

ETH Institute of Environmental Engineering

PhD Summer School, 2 - 7 July 2017
Einsiedeln, Switzerland

Catchment Transport Processes

In collaboration with the ETH Institute of Biogeochemistry and Pollutant Dynamics, EAWAG and the EPFL Institute of Environmental Engineering



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About the School

Background

The “Catchment transport processes” Summer School is part of the ETH-EPFL programme “Create your own Summer/Winter School 2017”. The programme selects and funds Summer and Winter Schools, that are organised by doctoral students from within the ETH-domain. One of the objectives of this programme is to enhance exchange between EPFL, ETH and other international students. In late 2016 four PhD students from different groups at ETH Zurich and EPFL applied to the funding programme proposing a Summer School focused on hydrology and transport processes. The School was successfully funded and will run for the first time in summer 2017 with the name *Catchment Transport Processes Summer School*.

Motivation

Water transports solutes, such as nutrients, toxins and contaminants, as well as a wide range of organisms and gas substances. Their impact on water quality is often critical, as in the case of eutrophication due to high nutrients concentration and residence time.

For this reason, a comprehensive water resources management requires a proper understanding and modeling of runoff generation combined with processes of solute transport at the hillslope and catchment scale.

The *Catchment Transport Processes Summer School* will provide attendees an overview of transport processes with relation to the hydrological cycle, explaining physical and chemical processes, highlighting findings from data analysis, and presenting modelling techniques.

Format

The *Catchment Transport Processes Summer School* is open to 30 PhD students, coming from ETH Zurich, EPFL and from other academic institutions around the world. The doctoral students will have different backgrounds and focuses related to the Summer School topics (hydrology, transport processes, aquatic systems, biogeochemistry, etc.). Invited Speakers will give lectures about their specific area of expertise related to catchment transport processes, facilitating discussion about the latest findings and modelling innovations.

The Summer School will take place in Einsiedeln (canton of Schwyz, Switzerland). During the School, students will be introduced to the topic through a series of lectures, discussions, poster presentations, and workshops. Additionally, they will take part in a field trip to a currently active study site to get familiar with monitoring systems and data collection practices.

Topic

The *Catchment Transport Processes Summer School* is thought and organized as a short course where participants can learn more about water and solute fluxes throughout the catchment and better understand the impacts of natural processes and anthropogenic disturbances on water resources. Participants will be given the chance to attend lectures held by some of the leading researchers in the fields of hydrology, biogeochemistry, aquatic chemistry, and limnology and actively participate to open discussions with them.

The School will cover four themes:

- (1) Introduction to transport processes and hydrological models;
- (2) Water fluxes and transit times in catchments;
- (3) Carbon and nutrients cycles in soil and rivers;
- (4) Circulation in lakes.



A view from the Mythen on the Alptal valley towards Einsiedeln. Credit: Ikiwaner.

Learning objectives

The participants of the Summer School will:

- (1) Freshen and extend their knowledge about the role of water transport processes at the catchment scale
- (2) Learn about recent findings and open questions in the field;
- (3) Improve their skills in data analysis and modeling of transport processes;
- (4) Actively discuss the topics with Lecturers and peers from different research groups and universities;
- (5) Collaborate with peers in small groups to focus on one topic of interest;
- (7) Expand their contact network.

Eligibility and credits

The School is open to PhD students from academic and research institutions around the world involved in hydrology, transport processes, and biogeochemistry. The attendance would be beneficial for both students in the first years of their PhD, helping them to improve their research ideas and skills, as well as students at the end of their studies, providing them an opportunity to present their findings to experts and colleagues.

Applications from Master students are also considered, especially if their thesis is related to the school topics.

Postdoc researchers are welcome to join the school, but accordingly to the fund regulations they will have to pay separately for their accommodation and full-board.

Applicants need to have strong interest in the topic and basic knowledge of catchment scale hydrology. The official language of the School is English; therefore, an excellent knowledge of the language is required. Active participation throughout the programme is expected.

The school is limited to a maximum of 30 participants and priority will be given to students from the ETH-domain (ETH Zurich, EPFL, EAWAG, EMPA, WSL and PSI).

Students can acquire up to 2 ECTS credits:

- (1) One credit is acquired by active participation to the discussions following the lectures and by the preparation of a poster about the participant current research. The posters and their presentation will be evaluated by the Lecturers.
- (2) A second credit will be acquired if the participant wants to elaborate on problems presented during the workshop. A report that includes a review of suggested literature and the analysis of one of the presented case studies must be submitted maximum two weeks after the end of the School.

