



The new FEH rainfall DDF model: results, comparisons and implications

Lisa Stewart, Gianni Vesuviano, Dave Morris and Ilaria Prosdocimi
CEH Wallingford

Outline of presentation

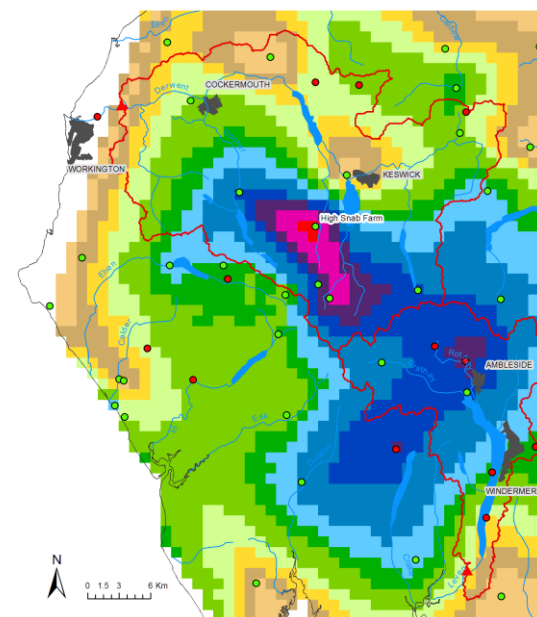
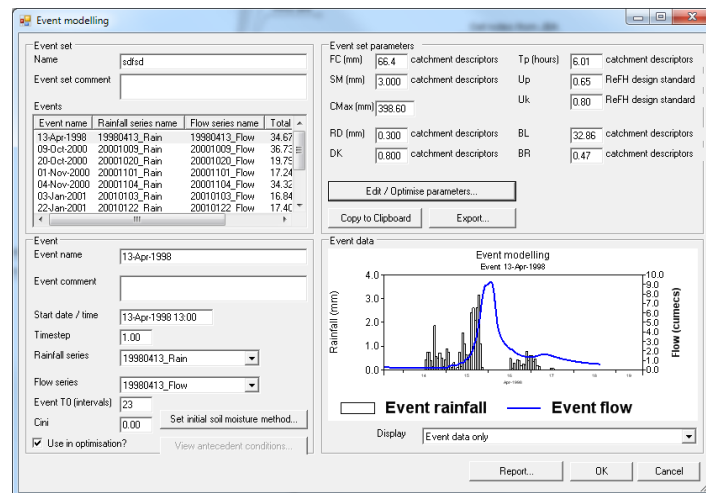
- Rainfall depth-duration-frequency (DDF) models
- Why revise the FEH rainfall DDF model?
- Development of FEH13 model and results
- FEH web service
- Conclusions and next steps



Rainfall DDF models in the UK

Used to estimate **total event rainfall** of a particular **duration** (a few minutes to several days) that corresponds to a particular **return period** (probability):

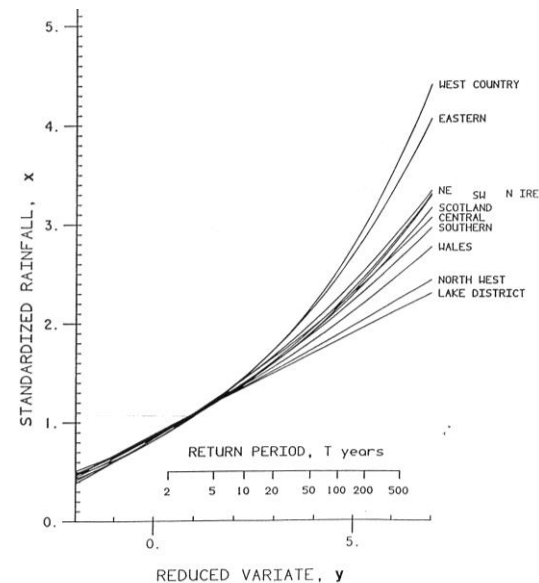
- Design storm inputs to rainfall-runoff model e.g. ReFH
- Post event analysis e.g. Boscastle (2004), Cumbria (2009)



The Flood Studies Report (FSR) model

FSR was published in 1975

- Based on paper maps and tables
- Over-generalised – masks important local and regional variations
- Includes PMP estimates



Typical growth curves for 1-day rainfall (from Dales & Reed, 1989)

The Flood Estimation Handbook (FEH)

The FSR was superseded by the FEH in 1999 incorporating:

- Digital datasets
- Longer records of rainfall and river flows
- Flexible regionalisation
- Rainfall model presented in Vol.2 based on FORGEX methodology
- Rainfall model implemented on FEH CD-ROM



Why revise the FEH rainfall DDF model?

