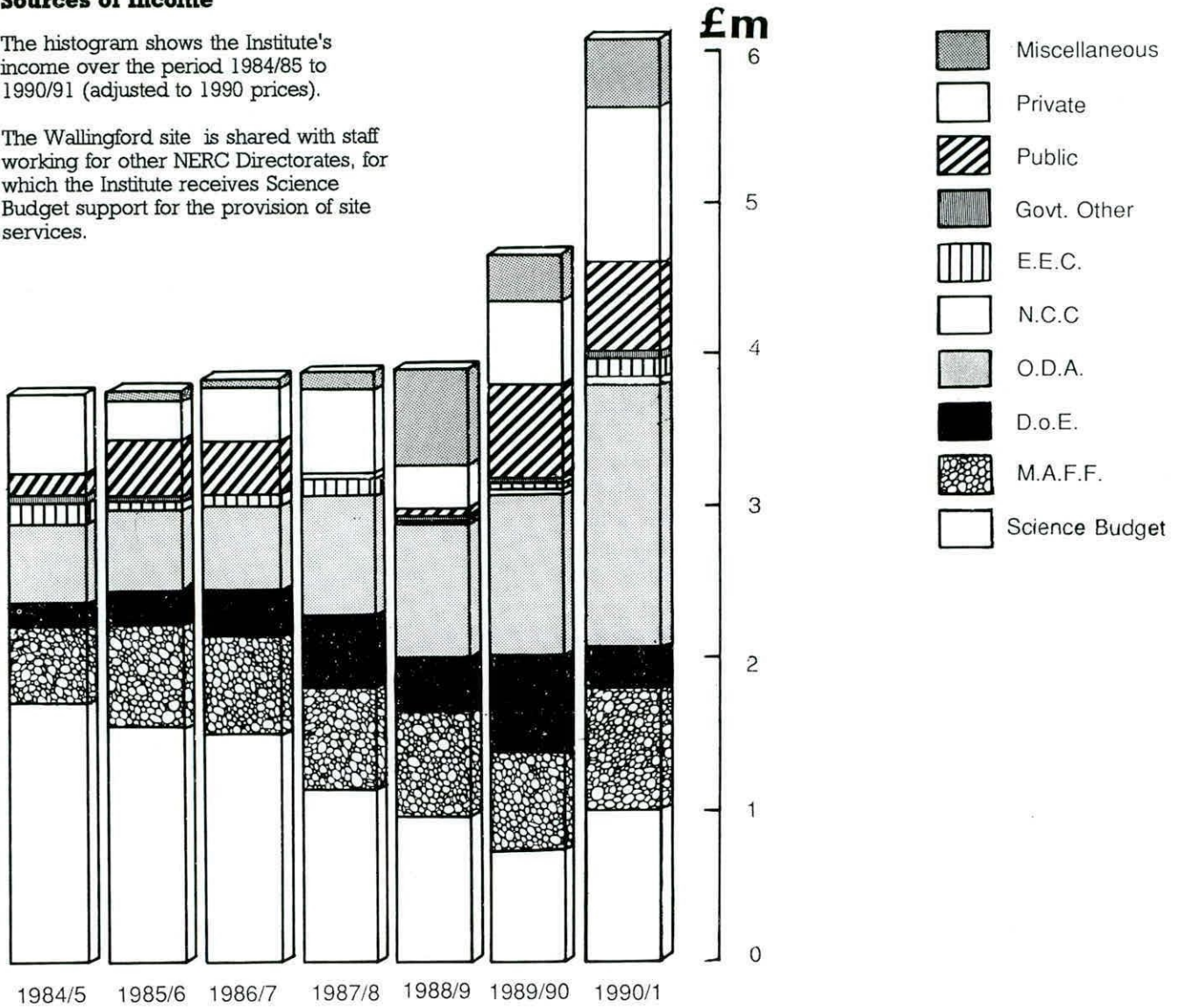


Appendix 1 Finance

Sources of income

The histogram shows the Institute's income over the period 1984/85 to 1990/91 (adjusted to 1990 prices).

The Wallingford site is shared with staff working for other NERC Directorates, for which the Institute receives Science Budget support for the provision of site services.



Appendix 2 Staff list as at 30 September 1991

Prof W B Wilkinson, PhD Director

M. A. Plummer

Personal Secretaries

A.G.P. Debney, BSc Assistant Director

A. D. Spencer

S. A. Phelan

HYDROLOGICAL PROCESSES

W. J. Shuttleworth, PhD
Divisional Head

I. R. Calder, PhD
Deputy Divisional Head, Hydrological
Adviser to ODA

B. A. Hawker
Personal Secretary

Evaporation Physics

J. H. C. Gash, PhD
- micrometeorology
A. J. Dolman, PhD
- climate modelling research
C. R. Lloyd, BA
- eddy correlation research
H. G. Bastable, PhD
- Amazonian climatology
E. M. Blyth, BA
- climate modelling research
A. D. Culf, PhD
- boundary layer meteorology

