



Hydro-meteorological Forecasting Model

Summary

In the past and future decades, numerous huge hydropower reservoirs have been / will be built in the Jinsha River Basin (JRB). In case those reservoirs will be operated properly, flood and drought events can be managed more effectively, and more social and economic benefit can be created.

This research aims at developing a short-mid-long term hydro-meteorological forecasting model in the Jinsha River Basin, in which the large reservoirs are integrated. Based on these runoff forecasts in different regions of the JRB, regulation of all the reservoirs can be optimized, which enables the more efficient control of flood and drought events. Furthermore the model can be used to estimate impacts of climate change on the future water resource and hydropower production in the JRB.

Objective

- Development of a short-mid-long term hydro-meteorological forecasting model (HMFM) for JRB with sufficient accuracy
- Integration of operation schemes of large reservoirs within the forecast model
- Forecasting system developed and operational on site
- Climate change impacts on the future water resources can be estimated based on the HMFM

Approach

RS (routing system) model was chosen to be the forecasting model. JRB has been divided into 53 regions. In RS model the parameters for the rainfall-runoff, flood routing, reservoir operation, etc. were calibrated and validated based on the observed time series of 2000 to 2015.

Meteorological forecasts from multiple meteorological models (BOH, ECWMF, CFS etc.) were used as inputs for hydrological forecasting



Results and Outcomes

Set-up and Calibration of RS Model

The RS Model developed by e-dric.ch was set-up and calibrated. The model features include 53 regions of runoff generation, inflow, flood routing, 53 stations used for calibration, and 10 operating reservoirs (Fig.1).

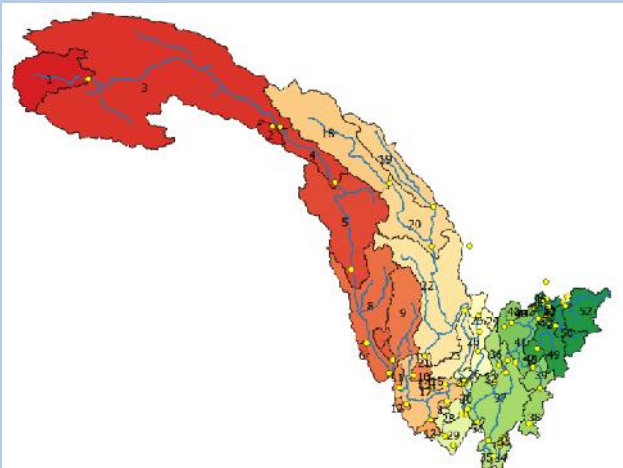


Fig. 1: RS model for JRB

Based on observed time series of 2000-2015, the model was calibrated with an average Nash-Coefficient of 0.85, and volume error of less than 1%. The discharge hydrograph of the station Shigu is shown in Fig.2.

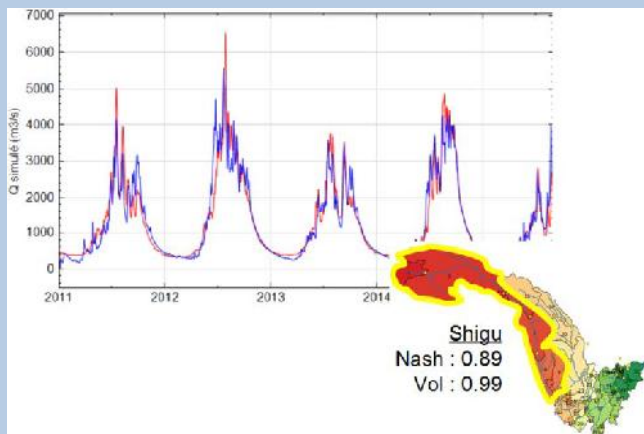


Fig.2: Discharge hydrograph of Shigu station

Forecasting System operational

The forecasting system was developed as follows:

A special database (RWDB-Swiss) was created for this project at Bureau of Hydrology of Changjiang Water Resources Commission, in order to run the system. The real-time and forecasted meteorological data from RWDB-Swiss were converted into the RS internal database. The RS model was then initialized with the last results used as initial conditions in order to get a continuous simulation. After the run of the RS model, the hydrological forecasts are sent back to the RWDB-Swiss (Figure3).

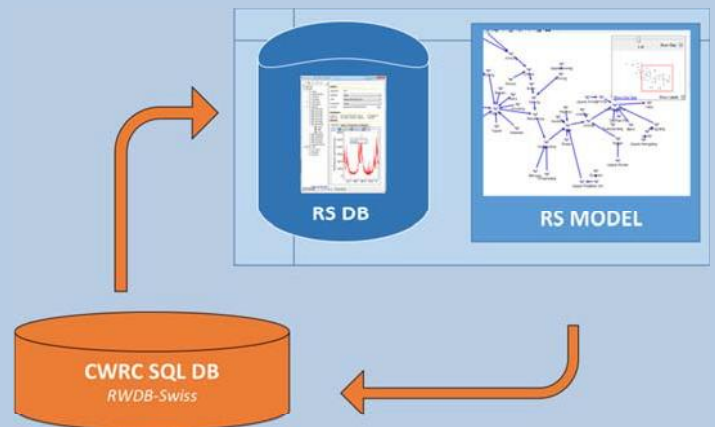


Fig.3: Coupling RS model with CWRC infrastructure