Rio Grande Basin, Brazil

Test Bed Leaders

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Test Bed Description

The Rio Grande drains an area of about 145,000 km2 of the Brazilian states of Minas Gerais and São Paulo, lying within a region roughly defined by 19o to 22o S and 43o to 48o W. The river is the main tributary of the River Paraná in its upper basin, and is used extensively for hydropower generation. Main hydropower installations are Marimbondo, Água Vermelha, Furnas and Estreito, each of which has installed capacity above 1,000 MW. In total, the Rio Grande basin has about 8,780 MW of installed capacity, which corresponds to approximately 12.3% of Brazil's hydropower installed capacity. Mean annual rainfall over the basin is approximately 1400 mm and is highly concentrated during 6 months from November to April.

Rainfall records of variable length and quality are available for 620 stations; flow records are available for 159 stations; and natural flows have been reconstructed for 19 sites extending back in some cases to 1931. Medium range forecasts (up to 15 days) and longer-term forecasts (up to a month or longer) are required for inflows into reservoirs from which hydropower is generated. Shorter-term forecasts (up to 7 days) are also of interest for local flood control purposes.

Key Scientific Questions

The questions are

- Can models of atmospheric behaviour be combined with hydrologic rainfall-runoff models to diminish the uncertainty in forecasts of future reservoir inflows?

- What is the uncertainty in forecasts obtained from this combined use, and how does this uncertainty compare with that of existing forecasting methods?

- Are SSTs useful for forecasting over the longer term (a month ahead or longer), and if so, can such forecasts be combined in any way (e.g., by Bayesian methods) with quantitative forecasts from regional climate models?

Key Objectives of the Research Project

- To explore the use of ensembles produced by the CPTEC model of global climate (CPTEC: Centro de Previsão de Tempo e Clima), for medium and longer-term forecasting, as input to a finer-scale (40 km grid squares) regional climate model (RAMS: Regional Atmospheric Modelling System) used by the University of São Paulo.

- To explore the use of forecasts produced by RAMS as inputs to the Hydrological Model for Large Basins developed at the Instituto de Pesquisas Hidráulicas, Porto Alegre, Brazil, for the purpose of predicting flows in the Rio Grande watershed, with lead-times extending up to a month and longer.

- To explore short-term rainfall forecasts from the operational ETA model of CPTEC as input to the Large Basins Hydrological model for the purpose of forecasting inflows to the most important reservoirs in the Rio Grande basin with lead times of up to 12 days.

Data Resources

Hydrological data for the watershed are available to the HEPEX community from the following site
http://galileu.iph.ufrgs.br/collischonn/ClimaRH/principal.htm