Vegetation Water Use

J. S. Wallace, PhD
- environmental physics
J. M. Roberts, PhD
- plant physiology, transpiration
S. J. Allen, PhD
- evaporation from semi-arid
vegetation
A.-L. C. McWilliam, PhD
- tropical vegetation gas exchange

Agrohydrology

C. H. Batchelor, BSc
- irrigation studies, crop water use
J. P. Bell, BSc
- soil physics; pesticides; drip irrigation
C. J. Lovell, PhD
- soil and water conservation
C. L. Abbott, MSc
- irrigation and pesticide studies

ODA Coordination

H. M. Gunston, BSc
- tropical agricultural hydrology

Sub-catchment Processes

R. J. Harding, PhD
- process modelling of soil/atmosphere
water movement

R. L. Hall, PhD
- evaporation modelling
M. Robinson, PhD
- soil water studies & streamflow
generation
P. T. W. Rosier
- soil moisture studies
I. R. Wright, BSc
- interception studies

Sub-surface Hydrology

J. Bromley, PhD
- groundwater resources
J. D. Cooper, BSc
- unsaturated soil water flux studies
D. S. Biggin
- groundwater resources, overseas
contracts
A. J. Dixon, BSc
- fluvial sediment - quaternary geology
C. M. K. Gardner, PhD
- soil moisture studies
M. G. Hodnett, BSc
- soil water fluxes and crop water use
S. A. Boyle
- soil hydrology
R. Ragab, PhD
- soil physics

Remote Sensing Applications

J. B. Stewart, PhD
- evaporation and radiation studies
G. Roberts, PhD
- remote sensing/surface hydrology
K. Blyth, M.Phil
- microwave remote sensing
J. W. Finch, PhD
- groundwater and geophysical studies
C. J. Holwill, PhD
- remote sensing

ENVIRONMENTAL HYDROLOGY

P. G. Whitehead, PhD
Divisional Head

J. A. Champkin
Personal Secretary

Water Quality Systems

A. Jenkins, PhD
- hydrochemical modelling, acid
deposition
R. J. Williams, BSc
- water quality modelling

A. J. Robson, BA
- mathematical modelling
A. Eatherall, BSc
- environmental modelling
D. J. Waters, PhD
- surface water acidification studies
C. A. L. Ishemo, BSc
- mathematical modelling
P. C. R. Volkner, BA
- water quality catchment studies
D. Butterfield
- assistant

Hydrological Modelling

R. J. Moore, MSc
- hydrological forecasting, weather
radar, stochastic hydrology
D. A. Jones, PhD
- stochastic hydrology & forecasting
J. C. Bathurst, PhD
- river hydraulics, mathematical
catchment modelling (seconded to
the University of Newcastle upon Tyne)
A. Calver, PhD
- hydrological analysis & distributed
modelling
D. M. Cooper, PhD
- distributed modelling stochastic
hydrology
J. C. Packman, MSc
- urban hydrology
R. M. Austin, MSc
- hydrological forecasting and control
V. A. Bell, BSc
- physics-based modelling
A. F. Chadwick, MSc
- hydrological forecasting
D. S. Hotchkiss, MPhil
- weather radar studies
D. R. Lewis, BSc
- distributed modelling

Hydrochemistry

C. Neal, PhD
- chemical hydrology
C. J. Smith, LRIC
- analytical chemistry
C. L. Bhardwaj, PhD
- analytical chemistry
M. Neal, PhD
- chemical analysis, X-ray diffraction &
mass spectrometry
H. A. Jeffery
- analytical chemistry
A. J. Lardner, BSc
- stable isotopes; instrument studies
G. P. Ryland, MSc
- analytical chemistry

Experimental Catchments

Based at Plynilimon

- K. Gilman, MA
– environmental impact, wetlands, mathematical techniques
- J. A. Hudson, BSc
– nutrient & snow studies, catchment hydrology, hydrometeorology
- G. J. L. Leeks, BSc
– fluvial geomorphology & sediment studies
- P. J. Hill
– field measurements; process studies
- S. Hill
– laboratory management
- W. A. Hughes
– network and site maintenance

Based at Balquhiddy

- R.C. Johnson, BSc
– catchment management, environmental impact
- J. T. Law, BSc
– catchment fieldwork

ENGINEERING HYDROLOGY

F. M. Law, BSc
Divisional head

S. J. Beresford
Personal Secretary

Flow Regimes and Environmental Management

- A. Gustard, PhD
– regional resource studies
- A. Bullock, PhD
– low flows and environmental management
- I. W. Johnson, PhD
– low flows & environmental management
- A. J. Wesselink, Ir. (Wageningen)
– European flow regimes
- A. R. Young, MSc
– low flows & environmental management
- A. J. Andrews, BSc
– low flows & environmental management
- J. M. Dixon
– hydrologist
- C. R. N. Elliott, BA
– low flows & environmental management; field studies
- K. M. Irving, BSc
– environmental hydrologist (artificial influences)
- A. E. Sekulin
– consultant programmer

