CLIMATE PROGRAM

Reliable seasonal climate forecasts can help developing countries plan for adverse and beneficial climate events, allocate resources and achieve development goals. Scientific advances in seasonal forecasting are creating opportunities to improve climate risk management, especially in tropical countries, where seasonal forecasts are most accurate and societal needs greatest. The changing probabilities of rainfall and temperature patterns can now often be predicted with some accuracy several months in advance.

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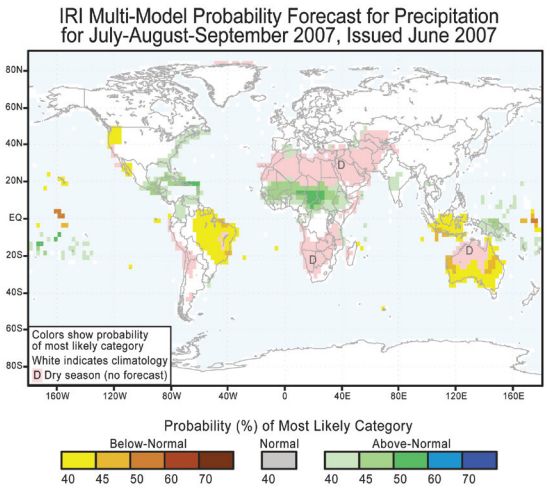
The Climate Program develops tools for generating climate-information products tailored to meet the needs of local decision makers. The approach is driven by the need to produce the best and most relevant climate information for effective climate risk management in sectors such as agriculture, water-resource operation, food security and public health.

Monthly Global Seasonal Forecasts

The IRI issues climate-prediction products and information on a monthly basis. Partners provide seasonal climate model outputs, which are used as essential input to IRI's forecasts. Forecast products include global maps showing regions of increased probability for being wetter-, dryer-, warmer- or colder-than-normal for the upcoming seasons. The map below, for example, shows one of IRI's global forecasts for precipitation. Detailed continental views are also available. Information on the uncertainties in the forecasts is provided to guide proper use.

Dynamical Climate Models

Our ability to make seasonal forecasts is based on the interactions between the atmosphere and the ocean. These interactions are complex and often near-global in extent. Better large-scale predictions are fundamental to improved regional ones, and the tailored climate forecast information needed in decision making. Our research in developing better large-scale predictions is focused on designing global modeling systems that capture the essential physics, yet are economical enough to be practical in the making and testing of seasonal climate forecasts. Regional climate models nested within the global ones enable the predictability of regional climate processes to be studied in much greater spatial detail. They provide a direct means to make seasonal climate predictions on the spatial scales often most relevant to risk-management decision makers. In partnership with regional institutions, we are developing dynamical prediction systems over northeastern Brazil, eastern equatorial Africa, and Southeast Asia.



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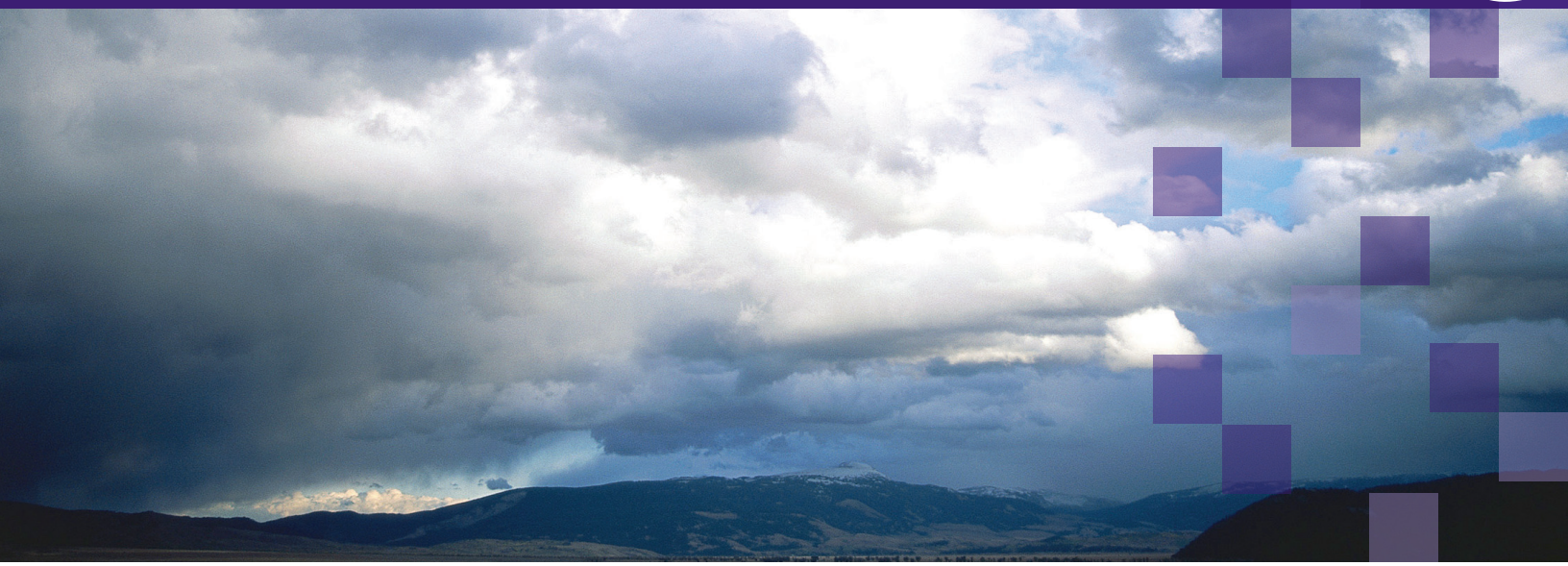