FEH/FSR comparisons for reservoir safety:

- Rainfall model results diverge significantly at 10,000-year return periods ($FEH > FSR$)
- In some cases $FEH > PMP$ from FSR
- MacDonald & Scott (2000, 2001):
 - Conclude that problems stem from extrapolation of line of best fit (DDF model rather than statistical analysis)
- Babbie Group (2000):
 - FEH estimates found to be $> 50\%$ greater in many upland areas in west and in much of Eastern England
 - Ratios greatest for $T=10,000$ years

Development of FEH13 model

- *Reservoir Safety – Long Return Period Rainfall* (Defra/EA Project FD2613)
- Duration: 1-192 hours
- Return period: 2 - 10,000+ years
- Complex statistical analysis of extensive dataset of annual and seasonal maxima
- Revised standardisation of annual maxima prior to pooling
- Improved model of spatial dependence
- Changes to the pooling methodology
- Subsequent work has refined the model and smoothed the results across the UK on a 1-km grid



delivering benefits
through evidence



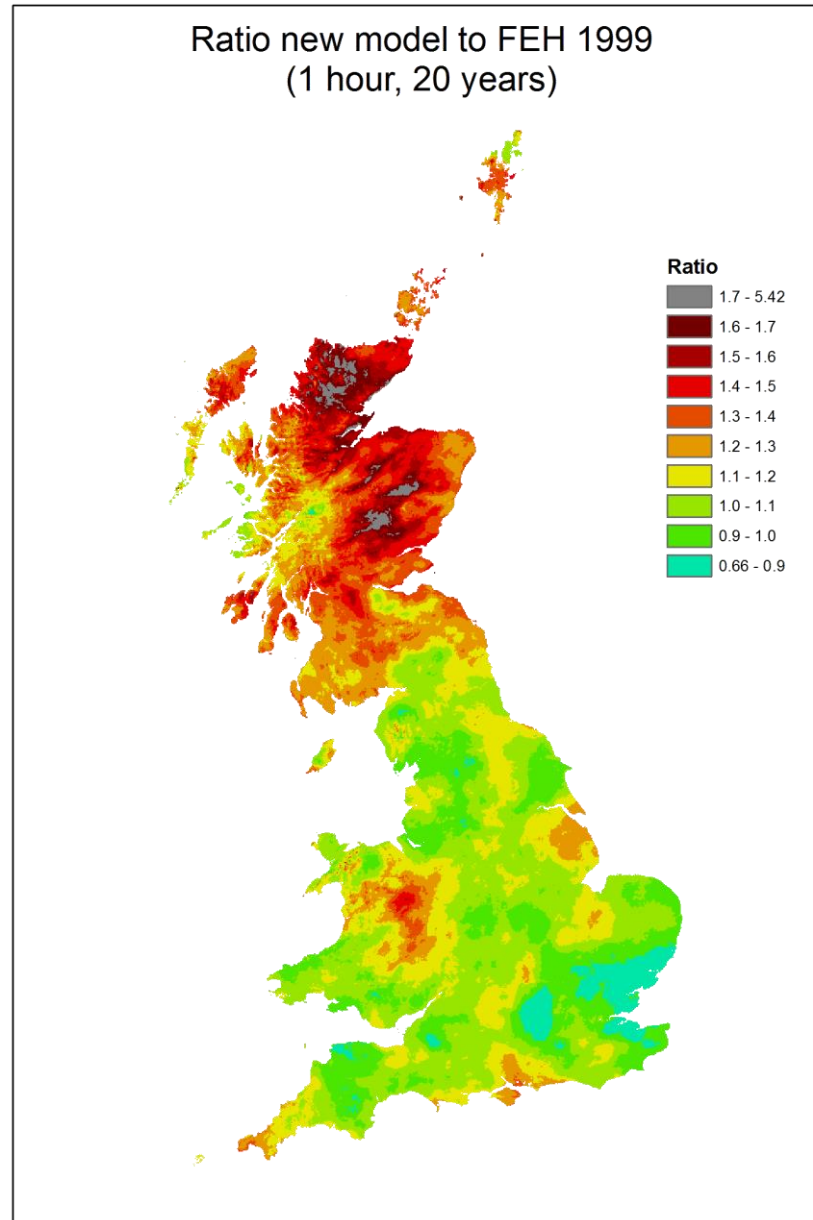
Reservoir Safety – Long Return Period
Rainfall