Schedule

	SUNDAY JUL 2	MONDAY JUL 3	TUESDAY JUL 4	WEDNESDAY JUL 5	THURSDAY JUL 6	FRIDAY JUL 7	
	WELCOME AND ICEBREAKER	INTRODUCTION TO TRANSPORT PROCESSES AND MODELLING	WATER FLUXES AND TRANSIT TIME IN CATCHMENTS	FIELD TRIP	CARBON AND NUTRIENTS CYCLES	CIRCULATION IN LAKES	07
08							08
09		08:30 Keynote 1 James Kirchner <i>ETH Zurich</i>	08:30 Keynote 5 Jan Seibert <i>University of Zurich</i>	08:30 Excursion to the Alptal valley Manfred Stähli <i>WSL</i>	08:30 Keynote 9 Stefan Krause <i>University of Birmingham</i>	08:30 Keynote 12 Alfred Johny Wüest <i>EPFL</i>	09
10		10:00 Poster Session 1 with coffee break	10:00 Poster Session 3 with coffee break	Benjamin Fischer <i>University of Zurich</i>	Coffee break	Coffee break	10
11		11:00 Keynote 2 James Kirchner <i>ETH Zurich</i>	11:00 Keynote 6 Ilja van Meerveld <i>University of Zurich</i>	Jana von Freyberg <i>ETH Zurich</i>	10:30 Keynote 10 Bernhard Wehrli <i>ETH Zurich, EAWAG</i>	10:30 Keynote 13 Marco Toffolon <i>University of Trento</i>	11
12		Lunch	Lunch	Lunch in the field	12:00 Introduction to the Workshops	12:00 Final Discussion	12
13					Lunch	Lunch	13
14		14:00 Keynote 3 Laurent Pfister <i>LIST</i>	14:00 Keynote 7 Gianluca Botter <i>University of Padova</i>		14:00 Keynote 11 Pierre A.G. Regnier <i>Université Libre de Bruxelles</i>	14:00 Beyond Academia Christoph Munz (<i>Arcadis</i>) Martin Rauber (<i>EBP Schweiz AG</i>) Irene Wittmer (<i>Plattform Wasserqualität VSA</i>)	14
15		15:30 Poster Session 2 with coffee break	15:30 Poster Session 4 with coffee break		Coffee break	15:00 Panel Discussion	15
16		16:00 Keynote 4 Simone Fatichi <i>ETH Zurich</i>	16:00 Keynote 8 Paolo Benettin <i>EPFL</i>		16:00 Parallel Workshops WS1 J. Kirchner (<i>ETH Zurich, WSL</i>) J. von Freyberg (<i>ETH Zurich</i>) WS2 S. Fatichi (<i>ETH Zurich</i>) WS3 P. Benettin (<i>EPFL</i>) WS4 B. Wehrli (<i>ETH Zurich, EAWAG</i>) WS5 S. Krause (<i>Univ. of Birmingham</i>)	16:00 Projects Discussion 16:15 Closing remarks and poster award	16
17	17:00 Arrival Check-in at Hotel Allegro	17:30 Guided tour of Einsiedeln and its Abbey <i>Einsiedeln Tourismus</i>	17:00 Introduction to the research in Alptal Manfred Stähli (<i>WSL</i>) Jana von Freyberg (<i>ETH Zurich</i>) Benjamin Fischer (<i>University of Zurich</i>)				17
18	18:00 Registration Setting up posters	Dinner	Dinner (<i>participants: self-organized; speakers and staff: restaurant in Einsiedeln</i>)	Dinner	Dinner		18
19	18:45 Welcome and outline of the school objectives Paolo Burlando <i>ETH Zurich</i>						19
20	Icebreaker Dinner						20
21							21

Lecturers



James W. Kirchner

Full Professor of Physics of Environmental Systems
ETH Zurich
Swiss Federal Institute for Forest, Snow and Landscape Research (WSL)
University of California, Berkeley

A physicist by training, James Kirchner has worked in fields ranging from hydrology, aqueous geochemistry, and geomorphology to evolutionary ecology and paleobiology. Much of his current work focuses on the flow, chemistry, and geomorphology of mountain streams.

Dr. Kirchner received his bachelor's and master's degrees from Dartmouth College, and his Ph.D. from the University of California, Berkeley. He was a member of the Berkeley faculty from 1991 through 2010, most recently as Goldman Distinguished Professor for the Physical Sciences and Director of Berkeley's Central Sierra Field Research Stations. From 2007 to 2012 he served as Director of the Swiss Federal Institute for Forest, Snow, and Landscape Research (WSL), where he supervised a scientific staff of 550, and where he remains as a senior scientist. He is currently Professor for the Physics of Environmental Systems at ETH Zurich, the Swiss federal technical university.

He became a Fellow of the American Geophysical Union in 2008. He was the European Geosciences Union's 2013 Ralph Alger Bagnold Medalist and the AGU's 2016 Langbein Lecturer.



Laurent Pfister

Head of research group, Catchment and Eco-Hydrology
Luxembourg Institute of Science and Technology (LIST)

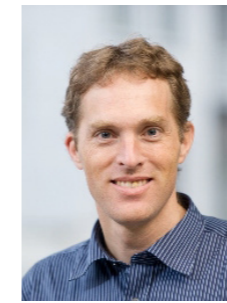
Laurent Pfister is leading the research group in 'Catchment and Eco-hydrology' at the Luxembourg Institute of Science and Technology (LIST). Since 2002, he has actively contributed to implement a state-of-the-art nested hydro-meteorological monitoring network in the Alzette River basin (Luxembourg), alongside facilities for hydro-chemical and stable isotope analysis of water samples at LIST. He owns a PhD in hydrology, as well as the accreditation to supervise research from the University of Strasbourg (F). Both as a project leader and researcher, he has been involved in more than 25 applied and fundamental research projects. With his research interests focusing on experimental hydrology, he has contributed to explore new research avenues based on novel observation techniques (e.g. thermal infrared imagery, portable mass-spectrometer) and hydro-ecological investigations (e.g. tracing surface runoff processes via terrestrial diatoms). To date, he has published both as first author and co-author 107 papers in peer-reviewed journals and has been involved in the publication of 17 books and book chapters.



