Markus Weiler

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EDUCATION

Dr. sc. techn. in Hydrology (Ph. D.) June 2001
Swiss Federal Institute of Technology (ETH) Zürich, Switzerland
Thesis: Mechanisms controlling macropore flow during infiltration - Dye tracer experiments and simulations

Diplom in Hydrology (M. Sc.) June 1997
Albert-Ludwigs University Freiburg, Germany
Minors: Soil Sciences, Geology, Statistics
Thesis: Study of runoff generation on hillslopes using tracer experiments and a physically-based numerical hillslope model

Vordiplom in Geography (Hydrology) (B.Sc.) June 1993
Albert-Ludwigs University Freiburg, Germany
Majors: Hydrology, Physical Geography
Minors: Physics, Chemistry, Statistics

STUDY ABROAD

Scholarship to the Ontario - Baden-Württemberg Exchange Program 1993 – 1994
Laurentian University Sudbury, Canada
Courses in Geomorphology, Land Resources, GIS, Fractal Geometry, Instrumental Analytical Chemistry, Earth Resources, and Geochemistry

RESEARCH EXPERIENCE

Postdoctoral Researcher Sept 2001 – to date
Dept. of Forest Engineering, Oregon State University (OSU) Corvallis, USA
Research topics:
- *Influence of forest roads in small watersheds, Prince of Wales Island, Alaska, USA*
- *Hydrological response and solute transport in forested hillslopes*
- *Virtual experiments – exploring the hydrology of hillslopes and catchments*
- *Preferential flow pathways in forested soils (sprinkling and dye tracer experiments)*
- *Transfer distribution of event and pre-event water – a new approach based on natural isotopes*
- *Water repellency in forest soils – effects on infiltration and hillslope hydrology*
- *Persistence of throughfall patterns under different forest vegetation*

Research Assistant July 1997 – July 2001
Swiss Federal Institute of Technology (ETH) Zürich, Switzerland
Co-Investigator in the following consulting/applied research projects:

- *Land use change and runoff processes - evaluation in three catchments in Rhineland-Palatinate, Germany*
- *Nonstructural measures on flood protection for the International Commission for the Protection of the Rhine (ICPR)*
- *Extreme floods of the Cuncumen River (Chile) - Hydrometeorology and runoff generation*
- *Hydrological Atlas of Switzerland - Flood Retention*

Research Assistant August – December 1995
Laboratory of Hydraulics, Hydrology and Glaciology (VAW) Zürich, Switzerland

- *Involved in a project on the identification of runoff generation processes on hillslopes funded by the Swiss National Scientific Research Foundation*
- *Application of different physically-based rainfall-runoff models*

TEACHING EXPERIENCE

Hillslope Hydrology
Oregon State University, Fall 2002, FE 605, 4 Credits
Co-taught with Jeff McDonnell

Runoff Generation at different hydrological scales - basics, experimental methods and simulation
Oct 2002, 3 day short course for graduate students at Potsdam University, Germany
Invited and sponsored by the International Quality Networks (IQN), DAAD, Germany

Snow Hydrology
Oregon State University, Winter 2003, 1 week field course at the Andrews Experimental Forest
Co-taught with Jeff McDonnell

Hydrology, Hydrogeology, and Water Resources Management
ETH Zurich, Switzerland, 1998-2001
Lecturing in the Postgraduate Program with emphasis on runoff generation processes

Current graduate students
Roman Portmann, M.Sc. student, started April 2002, Coop with University of Basel, Switzerland
Thesis: Hillslope hydrology of the Maybeso watershed in Southeast Alaska: Spatial and temporal characteristics of runoff generation in steep, forested watersheds

Matthias Retter, M.Sc. student, started Jan 2003, Coop with University of Freiburg, Germany
Thesis: Exploring subsurface flow pathways using natural and artificial tracers

Supervision of interns from abroad in the Department's work experience program
ETH Zurich, 1998-2001

Hydrology I, Hydrology II, Tracer hydrology
University of Freiburg, Germany, 1995-1996, Preparation of lectures as a teaching assistant

