

## **WMO WGSIP INITIATIVE:**

### **Long-Range Forecasts of Monsoons (LRFM) (A component of the WGSIP Prediction Capability Project)**

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#### **Context – Main goals**

The purpose of the WGSIP Initiative “Long-Range Forecasts<sup>1</sup> of Monsoons” (LRFM) is to make a systematic evaluation and inter-model comparison of long-range forecasts of the monsoons. The monsoon is a fundamental annual climate variation, at the same time, it also fluctuates in various time scales. The LRFM comprise from two themes: “Asian monsoon” and “Global Monsoons”. The first theme focuses on the Asian monsoon, which is the most prominent regional monsoon on the globe, the second theme deals with the global monsoons in a broader view. The LRFM research initiative will leverages publicly available hindcast datasets including: the Climate-system Historical Forecast Project (CHFP), which was coordinated by WCRP/WGSIP, Copernicus Climate Change Service (C3S), ENSEMBLES and Development of a European Multimodel Ensemble system for seasonal to inTERannual prediction (DEMETER).

#### **Asian Monsoon**

The Asian monsoon is the most dominant regional monsoon, which is strongly influenced by the atmosphere-land-ocean interactions in a region with complex geography (coastlines and terrains). The long-range forecast of the Asian monsoon had been a challenge for climate modeling. Although the model development is still in an incipient stage and its skill is still far from satisfactory, recent progress of climate modeling enables to generate meaningful predictions up to a season ahead. Better understanding of the dominant variability modes and processes controlling them reveals the predictable variability of the Asian monsoon. The dominant variability modes play a major role in modulating the Asian summer monsoon and are considered to give rise to the seasonal predictability. Thus, in this theme, it is planned to evaluate the reproducibility and prediction skills of key features/modes such as (1) developing-ENSO influence, (2) delayed ENSO influence through the so-called “Indian-western Pacific Ocean Capacitor” (IPOC) mode, (3) influence of the global warming/decadal variability, (4) the Indian Ocean Dipole mode (e.g., Wang et al. 2015, Kosaka et al. 2013).

#### **Expected outcomes:**

- Better understanding of processes and mechanisms responsible for the seasonal predictability of the Asian monsoon
- New diagnostic ways to describe the model performance of seasonal predictions of the Asian monsoon

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<sup>1</sup> In the WMO terminology, “long-range forecast” encompasses forecasts in a time-range from 30 days up to two years.

- Identification of key aspects to further improve the seasonal prediction skill of the Asian monsoon to facilitate the model development at modeling centers
- Provision of the systematic assessment of the prediction skill in latest and past seasonal prediction systems, to infer progress and prospects of the Asian monsoon seasonal predictions

### **Related initiatives and contact points**

CLIVAR/GEWEX Monsoons Panel (Rupa Kumar Kolli), GEWEX Regional Hydroclimate Project: AsiaPEX (to be launched soon, Yuhei Takaya)

### **Global Monsoon**

Several regions worldwide are dominated by a monsoon-like cycle of rainy and dry seasons (Wang and Ding 2008). The concept of the global monsoon (GM) has been developed to refer these features in a holistic view, originally in the climate change research (e.g., Wang and Ding 2006, Zhou et al. 2016), but this concept can also be extendedly applicable in the context of the climate prediction. Prior studies have examined the features, changes, and ocean forcing of the GM-related precipitation (Zhou et al. 2012). Because the GM is the fundamental and drastic feature in climate system, it is crucial to represent the GM features well in the dynamical models (Zhou et al. 2016). Better representation of the GM in dynamical models is expected to bring with the improved seasonal forecasts. In the “Global Monsoon” theme, it is planned to evaluate the performance of current dynamical models in predicting the GM and GM precipitation.

### **Expected outcomes:**

- Evaluation of the performance of dynamical models in the seasonal prediction of the GM index and GM precipitation patterns.
- Evaluation of the performance of dynamical prediction models in representing the impact patterns of the main factors of ocean forcing on the GM and precipitation.
- Understanding of main mechanism aspects responsible for the seasonal predictability of the GM index or GM precipitation.

### **Related initiatives and contact points**

Global Monsoons Model Inter-comparison Project (GMMIP; contact points: Tianjun Zhou)

### **References:**

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