Geophysical Research Abstracts, Vol. 7, 06748, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06748

An efficient distributed unconfined groundwater flow model for conjunctive use simulation. Numerical validation in heterogeneous aquifers with non horizontal bottom.

D. Pulido-Velazquez (1), A. Sahuquillo (1) and Joaquín Andreu (1)
(1) Instituto de Ingenieria del Agua y Medio Ambiente

To evaluate surface and groundwater conjunctive management it is usual to employ mathematical models that simulate simultaneously surface and groundwater components and the hydraulic interaction between them. If we want to take into account the stochastic behaviour of the surface hydrology, scenarios over long time horizons should be defined. Therefore, an efficient aquifer model is required for considering several management alternatives for long accumulated time periods. This is only possible in acceptable computational times solving the linear groundwater flow equation using the influence functions or the eigenvalue technique. These methods are strictly applicable only to confined aquifers (linear aquifers). The eigenvalue technique provides an explicit and continuous in time solution for confined groundwater flow equation. Through this solution the hydraulic heads and the stream aquifer flow exchange can be efficiently computed. It represents an important computational advantage in conjunctive use simulation. But many commonly exploited aquifers connected with the surface system are unconfined, and should be modelled using the non-linear Boussinesq equation. A groundwater flow solution in unconfined aquifer is presented. It is based on a new approach to linearize the Boussinesq equation. Using a change of variable it is possible to define an equation with similar structure as the linear confined groundwater flow equation. The only difference is found in a term usually negligible and another one that depends on the solution. This last term can be approximated by means of a fictitious stress, which can be defined without a high computational cost. Using this fictitious stress the Eigenvalues Method formulation can be applied, making use of its advantages. The proposed methodology has been validated solving

some synthetic study cases designed to check their operation including heterogeneous aquifers with non horizontal bottom.