

# Flood Risk from Extreme Events (FREE) NEWSLETTER

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## Welcome

As promised in the last Newsletter we have included here information on some of the FREE projects. The aim is to include successes and some of the difficulties encountered, and so we would like to encourage FREE researchers to provide information on all aspects of their projects either through their progress reports or as individual items of note to Chris Collier the FREE Science Coordinator <c.g.collier@salford.ac.uk>.

We hope that you enjoy this Newsletter. Any suggestions for improvements are most welcome.

FREE News

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## Contents

1. New data, uncertainty and modelling the Boscastle floods
2. Changing coastlines
3. Groundwater flooding in Chalk aquifers

4. Improving flood inundation hazard estimation
  5. The Pitt Review
  6. Land use management effects in extreme floods
  7. Netherlands opts for 'soft' sea defense
  8. Rainfall analysis suitable for design and R&D
  9. Knowledge Exchange
  10. Defra / EA Flood and Coastal Erosion Risk Management R&D programme
  11. Hydrometeorological ensemble simulations of flood events
  12. People
  13. Second FREE Science Meeting and Workshop
  14. Other meetings and conferences
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## 1. New data, representing uncertainty in high resolution NWP and using ensemble approaches for flood forecasting

The project led by Professor Anthony Illingworth (Reading) is seeking to exploit new data sources, data assimilation and ensemble techniques for storm and flood forecasting. Currently the Project is focussing on (1) assessing the new refractivity (a measure of atmospheric humidity) measurements derived from the operational C-band Cobbacombe radar; (2) analysing the impact of the perturbations of the model state on the 4km NWP ensemble simulations for the CSIP IOP18 case; and (3) using high resolution NWP forecasts as input to a distributed hydrological model to simulate the Boscastle flood event.

The next steps involve further analysis of the refractivity data quality, comparisons of the refractivity data with NWP output, and further analysis of the Boscastle case.

## 2. Changing coastlines

A model of the movement of sediments within Morecambe Bay and the Dee Estuary is being developed by the team led by Dr Sarah Dance (Reading). This involves the development of hydrodynamic models of these areas including storm surge components. The models will be capable of assimilating bathymetric information from SAR satellite data. Researchers Tania Scott and Polly Smith have been given a quad-bike tour of the Morecambe Bay mud flats by the NWNW Sea Fisheries Association (see photograph).



## 3. Groundwater flooding in Chalk aquifers

One and two dimensional models of the saturated zone have been applied to hillside field sites around East Illsley in the Chiltons. So far the simulated water table response is too attenuated, which is thought to be associated with specific storage. This project being led by Professor Howard Wheeler (Imperial College, London) plan to develop the two dimensional model further by trying to simulate pumping tests, and to model the River Lambourn around the village of Boxford. The improved model will be applied to the hillslope to simulate water table responses and in particular the various groundwater flooding events post 2000.

## 4. Improving flood inundation hazard estimation

A system linking downscaled HadCM3, Dynamic TOPMODEL and LISFLOOD to produce flood hazard inundation maps incorporating uncertainty from the model cascade is nearing completion. This work is being undertaken by the team led by Dr Hannah Cloke (Kings College, London). A minor problem has been encountered in that the UKCIP08 data from the Hadley Centre has a reduced number of ensembles because of

scaling difficulties. Hence it is only possible to use this reduced ensemble set in this work. It is not thought that this will pose any serious problem as extra RCM information from the ensembles project is available to compensate for this loss. A Project Steering Committee includes scientists from JRC Ispra, the Environment Agency and the Hadley Centre

## 5. The Pitt Review

As our readers will know following the flooding of June and July 2007 the Government established an independent review under Sir Michael Pitt into the lessons learned from the actions before, during and after the flooding. An interim report was issued for comment, and the final report was published at the end of June 2008 [[http://archive.cabinetoffice.gov.uk/pittreview/thepittreview/final\\_report.html](http://archive.cabinetoffice.gov.uk/pittreview/thepittreview/final_report.html)]. Chris Collier was asked by the FREE Steering Committee to produce a report outlining the relevance of FREE to the Interim Pitt Report. This was done noting on-going work within FREE of relevance to Pitt's Urgent Recommendations namely groundwater flooding (Recommendation 1); social vulnerability (Rec. 8); FLoaT (Rec. 9); and large return periods (Rec. 10). Also considered were the relevance of FREE activities to Pitt's Interim Conclusions namely climate change (IC .1 and 2); tools and techniques for predicting and modelling river flooding ((IC. 3); flood visualisation tools (IC. 6); improvements to operational systems (IC. 7); land management practices (IC. 32); improvements to rainfall forecasting (IC. 37); and severe weather warnings (IC. 38). This assessment was passed to the Chief Executive of NERC.