Flood and Storm Hazard

- D. W. Reed, PhD
– applied hydrology

- P. S. Naden, PhD
– applied hydrology
- S. M. Crooks, MSc
– engineering hydrology
- D. C. W. Marshall, MSc
– engineering hydrology
- E. J. Stewart, MSc
– rainfall studies
- A. C. Bayliss, HND
– flood analysis
- I. J. Dwyer, MSc
– mathematician

Impacts of Climate Variability and Change

- N. W. Arnell, PhD
– water resources impacts, regional hydrology
- N. S. Reynard, MSc
– hydrometeorologist

Surface Water Archive

- M. L. Lees, BSc
– hydrometric networks, archive manager
- T. J. Marsh, BSc
– editor, Hydrological Data UK series
- I. G. Littlewood, PhD
– water quality hydrologist
- S. J. Bryant, BSc
– data acquisition controller, assistant editor
- J. Carr
– publications artwork, catchment data
- S. C. Loader, BSc
– validation controller
- S. Black
– Surface Water Archives office

Hydrologic Geographical Information Systems

- R. V. Moore, MSc
– digital mapping & information systems
- D. G. Morris, BSc
– digital terrain models
- N. J. Bonvoisin, BA
– computer applications
- R. Flavin
– consultant programmer

Flood Event Modelling

- D. B. Boorman, PhD
– flood event modelling
- M. Polarski, BSc
– engineering hydrology
- M. C. Clayton
– hydrologist
- B. Gannon
– hydrologist
- H. A. Houghton-Carr, MSc
– engineering hydrology

Catchment Water Balances

- J. R. Blackie, MSc
– catchment studies, land-use change

- A. M. Roberts
– (on secondment to TFS Directorate)
- R. L. Hinton, MSc
– modelling land-use change
- S. B. Crane, BSc
– hydrometeorological data
- A. Matthews
– hydrological database manager; visits officer
- T. K. M. Simpson, BSc
– hydrological data processing and analysis

APPLICATIONS RESEARCH, POLICY STUDIES & INFORMATION

A.G.P. Debney, BSc
Divisional Head; Assistant Director

S. A. Phelan
Personal Secretary

Consulting Services

- F. A. K. Farquharson, MSc
– overseas contracts, flood estimation
- R. B. Bradford, MSc
– groundwater resources management
- J. R. Meigh, PhD
– water resources and flood estimation
- N. R. Runnalls, MSc
– groundwater resources and alluvial aquifers
- K. J. Sene, PhD
– hydrological modelling and evaporation estimation
- M. P. McCartney, MSc
– water resources and flood estimation
- V. J. Bronsdon
– hydrological assistant; cartographer

Hydrological impacts

- B. S. Piper, MSc
– Head of Marketing; environmental impacts, water resource developments
- M. C. Acreman, PhD
– flood estimation

Hydrology Software

Development

- Y. P. Parks, MSc
– engineering hydrology and software development
- K. B. Black
– systems analyst
- K. Down, BSc
– software development
- J. Zhang, PhD
– software development

Quality Assurance

- J. R. Parker
– PC operations/software
- G. N. Bell, BSc
– data processing and software sales

Instrumentation

- T. J. Dean, PhD
 – instrument development
 M. Turner
 – instrument development
 D. D. McNeil, BSc
 – instrument development
 M. R. Stroud
 – instrument technician
 M. E. Walker
 – instrument technician
 R. G. Wyatt
 – instrument technician

Workshop

- A. C. Warwick
 – instrument craftsman (workshop manager)
 G. H. Walley
 – instrument craftsman
 J. P. White
 – instrument craftsman

Information Services

- C. Kirby, BSc
 – public relations and publications
 J. H. Griffin, MPhil
 – production editor
 H. K. Stevens, BA
 – production editor

Library

- S. B. Wharton, BA
 – librarian
 D. S. Dolton
 – library assistant

IAHS Press

- P. J. Kisby
 – manager
 S. A. Cage
 – assistant editor
 P. J. Gash
 – assistant

TIGER Office

(Terrestrial Initiative in Global Environmental Research)

- M. A. Beran, BSc
 – TFS climate change coordinator:
 advisor to IH Climate Change section
 H. R. Oliver, PhD
 – TIGER III coordinator
 M. Howarth
 – finance & administration
 S. Austin
 – secretary

ADMINISTRATION

- A. D. R. Gray
 Head of Administration

 H. M. Wood
 Finance Officer

Finance and Accounts

- L. A. Aspinall, BSc
 A. M. Davies
 H. G. Thomas
 C. J. Allum
 T. A. Gibson
 L. Ross, BA
 S. Walsh

