Some papers of interest to Flood Studies Report users (1983 list)

Precipitation

Archer, D.R. 1981. Severe snowmelt in north-east England and its implications. *Proc. Instn Civ. Engrs* Pt. 2, **71**, 1047-1060.
From an analysis of flood events attributed wholly or partly to snowmelt, runoff rates are deduced and compared with those recommended for design use by the FSR.

Bell, F.C. 1976. The areal reduction factor in rainfall frequency estimation. *Institute of Hydrology Report No 35.*
Describes recent investigations into whether the areal reduction factor varies with location or return period.

Beran, M.A. & Sutcliffe, J.V. 1972. An index of flood-producing rainfall based on rainfall and soil moisture deficit. *J. Hydrol.* **17**, 229-236.
A description of the development of the variable 'RSMD' used in the FSR.

Jackson, M.C. 1977. Evaluating the probability of heavy rain. *Met. Mag.* **106**(b), 185-192.
A brief summary with examples of the rainfall statistics of Vol. II.

Keers, J.F. & Rodda, J.C. 1975. The variability of precipitation and evaporation. *Engineering Hydrology Today.* Proc. Conf. Instn Civ. Engrs, London.
An account of the progress during the International Hydrological Decade (1965-1974) in the understanding of the variability of precipitation and evaporation.

Keers, J.F. & Westcott, P. 1977. A computer based model for design rainfall in the UK. *Meteorological Office Scientific Paper 36.*
Presents equations and tables from which a computer program was written to perform the rainfall statistics calculations of Vol. II of the FSR.

Kelway, P.S. 1977. Rare or not so rare? – the vital question. *Weather*, **32**(10), 358.
Compares estimates of return periods of rainfall from the Bilham formula with those form the FSR with particular reference to a storm in August 1975.

Kelway, P.S. 1977. Characteristics of rainfall conditions with particular reference to north east England. *J. Instn Wat. Engrs & Sci.*, **31**(4), 251-268.
Includes discussion of various aspects of the FSR flood design procedures and of the rainfall statistics of Vol II of the FSR.

Flood Event Modelling

Boorman, D.B. 1982. A review of the Flood Studies rainfall/runoff model prediction equations for north west England. *Institute of Hydrology Report to the North West Weather Radar Project.*
A study of percentage runoff and unit hydrograph parameters which illustrates the considerable caution needed when testing for regional variation of national equations.

Boorman, D.B. & Reed, D.W. 1981. Derivation of a catchment average unit hydrograph. *Institute of Hydrology Report No. 71.*
Compares methods of deriving an average unit hydrograph by considering a number of events together.

Lowing, M.J. & Mein, R.J. 1981. Flood event modelling – a study of two methods. *Wat. Resour. Bull.* **17**, 599-686.
Evaluation of unit hydrograph and runoff routing models in reproducing recorded flow hydrographs on five UK catchments.

Mandeville, A.N. 1983. Augmented hydrograph hypothesis: discussion of principles. *Institute of Hydrology Report No. 82.*
The augmented hydrograph hypothesis provides an alternative approach to the concept of net rainfall for modelling the rainfall-runoff relationship in isolated storm events.

Forecasting

Brunsdon, G.P. & Sargent, R.J. 1982. The Haddington flood warning system. Advances in Hydrometry. Proc. Exeter Symp. *IAHS Publ. No. 134*, 257-272.
Describes the microprocessor based Haddington flood warning scheme which incorporates a modified version of the Isolated Event Model.

Reed, D.W. 1982. Real time flood forecasting by rainfall-runoff modelling – a case study. *Institute of Hydrology Report to Welsh Water Authority, Taff Division.* 82pp.
Considers the application of two rainfall-runoff models – one a unit hydrograph method – to flood warning on the rapidly responding Rhondda catchment.

Simpson, R.J., Wood, T.R. & Hamlin, M.J. 1980. Simple self-correcting models for forecasting flows on small basins in real time. Hydrological Forecasting. Proc. Oxford Symp, *IAHS Publ. No. 129*, 433-443.
Summarises research carried out by Simpson into simple self-correcting flood forecasting models. One of the models is the unit hydrography/losses model developed in FSR. Its performance is compared with that of HYSIM, a physically-based, distributed rainfall/runoff model.

