

Proving the possibility of using Delft3D in irrigation systems simulations

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Irrigation system's performance and sustainability are highly affected by sediment deposition. A significant amount of research has been carried out regarding non-cohesive sedimentation in rivers, coastal, estuaries and irrigation canals. For cohesive sediments, research has been undertaken only in rivers and estuaries, but not in irrigation canals. Also most of mathematical models are used for rivers, few models are used for irrigation canals. There is hardly any mathematical model that simulates cohesive sediments in irrigation systems. From literature review it was found that Delft3d model, which is originally designed for rivers, is suitable because it can simulate cohesive sediments and it deals with networks, also because of the big similarities between rivers and irrigation systems. This study verifies the possibility of using Delft3d in simulation of irrigation canals from a hydrodynamic and morphodynamic points of view. For this purpose the Delft3D model was applied to a hypothetical case study where a main canal feeds one branch canal to simulate flow in several canals with different sizes. In scenario 1 and 2 it is assumed that no sediment is in the system and its results are compared with other results obtained from mathematical model which is originally used in irrigation canals named DUFLOW model. The results of scenario 1 and 2 were too close to each other and the flow was steady in the canal, therefore based on the results of the comparison it can be stated that Delft3d model is suitable to be used in irrigation systems from hydrodynamic point of view. After getting these satisfactory results and proved ability of delft3d, scenario 3 were taken assuming cohesive sediments enter an irrigation systems with concentration equal to 0.05 kg/m³. Delft3d gave good image about cohesive sediments behaviour, so it can be stated that Delft3d model is suitable to be used in irrigation systems from morphodynamic point of view despite some constrains As a forward step, more studies need to be done on cohesive sedimentation in irrigation canals using delft3d model, since it has been proven that this model can be used in irrigation systems.

Keywords: Sediment deposition, Delft3D model, Cohesive sediments, DUFLOW model, Comparison.