GRANTS

Co-Investigator of Joint Venture Agreement OSU - USDA Forest Service 2002 – 2003
The hillslope hydrology of subsurface flow interception by forest roads, $ 120,000

Co-Investigator of Joint Venture Agreement OSU - USDA Forest Service 2001 – 2002
Hillslope Hydrology of the Maybeso Watershed, Southeast Alaska, $ 55,000

Swiss Federal Institute of Technology in Zürich 1998 – 2001
Investigation of the water exchange mechanisms between preferential flow paths and the soil matrix, CHF 120,000

PROFESSIONAL ACTIVITIES

Reviewer

Journal of Hydrology (3)
Water Resources Research (1)
Hydrological Processes (2)
Soil Science (2)
Hydrology and Earth System Sciences (HESS) (2)
NSERC (1)

Conference session organizer

MODSIM 2003, Townsville,Australia: Session A06: Interactions between field-based monitoring and modeling

Short courses and workshops participant (last 3 years)

- *Advanced modeling of water flow and contaminant transport in the vadose zone (HYDRUS and MACRO) by M. Th. van Genuchten, J. Simunek, M. Larsson, Monte Verità, Switzerland*
- *Quantification of flow in macropores by P. Germann, Bern, Switzerland*
- *Geostatistical approaches in soil science by A. Papritz, Zurich, Switzerland*
- *Water flow and solute transport in structured soils by H.-J. Vogel, Zurich, Switzerland*
- *Writing English for Science by M. Bryant, Center for Staff Training, ETH, Zürich, Switzerland*
- *Writing Clinic for Researchers by E. Furter-Graves, Center for Staff Training, ETH, Zürich, Switzerland*
- *IDL for Advanced Users - Professional application development by CREASO, Switzerland*

Memberships

American Geophysical Union (AGU)
International Association of Hydrological Sciences (IAHS)
European Geophysical Society (EGS)

PUBLICATIONS

Journal publications

Weiler, M. & McDonnell, J. (2003) On the effect of the depth distribution of drainable porosity and saturated hydraulic conductivity on hillslope hydrology. Water Resources Research (in preparation).

Weiler, M., Portmann, R., McDonnell, J. (2003) Spatial and temporal runoff generation in Southeast Alaska – observations and simulations. Hydrological Processes (in preparation).

Keim, R.F., Weiler, M., Skaugset, A.E. (2003) Temporal persistence of spatial patterns in throughfall. Journal of Hydrology (in preparation).

Weiler, M., McGlynn, B., McGuire, K., McDonnell, J. (2003) How does rainfall become runoff? A combined tracer and hydrologic transfer function approach. Advances in Water Resources (in review).

Weiler, M & Flühler, H. (2003) Inferring flow types from dye patterns in macroporous soils. Geoderma (in review).

Weiler, M. & McDonnell, J. (2003) Virtual experiments: A new approach for improving process conceptualization in hillslope hydrology. Journal of Hydrology (in review).

Weiler, M. (2003) A new approach to describe infiltration into soils containing macropores. Water Resources Research (in review).

Weiler, M. & Naef, F. (2003) Simulating surface and subsurface initiation of macropore flow. Journal of Hydrology (in press).

Weiler, M. & Naef, F. (2003) An experimental tracer study of the role of macropores in infiltration in grassland soils. Hydrological Processes (in press).

Naef, F., Scherrer, S. & Weiler, M. (2002) A process based assessment of the potential to reduce flood runoff by land use change. Journal of Hydrology 267, 74–79.

Weiler, M., Scherrer, S., Naef, F., Burlando, P. (1999) Hydrograph separation of runoff components based on measuring hydraulic state variables, tracer experiments and weighting methods. IAHS Publications No. 258, 249-255.

Weiler M., Naef F., Leibundgut C. (1998) Study of runoff generation on hillslopes using tracer experiments and a physically based numerical model. IAHS Publications No. 248, 353-360.

Published conference proceedings

Weiler, M., Uchida, T., McDonnell, J. (2003) Connectivity due to preferential flow controls water flow and solute transport at the hillslope scale. Proceedings of MODSIM 2003, Townsville, Australia.

