

Matt Horritt

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Profile

An experienced chartered engineer, researcher and scientific programmer, working as an independent consultant developing approaches to environmental and flood risk management in the UK and abroad. 15 years' experience in research and development in industry and universities; extensive experience in technical training; developing practical solutions for flood risk management for a wide range of clients and applications; and experience of working with development NGOs in Indonesia and the Philippines.

Experience

Probabilistic, uncertainty and risk analysis: Developed uncertainty methods for a number of Environment Agency projects: Long Term Investment Strategy, Thames Estuary 2100, Mapping Flooding from All Sources, Application of Probabilistic Flood Forecasting, Flood Risk from Defence Failure, and Validation of Probabilistic Flood Models. Developed components of the RASP method for the Environment Agency's NaFRA programme, and developed flood risk indicators, methods and datasets, and a rapid method for assessment of uncertainty in flood maps, for the Office of Public Works, Ireland. Developed statistical modelling approach for flood event set generation for insurance catastrophe modelling.

Teaching, training and professional development: Wide experience in teaching and training in universities in the UK and Europe, at undergraduate and postgraduate level. Developed and delivered technical training in hydraulic modelling, hydrology, GIS and probabilistic analysis, for clients in UK, the Philippines, Ireland, Netherlands and Indonesia, and mentored staff as part of professional development programmes.

Numerical model development: Lead developer for a number of applications in flood modelling and satellite image processing, in research and industry. Research models developed include LISFLOOD, SFV, and new algorithms for TELEMAC2D. Commercial applications include leading the development of ISIS2D, ISIS-FAST and MDSFlood for Halcrow, satellite image processing software for the EU, and numerical model development for other commercial clients.

Hydraulic and hydrological modelling: Undertaken Flood Risk Assessments for over 30 sites in UK, Ireland and India, using ISIS, HEC-RAS, TUFLOW and FEH. Technical lead for SEPA national fluvial flood mapping, and validation of national surface water maps for the Environment Agency, with further extensive experience in coastal and river model validation studies using remote sensing, ground survey and historical data. Experienced in reservoir flood risk safety analysis. Led programme of validation and improvement of hydraulic and hydrological models for National Operational Assessment of Hazards programme in the Philippines, and developed new Rapid Flood Alert System for Philippines river basins.

Remote Sensing: Extensive experience in the use of remotely sensed data to support flood

modelling, using airborne and satellite radar, swath sonar bathymetry, LiDAR and optical imagery.

Surveying: Led the post flood survey using differential GPS for the Carlisle 2005 floods as part of a NERC project. Surveyed vegetation heights and channel bathymetry for Royal Society funded Amazon expedition in 2005, and led forest and natural resource mapping for the government of Jenepono, Indonesia.

Education and Qualifications

- 2010 **Chartered Environmental Engineer** awarded by the Chartered Institute of Water and Environmental Management.
- 1995-1998 **PhD in Environmental Science** Environmental Systems Science Centre, University of Reading, Enhanced flood flow modelling using remote sensing techniques.
- 1991-1994 **BA in Natural Sciences** (Physics, Mathematics, Chemistry, Geology) Trinity College, Cambridge, 2:1.

Employment Summary

- 2011 - Present **Independent Consulting Engineer**
- 2014 **Flood Risk Modelling and Mapping Technical Specialist** National Operational Assessment of Hazards programme, the Philippines/ Voluntary Service Overseas.
- 2010-2011 **Natural Resource and Watershed Management Advisor** Government Forestry and Plantation Office, Jenepono, Indonesia/Voluntary Service Overseas.
- 2007-2010 **Specialist Modeller** Halcrow Group Ltd.
- 2005-2006 **Lecturer in Civil Engineering** University of Bristol.
- 2001-2007 **Consultant** Geostandards Ltd.
- 2001-2004 **NERC Research Fellow** School of Geography, University of Leeds and School of Geographical Sciences, University of Bristol.
- 1998-2001 **Post-doctoral Research Fellow** School of Geographical Sciences, University of Bristol.
- 1994-1995 **Laboratory technician** BNFL, Sellafield.
- 1990-1991 **Assistant Engineer** AEA Technology, Windscale.

Skills

Programming: Fluent in C, C++, Fortran, Qt, Python. Programming experience in IDL/PVWAVE, UNIX/LINUX OS, SQL databases.

GIS: ArcView, ArcGIS, Quantum GIS, MapInfo, PostGIS and Spatialite geodatabases.

Remote Sensing: PCI, ERDAS Imagine, and development of image processing algorithms for LiDAR, SAR and optical imagery.