Registry and Establishments

- S. A. Fenton
 P. M. Sanders

Switchboard and Reception

- E. Younghusband

Typing Pool

- J. Hornsby
 S. Smith
 S. Fairhurst
 H. Turner

Motor Transport

- R. G. Drewett
 – craftsman
 H. V. R. Jones
 – driver

Site Services

- J. R. Fraser
 – site services
 J. Spencer
 – caretaker/groundsman
 I. R. Standbridge
 – carpenter

Stores

- J. H. Jones
 – storekeeper

CASE STUDENTS

- A. Andrews, BSc – Oxford University
 A. Bennet, BSc – Stirling University
 A. Black, BSc – St Andrews University
 R. Boast, BSc – Oxford University
 J. Fisher, BSc – Lancaster University
 S. Henworth, MSc – Southampton University
 P. D. Hind, MSc – Newcastle University
 N. Mackenzie, MSc – Exeter University
 P. Quinn, BSc – Lancaster University
 K. Renshaw, BSc – University College of Wales, Swansea

SANDWICH COURSE STUDENTS

- D. G. Aberg – Sunderland Polytechnic
 E. J. Bent – Sunderland Polytechnic
 L. C. Branham – Luton College of Higher Education
 R. I. Burnill – Luton College of Higher Education
 P. S. Cullimore – Coventry Polytechnic
 S. K. Dawson – Luton College of Higher Education
 J. A. Duckers – Sheffield Polytechnic
 D. E. A. Elliott – Polytechnic South West
 A. S. Fairhurst – Luton College of Higher Education
 D. M. Hall – Coventry Polytechnic
 N. J. Hasnip – Coventry Polytechnic
 N. L. Mann – Luton College of Further Education
 M. Marshall – Oxford Polytechnic
 A. M. Odwell – Coventry Polytechnic
 J. M. O'Hara – Coventry Polytechnic
 J. Patel – Sheffield Polytechnic
 F. M. Standley – Coventry Polytechnic
 J. D. Sudlow – Coventry Polytechnic
 S. Yaqoob – Brighton Polytechnic

