

Institute of Water Management, Hydrology and Hydraulic Engineering

presented by

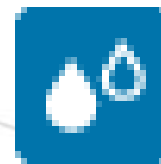
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University Structure



Department of
Water, Atmosphere and
Environment

Institute of Sanitary Engineering
and Water Pollution Control (SIG)

Institute of Hydrobiology and
Aquatic Ecosystem Management (IHG)

Institute of Waste Management (ABF)

Institute of Meteorology (MET)

Institute of Hydraulics and Rural
Water Management (IHLW)

**Institute of Water Management,
Hydrology and Hydraulic
Engineering (IWHW)**

Institute of Safety and Risk
Sciences

Workshops of the Water Institutes

Overview of IWHW

- Research fields
 - Water management
 - Hydrology
 - Hydraulic Engineering
- Scientific Approach
 - Field measurements
 - Physical hydraulic models (Lab)
 - Numerical modelling
- Education
 - Bachelor-, Master- and PhD Students
 - Postgraduate Education
 - International Programs (Tempus, Joint Study Programs,..)

Heads of the IWHW

Since 2011 Two Full Professorships / Research Groups:

„Hydraulic Engineering and Hydraulic Modelling“



Univ. Prof. Dr. Helmut Habersack (2011)



„Hydrology and Integrated Water Resources Management“



Univ. Prof. Dr. Karsten Schulz (2013)

Staff:

IWHW today:

- 2 full professor (head of institute)
- 1 em. professor
- 6 associate professors (Docents)
- approx. 65 senior and junior scientists
- 6 external lecturers
- 7 administrative and technical staff

Research Field Water Management

Relation between water and environment,
sustainable water use

- **Methods**

- Systems analysis and MCDM
- Decision Support Systems
- Integration of GIS and hydrological models
- Flood risk assessment and management

- **Projects**

- Rehabilitation of the Old Danube
- Flood risk assessment
- Flood warning systems
- Flood protection strategies
- Climate change impact studies (flood / droughts)



Research Field Hydrology

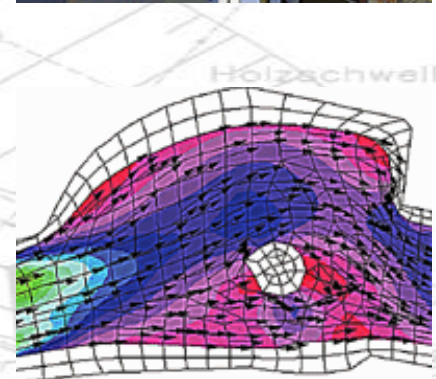
hydrological processes as a foundation for all water related planning and constructions; focus on discharge

- **Methods**

- continuous precipitation-runoff models
- Real time forecasting
- numerical groundwater models
- Process monitoring
- infiltration and river bed clogging

- **Projects**

- Discharge forecasts in the Danube basin
- Impact of climatic change on water resources
- Sedimentation of reservoirs
- Field monitoring of hydrological processes
- Snow / glacier monitoring



Research Field Hydraulic Engineering

Selection of technical measures to support economic and social interests of the society while maintaining and improving the ecological functionality of water bodies

- **Methods**

- Hydrometry, morpholog. field measurements
- Monitoring of rivers
- Hydraulic models
- Scale models in laboratory

- **Projects**

- River restoration programs
- Design of fish passes
- Sediment transport measurement and modelling
- 3-D hydraulic modelling
- Thermal loading of rivers



Education

Contribution to different curricula at BOKU

Post-graduate education

International programs

- Course program
 - Lectures, exercises, practical courses, seminars and excursions about hydrometry, hydrology, water management, and hydraulic engineering
- Bac, Master and Ph.D students
- Postgraduate Education
 - Seminars, short intensive courses,...