Robert Glusick / PhotoDisc

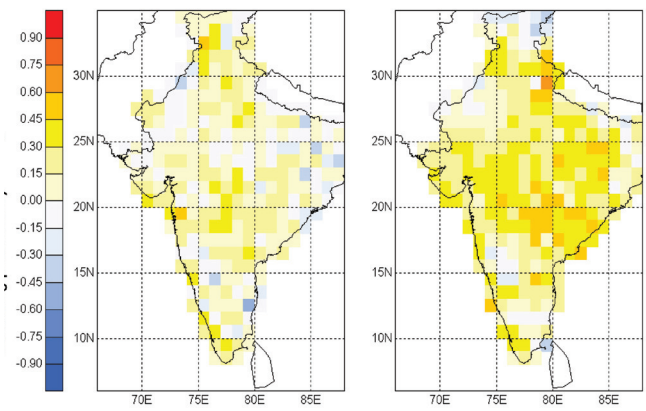
Combining Models with Observed Data

Dynamical climate models describe only imperfectly the complex processes of the climate system and need to be calibrated against observational data to produce reliable and relevant forecasts. At IRI, we develop and use statistical tools to correct systematic model errors and extract the information that is best suited to the needs of regional climate risk management. In doing so, we identify the strengths and weaknesses of each prediction model. For example, one model may excel at forecasting winter precipitation over North America, while another may be best at predicting the West African monsoon. No single prediction model is best in every aspect of climate prediction. Combining predictions from multiple models and taking into account their seasonally and geographically varying levels of skill, IRI produces a multi-model forecast that is superior to any single-model prediction. Additionally, the IRI makes these tools available to national meteorological services to produce forecasts tailored to their own observational data and needs. The resulting forecasts reliably indicate enhanced probability, when it exists, for the climate being drier-, wetter-, colder- or warmer-than-normal.

Predictability Research

Current seasonal forecasting capability is still mostly confined to predicting three-month averages of precipitation and temperature, in probabilistic terms. These are often of limited use to decision makers. Research at IRI is directed toward understanding which additional aspects of seasonal climate are predictable, such as the onset of the rainy season over Indonesia, or the probability of long dry spells or rainfall extremes during Kenya's growing season. Other research focuses on getting a better understanding of the inherent limitations of seasonal predictability and providing longer-term climate information related to human-induced climate change and decadal-scale natural variability. This research provides vital input to the optimum design of forecast systems, and to developing new kinds of forecast information for tomorrow's decision makers.

Correlation skill of seasonal hindcasts over India, June-September



Downscaled global-climate-model hindcasts in which rainfall frequency is more predictable than seasonal total.

About the IRI

The IRI works on the development and implementation of strategies to manage climate related risks and opportunities. Building on a multidisciplinary core of expertise, IRI partners with research institutions and local stakeholders to best understand needs, risks and possibilities. The IRI supports sustainable development by bringing the best science to bear on managing climate risks in sectors such as agriculture, food security, water resources, and health. By promoting and facilitating better management of climate related risks and opportunities in the present, we are creating solutions that will increase adaptability to long-term climate change. IRI is a member of the Earth Institute at Columbia University.