



ISIS FAST

Rapid flood-inundation analysis software



Cost-effective integrated modelling solutions.

ISIS FAST is an innovative flood inundation modelling tool designed to allow quick assessment of flooding using simplified hydraulics. It provides results in seconds or minutes as opposed to hours or days, which is up to 1,000 times faster than traditional two-dimensional models.

The software works by first identifying depressions on the floodplain then routing water through these depressions. Water depths in the depressions are determined by the volume of water flowing into each one, the level at which water can spill into neighbouring depressions and the water level in the neighbouring depressions. ISIS FAST is able to do this by adopting new and innovative ways of resolving the detailed hydraulics.

ISIS FAST allows modellers to rapidly estimate flood extents and depths from multiple sources of water, including tide, surge and fluvial overtopping or breaching of defences, surface water and sewer flooding. The speed with which it can calculate water depths gives modellers the flexibility to explore uncertainty. Event magnitude and the interactions and dependency between flood sources were previously unpractical or economical. ISIS FAST now makes this viable.

The application of ISIS FAST includes near real-time flood inundation prediction on the Tidal Thames in London through to prediction of areas susceptible to pluvial flooding for the whole of Scotland.

As part of the ISIS suite, ISIS FAST links dynamically to ISIS Professional one-dimensional models, enabling large and complex studies to be undertaken much quicker than previously possible.

Key features

- rapidly estimates flood extents and depths from many sources of flooding, including coastal, fluvial, surface water and sewer flooding
- pluvial flood mapping and risk assessments at local, regional and national scales
- real-time flood mapping when linked to forecast rainfall
- used in conjunction with more detailed modelling software, such as ISIS Professional and ISIS 2D
- can remove the cost of some detailed modelling by identifying the flood risk hot spots where detailed analysis is needed
- can be used in probabilistic analysis frameworks
- can test solutions that protect people, property, critical infrastructure and the urban environment

Delivering value – case studies

■ Fingal-East Meath Flood Risk Assessment and Management Study, Ireland

The aim of the Fingal-East Meath Flood Risk Assessment and Management Study in Ireland was to identify potential locations where pluvial floodwaters and surface runoff might accumulate within areas of significant risk. The risk of extreme rainfall events and overflow of the storm water drainage systems was a prime concern.

Halcrow used the ISIS FAST computational engine to route pluvial flood water over the floodplain. ISIS FAST revealed connectivity and volume-filling effects on the floodplain and ensured complete conservation of volume.

The results of the pluvial modelling replicated the historical flooding at almost all locations in areas at risk, but also highlighted further at-risk areas.

■ Surface water flood mapping, London

ISIS FAST has been used to map surface-water flooding on the Thames floodplain in East London. Compared with results delivered by an ISIS 2D (full hydraulics) model for the same area, ISIS FAST was able to reproduce flood extents and depths to within 10cm, but 1,000 times more quickly.

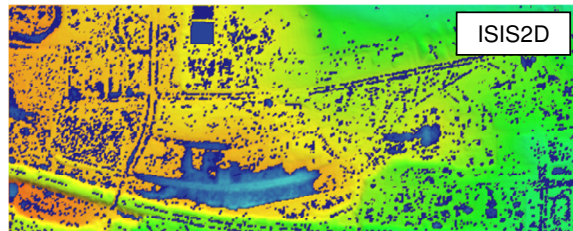
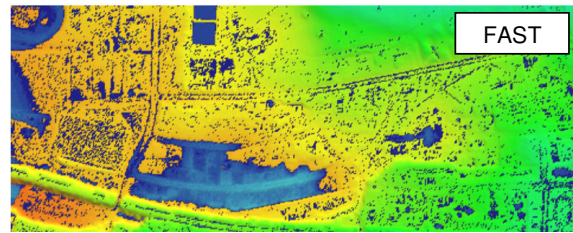


ISIS FAST's computational efficiency allows users to generate a Monte Carlo ensemble of thousands of simulations. Modellers can use this to explore the uncertainty arising from key hydrological parameters in a fully probabilistic framework.

■ Sewer surcharging, Glasgow

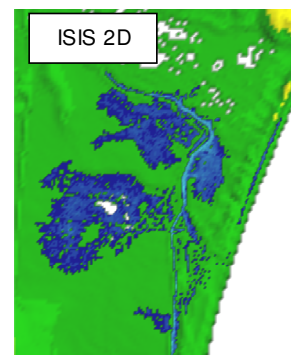
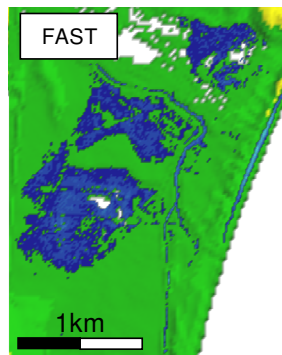
In Glasgow, ISIS FAST was used to model combined local rainfall and sewer surcharging. Comparison with ISIS 2D (full hydraulics) models showed similar flood extents with matching depths to within about 5cm.

The faster run times provided cost savings and the ability to undertake a fuller analysis of pinpointed areas of concern.



■ Coastal flooding, Suffolk

ISIS FAST can be used to rapidly model flooding from tide, surge and wave overtopping in coastal floodplains. For this project, a comparison with the ISIS 2D hydrodynamic model shows that ISIS can reproduce flood extents accurately, with water depths matching to within about 10cm. ISIS FAST run times were ten times quicker than ISIS 2D for this case.



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