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FROM UPSTREAM TO REAL TIME MANAGEMENT: RESEARCH FOR  
MODELLING IN A SURFACE IRRIGATION SYSTEM\*

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ABSTRACT

The Sorraia Irrigation Project is a well operated surface irrigation system but conceived decades ago. Modernization is needed to increase conveyance and distribution efficiencies, to improve flexibility of the system, to adequate it to modern exigences of farm irrigation, to adapt deliveries to irrigation scheduling needs, to provide improved utilization of available water and other natural resources. This is not possible maintaining traditional upstream control but implementing an intelligent upstream control with real time management.

To do so many research lines are being developed and this report concerns essentially the modelling approaches relative to the simulation of the canal system and the simulation of farm irrigation in the project area.

The hydraulic simulation of the canal system presents particular aspects since the automatic gates of constant upstream level constitute a specific problem for the application of the Saint Venant equations to describe the unsteady flow. The paper concern some research approaches that are most interesting since they may

\* Du contrôle amont à la gestion en temps réel: recherche pour la modélisation dans un périmètre au gravitaire.

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provide the basis for the required adoption of remote control and the application of real time operation: i) field calibration of a model using a combination of the continuity equation and of a discharge equation to simulate the behaviour of the automatic constant upstream level gates; ii) field calibration of a numeric model for the junctions of canals, transitions of size and form of canals, siphons and gates; iii) build-up of an aggregate hydraulic simulation model for the complete system.

Concerning the simulation of farm irrigation to build-up a management model governing reservoir releases, control points and deliveries to the distributaries, studies cover several aspects: i) improvement of model AGREGA for simulation of water consumptions and needs; ii) a data bank with meteorological, soils and crops data and irrigation data relative to the command area; iii) the irrigation simulation model ISAREG; iv) the development of an irrigation decision model to be applied at each distributary, GESREG; v) the aggregated and iterative use of such models to simulate the spatial water requirements and, therefore, releases and deliveries.

This case study do not present ultimate solutions but specific research steps essential to achieve them. Therefore, this report can be of particular interest for those who want to introduce real time management and need to investigate the solutions to be adopted.

#### RESUME ET CONCLUSIONS

Le Project d'Irrigation du Sorrala est un perimètre au gravitaire en bonnes conditions d'exploitation mais conçu il y a quelques decennies. Sa modernisation est nécessaire pour améliorer les efficiences de transport et distribution, pour augmenter sa flexibilité, pour l'adapter aux exigences modernes de l'irrigation à la ferme, pour que les fournissement s'adaptent à la conduite des irrigations, pour améliorer l'utilisation des ressources. Cela n'est pourtant pas possible si on maintien le contrôle amont traditionnel, obligeant donc à le transformer dans un contrôle amont intelligent avec gestion en temps réel.

Pour ce faire, plusieurs lignes de recherche sont en développement et ce rapport concerne essentiellement les approches aux modèles de simulation du système de canaux et de simulation des irrigations à la ferme dans le perimètre.

La simulation hydraulique concerne en particulier les problèmes spécifiques dus aux vannes automatiques de niveau constant amont, conduisant à des difficultés dans l'application des équations de Saint-Venant pour décrire l'écoulement variable.