Inundation modelling

Benchmarking a new fast inundation model to support uncertainty analysis

FRMRC2 has produced:

- Benchmark simulations of a fast two-dimensional inundation model developed by Bristol University to support uncertainty analysis and real-time inundation simulation, using test cases from the Environment Agency two-dimensional model benchmarking study.

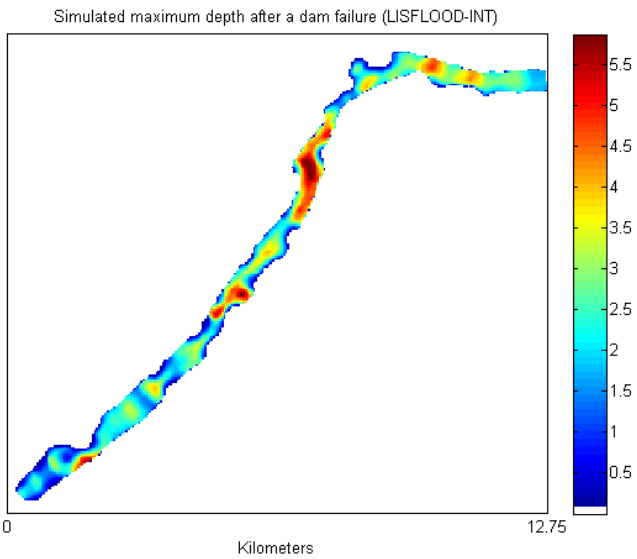
Intended readership:

- Model developers
- Environment Agency
- Consultants

Where to find more information:
http://www.bris.ac.uk/geography/research/hydrology/models/lisflood/

Summary

Two-dimensional flood inundation models are widely used tools for flood hazard mapping and an essential component of statutory flood risk management policy in many countries. Developing computationally efficient inundation models is important due to their increasing use within Monte Carlo frameworks, where many simulations are needed to estimate inundation probabilities and model uncertainties. However, more efficient models must usually make some compromises on the physical representation of flow, meaning it is imperative to understand the differences between these models and the codes currently used commercially.



This research benchmarked a new computationally efficient inundation model (LISFLOOD-INT) (Bates et al., 2010; Neal et al., 2011).

The recent Environment Agency two-dimensional model benchmarking report provided a set of relevant test cases, but also allowed for comparisons to be made with codes including TUFLOW, MKEFLOOD, SOBEK and ISIS2D and industry diffusive codes JFLOW-GPU and FlowRoute.

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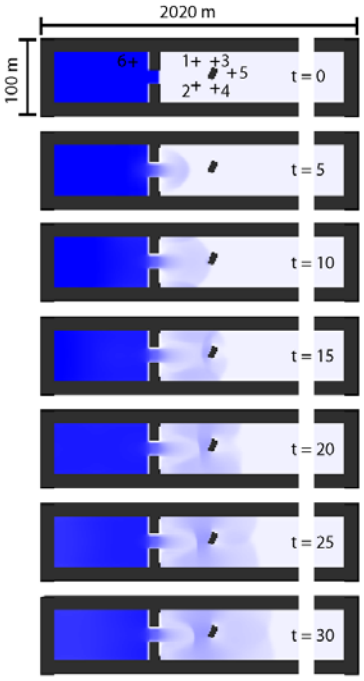
Although benchmarking tests are useful, it can often be difficult to obtain good experimental control as subtle differences in model implementation (e.g. spatial discretization, implementation of friction terms etc) may generate differences at least as large as those due to the differences in model hydraulics.

In order to overcome this issue this research benchmarked the new model against a diffusive (LISFLOOD-ATS) and shallow water model (LISFLOOD-Roe) written within the same code. This approach provides substantially improved experimental control such that we can be more confident about what caused the differences between simulations and the relative speeds of the models.



Results from LISFLOOD-Roe dam break test →

Other sources of information

Neal, J., Schumann, G., Fewtrell, T.J., Budimir, M., Bates, P. and Mason, D. Evaluating a new LISFLOOD-FP formulation with the summer 2007 floods in Tewkesbury UK. Journal of Flood Risk Management.

Bates, P. D., Horritt, M. S. & Fewtrell, T. J. 2010. An simple inertial formulation of the shallow water equations for efficient two dimensional flood inundation modelling. *Journal of Hydrology*, 387, 33-45. doi:10.1016/j.jhydrol.2010.03.027

Benchmarking of 2D Hydraulic Modelling Packages: http://publications.environment-agency.gov.uk/pdf/scho0510bsno-e-e.pdf

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- Department of Environment, Food and Rural Affairs/Environment Agency Joint Research Programme
- United Kingdom Water Industry Research
- Office of Public Works Dublin
- Northern Ireland Rivers Agency

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