McDonnell, J., McGlynn, B., Weiler, M. (2002) Scaling and non-linearity of runoff processes. Issues of scale and non-linearity in hydrology: Challenges and opportunities for scientific research and professional practice. Vancouver, Canada.

Weiler, M. & McDonnell, J. (2002) Virtual experiments: A new approach to study water flow and solute transport at the hillslope scale. ERB and Northern European FRIEND Project 5 Conference: Interdisciplinary Approaches in Small Catchment Hydrology: Monitoring and Research, Bratislava, Slovakia.

Weiler, M. & Naef, F. (2001) Verification of flow processes in soils with combined sprinkling and dye tracer experiments. Proceedings of IAHS International Workshop, Runoff Generation and Implications for River Basin Modelling, Freiburg, Germany, 345-355.

Weiler, M., Scherrer, S., Thoma, C., Fackel, P. & Naef, F. (2000) The potential to influence runoff processes by changes in land use. PIK Report No. 65, 286-294.

Theses

Weiler, M. (2001) Mechanisms controlling macropore flow during infiltration - dye tracer experiments and simulations. Diss. ETHZ No. 14237, Zürich, Switzerland, 150 pages. http://e-collection.ethbib.ethz.ch/cgi-bin/show.pl?type=diss&nr=14237.

Weiler, M. (1997) Untersuchungen zur Abflussbildung an Hängen mit Tracerversuchen und numerischen Modellierung der Wasserbewegung (*Study of runoff generation on hillslopes using tracer experiments and a physically based numerical model*). Diplomarbeit der Universität Freiburg i.Br., Germany.

Reports and Maps

Naef, F., Thoma, C., Weiler, M. (2002) Dämpfung von Hochwasserspitzen in Fliessgewässern (Attenuation of flood peaks in rivers). Hydrological Atlas of Switzerland, Plate 5.9.

Burlando, P., Ruf, W., Weiler, M., Pfaundler, M. (2002) Nonstructural measures on flood protection, International Commission for the Protection of the Rhine (ICPR), in: Egli, T. (2002) Hochwasservorsorge – Massnahmen und ihre Wirksamkeit, IKSR, 50p.

Naef, F., Scherrer, S., Thoma, C., Weiler, M., Fackel, P. (2000) Die Beurteilung von Einzugsgebieten und ihren Teilflächen nach der Abflussbereitschaft unter Berücksichtigung der landwirtschaftlichen Nutzung (*Evaluation of the runoff generation potential in watersheds and sub-watersheds under consideration of the current land use*). Study for the Department of Environment and Forestry, Rhineland-Palatinate, Germany. IHW Report B003, Zürich, Switzerland.

Naef, F., Kull, D., Weiler, M. (1999) Retentionswirkung von Vorlandüberflutungen (*Retenion effects of flood-prone areas*). Study for the Department of Environment and Forestry, Rhineland-Palatinate, Germany. IHW Report A006b, Zürich, Switzerland.

Naef, F., Scherrer, S., Weiler, M. (1998) Extreme Floods of the Cuncumen River – Hydrometerological study of the Quillayes Tailing Dam. Contracted by Bechtel Chile LTDA and Minera Los Pelambres. IHW Report 018, Zürich, Switzerland.

Naef, F., Scherrer, S., Thoma, C, Weiler, M., Kull, D. (1998) Hochwasserrelevante Flächen der Einzugsgebiete Katzenbach und Sulzbach (*Flood prone areas in two watersheds*). Study for the Department of Environment and Forestry, Rhineland-Palatinate, Germany. IHW Report B002, Zürich, Switzerland.

PRESENTATIONS

Connectivity due to preferential flow controls water flow and solute transport at the hillslope scale. Presenting at MODSIM 2003, Townsville, Australia, 2003

Virtual catchments – spatial variation of runoff generation in steep, forested headwater. Presenting at the XXVIII General Assembly of the European Geophysical Society, Nice, France, 2003

TRANSEP - a combined tracer and runoff transfer functions hydrograph separation model. Presenting at the XXVIII General Assembly of the European Geophysical Society, Nice, France, 2003

Spatial and temporal runoff generation in Southeast Alaska, Presenting at the International Workshop on Mountain Hydrology, Einsiedeln, Switzerland, 2003

