- The summary report of EASCOF includes the consensus outlook as well as the information on the latest climatological and oceanic conditions such as sea surface temperatures, sea ice extent and

surface climate conditions.

Capacity needs

What are the main capacity needs of the major stakeholders observed to date, of the NMHSs? RCC? Users?

- It is required for all participants, especially for those who are engaged in operational climate services, to have expertise regarding climate characteristics in East Asia (such as meteorological and climatological background regarding on the climate system of the region, remote influences from the tropics and the teleconnections in the mid- and high-latitude) and model characteristics (model specification and its prediction skill of numerical model) operated by own country.

How are these needs being addressed through the RCOF process? How could they be further addressed?

- Each session is coordinated alternately among JMA, KMA and NAMEM, which enables staff of host country to fully participate in EASCOF. This could provide a valuable opportunity for them to deepen their understandings and improve their capacity for climate services through discussion and exchanges of the expertise.
- The materials presented during the sessions are made available to the extent possible via a dedicated website, so staff of NMHSs even who did not participate in the session also can refer to those presentation materials after EASCOF session.

User involvement

Considering the main aim of EASCOF, which is to exchange information and expertizes on analysis method and forecast technique especially applied to monsoon activities in East Asia among the experts, there are no participation of "users" like stakeholders and user communities in EASCOF. In that sense, no answers are given in inquiries below.

How user needs are reflected in the forum, and after the forum,

Indicate the main (regional) users involved in RCOF

How is the forum used as a mechanism to collect user feedback? What are the main messages from feedback to date? What changes/plans have been made to address these (e.g., development of tailored products, forecasts of sector-specific variables)?

How are seasonal outlooks evaluated from user perspectives, and challenges met by them in the process of applying the information into decision making process identified, and how is this input addressed through the RCOF process?

SWOT analysis

Describe the main Strengths (indicate key benefits realized, with some examples of success stories based on user feedback), Weaknesses, Opportunities and Threats (SWOT) pertinent to the RCOF, both on regional and national scales.

- Strong: Because most participating NMHSs have the ability to develop and operate dynamical prediction systems and to issue seasonal forecasts by themselves, it is possible to summarize the consensus outlook through the profound discussion on the prediction basis and forecast skills by the forecasters, based on the outputs from various prediction models and its comparison.

Sustainability of RCOF

Role of a Regional Climate Centre (RCC)/RCC-Network functioning in the concerned region in the RCOF process

- The role of RCC in EASCOF is to contribute to the development of consensus outlook and valuable exchange of expertise for climate outlook through following activities:
  - Provide certainly numerical prediction products for the basis of consensus outlook
  - Send forecasters to the session of EASCOF who can interpret and assess GPC and RCC product in formulating seasonal forecasts.
- In addition, another role of RCC is to actively communicate with the research community and to promote sharing of information on the state-of-the-art expertise and techniques for climate services in the forum.

Recognition of the role of RCOF by the countries in the region

- RCOF plays an important role in boreal winter forecast which is issue of mutual concerns for China, Japan, Mongolia, and Korea. The consensus outlook is very useful to eliminate forecast uncertainty for the operational forecast of member country.

Coordination mechanisms established (such as, a network of focal points, management group) to plan, organize the sessions, discuss challenges and find solutions (such as on-line sessions)

Existing funding mechanisms, need for mobilizing resources to sustain the RCOF; List some of the major projects implemented with support to the RCOF sessions. Suggest approaches for long-term sustainability with minimal dependence on external resources.

- EASCOF is alternately hosted by Korea, Mongolia and Japan, and the host organization arranges the dates, agenda, etc. in consultation with other country's focal points including China.

Way forward

The future efforts in science (including key research questions and needs), operation, user engagement, sustainability.

- efforts in science
  - improvement of the performance of seasonal prediction system of participating NMHSs
  - progress in meteorological understandings of the East Asian monsoon system
- user engagement
  - sharing current status of utilizations of the long range forecast in each participating country and their activities for promotion of use of the forecasts, with aims the promotion for more utilizations of long range forecast through improvement of user interface

Use of objective regional seasonal forecasts in preparing the outlook, and suggestions for the development of global standards for RCOF operational practices

- It should be noted that there is a possibility to interfere with the development and implementation of RCOF activities by excessive standardization of RCOF operation since purposes of an implementation of RCOF varies from region to region and RCOFs have successfully developed in response to each national and regional demand for climate information.
- It is unclear what objective regional seasonal forecasts are in preparing the outlook because the definition and the technical background have not been clarified yet. With regard to preparing the seasonal outlook, it is in general important to carefully assess the model outputs, taking into consideration the current climate condition, the regional characteristics including the past statistical relationships and their predictabilities evaluated based on the result of hindcast experiments.

Possibility to expand the RCOF product portfolio (such as monitoring information for the recent and current seasons, sub-seasonal information including onset date, rainfall distribution, etc., variables other than rainfall and temperature, impact-based outlooks, etc.)

- In regard to EASCOF, it will be technically possible to expand the RCOF product such as monitoring information, sub-seasonal information, seasonal tropical cyclone forecast, etc., because most participating countries operate their own data assimilation systems and dynamical numerical prediction models.
- However, there are several problems to be considered from the viewpoint of the process to create additional and/or inter sessional RCOF products, that is, the session style (online or face to face meeting), frequency of the session, coordination mechanism and so on.