Volume 1 Technical Report (Part 2)

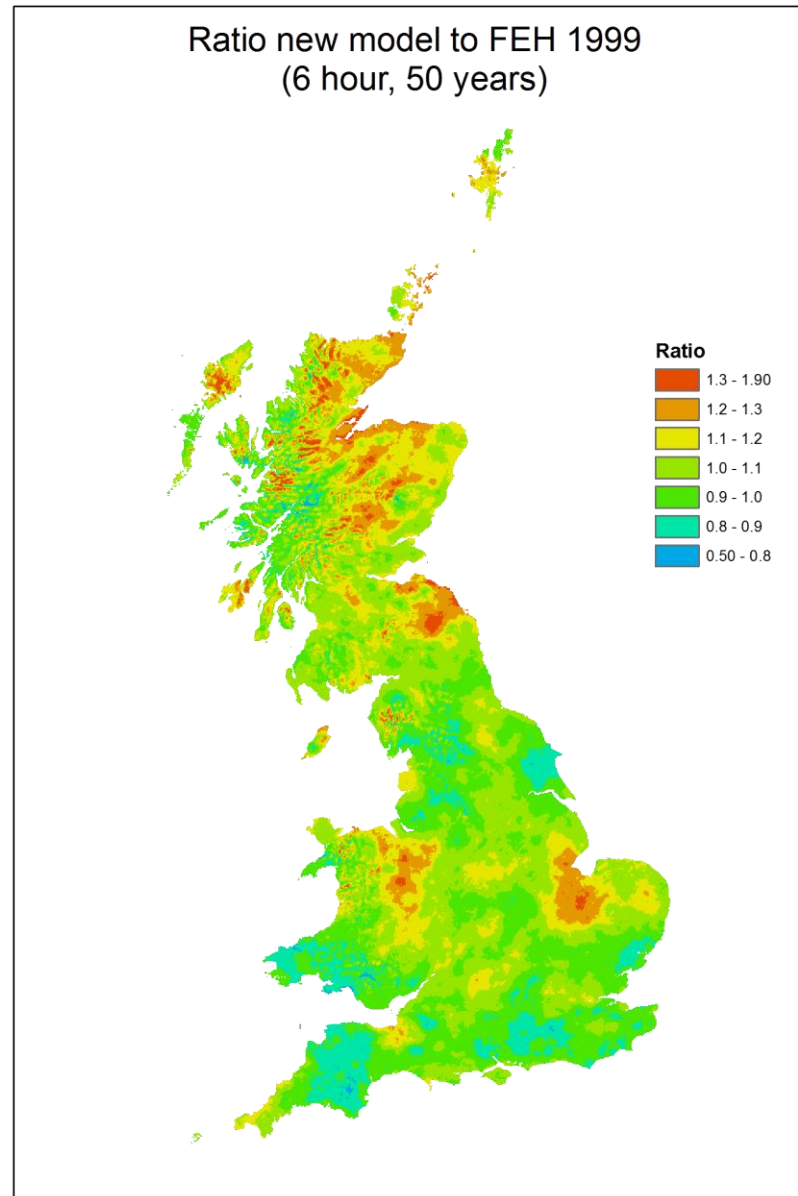
Project: FD2613 WS 194/2/39

Flood and Coastal Erosion Risk Management Research and Development Programme

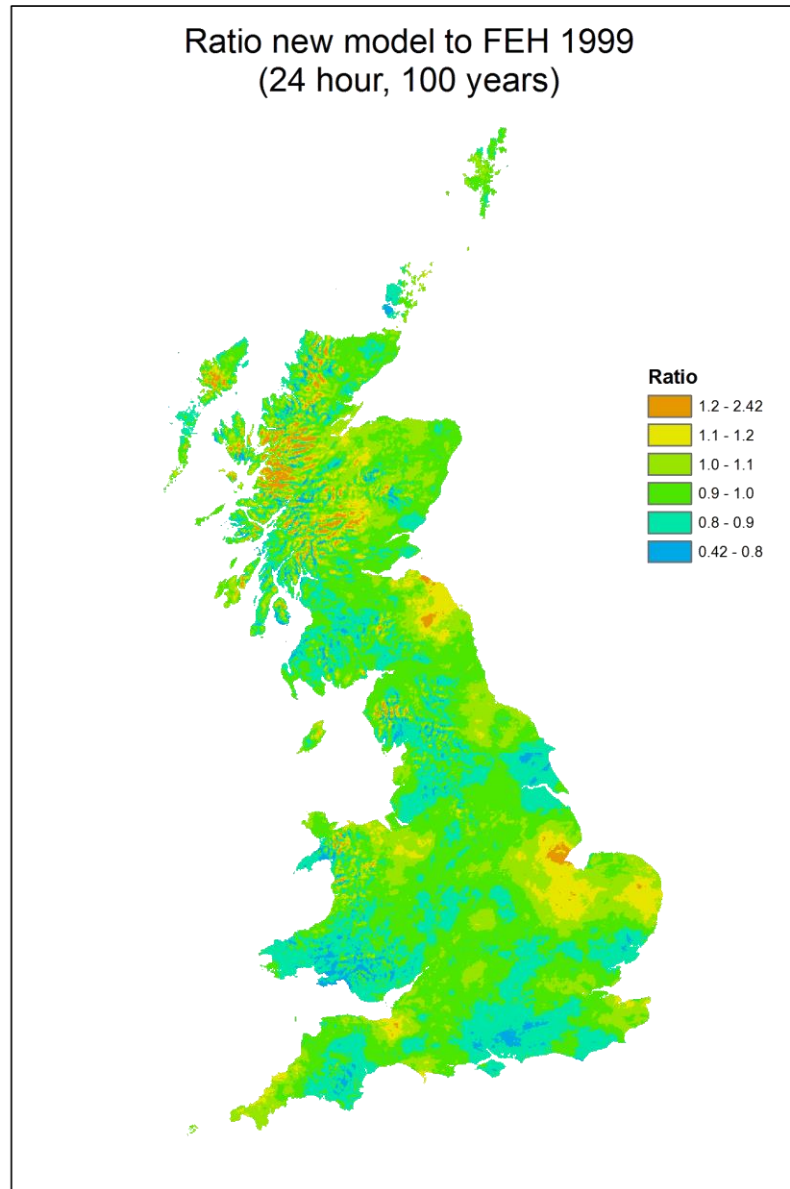
Example results 1



Example results 2



Example results 3



FEH web service

- Currently under development to deliver FEH catchment descriptors and DDF rainfall model outputs
- Will replace FEH CD-ROM 3
- Planned to include FEH13, FEH1999 and FSR rainfall models as well as FSR PMP values
- Pay-per-view system
- Currently at proof of concept stage
- Beta test version February 2015

FEH web service



Flood Estimation Handbook
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FLOOD ESTIMATION HANDBOOK

The essential tool for civil engineers, housing developers, insurers and others for rainfall and river flood frequency estimates in the U.K.

Fast. Easy to use. Cost effective.

[Sign up now →](#)



For users of the original CD-ROM based software we've updated to a new online service
[read more about how to migrate→](#)



WHAT IS IT?

The Flood Estimation Handbook offers guidance on rainfall and river flood frequency estimation in the UK. Flood frequency estimates are required for the planning and assessment of flood defences, and the design of other structures such



WHAT FOR?