Simone Fatichi

Associate researcher, Chair of Hydrology and Water Resources Management
ETH Zurich

Simone Fatichi is Research Associate and Lecturer at the Institute of Environmental Engineering at ETH Zurich since 2011. He received his BSc and MSc (cum laude) in Earth and Environmental Engineering at the University of Firenze (Italy) and he owns an International PhD title joint between the T.U. Braunschweig (Germany) and University of Firenze (Italy). His areas of expertise are hydrology, soil-water-plant interactions, biogeosciences, and analysis of climate change effects. His research covers a variety of topics and techniques including distributed hydrological and ecohydrologic modelling, modeling of processes of plant physiology and soil biogeochemistry, methods of stochastic hydrometeorology, and downscaling techniques to study climate change impacts. Recent research efforts have been devoted to enhancing the understanding of global change and its implications on water resources, ecosystems, and the carbon cycle. He was recipient of the Torricelli award in 2014.



Jan Seibert

Associate Professor, Hydrology and Climate, Department of Geography
University of Zurich

Jan Seibert is heading the group on Hydrology and Climate at the Department of Geography, University of Zurich (<http://www.geo.uzh.ch/h2k/>). Jan Seibert has obtained his PhD from Uppsala University in 1999 and has since then worked at Oregon State University, the Swedish University of Agricultural Sciences and Stockholm University. His main research interest is hydrological modelling at different scales in combination with experimental studies. Current research topics include the use of catchment models for land-use and climate change impact studies, runoff generation processes and topography, uncertainty analysis and risk assessment, the value of different types of data and the opportunities for citizen science in hydrology (for details see <http://www.geo.uzh.ch/~jseib/publications.html>). Jan Seibert is also serving on the editorial boards of Hydrology and Earth System Sciences (HESS), WIRES-Water and Hydrology Research.



Ilja van Meerveld

Group leader, Hydrology and Climate, Department of Geography
University of Zurich

Dr. Ilja van Meerveld is a group leader at the Department of Geography at the University of Zurich since 2014. Before that she was a lecturer at the Vrije Universiteit in Amsterdam and Simon Fraser University in Vancouver, BC. She obtained her PhD at the College of Forestry at Oregon State University and did a post-doc at the Environmental Fluid Mechanics Group at the Ecole Polytechnique Fédérale de Lausanne. Her main research interest is in hillslope and catchment hydrology. Her current research focuses on spatial and temporal variability in shallow groundwater dynamics, stream network expansion and contraction, connectivity, and the effects of land use change on hydrological processes. She is also involved in the crowdwater project on the potential of citizen science in hydrology.



Gianluca Botter

Associate Professor of Hydrology and Water Resources Management
University of Padova

Gianluca Botter holds a degree in Environmental Engineering (2001) and a Ph.D. in Environmental Modeling (2005) from the University of Padova, where he's currently associate professor of hydrology and water resources management. He's author and co-author of more than 60 papers in peer-reviewed journals, including PNAS, PlosONE and Geophysical Research Letters (Google scholar h-index = 25). In 2010 he has been awarded with the Torricelli prize as leading under-34 researcher in the fields of Hydraulics and Hydrology. In 2011 he received the Outstanding Referee Award for Water Resources Research from the American Geophysical Union, and in 2013 he was awarded the Certificate of Excellence in Reviewing by Advances in Water Resources, Elsevier. His scientific interests include: i) the characterization of river flow regimes from landscape and climate; ii) the development of catchment-scale transport models based on the concept of dynamical travel time distributions; iii) the analysis of water quality patterns in space and time; iv) the interaction between anthropogenic activities, flow regimes and in-stream ecological processes.



Paolo Benettin

Scientist, Laboratory of Ecohydrology
EPFL

Paolo Benettin is a scientist at the Laboratory of Ecohydrology at EPFL since 2015. He owns a master and a Ph.D. in Environmental Engineering from University of Padova, Italy. The main research field is catchment hydrology, with special interest in hydrologic transport and travel time distributions. His work aims at bridging and implementing theories of transport at catchment scale with empirical evidence from field measurements.

**Manfred Stähli**

Head of Research Unit, Mountain Hydrology and Mass Movements
Swiss Federal Institute for Forest, Snow and Landscape Research (WSL)

Dr. Manfred Stähli is a Civil Engineer with a PhD in Environmental Physics from the Swedish University of Agricultural Sciences. Since 2006 he has been heading the research unit Mountain Hydrology and Mass Movements at the Swiss Federal Research Institute WSL, with approximately 40 people, working in the field of Water Resources and Natural Hazard Management. His main area of expertise is in the field of winter hydrology in alpine and northern-latitude areas, including snow and frozen soil. During the past five years he has been co-author of two national syntheses on water resources under climate change and he has developed, together with his team, a drought early warning system for Switzerland.

**Jana von Freyberg**

Postdoctoral researcher, Physics of Environmental Systems
ETH Zurich

Jana von Freyberg is a postdoctoral researcher in the group of Physics of Environmental Systems at ETH Zurich. Her PhD project at the Swiss Federal Institute of Aquatic Science and Technology (EAWAG) focused on Groundwater dynamics and streamflow generation in a mountainous headwater catchment, for which she received her PhD from the Université de Neuchâtel in 2015. She owns a master in Hydrogeology from the Technische Universität Berlin. In her current research, Jana von Freyberg integrates studies on hydrogeology, watershed hydrology and water quality with particular focus on water and solute fluxes in snowmelt dominated, forested headwater catchments. To capture fast hydro-chemical responses at such sites, she uses innovative sampling and analysis instruments that are deployed directly at the field. In a second project, she collaborates with researchers from the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) to investigate the role of snowmelt for groundwater storage and summer low flow in a pre-Alpine catchment.