IWHW involvements

General remarks

- Course structure comprises Lectures and Exercises
- Bachelor courses partially exhibit large number of participants
- Master courses include mandatory and elective lectures
Structural exercises have high effort in supervision

Programs with WAU responsibility

Environmental Engineering (Kulturtechnik und Wasserwirtschaft)

Bachelor Level

- *Environmental Engineering (Kulturtechnik und Wasserwirtschaft)* 48 %

Master Level

- *Environmental Engineering (Kulturtechnik und Wasserwirtschaft)* 44 %
- *Water Management and Environmental Engineering (WMEE)* 57 %
- *Applied Limnology (MAL)* 100 %
- *Natural Resources Management and Ecological Engineering (NARMEE)* 38 %
- *Environmental Sciences – Soil, Water and Biodiversity (ENVEURO)* 35 %

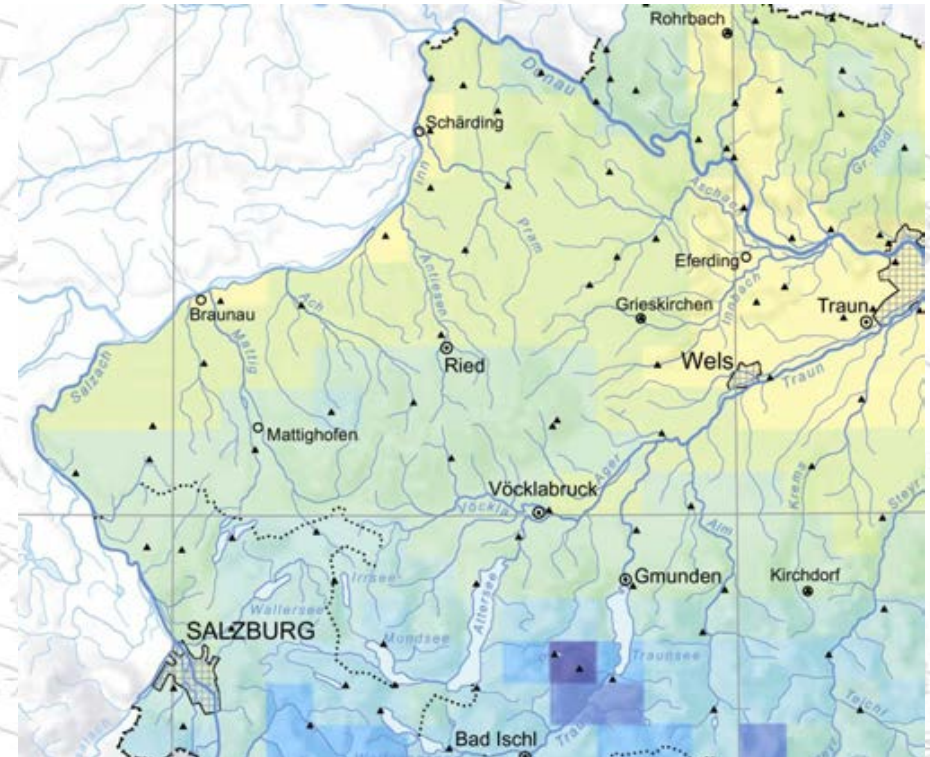
Examples of past and recent projects

- Applied research for public sector
- Funded basic research projects
- International programs (EC)
- Expertise and consulting



Hydrological Atlas of Austria
 A nation wide set of digital and printed maps of the main hydrological features of Austria