Appendix 3 Publications

(i) Scientific papers

- Acreman, M.C.** 1990. A simple stochastic model of hourly rainfall for Farnborough, England. *Hydrol. Sci. J.*, **35**, 119-148.
- Acreman, M.C.** and Collinge, V.K. 1991. The Calderdale storm revisited: an assessment of the evidence. BHS Third National Hydrology Symposium, Southampton, 4.11-4.16.
- Allen, S.J., Oliver, H.R., Gash, J.H.C.** and **Wallace, J.W.** 1990. Albedo variation over vegetated and bare soil surfaces in the Sahel. Third WMO symp. on meteorological aspects of tropical droughts with emphasis on long-range forecasting. WMO/TD-353, 187-190.
- Andersson, L. and **Harding, R.J.** 1990. Soil-moisture deficit simulations with models of varying complexity for forest and grassland sites in Sweden and the UK. *Water Resour. Manage.* **5**, 25-46.
- Arnell, N.W.** 1991. Hydrological data for Northern and Western Europe: the FRIEND data base. NATO advanced research workshop on opportunities for hydrological data in support of climate change studies, Koblenz.
- Arnell, N.W.** 1991. Developing grid-based estimates of hydrological characteristics for Northern and Western Europe using the FRIEND database. NATO advanced research workshop on opportunities for hydrological data in support of climate change studies, Koblenz.
- Arnell, N.W., Brown, R.P.C.** and **Reynard, N.S.** 1990. Impact of climatic variability and change on river flow regimes in the UK. *IH Report No. 107*.
- Batchelor, C.H., Bell, J.P., Cooper, D.M.** and **Piper, B.S.** 1990. Soil moisture and plant growth measurements for irrigation modelling. EUR Report 11935. 118-130.
- Bathurst, J.C., Hubbard, L., Leeks, G.J.L., Newson, M.D.** and **Thorne, C.R.** 1990. Sediment yield in the aftermath of a dambreak flood in a mountain stream. In: *Hydrology in Mountainous Regions II. Artificial Reservoirs, Water and Slopes* (eds R. O. Sinniger & M. Monbaron). *IAHS Pub. no. 194*, 287-294.
- Binley, A.M., Beven, K.J., Calver, A.** and **Watts, L.G.** 1991. Changing responses in hydrology: assessing the uncertainty in physically-based model predictions. *Wat. Resour. Res.*, **27**, 1253-1261.
- Blackie, J.R., Roberts, A.M., Matthews, A., Simpson, T.K.M., Hughes, C.** and **Burton, K.B.** 1990. *Experimental catchments yearbook 1987*. Institute of Hydrology.
- Blackie, J.R.** and **Simpson, T.K.M.** 1991. Climatic variability within the Balquhiddar catchments and its effect on Penman potential evaporation. *J. Hydrol.*
- Blyth, K.** 1990. MAESTRO-1 Airborne Synthetic Aperture Radar (SAR) Campaign 1989. Data Report. ESA/JRC Report. IRSA/MWT.
- Blyth, K.** and **Andrews, A.J.** 1990. Measurement of soil moisture over grassland using airborne microwave sensors. IAHS and Netherlands Soc. Rem. Sens. Int. Symp. Rem. Sens. & Water Resources, Enschede 1990.
- Bonvoisin, N.J. Moore, R.V.** and **Morris, D.G.** 1990. A water information system case study. GIS '90 Symposium, Vancouver, Canada, March 1990.
- Boorman, D.B., Hollis, J.M.** and **Lilly, A.** 1991. The production of the HOST data set. BHS Third National Hydrology Symposium, Southampton, 6.7-6.14.
- Boorman, D.B.** and **Hollis, J.M.** 1990. A hydrologically-based classification of the soils of England and Wales. MAFF Conference, Loughborough, 1990.
- Brown, R.P.C.** 1990. Reservoir storage - yield analysis using the annual failure method. *J. IWEM* **5**, 2, 116-122.
- Bullock, A., Gustard, A.** and **Grainger, E.S.** 1991. Instream flow requirements of aquatic ecology in two British rivers. *IH Report No. 115*.
- Bullock, A.** and **Johnson, I.W.** 1991. Towards the setting of ecologically acceptable flow regimes with IFIM. BHS Third National Hydrology Symposium, Southampton, 2.67-2.72.
- Calver, A.** and **Binning, P.** 1991. On modelling hillslope water flow paths and travel times. *J. Hydrol.* **121**, 333-342.
- Calver, A.** and **Wood, W.** 1990. Lumped and distributed mass matrices in subsurface flow. *Wat. Resour. Res.* **26**, 819-825.
- Calver, A.** and **Wood, W.L.** 1991. Dimensionless hillslope hydrology. *Proc. Instn Civ. Engrs, pt 2*, **91**, 593-602.
- Christoffersen, N. and **Neal, C.** 1990. Aluminium mobilization in soil and streamwaters at three Norwegian catchments with differences in acid deposition and site characteristics. *Sci. Tot Environ.*, **96**, 175-188.
- Christoffersen, N., **Neal, C., Hooper, R.P., Vogt, R.D.** and **Andersen, S.** 1990. Modelling streamwater chemistry as a mixture of soil-water end members - a step towards second generation acidification models. *J. Hydrol.*, **116**, 307-320.
- Christoffersen, N., **Neal, C.** and **Mulder, J.** 1990. Reversal of stream acidification at the Birkenes catchment in southern Norway: predictions based on potential ANC changes. *J. Hydrol.*, **116**, 77-84.
- Christoffersen, N., **Robson, A., Neal, C., Whitehead, P.G., Vigerust, B.** and **Henriksen, A.** 1990. Evidence for long-term deterioration in stream water chemistry at the Birkenes catchment, southern Norway. *J. Hydrol.*, **116**, 63-76.
- Cooper, J.D., Gardner, C.M.K.** and **Mackenzie, N.** 1990. Soil controls on recharge to aquifers. *J. Soil Sci.*, **41**, in press.
- Coyle, A.J., Kelbe, B.E., Reed, D.W.** and **Stewart, E.J.** 1991. A temporal look at hydrological extremes. BHS Third National Hydrology Symposium, Southampton, 6.51-6.60.
- Cooper, J.D., Gardner, C.M.K., Wellings, S.R., Bell, J.P., Hodnett, M.G., Boyle, S.A.,** and **Howard, M.J.** 1990. Unsaturated zone hydrology of the south eastern English chalk. *Proc. Int. Chalk Symp.*, Brighton.
- Dautrebande, S., **Polarski, M.** and **Dewalsche, J.** 1990. Essais de mobilité de pesticides dans les sols agricoles (Mobility tests of pesticides in agricultural soils). *J. Hydrol.*, **117**, 301-321.
- Dixon, A.J., Bradford, R.B., Cooper, D.M., Reeve, C.R.** and **Tucker, D.K.** 1990. A hydrogeological assessment of the impact of proposed sand and gravel extraction on an adjacent ecologically sensitive floodplain environment - a case study. In: *Gaskarth, J.W.* and **Lumsden, A.C.** (eds), *Proc. 6th Extractive*

Industry Geology Conf., Birmingham University, 70-81.

Dolman, A.J., Gash, J.H.C., Roberts, J.M. and Shuttleworth, W.J. 1990. Stomatal and surface conductance of tropical rainforest. *Agric. For. Meteorol.*, **54**, 303-318.

Fiebig, D.M., Lock, M. and **Neal, C.** 1990. Riparian zone groundwater as a source of carbon for a headwater stream. *J.Hydrol.* **116**, 217-238.

Gabriele, S. and **Arnell, N.W.** 1991. A hierarchical approach to regional flood frequency analysis. *Wat. Resour. Res.* **27**, 1281-1290.

