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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.

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This is a good paper assessing the efficiency of VOF techniques in the field of dam break flow modelling. Previous publications showed the advantage of full Navier-Stokes equations for refined flow modelling of various free surface flows, such as non linear waves and dam breaks, but, as VOF techniques could happen to be less accurate for computing the free surface elevation than classical methods like standard finite elements, it deserved a verification. We have with this paper a first assessment.

Here are my general remarks or hints for further researches :

* There is no friction in the two test-cases. It is however the most important factor in dam-break computations. A real life case with friction, like the Malpasset test-case used in the CADAM concerted action would be an interesting extra test-case (this is an

idea for further articles...).

* The 2 test-cases are comparisons to small scale physical models. In this case we have small cells and the k-epsilon model is probably applicable (though almost all validations are done in internal flows at very small scale). This would probably not be the case in real life applications, where much larger cells are used and the numerical velocity gradients loose their physical meaning. In such cases only the turbulence model for diffusion on the vertical is relevant. Generally speaking the efficiency of VOF methods on highly distorted meshes (horizontal versus vertical) is also a point to be tested.

* the fact that non hydrostatic equations will give higher celerity of waves is questionable and may not be always the case. A recent PhD thesis by Edmond E. Tossou (edjrosse-edmond.tossou.1@ulaval.ca) at the university of Laval in Quebec compares Serre equations and SW equations. It is shown that non hydrostatic terms slow down the flood wave and this is presented as a well known phenomenon. In my own experiments on the Malpasset test-case, I see no difference between 2D and 3D. It is then an open question with probably not a single answer.

Remarks and hints for minor revisions :

* at the top of page 6766, and then in page 6770, there is a little ambiguity on the k-epsilon model used : it is said that the standard k-epsilon model is used, and that the depth-integrated k-epsilon model is implemented and included in the software, but nowhere it is really said that the depth-integrated version has been duly used in 2D. As the depth-integrated version accounts for dispersion which may sometimes be more important than turbulence, it indeed should be used.

* the time-steps, 0.02 and 0.01 s seem to be very small. Are explicit schemes used, maybe giving the corresponding CFL numbers based on celerity or velocity would be more informative.

* page 6766 the word "specie" is probably a misprint, is it species or special ?

* anglo-saxons would rather say "consists of" than "consists in".

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