Exploring the First Order Controls of Hillslope Scale N and DOC Flushing: A Virtual Experiment Approach. Presented at the AGU Fall Meeting, San Francisco, USA, 2002

Virtual experiments: A new approach to study water flow and solute transport at the hillslope scale. Presented at the ERB and Northern European FRIEND Project 5 Conference: Interdisciplinary Approaches in Small Catchment Hydrology: Monitoring and Research. Demanovska dolina, Slovakia, 2002

Multi-Criteria Validation of an Infiltration Model for Macroporous Soils. Presented at the XXVII General Assembly of the European Geophysical Society, Nice, France, 2002

Multi-Criteria Validation of an Infiltration Model for Macroporous Soils. Presented at the AGU Fall Meeting, San Francisco, USA, 2001

A new approach to describing water movement in macroporous soils. Presented at the Chapman Conference on State-of-the-Art Hillslope Hydrology, Sunriver, Oregon, USA, 2001

Initiation and interaction of macropore flow during rainfall events. Presented at the XXVI General Assembly of the European Geophysical Society, Nice, France, 2001

The potential to influence runoff processes by changes in land use. Presented at the European Conference on Advances in Flood Research, Potsdam, Germany, 2000

How do floodplains influence the discharge of extreme flood? Presented at the European Conference on Advances in Flood Research, Potsdam, Germany, 2000

Verification of flow processes in soils with combined sprinkling and dye tracer experiments. Runoff Generation and Implications for River Basin Modeling, Freiburg, Germany, 2000

Dye pattern in soils: detecting relevant structures. Presented at the XXV General Assembly of the European Geophysical Society, Nice, France, 2000

Where do land use changes affect storm runoff? Presented at the XXV General Assembly of the European Geophysical Society, Nice, France, 2000

Methods to evaluate preferential flow processes in soils. Presented at “Testable stochastic features of subsurface structures, flow and transport” Workshops at the CSF, Monte Verità, Switzerland, 1999

Hydrograph separation of runoff components based on measuring hydraulic state variables, tracer experiments and weighting methods. Presented at the XXII General Assembly of the International Union on Geodesy and Geophysics, Birmingham, UK, 1999

Influences of Soil Water Content and Rainfall Intensity on Preferential Flow. Presented at the XXIV General Assembly of the European Geophysical Society, Den Haag, Netherlands, 1999

Study of runoff generation on hillslopes using tracer experiments and a physically based numerical model. Presented at the HeadWater’98 Conference, Merano, Italy, 1998

SOFTWARE DEVELOPMENT

IN^{3}M (INfiltration-INitiation-INteraction-Model)

A plot scale model describing initiation and interaction of macropore flow by a consistent and analytical approach. The model uses physically-based parameters, simulates interaction individually for a set of macropores, and can simulate dye patterns for multi-criterion validation (1 publication)

DRP (Dominant Runoff Processes Model)

A catchment and event scale rainfall-runoff model based on 'similar runoff generation units' (SRGU), which are sub-areas, where similar runoff process dominates. For each SRGU the specific runoff process is modeled based on a one or two-dimensional cross sections (characteristic profile) (2 publications)

HILL-VI (Hillslope – Virtual)

A hillslope scale model integrated in the "virtual experiment" approach, based on water and mass balance calculation within the saturated and unsaturated zone in relation to soil physical properties. It is especially powerful in visualizing four-dimensional dynamics of water flow and solute transport. A "light" version is also available in EXCEL for teaching applications (1 publication)

TRANSEP (tracer and runoff transfer function hydrograph separation model)

A lumped catchment model integrating the instantaneous unit hydrograph (IUH) approach with the isotope hydrograph separations (IHS) technique. The model is based on transfer functions representing the runoff response, event water and pre-event water transfer (1 publication)

SPECIAL SKILLS

Computer

Skilled user of IDL and PV-Wave development environment
GIS software ARC-INFO, ArcView, GRASS and IDRISI
Programming in C and FORTRAN
HTML and Javascript – Website programming for several institutes at ETH.

Languages

German: native speaker
English: fluent
French: basics

Leadership

Officer of the student geography association
Swimming instructor and lifeguard certificates