**Bernhard Wehrli**

Full Professor of Aquatic Chemistry
ETH Zurich, EAWAG

Bernhard Wehrli is Professor for Aquatic Chemistry at the Department of Environmental Sciences at ETH Zurich and the present head of the Institute of Biogeochemistry and Pollutant Dynamics. His research group is studying lakes and rivers with a focus on biogeochemical processes affecting carbon and nutrient cycles. The group combines chemical sensors, stable isotope techniques and modelling. Bernhard Wehrli studied chemistry at ETH Zurich and sanitary engineering and water protection in an ETH graduate course. After graduating, he conducted research at Caltech in Pasadena and at the University of Paris 6. He was a member of the research council of the Swiss National Science Foundation and of the Eawag directorate. Advancing interdisciplinary collaboration in teaching and research is the most important challenge in his daily business.

**Alfred Johnny Wüest**

Full Professor of Physics of Aquatic Systems
EPFL, EAWAG

Prof. Alfred Johnny Wüest is head of the Physics of Aquatic Systems Laboratory (Margaretha Kamprad Chair) at EPFL Lausanne and member of the Eawag directorate. His research focuses on small-scale processes such as turbulent mixing, boundary layer fluxes and double-diffusion. The applied research and expert services was mostly related to lake management (nutrients, turbidity, heat use and hydropower). The goal of the larger and interdisciplinary projects was usually to assess the anthropogenic effects on physical and biogeochemical effects in stratified lakes and reservoirs with an applied research component. But A. Wüest liked also especially the possibilities of investigations of very special aquatic systems as Lake Ohrid, Lake Baikal and Lake Kivu.

**Benjamin Fischer**

Postdoctoral researcher, Hydrology and Climate, Department of Geography
University of Zurich

Benjamin successfully completed his PhD in the group of Jan Seibert at the University of Zürich in 2016 and is currently working in the same group as postdoc. The main focus of his PhD research was to investigate the spatiotemporal runoff processes in the Alptal, a pre-alpine catchment in Switzerland with high amount of rainfall and different land covers, using hydrometric data, isotopic and hydrochemical variables, obtained during extensive field work. Simultaneously Benjamin set up the stable isotope laboratory at University of Zürich, supervised several internship students, B.Sc. and M.Sc. students, helped and co-organized different courses. Next to his main PhD-project Benjamin could expand his knowledge on spatiotemporal hydrological runoff processes and the application of stable isotopes, in several "hobby" side projects.

**Stefan Krause**

Professor for Ecohydrology and Biogeochemistry
University of Birmingham

Stefan Krause is Professor for Ecohydrology and Biogeochemistry at the School of Geography, Earth and Environmental Sciences of the University of Birmingham, UK. He obtained his PhD in Hydrology from the University of Potsdam in 2005 and worked at Lancaster University and the University of Keele before taking up his position in Birmingham in 2011. His work on ecohydrological functioning and biogeochemical cycling at groundwater – surface water interfaces particularly focuses on the investigation of non-linear ecohydrological process dynamics and responses to environmental change, including the analysis of hotspots and hot moments, tipping points and threshold behavior at ecohydrological interfaces. His work on multi-component reactive transport processes integrates novel distributed sensor network technologies with smart tracer and adaptive modeling approaches.

**Pierre A.G. Regnier**

Full Professor of Earth System Science, Director of BGeoSys
Université Libre de Bruxelles

Prof. Pierre Regnier is professor of Earth System Science, director of the research group "Biogeochemistry and Modelling of the Earth System" (BGeoSys) and Vice-Chair of the Department of Geosciences, Environment and Society at the Université Libre de Bruxelles (Belgium). As a biogeochemical modeller, his research focuses on the anthropogenic perturbation of the global carbon cycle with a strong focus on inland water, estuaries and coastal environments. His expertise encompasses biogeochemistry of carbon and nutrients, CO₂ and methane cycling, reactive-transport modelling and modelling of land-ocean interactions.

**Marco Toffolon**

Associate Professor of Hydraulics
University of Trento

Marco Toffolon is Associate Professor of Hydraulics at the University of Trento, Italy. After a Ph.D. in Hydraulic Engineering from the University of Padova, he joined the Department of Civil, Environmental and Mechanical Engineering of the University of Trento, teaching courses on environmental hydraulics and open channel flows. His research interests cover different aspects of environmental fluid mechanics: physical limnology, sediment transport and morphodynamics, tidal hydrodynamics, pollutant dispersion, eco-hydraulics, ecogeomorphology. His main expertise is in mathematical modelling of environmental systems, with a special emphasis on minimal models developed to grasp the dominant dynamics. He serves as associate editor for the Journal of Hydrology and the Journal of Limnology.



Christoph Munz

Senior Project Manager, Chemical Risk Assessment & Contaminated Sites
Arcadis Schweiz AG

Christoph Munz is a Civil Engineer (ETHZ) with a PhD in Environmental Engineering & Science from Stanford University, California, USA. After 4 years of applied research in drinking water treatment at EAWAG, 1989 he moved to private industry as a consulting engineer. He was a founding member & partner (1995) of BMG Engineering Ltd, as of 2015 Arcadis Schweiz AG (in Schlieren Switzerland). As Dept. Head for Chemical Risk Assessment & Contaminated Sites he was Project Manager and/or Leading Engineer/Scientist and/or responsible for QA/QC in many large and/or complex projects in the areas of contaminated site assessment & remediation.