Urban Hydrology

Hall, M.J. 1982. A dimensionless unit hydrograph for urbanising catchment areas. *Proc. Instn Civ. Engrs*, Pt. 2., **71**, 37-50. (Discussion *Ibid.* **73**, 211-216.)
Describes the analysis behind the unit hydrograph and lag time equations adopted in the CIRIA report TN100 by Hall & Hockin. Comparison with FSR procedures is drawn in the discussion.

Hall, M.J. & Hockin, D.L. 1980. Guide to the design of storage ponds for flood control in partly urbanised catchment areas. Construction Industry Research & Information Association Technical Note 100.
A guide to storage pond design, using modified FSR and Suppplementary Report No. 5 techniques. SR5 flood frequency methods are adopted unchanged for preliminary investigations but for detailed design a smooth unit hydrograph shape defined in terms of lag time is adopted in preference to the FSR triangle.

Kidd, C.H.R. & Lowing, M.J. 1979. The Wallingford urban subcatchment model. *Institute of Hydrology Report No. 60.*
Includes an account of percentage runoff modelling, for sewered catchments, using a similar approach to the FSR.

Kidd, C.H.R. & Packman, J.C. 1980. Selection of design storms and antecedent conditions for urban drainage design. *Institute of Hydrology Report No. 61.*
Of possible interest to anyone following up the design storm aspects of the FSR (I.6.7).
(See also: J C Packman & C H R Kidd. A logical approach to the design storm concept. *Wat. Resour. Res.*, **16**, 994-1000.)

Packman, J.C. 1978. Flood simulation in partly urbanised catchments. Proc. Int. Conf. on Urban Storm Drainage, Southampton. 686-694.
Comparison of FLOUT and unit hydrograph models when catchment is only partly urbanised.

Packman, J.C. 1980. The effects of urbanisation on flood magnitude and frequency. *Institute of Hydrology Report No. 63.*
A detailed account of previous research on this topic and the analyses behind the recommendations contained in Supplementary Report No. 5.

Price, G.A., Packman, J.C. & Kidd, C.H.R. 1980. A simplified model for sewered catchments. *Institute of Hydrology Report No. 62.*
Describes a method of modelling a sewered catchment without the need for pipe-by-pipe hydraulic flow routing.

Wilkinson, R. & Sargent, C.M. 1982. The use of a distributed catchment model for the evaluation of design discharges in the urban environment of the River Tame, West Midlands. *J. Inst. Wat. Engrs & Sci.* **36**, 309-317.
Discusses the problem of evaluating design discharges in urban areas and confirms the benefit of a distributed approach in modelling larger catchments.

Flood Routing

Jones, S.B. 1981. Choice of space and time steps in the Muskingum-Cunge Flood routing method. *Proc. Instn Civ. Engrs.* Pt. 2, **71**, 759-772. (Discussion *Ibid.* 1982, **73**, 679-681.)
Cunge's comparison of Muskingum and Convective Diffusion flood routing methods was wrongly interpreted in FSR III Figure 2.10. This paper explores the methods again, and presents a new figure from which space and time steps should be chosen.

Price, R.K. 1980. FLOUT – a river catchment flood model. *Hydraulics Research Station Report No. IT 168* (Revised January 1980).
The FSR unit hydrograph technique is combined with the river routing techniques of FSR Vol. III, giving an integrated model for the investigation of river reaches with multiple inputs – both discrete and laterally distributed. Applications to modelling the rainfall-runoff response of complete catchments are possible. (See also: Price, R.K., A river catchment flood model. *Proc. Instn Civ. Engrs.* Pt. 2, **65**, 655-668.)

Flood Statistics

Archer, D.R. 1981. A catchment approach to flood estimation. *J. Inst. Wat. Engrs & Sci.* **35**, 275-289.
Describes adjustments to FSR estimates of the mean annual flood and growth curves based on an analysis of flow data in the Northumbrian Water Authority area.

Archer, D.R. 1981. Seasonality of flooding and the assessment of seasonal flood risk. *Proc. Instn Civ. Engrs.* Pt. 2, **70**, 1023-1035.
Relates the seasonal variation of the properties of floods above a given return period to the controlling factors of storm rainfall and soil moisture.