Hydraulic Modelling: Experienced TELEMAC, HEC-RAS, ISIS, ISIS2D, FEH, and TUFLOW user.

Languages: Competent in Indonesian including technical; basic French.

Personal Details

- Date of Birth: 27/10/1971
- Nationality: British
- Driving License: Full, clean UK car and motorcycle

Publications

1. Sampson C.C., Bates P.D., Neal J.C. and **Horritt M.S.** 2013. An automated routing methodology to enable direct rainfall in high resolution shallow water models. *Hydrological Processes*, 27(3), 467–476.
2. **Horritt M.S.** and Wright N.G. 2012. A mixing length model for estimating channel conveyance. *Proceedings of the Institution of Civil Engineers - Water Management*, 166(4), 165-174.
3. Sampson C.C., Fewtrell T.J., Duncan A., Shaad K., **Horritt M.S.** and Bates P.D. 2012. Use of terrestrial laser scanning data to drive decimetric resolution urban inundation models. *Advances in Water Resources*, 41, 1-17.
4. **Horritt M.S.**, Bates P.D., Fewtrell T.J., Mason D.C., Wilson M.D. 2010. Modelling the hydraulics of the Carlisle 2005 flood event. *Proceedings of the Institution of Civil Engineers - Water Management*, WM6, 273-281.
5. Bates P.D., **Horritt M.S.** and Fewtrell T.J. 2010. A simple inertial formulation of the shallow water equations for efficient two-dimensional flood inundation modelling. *Journal of Hydrology*, 387, 33-45.
6. Schumann G., Bates P.D., **Horritt M.S.**, Matgen P. and Pappenberger F. 2009. Progress in integration of remote sensing-derived flood extent and stage data and hydraulic models. *Reviews of Geophysics*, 47, RG4001.
7. Trigg M.A., Wilson M.D., Bates P.D., **Horritt M.S.**, Alsdorf D.E., Forsberg B.R., Vega M.C. 2009. Amazon flood wave hydraulics. *Journal of Hydrology*, 374 (1-2), 92-105.
8. Neal J.C., Bates P.D., Fewtrell T.J., Hunter N.M., Wilson M.D., **Horritt M.S.** 2009. Distributed whole city water level measurements from the Carlisle 2005 urban flood event and comparison with hydraulic model simulations. *Journal of Hydrology*, 368(1-4), 42-55.
9. Fewtrell T.J., Bates P.D., **Horritt M.S.** and Hunter N.M. 2008. Evaluating the effect of scale in flood inundation modelling in urban environments. *Hydrological Processes*, 22(26), 5107-5118.
10. Hunter N.M., Bates P.D., **Horritt M.S.** and Wilson M.D. 2007. Simple spatially-distributed models for predicting flood inundation: a review. *Geomorphology*, 90(3-4), 208-225.
11. Wilson M., Bates P., Alsdorf D., Forsberg F., **Horritt M.**, Melack J., Frappart F. and Famiglietti J. 2008. Modeling large-scale inundation of Amazonian seasonally flooded wetlands. *Geophysical Research Letters*, 34(15).
12. Mason D.C., **Horritt M.S.**, Dall'Amico J.T., Scott T.R. and Bates P.D. 2007. Improving river flood extent delineation from synthetic aperture radar using airborne laser altimetry. *IEEE Transactions on Geoscience and Remote Sensing*, 45(12).
13. Mason D.C., **Horritt M.S.**, Hunter N.M. and Bates P.D. 2007. Use of fused airborne scanning laser altimetry and digital map data for urban flood modelling. *Hydrological Processes*, 21, 1426-1447.
14. **Horritt M.S.**, Di Baldassarre G., Bates P.D. and Brath A. 2007. Comparing the performance of 2-D finite element and finite volume models of floodplain inundation using airborne SAR imagery. *Hydrological Processes*, 21(20), 2745-2759.
15. Horsburgh K. and **Horritt M.S.** 2006. The Bristol Channel Floods of 1607 - reconstruction and analysis. *Weather*, 61(10), 272-277.
16. Bates P.D., Wilson M.D., **Horritt M.S.**, Mason D.C., Holden N., and Currie A. 2006. Reach scale floodplain inundation dynamics observed using airborne Synthetic Aperture Radar imagery: data analysis and modelling. *Journal of Hydrology*, 328(1-2), 306-318.
17. **Horritt M.S.**, Bates P.D. and Mattinson M.J. 2006. Effects of mesh resolution and topographic

representation in 2-D finite volume models of shallow water fluvial flow. *Journal of Hydrology*, 329(1-2), 306-314.

