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## **EXPERIMENTAL EXCHANGE OF LONG-RANGE FORECASTS AND REPORT OF RESULTS**

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### **Summary and purpose of document**

This document outlines the APEC Climate Network (APCN) project for real-time exchange of climate prediction information, being carried out by the Korea Meteorological Administration (KMA).

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### **Action proposed**

The Team is invited to make recommendations based on the proposals submitted in this document.

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## **EXPERIMENTAL EXCHANGE OF LONG-RANGE FORECASTS AND REPORT OF RESULTS**

### **1. INTRODUCTION**

The Korea Meteorological Administration (KMA) has been carrying out the APEC Climate Network (APCN) project for the real-time exchange of climate prediction information among the APEC member economies in order to reduce the effects of natural disasters and to provide benefit to industries and socio-economic activities in the Asian-Pacific region through international cooperation. The APCN project is focused on global climate monitoring and prediction, aimed at integrated preventive strategy development.

As the first step in establishing a network under the APCN for the exchange of real-time climate information, the dynamic multi-model ensemble forecast has been attempted to form the basis of optimum global climate prediction. The dynamic ensemble seasonal prediction data for the summer precipitation, which is one of the most difficult and challenging parameters to predict, have been collected from National Meteorological and Hydrometeorological Services (NMHS) and research institutes equipped with infrastructure to produce the dynamic seasonal prediction information.

The participating organizations and institutes involved in the real-time multi-model ensemble experiments to build-up the infrastructure for joint operational seasonal forecast are: the Meteorological Service of Canada, China Meteorological Administration, Institute of Atmospheric Physics of China, Central Weather Bureau of Chinese Taipei, Japan Meteorological Administration, Korea Meteorological Administration, Meteorological Research Institute of Korea, Russian Federal Service for Hydrometeorology and Environmental Monitoring, Main Geophysical Observatory of Russia, National Aeronautics and Space Administration, National Centres for Environmental Prediction (NCEP) of the USA, and the International Research Institute for Climate Prediction of the USA. KMA is responsible for the processing of dynamic ensemble prediction data and making it available to the participating members. The multi-model ensemble products can be distributed through the provision of access to the APCN web site, upon agreement under the auspices of WMO.

The APCN project will be carried out in two phases: the experimental phase and the implementation phase. Included in the experimental phase are activities for establishing the scientific basis for multi-model ensemble forecasts and the enhancement of necessary infrastructure, followed by the generation of multi-model ensemble based on the prediction information provided by participating members and dissemination of climate monitoring and forecast information to participating members in the implementation phase.

In the experimental phase, it is necessary to build-up a systematic channel for producing and exchanging long-range prediction information in a standardized format among the participating Institutes, parallel to research efforts to improve the predictability. The optimum number of ensemble members from individual models needs to be decided based on the results of research on predictability and the infrastructure of participating institutes. Taking into account the time constraints on data acquisition and processes. A standardized data format can help to reduce data processing. The climatology most often used is the average of long-term simulation of their own models, while some models use the NCEP reanalyses. A preliminary study showed that the climatology obtained from multi-year seasonal prediction runs, which is non-trivial and can reduce

the bias in the prediction fields. Using different climatologies for computing anomalies is an unknown source of uncertainty, which needs extensive studies.

The precipitation forecast using a multi-model ensemble is relatively successful in the tropics. The calculation of the probability of heavy precipitation episodes using daily forecast data provides useful information for various regions. The high-resolution model shows superiority in storm development and monsoon rainband. A preliminary experiment indicates that the weighted multi-model ensemble forecast based on pattern correlation coefficient between forecast and observation derived from previous year exceeds the predictability of the simple average of all the members available. It is recommended that for better predictability the weighting coefficient be derived using much larger samples, and the models participating in the multi-model ensemble be kept unchanged. Otherwise, the time-consuming and high-cost processes of computing model statistics must be repeated. An organized research team can carry out the research project to develop science and technologies involved in optimal method of blending various model outputs.

A better-organized effort is needed to assemble the many parts of exercises in climate modelling, diagnostics, and post-processing of climate prediction information in order to provide various end-users with reliable seasonal forecast information. KMA has organized the APCN Steering Committee, consisting of leading scientists in the fields of climate modelling, model diagnostics, and other areas of interest to the seasonal prediction. The functions of the Committee are to discuss the direction of and policy on international cooperation for the prevention of natural disaster, to discuss strategies for acquiring the necessary funding for the operation of APCN, and to provide guidelines on research and development activities involving dynamic climate forecast. The role of the APCN Steering Committee is to orchestrate the individual efforts in operational Centres and Research Institutes within the framework of APEC.

## **2. RECOMMENDATIONS FOR FUTURE CONSIDERATION**

Special attention is needed to develop the long-range forecast and verification techniques on global hydrological cycle monitoring and prediction aimed at integrated preventive strategy development. Considering the current level of understanding and the size of the tasks involved in producing reliable seasonal prediction information, the tasks should be properly distributed until credibility is established, whereas extensive and organized research efforts should be supported for establishing the scientific basis and the enhancement of necessary infrastructure. To encourage and assemble the regional activities related to long-range forecasting, WMO is requested to set up a strategic plan to orchestrate individual research efforts in operational Centres and Research Institutes.

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