MATHEMATICAL MODELLING OF AN UPSTREAM CONTROLLED IRRIGATION CANAL NETWORK

by

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ABSTRACT

Herein is presented a mathematical model (model SIMCAR) developped to solve the gradually varied unsteady flow in an upstream controlled canal system, resulting from the fluctuations in the inflow rate and/or fluctuations in the lateral outflows at the canal offtakes.

Model SIMCAR simulates the unsteady flow phenomena in branched canal networks equiped with automatic radial gates (upstream constant water level, AMIL type) and also regarding other hydraulic structures: transitions and siphons.

The model is based on the Saint-Venant system of equations, which are solved by a finite-difference technique with a four-point implicit scheme weighted in time and space (Preissmann scheme). The final linear system of equations is solved by the double-sweep algorithm.

Model calibration and validation are made for two experimental case studies presented herein. Afew model applications are also proposed.

In this work another model is also presented: the model EFICAR and some numerical results, corresponding to two years of experiments in the irrigation system studied. This model determines the conveyance, distribution and system efficiencies.

Key words: irrigation networks, irrigation canal regulation, upstream control, unsteady flow in open-channels, hydraulic models, linear implicit methods of finite differences, double-sweep algorithm, model calibration and validation, efficiencies irrigation canal.