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Hydrology and Earth System Sciences Discussions

Interactive comment on "CFD modelling approach for dam break flow studies" *by* C. Biscarini et al.

Anonymous Referee #4

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In the submitted paper, the authors compare the results of a 2D model based on the shallow water equations and a 3D model based on the Reynolds-Averaged Navier-Stokes equations for two dam-break test cases. It is not very clear if the authors contributed to the development/implementation of the numerical solutions or if they just used readily-available software.

The obtained results from test case 1 do not show much as it is a frictionless (non-realistic) example for which there are no experimental results. Comparison of the 3D model results with the experimental results from test case 2, presented in Fig 14, is interesting and shows some good quantitative agreement but the timing of the shock propagation seems not to be very accurate. At t=3s the modelled peak clearly lags behind the measured one.

The conservation equations used in both models are expressed in terms of the primitive variables and it has been proven that in the presence of shock waves the solution of such non-conservative formulation of conservation laws converges to wrong solutions and provides incorrect shock speed. (see T.Y. Hou and LeFloch P. Why Non-conservative Schemes Converge to wrong solutions: Error Analysis, Mathematics of Computation, 62, pp 492-530, 1994). It has also been shown that even when using a conservative numerical method, the non-conservative formulation of the conservation laws shows much smaller shock speeds than the conservative formulation, with difference increasing with the shock strength. (See Fig 3.16, page 63 in Shock-Capturing Methods for Free surface Shallow Flows, E.F. Toro, 2001)

As the numerical methods used in both models are not shock-capturing they are not able to capture propagation of the shock waves accurately. Hence, the obtained results are not any news as they could have been predicted from the very beginning. The interesting research would be to compare realistic experimental results with results obtained by a model based on the conservative formulation of conservation laws solved by shock-capturing methods and results obtained from a 3D Navier-Stokes model used in this paper. I would not recommend this paper to be published.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 6759, 2009.