Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

A σ-coordinate model for 3D free-surface flows using an unstructured finite-volume technique MIGUEL UH ZAPATA, Center for Mathematical Research, CIMAT-Merida — The aim of this work is to develop a numerical solution of three-dimensional free-surface flows using a σ-coordinate model, a projection method and an unstructured finite-volume technique. The coordinate transformation is used in order to overcome difficulties arising from free surface elevation and irregular geometry. The projection method consists to combine the momentum and continuity equations in order to establish a Poisson-type equation for the non-hydrostatic pressure. A cell-centered finite volume method with a triangular mesh in the horizontal direction is used to simulate the flows with free-surfaces, in which the average values of conserved variables are stored at the centre of each element. A parallel algorithm is also presented for the finite volume discretization of the 3D Navier-Stokes equations. The proposed parallel method is formulated by using a multi-color SOR method, a block domain decomposition and interprocessor data communication techniques with Message Passing Interface. The model has been validated by several benchmarks which numerical simulations are in good agreement with the corresponding analytical and existing experimental results.

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Date submitted: 26 Jul 2016 Electronic form version 1.4