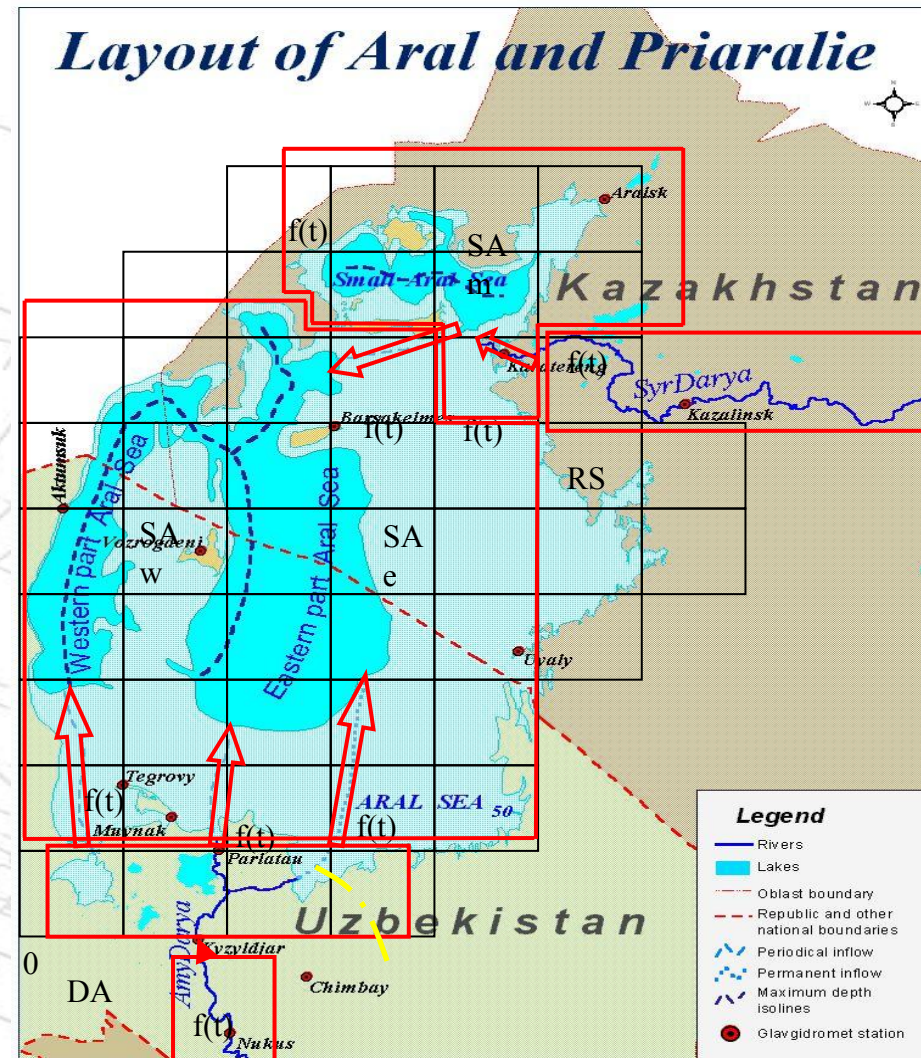
1	Grundlagen	1
2	Niederschlag	2
3	Verdunstung	3
4	Schnee und Gletscher	4
5	Fließgewässer und Seen	5
6	Grundwasser	6
7	Wasserhaushalt	7
8	Stoffhaushalt	8
9	Wasserwirtschaft	9
10	Wasser und Umwelt	10



REBASOWS:

The rehabilitation of the ecosystem and bioproductivity of the Aral Sea under conditions of water scarcity

INTAS Project – 0511



- Design of new plants
- Upgrading of old plants

• Integrated Approach

- *Hydropower generation*
- *Environmental protection*
- *consideration of landscape*