Gardner, C.M.K., Bell, J.P., Cooper, J.D., Dean, T.J., Gardner, N. and Hodnett, M.G. 1990. Soil water content. In: Smith, K.A. and Mullins, C. (eds), *Soil Analysis: Physical Methods*. Marcel Dekker, New York. 1-74.

Gunston, H.M. 1990. Surface resources: crisis management vs creative planning. *Devel. World Water*, 12-14.

Gustard, A. and Bullock, A. 1991. Advances in low flow estimation and impact assessment. BHS Third National Hydrology Symposium, Southampton, 2.73-2.80.

Harriman, R., Ferrier, R.C., **Jenkins, A.** and Miller, J.D. 1990. Long- and short-term hydrochemical budgets in Scottish catchments. In: *The surface waters acidification programme*. B.J. Mason (ed) Cambridge University Press.

Hodnett, M.G., Bell, J.P., Batchelor, C.H. and AhKoon, P.D. (eds) 1990. *Irrigation Theory and Practice*. Proceedings of the International Irrigation Conference, Southampton.

Hodnett, M.G., Bell, J.P. and AhKoon, P.D. 1990. The control of drip irrigation of sugar cane using "index" tensiometers: some comparisons with control by the water budget method. *J. Agric. Wat. Manag.* **17**, 189-207.

Hooper, R.P., Christophersen, N. and **Neal, C.** 1990. Endmember mixing analysis - an analytical framework for the interpretation of streamwater chemistry. *J.Hydrol.*, **116**, 321-343.

Houghton-Carr, H.A. 1990. Investigation of event return periods. IH Applied Hydrology Informal Note No.114.

Houghton-Carr, H.A. and Boorman, D.B. 1991. A national archive of flood event data for the UK. BHS Third National Hydrology Symposium, Southampton, 6.35-6.41.

Hudson, J.A., Johnson, R.C. and

Blackie, J.R. 1990. Choice and calibration of streamflow structures for two mountain experimental basins. In: Proc. Lausanne Symp. on Hydrology in Mountainous Regions. *IAHS Publication No. 193*, 275-282.

Hughes, C. Strangeways, I. and **Roberts, A.M.** 1991. Field evaluation of two aerodynamically profiled raingauges. *Weather* August 1991.

Jakeman, A.J., Dietrich, C.R., Ghassemi, F., **Littlewood, I.G.** and **Whitehead, P.G.** 1990. Practical solution of some forward and inverse problems in hydrology. Mini-Conference on Inverse Problem in Partial Differential Equations, August 1990, Australian National University.

Jakeman, A.J., Ghassemi, F., Dietrich, C.R., Musgrove, T.J. and **Whitehead, P.G.** 1990. Calibration and reliability of an aquifer system model using generalized sensitivity analysis. Proc. Conf. ModelCARE 90: Calibration and Reliability in Groundwater Modelling. *IAHS Pub. No 195*, 43-52.

Jakeman, A.J., **Littlewood, I.G.** and Symons, H.D. 1991. Features and applications of IHACRES, a PC program identification of unit hydrographs and component flows from rainfall, evapotranspiration and streamflow data. In: Vichnevetsky, R. and Miller, J.J.H. (eds) *Proc. 13th World IMACS Conf.*, Dublin, **4**, 1963-1967.

Jakeman, A.J., **Littlewood, I.G.** and **Whitehead, P.G.** 1990. Computation of the Instantaneous Unit Hydrograph and Identifiable Component Flows and Application to Two Small Upland Catchments. *J. Hydrol.* **117**, 275-300.

Jakeman, A.J., **Littlewood, I.G.** and **Whitehead, P.G.** 1990. Catchment-scale rainfall-runoff event modelling and dynamic hydrograph separation using time series analysis techniques. In: D.G. Farmer and M.J. Rycroft (eds) *Computer Modelling in the Environmental Sciences*. IMA Conference Series, Oxford University Press, 89-101.

Jakeman, A.J., **Whitehead, P.G., Robson, A., Jenkins, A.** and Taylor, J.A. 1990. A method for predicting extremes of stream acidity and other water quality variables. *J.Hydrol.*, **116**, 375-390.

Jenkins, A., Harriman, R. and Tuck, S.J. 1990. Integrated hydrochemical responses on the catchment scale. In: *The surface waters acidification programme*. B.J. Mason (ed) Cambridge University Press.

Jenkins, A., Whitehead, P.G., Musgrove, T.J. and Cosby, B.J. 1990.

Regional model of acidification for Wales. *J.Hydrol.* **116**, 403-416.

Jenkins, A., Whitehead, P.G., Cosby, B.J. and Birks, H.J.B. 1990. Modelling long-term acidification: a comparison with diatom reconstructions and the implications for reversibility. *Phil. Trans. R. Soc. Lond.*, B **327**, 435-440.

Johnson, R.C., Blackie, J.R. and **Hudson, J.A.** 1990. Methods of estimating precipitation inputs to the Balquhiddy catchments, Scotland. In: Proc. Lausanne Symp. on Hydrology in Mountainous Regions. *IAHS Publication No. 193*, 7-14.