Beran, M.A. 1979. The Bransby Williams formula – an evaluation. *Proc. Instn Civ. Engrs.* Pt. 1, **66**, 293-299. (Discussion *Ibid.* 1980, **68**, 145-147).
A comparison of the observed catchment response time with those estimated from the Bransby Williams formula for 129 UK catchments indicates that the formula underestimates response time.

Beran, M.A. 1981. Communication on a catchment approach to flood estimation. *J. Inst. Wat. Engrs & Sci.* **35**, 528-535.
Demonstrates that it is possible that the within-region variation reported by the author could have arisen by random sampling.

Beran, M.A. & Nozdryn-Plotnicki, M.J. 1977. The estimation of low return period floods. *Hydrol. Sci. Bull.* **22**, 275-282.
Presents a method of estimating floods with small (less than 2 years) return periods from FSR techniques.

Beran, M.A., Blood, J. & Bulman, R. 1980. Discussion on design flood estimation for bridges, culverts and channel improvement works on small rural catchments. *Proc. Instn Civ. Engrs.* Pt. 1, **68**, 317-322.
Beran refers to work described in Supplementary Report No. 6 on flood prediction for small catchments and points to a statistical error in evaluating the confidence interval. Messrs Blood and Bulman discuss the need to exercise engineering judgement when dealing with small catchments.

Cunnane, C. 1973. A particular comparison of annual maximum and partial duration series methods of flood frequency prediction. *J. Hydrol.* **18**, 257-271.
Shows that for some cases the annual exceedance series provides a poorer estimate of the T-year flood than the annual maximum series.

Cunnane, C. 1974. Frequency analysis of recorded flood data. PhD Thesis. University College, Galway, Republic of Ireland.
A detailed account of the statistical work behind the FSR.

Cunnane, C. & Nash, J.E. 1971. Bayesian estimation of frequency of hydrological events. Mathematical Models in Hydrology. Proc. Warsaw Symp, *IAHS Publ. No. 100.*
Deals with the theory of combining a regional flood of frequency analysis with a sample of annual maxima. Example included.

George, A.B. 1982. Devon floods and the waterways of bridges. *Proc. Instn Civ. Engrs.* Pt. 2, **73**, 125-134. (Discussion *Ibid.*, 687-692.)
The magnitude and return period of peak flows at a number of sites are estimated for four major flood events in Devon. Guidelines for design return periods for bridges are presented.

Leese, M.N. 1973. The use of censored data in the estimation of Gumbel distribution parameters for annual maximum flood series. *Wat. Resour. Res.* **9**, 1534-1542.
Shows how truncated or historic data can be used in the maximum likelihood fit of a Gumbel distribution.

Leese, M.N. 1973. The use of censored data in estimating the T-year flood. Design of Water Resources Projects with Inadequate Data. Proc. Madrid Symp, *IAHS Publ. No. 108*, 236-247.
Outlines a way of including historic or truncated flood data in the estimation of flood frequencies.

Poots, A.D. & Cochrane, S.R. 1979. Design flood estimation for bridges, culverts and channel improvement works on small rural catchments. *Proc. Instn Civ. Engrs.* Pt. 1, **66**, 663-666. (Discussion *Ibid.* 1980, **68**, 317-322.)
Describes the development of a three-variable equation for estimating the mean annual flood based on 42 rural catchments in the UK of area less than 20 km^2.

Stevens, M.J. & Lynn, P.P. 1978. Regional growth curves. *Institute of Hydrology Report No. 52.*
Two types of statistical tests indicated that despite the similarities of some regional curves there were not strong enough grounds for concluding that they were identical. Two new curves are proposed for estimating floods with a return period greater than 500 years.

Fenland Drainage

Beran, M.A. 1982. Aspects of flood hydrology of the pumped fenland catchments of Britain. In: *Polders of the World*, Proc. Lelystad Symp., Vol. I, 643-652.
Describes the extent of pumped areas and presents statistical information on the average and flood flows encountered.

Beran, M.A. 1982. The drainage of low lying flat lands. Proc. Cranfield Conf. of River Engineers.
Presents flood frequency curves and mean annual daily maximum pumping rates for 15 small pumped catchments in different parts of the UK.