Martin Rauber

Senior Project Manager, Environment and Water Department
EBP Schweiz AG

Dr Martin Rauber is an Environmental Engineer (ETHZ) with a PhD in the field of modelling contaminant transport in heterogeneous aquifers. He had his own consulting business for almost a decade and has been working in several engineering companies. In his current position as a senior project manager at EBP he has the opportunity to consequently pursue his strong interest in interdisciplinary cooperation. His consulting activities focus on the design and implementation of water infrastructure, integrated (urban) water management, climate change impact assessment and adaptation, and hydroinformatics. In the last decade he has mainly worked on projects abroad, namely in the Balkans, North Africa, Central Asia and South East Asia. He is currently involved as a water expert in the «Bregalnica River Basin Management» project in Macedonia, the «Jinsha River Basin» project in China and the «Integrated Urban Water Management» project in Morocco. Apart from his consulting work he is leading the internal research project on developing a «Quick Scan» methodology for assessing the current state of the urban water management.



Irene Wittmer

Group leader
Platform Water Quality, VSA (Swiss Water Association)

Since 2015, Dr. Irene Wittmer leads the Platform Water Quality of VSA, the Swiss Water Association. After studying environmental science at ETH Zurich, she completed a PhD at EAWAG on the topic «Inputs of pesticides and biocides to surface waters» and has since worked on the topic of chemicals in water bodies, the question of the sources of the diverse chemical inputs, and how pollution can be measured through targeted monitoring.



Discharge measurement in the upper part of the Erlench (WS04) using flurometer and Rhodamine, i.e., dye as tracer. Credit: B. Fischer.

Activities

Welcome and icebreaker

At the beginning of the School, opportunities to meet and interact among the participants will be facilitated. Students and Invited Speakers will be welcomed by the Organising Committee and one of the main supporters of the Summer School, Prof. Paolo Burlando. The Organising Committee will introduce the outline of the week and afterward an icebreaker dinner is offered.

On Monday evening the group will participate to a guided tour of Einsiedeln and its Abbey to discover the beauty of this small village. There will also be a chance for participants to interact in a more informal environment.



Lectures

During the School Professors and experts in different fields of research will deliver keynote lectures. Lectures of 1.5 hours will consist of presentations, small assignments and discussions, where all students are expected to participate actively.

Poster sessions

Participants are invited to prepare and bring a poster about their current research, related to one of the focuses of the School. Posters will be presented in different time slots at the beginning of the School in order to give students the opportunity to introduce themselves and their research interests. The discussion with Lecturers and peers will continue during the whole week and posters will be evaluated by the Invited Speakers. The best poster will be awarded with a prize on the last day of the week.

Workshops

Parallel workshops will be held during one afternoon. These will provide the students an hands-on experience with the data analysis and modelling techniques discussed during the Lectures. Participants will choose one of the parallel workshops accordingly to their interest and they will work in small groups. Each group will be led by a Lecturer, who is in charge of presenting a case study and assigning practical exercises about it. Students will have the opportunity to gain one credit by submitting a report on the topic discussed during the workshop.



A view on Einsiedeln and its monastery. Credit: Hotel Allegro..

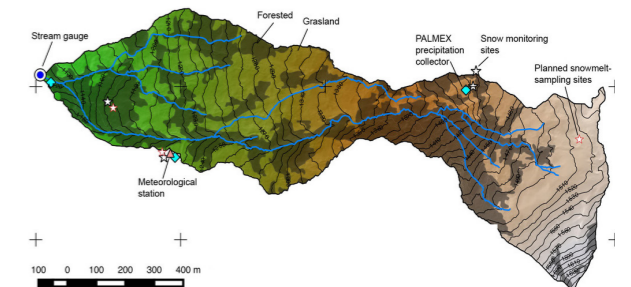


The meteorological station «Erlenhoehe» at the Erlenbach catchment. Credit: J. von Freyberg.

Field trip

A one-day field trip to the Alptal valley, in Canton Schwyz, will take place. This will give an opportunity to “see” hydrology and transport processes in action and to better understand measurement techniques. The group will reach the Zwäckentobel, a 4.3 km² pre-alpine headwater catchment. The Zwäckentobel basin has been a hydrological test site of the WSL (Swiss Federal Institute for Forest, Snow and Landscape Research) as well as of the Hydrology and Climate Unit of the University of Zurich for several years. The field trip consists in a pleasant walk through the catchment, visiting different sub-catchments, monitored by WSL and University of Zurich. Experts who are working in the sites will give technical lectures in the field, offering the opportunity to get a closer look at field instrumentations and data collection processes.

One of these sub-catchments is the Erlenbach, studied by WSL since 1965. Both climatic and hydrological variables are monitored in the basin and long-term observations of discharge and different hydrochemical variables are available.



Topography, land cover and instrumentation at the Erlenbach catchment. Credit: J. von Freyberg.



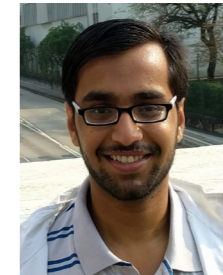
Automatic water sampler. Credit: B. Fischer.