- Flood defence planning
- Flood risk analysis
- New development planning
- Rarity assessment of notable rainfalls or floods



FEATURES

- Flood defence planning
- Risk analysis



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Map view



Flood Estimation Handbook
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Map

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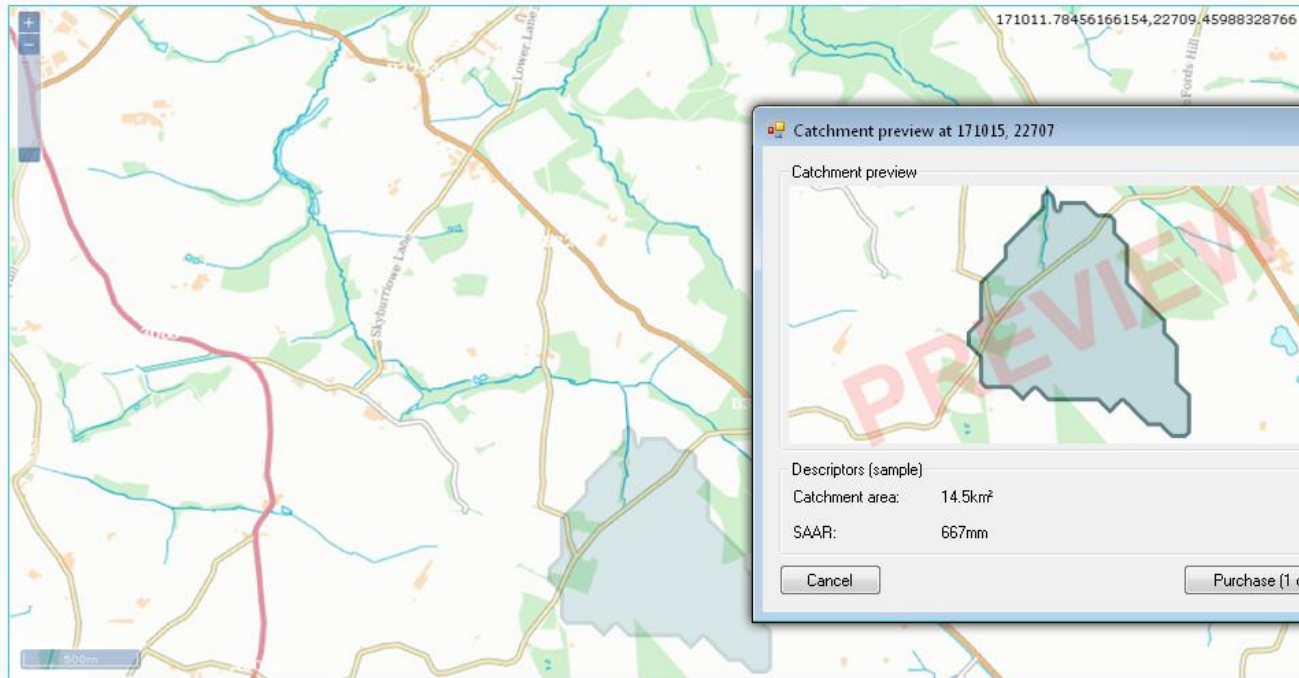
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My Places 4

Q SEARCH

Enter grid ref.

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Map with full catchment descriptors

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Map Help Adminuser ▾

My Places 4

Q SEARCH

Catchment at 171015, 22707

Descriptor	Value	Unit
SAAR	650	mm
BFIHOST	0.534	
DPLBAR	0.76	km
DPSBAR	36	m/km
ASPVAR	0.60	
FARL	0.961	

Export...