Johnson, R.C. and Simpson, T.K.M. 1990. The automatic weather station network in the Balquhiddy catchments, Scotland. In press.

Johnson, R.C. and Blackie, J.R., 1990. An introduction to the research in the Balquhiddy experimental catchments. In press.

Johnson, R.C. and Hudson, J.A. 1990. The development of rainfall regression models to improve catchment rainfall estimates in the Scottish Highlands. (in press).

Johnson, R.C. and Law, J.T. 1991. The water balance of two small upland catchments in Highland Scotland with different vegetation covers. *IAHS Publ. No. 204*, 377-385.

Law, F.M. 1990. Rainfall-runoff modelling. In: *Avoiding disasters: A report of papers presented to the Hazards Forum 1990*. Thomas Telford, 19-20.

Law, F.M. 1991. Comments on a paper by Vit Klemes. Proc. 25th Aniv. Symp. IHD/IHP, UNESCO, Paris. Invited discussion papers, 55-57.

Law, F.M. and Moore, R.V. 1991. The Water Information System - a workstation solution for water agencies with large data holdings. Proc. Conf. *Computer Applications in Water Resources*, Taipei.

Law, F.M. and Simmons, I. 1990. The growth and maintenance of an intense tropical cyclone-like system as simulated with a large scale atmospheric model. In: *Proc. Simulation Society of Australia*, Canberra.

Leeks, G.J.L. 1990. Fluvial sediment transport and plantation forestry: Monitoring and application - case studies from upland Mid-Wales. Presented at the 3rd International Workshop on Gravel-Bed Rivers.

Lees, M.L., Bryant, S.J. and Marsh, T.J. 1990. The 1988/89 drought - a

- hydrological review. In: *1989 Yearbook, Hydrological data UK series*. Institute of Hydrology. 27-44.
- Lees, M.L.** and **Marsh, T.J.** 1991. Hydrological data: The Surface Water Archive. *Irrigation News* **19**, 27-33.
- Littlewood, I.G.** and Jakeman, A.J. 1991. Hydrograph separation into dominant quick and slow flow components. BHS Third National Hydrology Symposium, Southampton, 3.9-3.16.
- Lloyd, C.R.** 1990. The temporal distribution of Amazonian rainfall and its implications for forest interception. *Q. J. R. Meteorol. Soc.*, **116**, 1487-1494.
- Lundquist, D., Christophersen, N. and **Neal, C.** 1990. Towards developing a new short term model for the Birkenes catchment - lessons learned. *J. Hydrol.* **116**, 391-402.
- Marsh, T.J.** and **Bryant, S.J.** 1991. A hydrological review of the volatile climatic conditions experienced over the period 1988-1990. BHS Third National Hydrology Symposium, Southampton. 4.1-4.9
- Marsh, T.J.** and Monkhouse, R.A. 1990. Hydrological aspects of the development and rapid decay of the 1989 drought. *Weather*, **45**, 290-299.
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Appendix 4 Research projects

Programme 4 - Management of Aquatic Ecosystems

Physical habitat simulations in rivers (PHABSIM)
Ecologically acceptable flows

Programme 5 - Impact of Man on the Hydrological Cycle

Experimental catchments

Plynlimon water use
Effect of clear felling on upland runoff
Llanbrynmair chemical study
Water resource, upland afforestation: catchments
Fluvial geomorphology
Conservation management of wetlands
Hydrology and wetland conservation
Hydrological studies, West Sedgemoor
Catchment urbanisation and flood runoff
Wallrus rainfall-runoff model
Effects of agricultural soil erosion on watercourses
Runoff models for catchment planning
Updating the WURD database

Catchment data

Plynlimon data processing, analysis & modelling
Catchment modelling and data analysis

Hydrological modelling

Physically based modelling: the IH Distributed Model
Système Hydrologique Européen (SHE) Model
Real-time forecasting of river flows
Distributed hydrological & hydrochemical models
Weather radar and climatic hazards
Snowmelt forecasting model
Yorkshire river flow forecasting system
Regional & national radar rainfall forecasting
Variations in storm rainfall over London
Modelling nitrate leaching to surface waters
Weather radar and storm & flood hazard

Water quality

Network of European catchments
Modelling the effects of acid deposition
Water quality modelling design & management
Pesticide pollution in catchments
Acid waters monitoring network
Contaminant loads in rivers
Balquhidder water quality study
Water colour modelling
Detecting climate change using river basin data
Organics in the aquatic environment
Modelling the effects of climate change
Thames flood channel environmental impact assessment
Critical loads of sulphur and nitrogen
Modelling recovery from acidification

Nepal research project
Middle Thames: water quality modelling

Agrohydrology

Mauritius drip irrigation: special studies
Small-scale irrigation schemes: collector wells
Soil physics drip irrigation: special studies
Estimation of effective rainfall