Participants



Lorenz Ammann
PhD Environmental System
Sciences
EAWAG and ETH Zurich

I design and evaluate simple conceptual models to investigate the mobilization and transport of herbicides during rainfall events in small agricultural headwater catchments in the Swiss Midlands. By analyzing observed spatiotemporal differences of in-stream concentration dynamics, I want to delineate critical source areas. My current analysis is largely based on a controlled herbicide application experiment in the canton of Zurich conducted in 2009.



Harsh Beria
PhD Hydrological Modelling
University of Lausanne

I use stable water isotopes to try improving the certainty in hydrological flux estimates by incorporating them in a continuous modelling setup. I try to link the isotope measurements to flux estimates through conceptual models, using a combination of travel time distributions and mixing models. The aim is to see if high frequency isotope data can improve hydrologic flux estimates, especially evaporation, hence aiding in closure of the water budget.



Nino Amvrosiadi
PhD Hydrology
Uppsala University

I focus on hillslope scale hydrological modelling for systems with relatively shallow groundwater.

My main research question is how the assumptions regarding the soil micro-characteristics, which are not directly measurable with undisturbed experiments, add up and affect the water age and transit time distribution on larger scales.



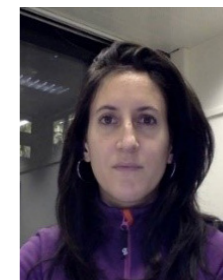
Andrea Betterle
PhD Water Resources and Drinking
Water
EAWAG

My research focuses on studying how differences in the climatic and landscape properties of catchments affect flow dynamics along river networks. Stochastic approaches are developed to account for the spatial variability of intrinsic probabilistic processes (e.g. rainfall), helping us to understand how differences in catchment-scale hydrological forcing affect similarities of streamflow dynamics and flow regimes at two arbitrary catchment outlets.



Lisa Anhäuser
PhD Surface Waters
ETH Zurich and EAWAG

I started my PhD in March 2017. In an interdisciplinary approach of three involved PhD students, we will investigate the regulation of nitrogen turnover in lakes. In my research I will focus on biogeochemical transformation processes and burial in the sediments. To separate and quantify microbial processes like denitrification and anammox, I will use ^{15}N stable isotope labeling techniques. Gas measurements in the water column and analysis of biomarkers related to N cycles such as proteins, lipids and pigments in the vertical sequence in sediments will help to refine the mass balances of nitrogen cycles.



Marta Boix Canadell
PhD Civil and Environmental
Engineering
EPFL

My research focuses on the study of the ecosystem metabolism rates in Alpine streams and how they are impacted by the hydrological, light and temperature regimes and disturbance dynamics.



Martina Botter
PhD Environmental Engineering
ETH Zurich

My research focuses on the comprehension of solutes behavior and transport at the catchment scale. I aim to understand how the observed streamflow solute concentrations reach the outlet, as a result of transport processes and reactions in the catchment. Through the exploration of C-Q relationships, the final goal is to understand what kind of parametrization can best represent different solute behaviors, in order to finalize a simple hydro-chemical model at the catchment scale.



Gabriel Cotte
PhD Earth Surface Dynamic
University of Lausanne

My research focuses on the interface between rivers and lakes. I study the processes of nutrient and pollutant transport from a river to a lake. My study case is the Lake Geneva where I am using the stable isotope of the water to trace the path of the Rhône River, the major tributary of the lake. My objective is to determine the conditions to create an interflow and/or an underflow and the extent of such flows. For it, I organise sampling campaigns at different seasons to evaluate the influence of tributary's density and thermal conditions and circulation of the lake.



Nena Susanna Griessinger
PhD Mountain Hydrology
WSL and University of Zurich

In my PhD project, I study snowmelt as a major contribution to runoff in Alpine catchments. I focus on the integration of data from snowmelt models into hydrological models. Having used daily input data in the first study, I will integrate hourly data in the next step. The snowmelt models differ in their complexity, but are (regarding computing time) feasible for operational purposes. The sensitivity of hydrological models to the representation of snowmelt is tested for a variety of Swiss catchments.



Vince Kaandorp
PhD Soil and Groundwater Systems
DELTA RES

My PhD research focusses on the groundwater contribution to lowland streams and its influence on ecological habitat characteristics such as discharge, chemistry and temperature. Catchment travel times were modelled and StorAge Selection functions used to describe different catchments. The influence of groundwater on stream temperature was measured with DTS using fibre optic cables. Existing datasets are used and enhanced with new field measurements of e.g. water chemistry, seepage and Radon-222.



Nicole Burri
PhD Water Resources and Drinking Water
EAWAG

My research proposal is titled 'Water Distribution - Adaptive monitoring and distributed modelling at catchment scale: Thur Catchment, Switzerland'. The project will focus on the management and development of an existing data platform, and the development of adaptive and event based monitoring of water characteristics. The goal of the project is to include the groundwater flow system into the semi-distributed model. The overall concept of the project will be tested in the Piave Basin in Italy.



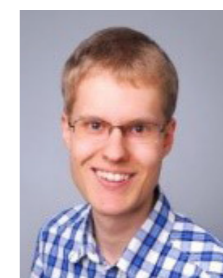
Marco Dal Molin
PhD Hydrological Modelling
EAWAG and University of Neuchâtel

Retention areas, river restoration efforts, and groundwater can be used together to help mitigate the effects of floods and drought. The objective of my project is to investigate how these components interact and to identify which measures for river corridor protection, restoration, and management are most effective. To achieve it, I develop and apply a semi-distributed hydrological model in a hypothesis-testing framework to model water quantity and quality in the study area of Thur catchment (CH).