18. **Horritt M.S.** 2006. A methodology for the validation of uncertain flood inundation models. *Journal of Hydrology*, 326 (1-4), 153-165.

19. Hunter N.M., Bates P.D., **Horritt M.S.**, Wilson M.D. 2006. Improved simulation of flood flows using storage cell models. *Proceedings of the Institution of Civil Engineers - Water Management*, 159 (1), 9 -18.

20. **Horritt, M.S.** 2006. A linearized approach to flow resistance uncertainty in a 2-D finite volume model of flood flow. *Journal of Hydrology*, 316(1-4), 13-27.

21. Hunter, N.M., **Horritt, M.S.**, Bates, P.D., Wilson, M.D., Werner, M.G.F. 2005. An unconditionally stable explicit solution for raster-based storage cell modelling of floodplain inundation. *Advances in Water Resources*, 28, 975-991.

22. Hunter, N.M., Bates, P.D., **Horritt, M.S.**, De Roo, A.J.P. and Werner, M.G.F, 2005. Utility of different data types for calibrating flood inundation models within a GLUE framework. *Hydrology and Earth System Sciences*, 9(4), 412-430.

23. Bates P.D., Dawson R.J., Hall J.W., **Horritt M.S.**, Nicholls R., Wicks J. and Hassan M. 2005. Simplified two-dimensional modelling of coastal flooding for risk assessment and planning. *Coastal Engineering*, 52(9), 793-810.

24. Pappenberger, F., Beven K., **Horritt, M.** and Blazkova S. 2005. Uncertainty in the calibration of effective roughness parameters in HEC-RAS using inundation and downstream level observations. *Journal of Hydrology*, 302(1-4), 46-69.

25. Hall, J., Tarantolo, S., Bates, P. and **Horritt, M.S.** 2005. Distributed sensitivity analysis of flood inundation model calibration. *ASCE Journal of Hydraulic Engineering*, 131(2), 117-126.

26. Bates P.D., **Horritt M.S.**, Aronica G. and Beven K. 2004. Bayesian updating of flood inundation likelihoods conditioned on flood extent data. *Hydrological Processes*, 18, 3347-3370.

27. **Horritt M.S.** 2004. Development and testing of a simple 2-D finite volume model of sub-critical shallow water flow. *International Journal for Numerical Methods in Fluids*, 44, 1231-1255.

28. Mason, D.C., Cobby D.M., **Horritt, M.S.** and Bates, P.D. 2003. Floodplain friction parameterisation in two-dimensional river flood models using vegetation heights derived from airborne scanning laser altimetry. *Hydrological Processes*, 17(9), 1711-1732.

29. Cobby D.M., Mason, D.C., **Horritt, M.S.** and Bates, P.D. 2003. Two-dimensional hydraulic flood modelling using a finite element mesh decomposed according to vegetation and topographic features derived from airborne scanning laser altimetry. *Hydrological Processes*, 17(10), 1979-2000.

30. Ad P.J. De Roo, Jens Bartholmes, Paul.D. Bates, Keith Beven, Paolina Bongiannini-Cerlini, Ben Gouweleeuw, Erdmann Heise, Michael Hils, Anthony Hollingsworth, Bo Holst, **Matt Horritt**, Neil Hunter, Jaap Kwadijk, Florian Pappenburger, Paolo Reggiani, G. Rivin, Kai Sattler, Eric Sprokkereef, Jutta Thielen, Ezio Todini and Marc Van Dijk. Development of a European Flood Forecasting System. *International Journal of River Basin Management*, 1(1), 49-59.

31. **Horritt, M.S.**, Mason, D.C., Cobby, D.M., Davenport, I.J. and Bates, P.D. 2003. Waterline mapping in flooded vegetation from airborne SAR imagery. *Remote Sensing of Environment*, 85, 271-281.

32. Bates, P.D., Marks K.J. and **Horritt, M.S.** 2003. Optimal use of high-resolution topographic data in flood inundation models. *Hydrological Processes*, 17, 537-557.

33. **Horritt, M.S.** and Bates, P.D. 2002. Evaluation of 1-D and 2-D models for predicting river flood inundation. *Journal of Hydrology*, 268, 87-99.

