

## An adjoint-based optimal control model for unsteady free surface flows

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### SUMMARY

As extreme natural disasters, flood events raise governments, institutions and general society concern because of their destructive effects. The adjustment and control of hydraulic structures is a daily action to obtain certain level and flow values in order to reduce flood damage used to regulate water volumes to downstream regions, as well as to meet the demands of agriculture, livestock and hydroelectric energy production. The temporal and spatial evolution of flood waves in rivers is often simulated under the shallow water hypothesis [1]. This allows the approximation in cross-section, averaged one-dimensional models [2]. At the same time, hydraulic structures such as a reservoir can be modelled using an aggregated formulation, which, avoiding the discretization of the domain and the calculation of some hydraulic variables, contributes to computational efficiency [3]. The main objective of the this work is the development and implementation of a control method based on adjoint variables that allows maintaining a certain level in a reservoir by modifying the height of the dam weir, using one-dimensional and hydrological models for the flow. A sensitivity analysis is carried out to verify the capacity of the method implemented by means of simplified cases, in order to subsequently study a real domain in the Ebro river.

**Keywords:** CFD, shallow water, hydrodynamic, flood events, adjoint-based control method

**AMS Classification:** 76M12, 65M08, 37N10

### References

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