



Flow forecasting system downstream the Itaipu dam and flood hazard assessment

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The main task of the Division of Hydrology and Energy Studies (OPSH) of the Itaipu Binacional Hydropower Dam is to provide the flow forecast for both, upstream and downstream of the dam, to support programming and planning of energy operation for the actual and for the next nine days taking into account the energy demand and some hydraulics restrictions. In addition, it is responsible for emitting the Hydrologic Warning Bulletin (HWB) to the population, in case of significant increase in levels of the Parana River downstream of the dam.

The aim of this paper, is to present a new methodology used by the OPSH to perform these tasks, based on the implementation of the HEC-RAS hydrodynamic model coupled with the IPH-MGB distributed hydrologic model on the downstream reach of Itaipu Dam.

The methodology includes: a) data acquisition and consistency, b) supervision of the hydroelectric system and definition of discharges of the hydropower plants upstream the dam, c) hydrologic simulation with the IPH-MGB model, d) hydrodynamic simulation with the HEC-RAS model e) emission of levels and flows forecast f) flood hazard assessment.

The goal of the forecast is to provide levels and flow in the reach of the Parana River between the Itaipu Dam and the hydrometric station R11, located downstream the Iguazú River confluence. This is important for the dam management, because it allows the estimation of levels in the gauge station R11 in order to take control of the hydraulic restrictions of levels in this section of the Parana River, established by the Tripartite Treaty, among Argentina, Brazil and Paraguay. Furthermore, once the hydrodynamic model is launched, with updated data, it allows estimating hourly, the tailwater levels of the dam and then the hydraulic total head in order to support the scheduling and real-time operation, in the process of electric power generation.

Regarding the emission of the HWB, the aim is to provide information to the downstream population of Itaipu Dam, National Emergency Agencies and local Governments on forecast levels of the Parana River, in a very short term horizon, in situations of possible floods that could affect and damage houses and/or infrastructure in Paraguay and Brazil.