The Chairman of the FREE Steering Committee, Professor Paul Hardaker, met with Sir Michael Pitt and Lord Chris Smith (the new Chairman of the Environment Agency) for dinner in July at the Reform Club in London, along with representatives from the Cabinet Office, the Environment Agency and CIWEM, to discuss the implementation of the Pitt Review recommendations.

On 30 July 2008 Defra's response to the Secretary of State, Hilary Benn's request for them to produce an outline of a National Flood Emergency Framework (NFEF), called for in the Pitt Report, was published on the Defra web site. This is on-going work, but it is anticipated that the NFEF will comprise the following sections:

1. (a) An outcome and purpose section.

- (b) A strategic objectives section.
  - (c) A section on context and scope.
  - (d) A section on flood risk in England.
  - (e) The legal framework for flood emergency planning and response.
  - (f) A section on types of flooding, flood scenarios and planning.
2. Impacts and consequences.
  3. Preparations that have been made to deal with serious flooding events.
  4. Arrangements for responding to actual events of severe flooding.
  5. Maintenance of essential services during a flooding emergency.
  6. The early post-flooding arrangements for transition to recovery and the restoration of disrupted essential services.
  7. Roles and responsibilities of the actual or potential main players in a flooding emergency.
  8. Arrangements for communication and public engagement in the event of a flooding emergency.

## **6. Land use management effects in extreme floods**

As noted in the previous section one recommendation of the Pitt Review was further study of the impact on severe flooding of land management practices. Newcastle University and Imperial College are undertaking research within FREE in this area. Following work undertaken in the FRMRC by Imperial College on the hydrological effects of soil compaction, land underdrainage and tree shelter belts at Pontbren, Imperial College are extending the modelling for a wider range of land use management to encompass the land use/management interventions in the Eden and Hodder (Ribble) catchments. A digital river channel network already exists for the upper Eden, and preliminary river networks have been generated for the Hodder. These have been used in the testing of an enhanced hydraulic routing model developed by Newcastle University.

Hourly rainfall fields for extreme storms under present and future climates using a single site Neyman-Scott Rectangular Pulses (NSRP) model have been generated for a range of return periods for a small subcatchment of the Hodder (25 km<sup>2</sup>). These fields are being used by Newcastle University in some preliminary simulations to assess hydrological sensitivity.

## **7. Netherlands opts for 'soft' sea defence**

CIWEM Business Briefing reported (September 2008) that the creation of tidal marshes on the mud-flat side of the Dutch Closure Dike (Afsluitdijk) will provide, according to a consortium consisting of engineering consultancy, DHV, Wageningen IMARES and Alle Hoesper, the Netherlands with a sea defence, a new nature area and recreation opportunities. The consortium's proposal involves the establishment of 1500 hectares of new tidal marshes.

## **8. Rainfall analysis suitable for design and R&D**

UKWIR (UK Water Industry Research Limited) reported (September 2008) that they have been involved in the DTi System Based Analysis and Management of Urban Flood Risks (SAM) project. This aims to develop a risk based procedure and tools to support integrated urban drainage design and management for use by drainage practitioners. As part of this work a requirement for improved rainfall information in the context of urban drainage was identified at a UKWIR Technology Transfer workshop held in July.

## **9. Knowledge Exchange**

As FREE PIs will recall the deadline for NERC Knowledge Exchange proposals was 5 August 2008. Proposals will be considered with other KE Proposals in November 2008. Those of you that might have missed this call are encouraged to submit proposals to the next NERC KE round in early 2009. In the meantime if FREE PIs are aware of KE activities taking place within the projects they are leading please drop a note to Chris Collier as the FREE Steering Committee would be very interested in hearing about such activity.

