Implementation of seasonal climate prediction

over ECO region

Abstract:

Global climate change is influencing the frequency and severity of hydrologic extremes, including floods and droughts, resulting in a number of issues with respect to, for instance, food and water security. Climatic variability occurs at widely varying temporal and spatial scales. This variability often impacts negatively on agricultural and natural ecosystems. Although floods and droughts have always been an integral part of human existence, our collective coping strategies have so far been limited by the complexity of systems responses to climate, environment and management and our inability to predict the consequences of such systems dynamics. This has led to the development of conservative management approaches that usually fail to capitalize on the up sides of climate variability and often only poorly buffer against the severe downsides.

ECO region, as one of the most vulnerable areas of the world to climate change, has experienced lots of weather-related disasters. Droughts, dust haze and sand storms; more frequent floods; unpredicted torrential rains; land erosion; water shortages; and reduced agricultural production are among climatic phenomena heavily affecting and continuing to threat the ECO Region, especially the mountainous areas. For instance, climate change impacts on the form of precipitation cause to have more rainfall than snowfall. This would lead to see decreases in snow cover as a water resource and increases in flooding due to rapid snow melt and heavy rainfalls, especially in mountainous areas. While decadal plans for infrastructure adaptation and capacity building are important for managing water and natural resources under this changing climate in ECO region, timely early (seasonal) warning, or so-called seasonal climate forecasting, is essential for hydro-climatological hazard mitigation by increasing preparedness.

When considering prediction of the climate on the seasonal timescale (i.e. typically up to a year ahead) an important distinction has to be made between dynamical predictions, those which use complex dynamical numerical models of the main Earth system components, and statistical predictions, those which use regional historical relationships between physical variables such as temperature and precipitation with statistical models of varying degrees of sophistication. While dynamical seasonal prediction is a relatively recent endeavor, statistical models have been used since the late 1800s. It is only with the advent of the former, however, that seasonal forecasting has grown dramatically. Key to this burgeoning has been the extensive use of complex dynamical models which have allowed unprecedented detailed investigations of the climate system, consequently with an improved understanding of the dynamical evolution of the main components of the Earth system, including their interaction. In turn, such an understanding has translated into the ability to produce usable and useful operational seasonal prediction on the global scale (although subtly distinct, prediction and forecast are used interchangeably).

Based on what mentioned earlier, the seasonal climate forecasting might be by far the most important challenge that should be addressed in ECO region. Utilizing dynamical climate predictions is an appropriate and maybe the best approach to solve this issue in the region, especially mountainous areas. The outcome of the proposed research would be an optimized dynamical seasonal climate forecasting system for the study area which will lead to improve decadal plans for infrastructure adaptation and capacity building.

The objectives for seasonal climate prediction over ECO region are as bellow:

- To develop a climate prediction system to be applicable in ECO Member states
- Capacity building of national meteorological services in operational climate prediction
- Having a reliable seasonal climate prediction system over ECO region specially in high mountainous area
- Issuing probabilistic / ensemble climate prediction using dynamical downscaling of global climate forecast models by a regional climate model
- Providing seasonal prediction maps and data over the region to be accessible freely by national climate services authorities
- Cooperation with WMO/GFCS program in providing sectoral climate services
- Providing monthly prediction of climatological parameters of precipitation, minimum and maximum temperature
- Timely issuing of climate announcements and warnings in case of high-impact climate phenomena
- Have close cooperation with agriculture sector in preparation of related climate prediction and information