Xingguo Han
PhD Environmental Microbiology
ETH Zurich

My PhD project will mainly focus on investigating bacterial and archaeal community structure and composition in both surface and subsurface sediments of five Swiss lakes along with different bioturbation, trophic status and organic matter composition by next generation and metagenomic sequencing. Besides, I will explore the paleo-environmental changes around the lakes implied by the potential sequencing of eukaryotic DNA buried in deep lake sediments.



Michael Kraft
PhD Hydrology and Climatology
Heidelberg University

I am doing my PhD in Geography at Heidelberg University since June 2016. My research focus is the analysis of drought impacts on soil water fluxes under different land uses in South-western Germany. Furthermore, I investigate nitrate concentrations in soils and may verify nitrate shifts caused by drought. The collected data (own field experiments on two agricultural sites and existing data e.g. from a forest site) is used to further develop the eco-hydrological model TRAIN.



Elisa Calamita
PhD Biogeochemistry and Pollutant Dynamics
ETH Zurich

Artificial river impoundments represent discontinuity elements that disrupt the natural balance between thermal, chemical, morphological and ecological regimes. The goal of my research is to develop a modelling framework to investigate and quantify the impact of large dams on downstream water quality in tropical context. Particularly, I aim to assess the reversibility of the main downstream alterations and consequently the quantification of their longitudinal extent.



Lisa Gallo
MSc Civil Hydraulic Engineering
EPFL and Università degli studi di Padova

I am a student in civil engineering from the University of Padua and I am doing my Erasmus in Switzerland, at the ECHO laboratory (EPFL). My master project focuses on the Uhlířská catchment, situated in the northern part of Czech Republic. The goal of my work is to model the transport of stable water isotopes from precipitation to streamflow, using a "travel time distribution" approach to understand the age of the water.



Edith Horstmann
PhD Environmental Science
EAWAG

Due to their chemical inertness the solubility of noble gases in groundwater depends only on the temperature during recharge, which makes them an excellent means to study transport processes and groundwater recharge. In my thesis, I am planning to take sediment pore water samples in the catchment area of the river Thur, and install an on-site mass spectrometer to measure long time series of gas concentrations. The aim is to study the exchange across aquifer/aquitard interfaces and river-groundwater exchange during bank infiltration.



Michael Mader
PhD Applied Geology
Friedrich-Alexander Universität Erlangen-Nürnberg

My current research deals with the analyses of stable isotopes of dissolved oxygen, carbon and its application to biogeochemical issues. The studies mainly focus on surface waters, shallow groundwater and their interference in hyporheic and riparian zones. The objective of these investigations is to reveal sinks and sources, basic processes, metabolic rates and related links to hydrological parameters



Anne Marx
PhD Hydrogeology
*Friedrich-Alexander Universität
Erlangen-Nürnberg*

My research focuses on the investigation of dissolved organic and inorganic carbon (DOC, DIC), particulate organic carbon (POC) concentrations and its stable isotopes in headwater catchments. The objective is to increase the understanding about carbon flux quantifications and carbon dynamics from the soil water and groundwater compartment into surface waters and to the atmosphere as well as related processes.



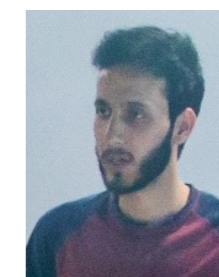
Maximilian Ramgraber
PhD Water Resources & Drinking
Water
EAWAG

In my PhD thesis I am focusing on the creation of a quasi-real time numerical model of a valley catchment near Zurich. Tying into a wireless sensor network yet to be installed by my project partner, we hope to create a monitoring system closely following the current groundwater situation and 'branching off' scenario models in regular intervals in order to improve predictive capabilities.



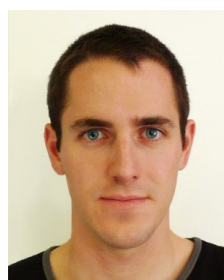
Dora Valente Salgueiro
PhD Civil Engineering
EPFL and ULisbon

My research has been focused on the transport of density currents, generated either by suspended substances or temperature differences, and the modelling of these stratified flows. To study these transport processes, I have been conducting laboratory experiments, on the propagation of a continuous release of a higher density mixture into a tank with freshwater, and calibrating and validating a mathematical modelling tool for the simulation of these processes.



Omar Wani
PhD Environmental Engineering
EAWAG and ETH Zurich

My research focuses on proper quantification and reduction of uncertainty for environmental model forecasts. I am mainly interested in hydrologic rainfall-runoff and water quality models. I also work on the geostatistics of rainfall fields. My research interests include parameter inference of models within a Bayesian framework and usage of machine learning for enhanced modelling.



Anthony Michelin
PhD Earth Surface Dynamics
Université de Lausanne (UNIL)

The objective of my PhD is to investigate the snow storage dynamics and melt pathways in a high Alpine catchment based on an experimental-modelling approach. Our work is focused on the Vallon de Nant catchment in the Vaud Alps of Switzerland. We expect the stable isotopes of water to help us understand how pathways of meltwater influence the response of the streamflow during the melting season.



Federica Remondi
PhD Environmental Engineering
*ETH Zurich and Singapore-ETH
Centre*

In my current research, I study water residence and transit time variability in time and space by developing a fully distributed model that couples hydrologic and transport processes. Looking both at the time and space distribution of water residence and transport, this tool can be useful for predicting water and solute fluxes and for better understanding the dependence of catchment transit and residence times on geomorphological and climatic factors.