## **10. Defra / EA Flood and Coastal Erosion Risk Management R&D programme**

(Research contractor: Consortium of Royal Haskoning (lead), POL, JBA and Prof. Tawn; contractor project manager: Tamzen Strudwick)

Stefan Laeger, EA Project Manager for this project <stefan.laeger@environment-agency.gov.uk>, has provided the following update:

After an extensive consultation and scoping phase which ended in June 08 the scope of the project has been refined to take into account valuable feedback from stakeholders:

- Updating the extreme sea levels is seen as the most important part of this project. To reflect this more resources have been allocated to this task.
- The Extremes and Swell Analysis will be extended to cover Scotland (courtesy of additional funding from SEPA).
- A Flood Event Database will not be developed as part of this project. Although seen as beneficial, it was felt that this is better addressed in a separate project and should focus on urban and other inland flooding first rather than starting from a coastal perspective. This also enables the project to allocate sufficient resources to the extreme sea level task.
- Due to IT and licensing constraints the project will not be able to make the prototype software tool available externally. However, interested stakeholders, such as consultants, will be able to gain access to the new datasets (once approved) through their EA Area Office via the existing channels for data requests. A final decision regarding the internal tool deployment will be made at the end of the project (spring 2011).

The project team is currently conducting the extreme sea level and swell analysis and developing the software prototype. As part of the extreme sea level task it is intended to conduct a validation exercise against local tide gauge data between Class A sites (subject to funding).

## **11. Hydrometeorological ensemble simulations of flood events**

A hydrometeorological modelling study has been described in a recent paper of the Quarterly Journal of the RMetS. The study examines the feasibility of high-resolution mesoscale model-driven runoff simulations for a small basin of Majorca in the Balearic Islands. Results show that high resolution numerical weather experiments in an area of complex orography accurately reproduce most of the extreme precipitation events studied, enabling potentially valuable discharge simulations, despite the small size of the basin. The value of the multi-physical model ensemble in conveying the uncertainty of precipitation, and therefore the discharge

experiments, is also discussed. The full reference is,

Amengual, A., Romero, R. and Alonso, S. (2008) "Hydrometeorological ensemble simulations of flood events over a small basin of Majorca Island, Spain", *Quart. J. R. Met. Soc.*, 134, 1221-1242

## **12. People**

Professor Chris. D. Kummerow, Department of Atmospheric Science, Colorado State University assumed chairmanship of the GEWEX Radiation Panel in January 2008.

Professor Julia Slingo, Department of Meteorology, University of Reading will become President of the Royal Meteorological Society at the beginning of October 2008.

## **13. Second FREE Science Meeting and Workshop**

The Second FREE Science Meeting will be held on 12-13 November 2008 at the University of Reading. All participants in FREE Projects are invited to contribute papers. A separate registration form will be distributed by the Science Coordinator to PIs very soon. Further details of accommodation etc will be placed on the NERC FREE web site by the NERC Office in early September.

Before this meeting a half day Workshop will be held on 11 November 2008 at the same location. The focus of the Workshop will be a facilitated discussion on how to integrate the FREE programme's different activities. PIs are invited to send one person from each team to attend. This need not be the PI, and the PIs are encouraged to send the earlier career stage researchers if possible. Names should be passed to the Science Coordinator by 1 October 2008. The aim of the Workshop is for attendees to come up with a list of may be three small activities which will then be discussed by the FREE Steering Committee. These activities, to be coordinated by the Science Coordinator, may then be funded without peer review.

## **14. Other meetings and conferences**

6-11 September 2008: BA Festival of Science, University of Liverpool (Climate Change Question Time 9 September organised by the RMetS)

22-24 September 2008; International Conference on Climate Change Impacts and Adaptation – Dangerous rates of change, University of Exeter further details <http://climatechangeconference.createsend4.com/viewEmail.aspx?>

30 September – 2 October 2008: FLOODrisk 2008 conference, University of Oxford see FLOODrisk 2008 website.

15-19 December 2008 AGU Fall Meeting, San Francisco, USA

11-15 January 2009: 23rd AMS Conference on Hydrology , Phoenix, Arizona, USA

29 June – 2 July 2009: Royal Meteorological Society 2009 Conference on ‘Meteorological Science in time and space – from local weather to global climate change’. There will be a call for Workshop proposals opening in September for this event and it is hoped that PIs from FREE will contribute to this activity.

31 August – 4 September 2009: WWRP Nowcasting Conference, Whistler, British Columbia, Canada

5-9 October 2009: AMS Radar Conference, Williamsburg, USA