34. **Horritt M.S.** 2002. Stochastic modelling of 1-D shallow water flow over uncertain topography. *Journal of Computational Physics*, 180, 327-338.
35. **Horritt, M.S.**, 2002. Evaluating wetting and drying algorithms for finite element models of shallow water flow. *International Journal for Numerical Methods in Engineering*, 55: 832-851.
36. Aronica, G., Bates, P.D. and **Horritt, M.S.**, 2002. Assessing the uncertainty in distributed model predictions using observed binary pattern information within GLUE. *Hydrological Processes*, 16, 2001-2016.
37. Wilson, C.A.M.E. and **Horritt, M.S.**, 2002. Measuring the flow resistance of submerged grass. *Hydrological Processes*, 16, 2589-2598.
38. **Horritt, M.S.** and Bates, P.D. 2001. Effects of spatial resolution on a raster based model of flood flow. *Journal of Hydrology*, 253, 239-249.
39. **Horritt, M.S.** and Bates, P.D. 2001. Predicting floodplain inundation: raster-based modelling versus the finite element approach. *Hydrological Processes*, 15, 825-842.
40. **Horritt, M.S.**, Mason, D.C. and Luckman, A.J. 2001. Flood boundary delineation from synthetic aperture radar imagery using a statistical active contour model. *International Journal of Remote Sensing*, 22(13), 2489-2507.
41. **Horritt, M.S.** 2000. Calibration of a 2-dimensional finite element flood flow model using satellite radar imagery. *Water Resources Research*, 36(11), 3279-3291.
42. **Horritt, M.S.** 2000. Development of physically based meshes for two-dimensional models of meandering channel flow. *International Journal for Numerical Methods in Engineering*, 47, 2019-2037.
43. **Horritt, M.S.** 1999. A statistical active contour model for SAR image segmentation. *Image and Vision Computing*, 17, 213-224.
44. Bates, P.D., **Horritt, M.S.** and Hervouet, J.-M. 1998. Investigating two-dimensional, finite element predictions of floodplain inundation using fractal generated topography. *Hydrological Processes*, 12, 1257-1277.
45. Bates, P.D., **Horritt, M.S.**, Smith, C.N. and Mason, D.C. 1997. Integrating remote sensing observations of flood hydrology and hydraulic modelling. *Hydrological Processes*, 11, 1777-1795.

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46. **Horritt M.**, Wicks J., Vasquez Lara C., Wright N., Marks K. 2008. The right tool for the job: risk based model selection for decision making. Proceedings of Flood and Coastal Management Conference 2008.
47. Adamson M., Wicks J., **Horritt M.** 2008. Implementing the floods directive - indicators of flood risk. Proceedings of Flood and Coastal Management Conference 2008.
48. **Horritt M.**, Choudhury F., Lin B., Ahmadian R. 2008. Comparison of grid based floodplain modelling methods. Proceedings of Flood and Coastal Management Conference 2008.
49. Bates, P.D., Anderson, M.G. and **Horritt M.S.** 1998. Terrain information in geomorphological models: stability, resolution and sensitivity. In S.N. Lane, K.S. Richards, J.H. Chandler (Eds), *Landform modelling, monitoring and analysis*, Wiley and sons, Chichester.
50. Bates, P.D., Horritt, M.S., Cobby, D.M. and Mason, D.C. Flood inundation modelling using LiDAR and SAR data. In R. Kelly, N. Drake and S. Barr (Eds), *Spatial modelling of the terrestrial environment*, Wiley.
51. Hunter N.M., **Horritt M.S.**, Bates P.D. and Werner M.G.F. 2004. Theoretical and practical limits to the use of storage cell codes for flood inundation modelling. IMA International Conference of Flood Risk Assessment, IMA, Southend-on-Sea, UK, 85-94.
52. Bates P.D. and **Horritt M.S.** Modelling wetting and drying processes in hydraulic models. In

Bates, Lane and Ferguson (Eds), Computational Fluid Dynamics: applications in environmental hydraulics, Wiley.

53. **Horritt M.S.** Parameterisation, validation and uncertainty analysis of CFD models of fluvial and flood hydraulics in the natural environment. In Bates, Lane and Ferguson (Eds), Computational Fluid Dynamics: applications in environmental hydraulics, Wiley.

54. Bates P.D., **Horritt M.S.**, Hunter N.M., Mason D.C. and Cobby D.M. Numerical modelling of floodplain flow. In Bates, Lane and Ferguson (Eds), Computational Fluid Dynamics: applications in environmental hydraulics, Wiley.

55. Pearson, D., **Horritt, M.S.**, Gurney, R.J. and Mason, D.C. 2001. The use of remote sensing to validate hydrological models. In M.G. Anderson and P.D. Bates (Eds), *Model Validation: perspectives in hydrological Science*. Wiley and sons, Chichester.