Statistical evaluation of CFS seasonal precipitation forecasts for large-scale droughts in Africa and India

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Monthly and seasonal meteorological forecasts are routinely produced by several international weather services using global coupled ocean-atmosphere general circulation models. This kind of information can be used as source of information in operational hydrological monitoring and forecasting systems to improve early drought warnings. In March 2011, a new version of the global coupled model of the National Centre for Environmental Prediction, the Climate Forecast System (CFS) Version 2, became operational providing real-time ensemble forecasts up to nine months. However, a comprehensive analysis of the CFS forecast for the prediction of droughts in water stress regions has not yet been performed. In this study we evaluate the CFS precipitation forecasts for large-scale droughts that occurred during the rainy season in West Africa, East Africa and India. The target areas are large-scale river-basins like Volta (West Africa), Ganges (India) and the administrative area of Kenya. The forecasts are compared to monthly precipitation observations provided on a regular grid by the Global Precipitation Climatology Centre. In addition, the CFS performance is evaluated using areal monthly precipitation amount of the river basin of interest as an indicator for dry months. The verification is done for the period 1982-2009 using all ensemble members of the retrospective CFS archive. The outcomes of this study illustrate, that the CFS in some cases can simulate general features of the monthly precipitation regime for the respective river basins. However, an evaluation using the entire retrospective CFS forecasts demonstrates a low accuracy. Furthermore, the seasonal forecasts of monthly precipitation are characterized by a large over- and underestimation during the rainy season depending on the target region.

In this presentation, the following issues are highlighted: (i) The performance of the CFS precipitation forecast for individual events such as the severe India drought in 2007 and the Sahel drought in 1983; (ii) The CFS forecast performance for predicting areal monthly precipitation of a river basin for different lead times using a set of verification measures to determine bias, accuracy and skill; (iii) The value of the CFS forecast if the monthly areal information is used for a warning of dry months during the rainy season.