Fillenham, L.F. & Jack, L. 1975. Evaluation of flood prevention scheme for Middle Level, Cambridgeshire. *J. Inst. Wat. Engrs. & Sci.* **29**, 297.
Outlines computer model for drainage improvements of a large East Anglian fen area.

Hall, M.J. & Prus-Chacinski, T.M. 1975. Forecasting runoff values for the drainage of peat lands. *J. Agric. Eng. Res.* **20**, 267-278. (Discussion *Ibid.* 1976, **21**, 329-331.)
Derives rainfall:pumped-runoff relationship for storm events in the Crossens area of Lancashire.

Catchment Characteristics

Farquharson, F., Mackney, D., Newson, M.D. & Thomasson, A.J. 1978. Estimation of runoff potential or river catchments from soil survey. Special Survey No. II, Soil Survey, Harpenden.
This is an account of the need for, development and use of, an index of potential runoff based on soils information.

Gustard, A. 1983. Regional variability of soil characteristics for flood and low flow estimation. In: Spatial Variability of Soil Physical Properties (Proc. EGS Symp.). *Agric. Water Manage.*, **6**, 255-268.
Discusses the need to combine two approaches, one based on regional soil survey, the other on an analysis of flow data, when developing a hydrological classification of soils for flood and low flow estimation.

Heerdegen, R. & Beran, M.A. 1982. Quantifying source areas through land surface curvature and shape. *J. Hydrol.* **57**, 359-373.
Map-based estimates of land curvature and slope are used to identify source areas and to relate to indices of flood response.

Newson, M.D. 1975. Mapwork for Flood Studies, Part I: Selection and derivation of Indices. *Institute of Hydrology Report No. 25.*
Deals with selection of catchment characteristics used in the FSR.
Part II: Analysis of Indices and remapping. 1976.
Reports on the interrelationships between variables described in Part I and on the mapping of these variables for the UK.

Newson, M.D. 1978. Drainage basin characteristics, their selection, derivation and analysis for a flood study of the British Isles. *Earth Surface Processes*, **3**, 277-293.
The selection and use of 'independent' variables for flood estimation is described together with the interrelationship between drainage basin characteristics and their value as objective regional descriptors.

Wiltshire, S.E. & Hewson, A.D. 1983. A conversion factor for stream frequencies derived from Second Series 1:25,000 scale maps. *Institute of Hydrology Report No. 84.*
Describes the details of a study aimed at estimating the number of stream junctions on a First Series 1:25,000 scale map from the count on a Second Series map.

General

Drayton, R.S., Kidd, C.H.R., Mandeville, A.N. & Miller J.B. 1980. A regional analysis of river floods and low flows in Malawi. *Institute of Hydrology Report No. 72.*
Presents a method for estimating the mean annual flood from catchment characteristics and derives regional flood frequency curves from an analysis of 28 flow records.

Institution of Civil Engineers. 1978. Floods and reservoir safety: an engineering guide.
An engineering guide to the hydrological and hydraulic assessment of reservoir safety including derivation of design flood, flood routing and wave surcharge.

Johnson, P. 1981. The future of flood estimation and the Flood Studies Report. *Proc. Instn Civ. Engrs.* Pt. 1, **70**, 833-843.
Summarises the conclusions of the conference "The Flood Studies Report – 5 Years On" and presents a list of priority tasks to improve and extend the Flood Studies Report.

Lowing, M.J. & Simpson, R.W. 1981. The 1975 and 1980 Flood Studies Conference of the Institution of Civil Engineers. Water Forum 81. Proc. ASCE Conf. San Francisco.
A summary of flood design procedures in the UK and the recent history of investigations and publications.

Marshall, J.K. 1977. Use of the Flood Studies Report for a drainage study at Hereford. *J. Inst. Wat. Engrs & Sci.* **31**, 187-201.
Describes experience in applying the FSR techniques to a 42 km^2 catchment at Hereford.

Potter, H.R. 1978. The use of historic records for the augmentation of hydrological data. *Institute of Hydrology Report No. 46.*
Identifies historical sources and describes a systematic method for searching records to extract hydrological information.

Sutcliffe, J.V. 1978. Methods of flood estimation: a guide to the Flood Studies Report. *Institute of Hydrology Report No. 49.*
Provides a framework for selecting the most appropriate method of flood estimation and presents sufficient material to carry out the steps in design flood estimation without continually referring to the main report.