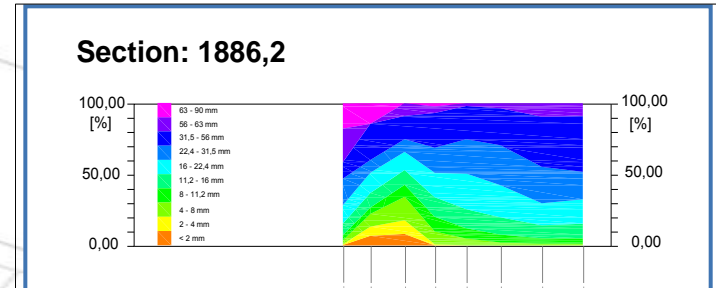


Experimental field for automatic data collection

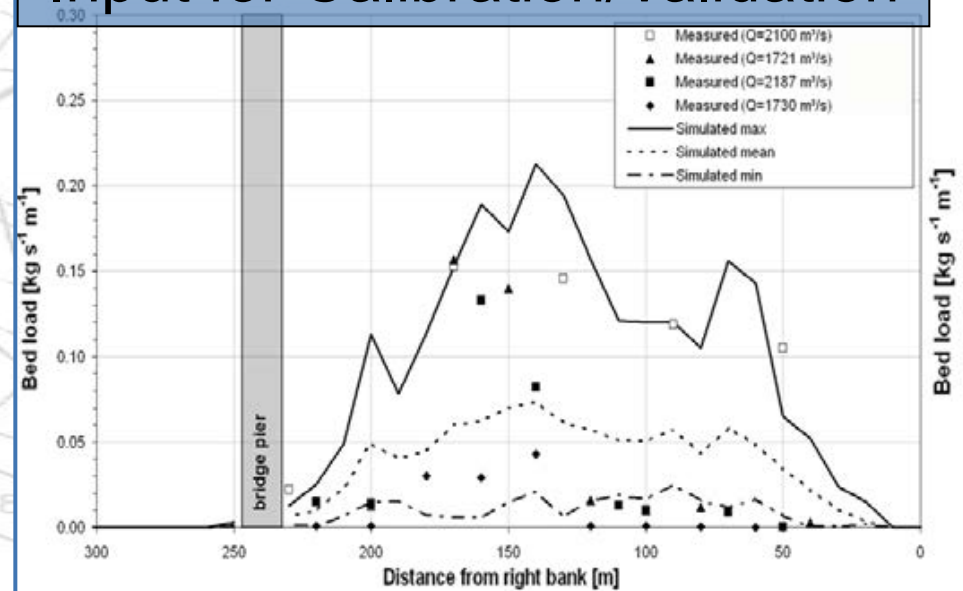


Hydraulic Engineering – Innovative Monitoring Systems

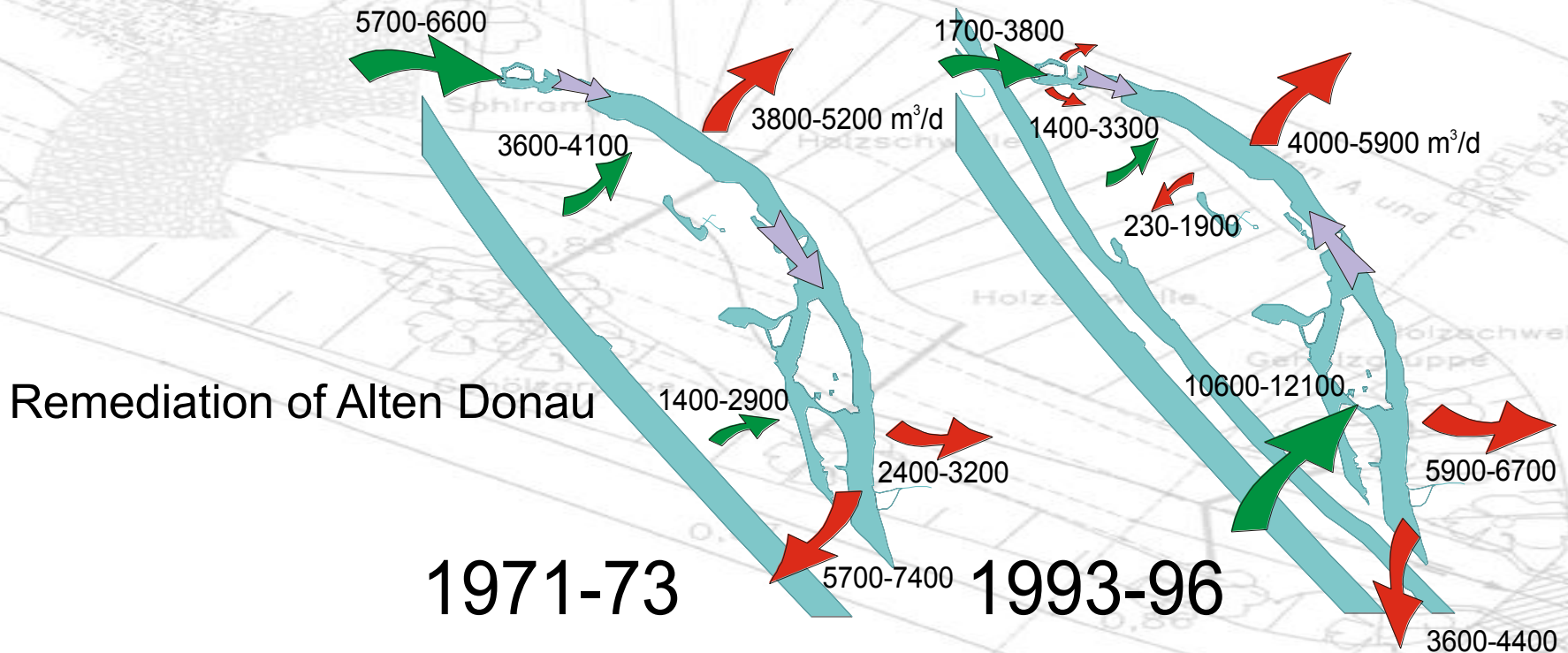
Measuring sediment transport

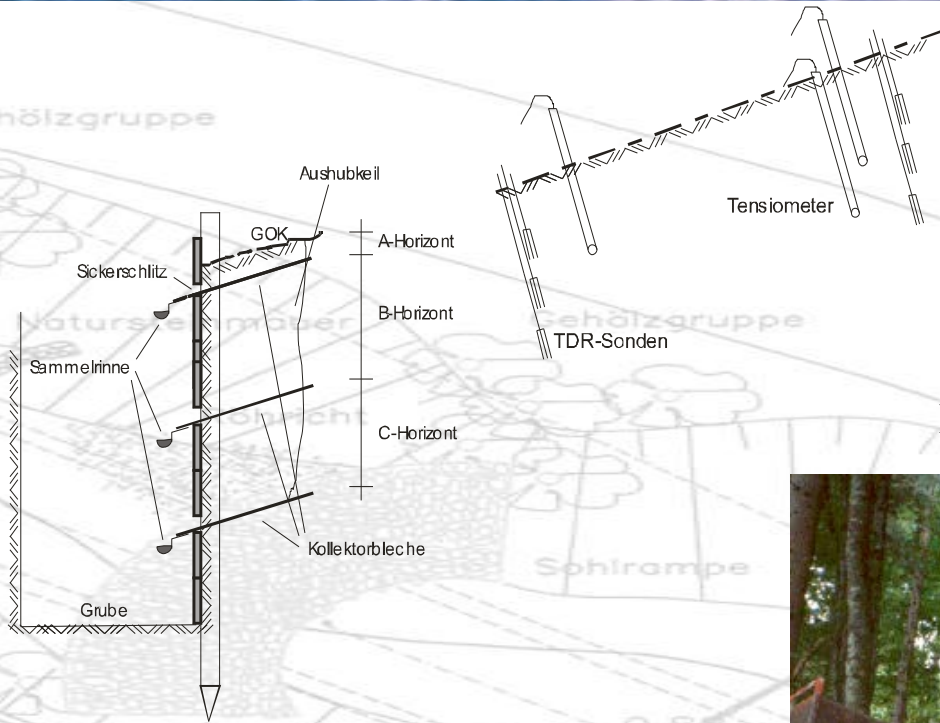


Input for Calibration/Validation



Integrated approach to study the interaction between surface and groundwater flows quantity and quality





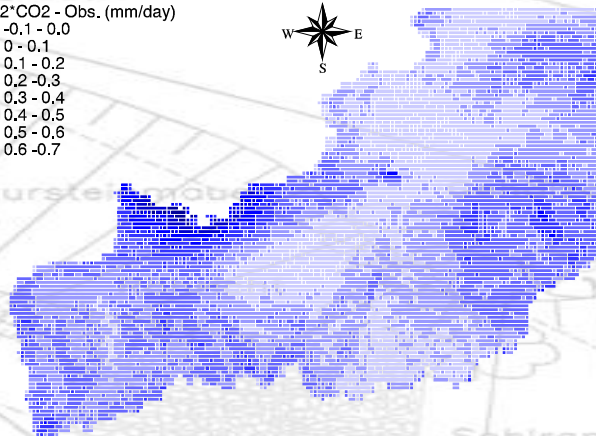
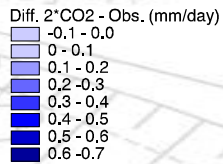
Irrigation experiments in different forest stands

