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Particle Finite Element Method and Level Set Method for the simulation of the failure of rockfill dams due to overtopping phenomena.

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ABSTRACT

An increasing interest is rising on the study of rockfill embankment dams during overspilling. Design criteria of earth dams are being reviewed in many countries to guarantee an increasing safety level in front of an exceptional flooding. Current work focuses on the numerical simulation of such structures under extreme conditions.

A generalized non-darcian model is studied for the flow outside and inside a porous medium [1]. This is included as a generalization of a Navier Stokes model and used together with a level set method to take in account free surface effects [2].

This flow is coupled with the motion of the structure of interest, which is modeled via the Particle Finite Element Mathod [3]. This allows to take into account arbitrary variation for the structural domain while preserving the full efficiency of an eulerian approach for the solution of the external and internal flow.

All of the solvers are implemented in the same framework, a multiphysic code called Kratos [4].

The final objective is the definition of a reliable numerical tool for the assessment of the behavior of rockfill embankments during overspill phenomena.

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