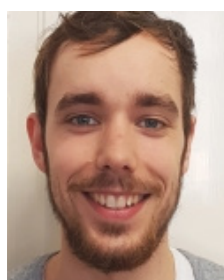
Carl Love Mikael Råman Vinnå
PhD Environmental Engineering
EPFL

The aim of my Ph.D. project is to find suitable locations for future drinking water intakes in the perialpine Lake Biel. Hydrodynamic models of the lake and the surrounding watershed, in combination with field measurements, are used to evaluate present and future conditions affecting drinking water quality. Physical processes under investigation includes but is not limited to; water temperature, stratification, turbidity, dissolved oxygen, river intrusions, water renewal and sediment stability.



Benedikt Werner
PhD Hydrogeology
*Helmholtz centre for environmental
research - UFZ*

The hydrologic and biogeochemical controls for the mobilization and transport of DOC from riparian soils to the streams are investigated in my research by new high frequency, in situ sensing techniques. The change of concentration and composition of DOC during transport to the catchment outlet will be evaluated. Based on the results, this allows to derive an improved mechanistic model of catchment-scale, needed to predict future trends in DOC export.



Thomas James Oudega
PhD Geohydrology and Subsurface
Transport Processes
Technical University Vienna

I studied Earth Sciences with a focus on Geology and Hydrology. In my diploma thesis I researched the transport of contaminants in a River Bank Filtration system. In August 2016 I joined the Vienna Doctoral Programme on Water Resource Systems as an associated student. I research the fate and transport of microorganisms during groundwater transport. This is done by performing tracer tests in an alluvial aquifer, and subsequent numerical modeling of the processes at work in the subsurface.



Andrea Rücker
PhD Mountain Hydrology
WSL

My interdisciplinary PhD project aims at the improving predictions of summer low flows using tracer hydrology. Fieldwork will provide information on environmental isotopes (^{18}O , ^2H , geochemical tracers) which will be used for hydrograph separation. Our sampling network in the Alp 46.4 km² and the nested Erlenbach basin includes the collection of stream water, precipitation and meltwater. A fully automated snowmelt lysimeter setup was developed to catch the meltwater signature in space and time.



José Tunqui
PhD Hydrology
*Pierre and Marie Curie University and
Irstea-Antony*

I am a PhD candidate in hydrology at Pierre and Marie Curie University and Irstea-Antony, France, working in the development of a hydrogeochemical conceptual model for the simulation of chemical concentrations from hydrometeorological data (flow, precipitation).



Lisa Wild
PhD Environmental Engineering
TU Munich

In the area of Hohenthann (90km northeast of Munich), nitrate contamination has become a threat to the drinking water supply. Using environmental isotopes ($\delta^2\text{H}$ & $\delta^{18}\text{O}$, $3\text{H}/3\text{He}$, 3H , ^{14}C and $\delta^{15}\text{N}$ nitrate & $\delta^{18}\text{O}$ nitrate), I calculate oxygen and nitrate reduction rates and determine the factors driving and limiting these processes in groundwater. To reach this goal I will model mean groundwater transit times (MTT), and link these results with the amount of reduced oxygen and nitrate in the aquifer.

Practical information

Dates

The School starts on Sunday 2nd July 2017 at 6.30 pm CET with an introduction and ice-breaker dinner and ends on Friday 7th July 2017 at 4.30 pm CET. Participants are kindly requested to arrange their travel accordingly to this schedule.

Venue

The School will be held in Einsiedeln (Canton Schwyz, Switzerland) at Allegro seminar hotel. Students will be hosted in fully equipped 2- 3- and 4-bed rooms. The hotel address is:

Hotel Allegro/SJBZ
Annuntiata-Stiftung Schwyz
Lincolnweg 23
CH-8840 Einsiedeln
<https://goo.gl/maps/gpieNYe33qt>
Phone +41 (0)55 418 88 88
<http://hotel-allegro.ch/en/>

Getting there

... by train and bus

Einsiedeln is well reachable with the public transportation system. The SBB rail transport system has connections every half hour between Zurich and Einsiedeln. Once arrived at Einsiedeln train station (Einsiedeln Bahnhof), you can reach the hotel with a 20-minute walk or with the bus. The bus stop called "Friedhof" is approx. 250 m to Hotel Allegro. Check the SBB online timetable for your detailed connections and for purchasing your ticket: <https://www.sbb.ch/en/home.html>

... by car

Einsiedeln is located 40 km away from Zurich. Driving on the A3 from Zurich to Chur you will reach Einsiedeln in 15 minutes from the exits Richterswil and Schindellegi. Free private parking is available at the hotel site.



Location of Einsiedeln in Switzerland.

... by plane

The closest airport to Einsiedeln is Zurich airport. Inside the airport there is the train station "Zürich Flughafen" from where you can take the train to reach Einsiedeln (see "Getting there by train and bus" section).

Costs

The contribution fee for the school is 250 CHF per participant. The cost covers all the expenses during the Summer School (accommodation and full board for the entire week, except for one dinner).

Participants are expected to self-organize:

- the dinner of Tuesday 4th of July;
- the travel to and from the venue;
- health/travel insurance;

and to check their requirements for a Visa.

Contacts

Main Contact

For any information, please contact the Organisation Team at:

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Checking the real-time monitoring of water quality. Credit: J. von Freyberg.



For further information

→ www.bit.ly/CTPSchool2017

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