Rainfall

Design rainfall and event rarity View

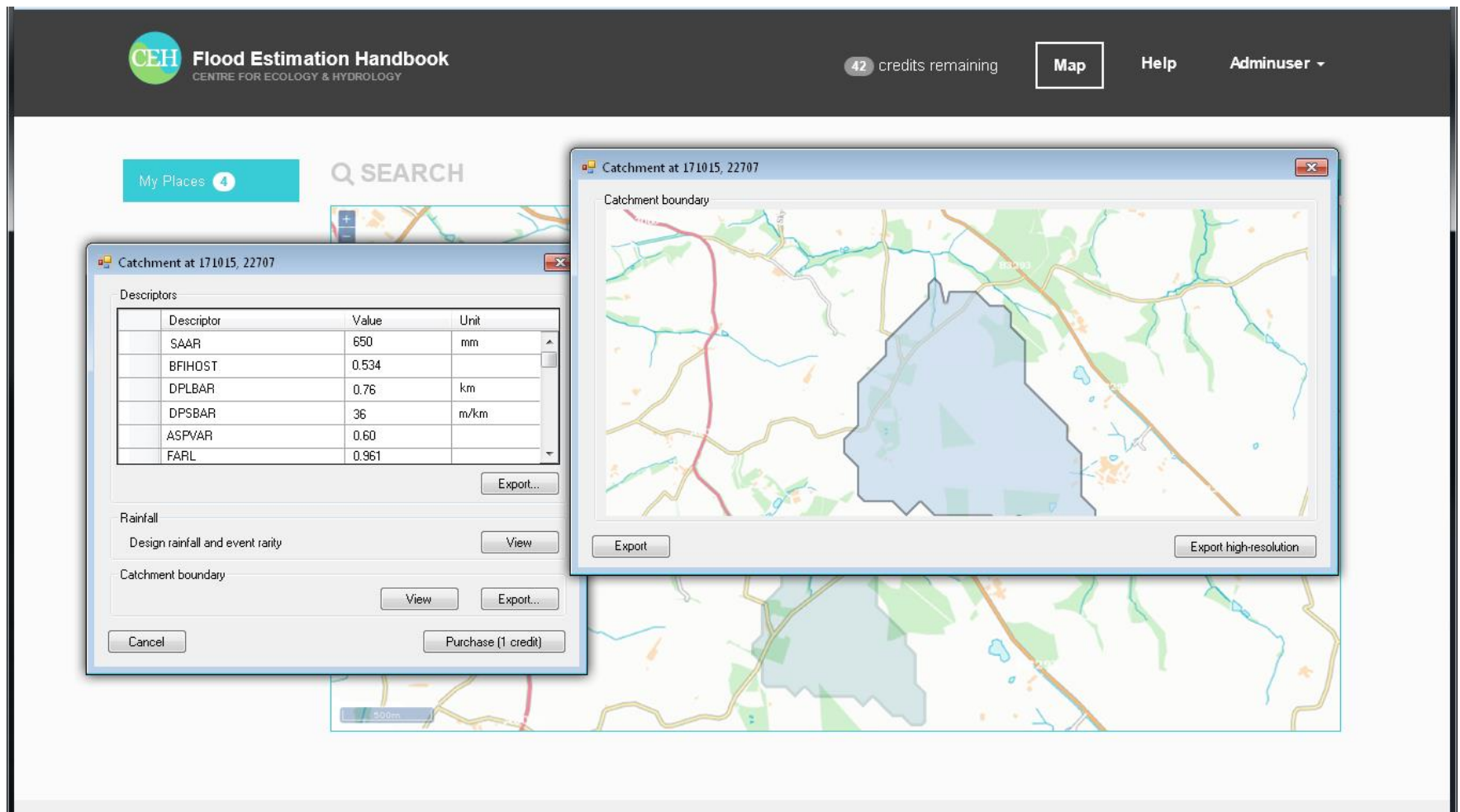
Catchment boundary View Export...

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Catchment at 171015, 22707

Catchment boundary

Export Export high-resolution



Rainfall model outputs

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Map

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Export...

Rainfall
Design rainfall and event rarity
View

Catchment boundary
View Export...

Cancel


Purchase (1 credit)

Catchment at 171015, 22707

Rainfall modelling
Calculate Design Rainfall ▾ for
☐ catchment
☐ 1 km grid point
Area: 14.2 km²
Duration: Hours ☐ Fixed
Return period: Years ☐ Sliding
☐ AM
☐ POT
Rainfall depth:
Calculate

GRAPH HERE

Export

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Summary

- FEH13 DDF model will replace existing FEH rainfall model for complete range of durations and return periods
- Complex statistical analysis that underlies the new model was peer reviewed by eminent scientists on Project Advisory Group
- More recent developments will be published shortly as report(s) and journal papers
- ReFH rainfall-runoff method will require recalibration/re-evaluation
- FEH web service to be available during 2015

Further information: ejs@ceh.ac.uk

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