Hydrochemistry

Hydrochemical process studies
Forestry impact on upland water quality
Hydrochemical impact of hardwood plantation
Environmental isotopes
Identifying hydrological flow pathways, Spain
Biogeochemistry of a granitic catchment in southern France

Consultancy, UK

Livox quarry extension
Sub-surface exploration contracts
Environmental effects of blanket peat exploitation
Chichester groundwater modelling
Lincoln washland model
Pollution at Sawston Mill, Cambridgeshire
Colliford reservoir - flow extensions
Wentworth Club, Surrey: water resources
Flood forecasting for five Indonesians

Consultancy, Overseas

Hydrometry for Somalia
Groundwater control, Doha (West Bay)
Lake Toba Study, Indonesia
World flood study
Hydrological training - Morocco
Evaporation study for Okavango swamp, Botswana
Toor al Baha agricultural development project
Rochon reservoir inflows, Seychelles
Upper Chi development, feasibility study
Komati basin, Swaziland
Kilibasi water resources study, Kenya
Mogadishu stage 2B wellfield
Real-time flood forecasting - Hong Kong

Programme 6 - Land Surface Water Balance

Land surface energy balance

First ISLSCP Field Experiment
Hydrological atmospheric pilot experiment (HAPEX)
Energy balance of Sahelian savannah
Modelling regional scale evaporation, Sahel
Regional scale surface energy balance
UK Met. Office joint development (MITRE)
Boundary layer development in the Sahel
European desertification experiment

Vegetation water use

Plant physiological controls of evaporation
Water use efficiency of rainfed crops
Broadleaf plantation in lowland Britain
Sahel water balance conference

Environmental impact of trees

Environmental implications of trees and land-use systems
Western Ghats forest project, India

Sub-surface processes

Hydrology of shallow groundwater environments
Measurement of soil hydraulic properties
Worton Rectory Farm groundwater investigation
Arid zone recharge
Burnham Beeches: groundwater feasibility study
Development of auger method of well installation
Groundwater storage in chalk aquifers
Hillslope processes: Zimbabwe
Impact of flood protection on wildlife habitats
HAPEX II - Sahel: soils
Aquifer drawdown effects study

Physics of surface/near surface hydrological models

Stream hydrograph and storm runoff mechanisms
Evaporation of rain and snow from the uplands
Monitoring of soil moisture for flood hydrology

Remote Sensing

Remote sensing of semi-arid regions
Remote sensing of soil & vegetation moisture
Remote sensing of groundwater recharge and discharge
European Space Agency ERS-1 mission
Application of remote sensing to hydrology
Remote sensing for hydrological models
ERS-1: microwave remote sensing in hydrology
Evaporation input for GCMs from satellite data
Remote sensing of land cover types

ABRACOS

ABRACOS: micrometeorology and climatology
ABRACOS: plant physiology and soils
Tropical rainforest processes

Programme 12 - Atmospheric Science & Hydrological Extremes

Surface Water Archive

UK surface water data
Water resources research progress
The 1989/90 Yorkshire drought

Catchment characteristics and archives

Flood hydrograph estimation procedures
Representative basin database
Development of a hydrogeographic database
Water Information System

Flow regimes

Flow regimes in Western Europe
Low flow studies
Micro low flows
Environmental impact assessment - water resources
Low flows in the River Frome, Hereford.
Discharge categories of Northern Ireland rivers
Land-use and water resources in Southern Africa
Broad Oak reservoir hydrology
Low flow estimation in artificially influenced catchments

Storm hazards and hydrological extremes

Small catchment response, radar/water levels
Review of flood studies, statistical procedures
Direct stage frequency relationship
Rainfall extremes
Acute rainfall variations in upland areas
Flood estimation methods: training courses
Asian/Pacific tropical flow regimes
Thames model hydrology
Rufford Park flood study
Rainfall forecasts, Cameroon hydroelectric schemes
Joint probability study (reservoir safety)
Allowance for Discretization in Hydrological and Environmental Risk Estimation (ADHERE)
Bank-full return periods for Thames weirs
Rain-induced landslides

Climate change

Impact of climate change on water resources
Extreme event hazard reduction
Impact of climate change on terrestrial ecosystems
Hydrological aspects of the mild winter 1989/90
Hydrological characteristics of the summer of 1990

Hydrological software

Software development
HYDATA
HYRRM (hydrological rainfall runoff model)
GRIPS (groundwater information processing system)
QUASAR - Micro-version model
The IHDM package
Micro-FSR
Quality assurance of software
Software sales and support
FFAP (flood frequency analysis package)
HYQUAL (water quality database)
Software training
Provision of QUASAR and DMM

Programme 13 - Scientific Services

Hydrological instrumentation

Capacitance probe
Automatic weather station
Field instruments
Maintenance and development of Hydra equipment

Information and dissemination activities

Hydrochemistry laboratory

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