Conferences

BNCOLD & Univ. of Newcastle 1975. *Inspection, Operation and Improvement of Existing Dams.*
The report of technical session 4 contains a number of papers dealing with the application of the FSR to specific areas

Institution of Civil Engineers 1975. *Flood Studies Conference.* London.
Opening Address. Sir Angus Paton.
1. Rainfall. A.F. Jenkinson.
2. Snowmelt. P. Johnson.
   Discussion of Papers 1 & 2
3. Prediction of the runoff hydrography from a design storm. M.J. Lowing.
4. Flood routing methods. R.K. Price.
   Discussion on Papers 3 & 4
5. Assessment of records and use of historic flood records. R.C. Jones.
6. Flood estimation by statistical methods. C. Cunnane.
   Discussion of Papers 5 & 6
7. The extension of short records. M.A. Beran.
8. Flood estimation from catchment characteristics. J.B. Miller & M.D. Newson.
   Discussion on Papers 7 & 8
9. Choice of estimation techniques. J.V. Sutcliffe.
10. Application of studies to river management. C.J.N. Cotton.
    Discussion on Papers 9 & 10.
    Discussion on Reservoir flood standards.

Institution of Civil Engineers 1980. *Flood Studies Report – Five Years On.* Manchester.
(Includes over 350 references related to flood hydrology)
Opening address. P.O. Wolf.
1. General use and abuse of the Flood Studies Report in the United Kingdom. H. van Oosterom.
2. Use of the Flood Studies Report Overseas. J.V. Sutcliffe.
3. A historical perspective on the Flood Studies Report. M.J. Hall.
   Discussion on Papers 1-3.
4. Recent advances in statistical flood estimation techniques. M.A. Beran.
5. The application of meteorological information to flood design. C.K. Folland, P.S. Kelway & D.A. Warrilow.
6. Recent advances in flood estimation techniques based on rainfall-runoff. M.J. Lowing & D.W. Reed.
   Discussion on Papers 4-6.
7. The Flood Studies Report and the Institution's Guide to Floods and Reservoir Safety. F.M. Law.
8. Experience in the use of the Flood Studies Report for reservoir spillway design. P.S. Hallas.
9. Use made of the Flood Studies Report for reservoir operation in hydroelectric schemes. F.G. Johnson, J.M. Jarvis & G. Reynolds.
10. Use made of the Flood Studies Report for reservoir operation for water supply and flood control. P.G. Mackey.
    Discussion on Papers 7-10.
11. Effects of catchment urbanization on flood flows. J.C. Packman.
12. Effect of improved land drainage on river flood flows. A.D. Bailey & T. Bree.
13. The place of economic evaluation in determining the scale of flood alleviation works. G. Cole & E.C. Penning-Rowsell.
    Discussion on Papers 11-13.

Additional papers relating to the Flood Studies Report, 1983-1993

Acreman, M.C. 1985. Predicting the mean annual flood from basin characteristics in Scotland. *Hydrol. Sci. J*, **30**, 37-49.

Acreman, M.C. 1989. Extreme historical UK floods and maximum flood estimation. *J. IWEM*, **3**, 404-412.

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Acreman, M.C. & Sinclair, C.D. 1986. Classification of drainage basins according to their physical characteristics; an application for flood frequency analysis in Scotland. *J. Hydrol.* **84**, 365-380.

Acreman, M.C. & Wiltshire, S.E. 1989. The regions are dead: long live the regions. Methods of identifying and dispensing with regions for flood frequency analysis in the UK. In: Roald, L., Nordseth, K. & Hassel, K.A. (eds), FRIENDS in Hydrology, *IAHS Publ. No. 187*, 175-188.

Archer, D.R. 1983. Computer modelling of snowmelt flood runoff in north-east England. Proc. ICE, Pt 2, **75**, 155-173. [Report on informal discussion, *Proc. ICE*, Pt 1, **76**, 800-803.]

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Bayliss, A.C. & Jones, R.C. 1993. The peaks-over-threshold flood database: summary statistics and seasonality. *IH Report No. 121*. Institute of Hydrology, Wallingford.

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