Mathematical Modelling and Field Study of Unsteady Flow in an Irrigation Canal System

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ABSTRACT

A computer model for simulation of upstream controlled canal systems, based on the Saint-Venant system of equations, was developed. The system of equations are solved by a four-point linear finite-difference implicit scheme, weighted in time and space. The final linear system of equations is solved by the double-sweep algorithm. The model, a stability and sensivity analysis of the numerical method are presented as well as the model calibration and verification for the canal network of the Sorraia Irrigation Project, Portugal.

INTRODUTION

Upstream control with constant upstream water level AMIL radial gates (Kraatz and Mahajan [1]) is the most used regulation method of irrigation gravity systems in Portugal. This type of regulation is appropriate for systems with rigid delivery schedules, namely the rotation, because there are no storage reserves in the canals (Cunge and Woolhiser [2]). The distribution management has to predict all demands or rejections in advance of their occurrence and, consequently, to open or to close the upstream discharge regulator.

In Portugal, social reasons led to substitute rotation by restricted arranged schedules (Replogle [3]). These delivery rules make nearly impossible the optimization of the releases. The offtakes are numerous, the variations of demand occur quickly and they are of different signs (demands and rejections) while the propagation times along the network are