Experimental design:

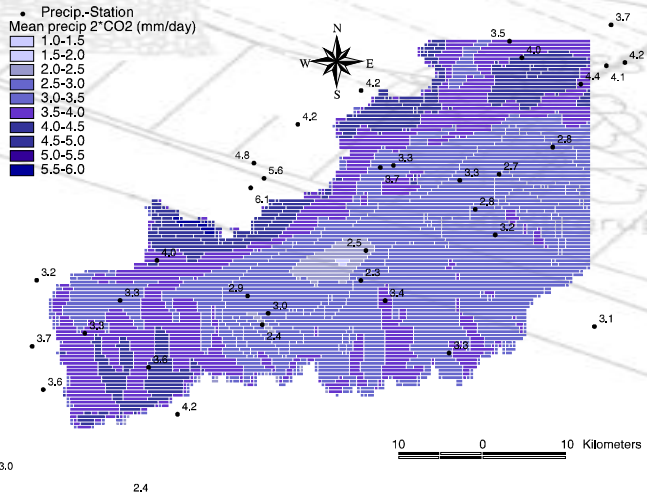
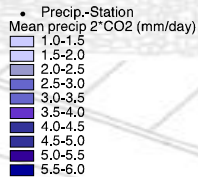
- Measurement of surface runoff and interflow
- TDR measurements in different depths
- Complementary tensiometer measurements



Possible Regional Impacts of Climate Change



10 0 10 Kilometers



10 0 10 Kilometers

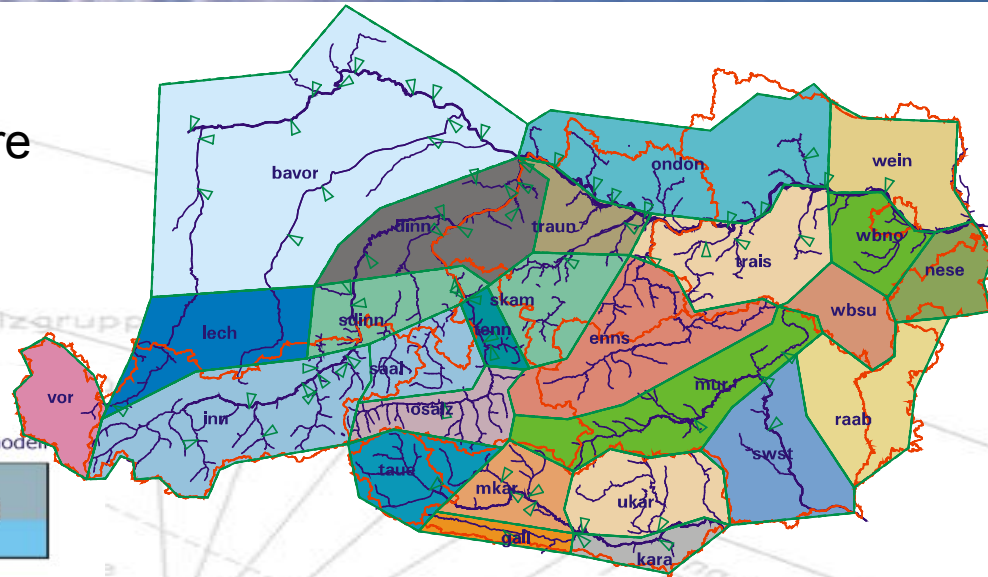
- **Water balance**
- **Snow cover**
- **Floods**
- **Groundwater recharge**

Consequences for agriculture, tourism, hydropower, environment

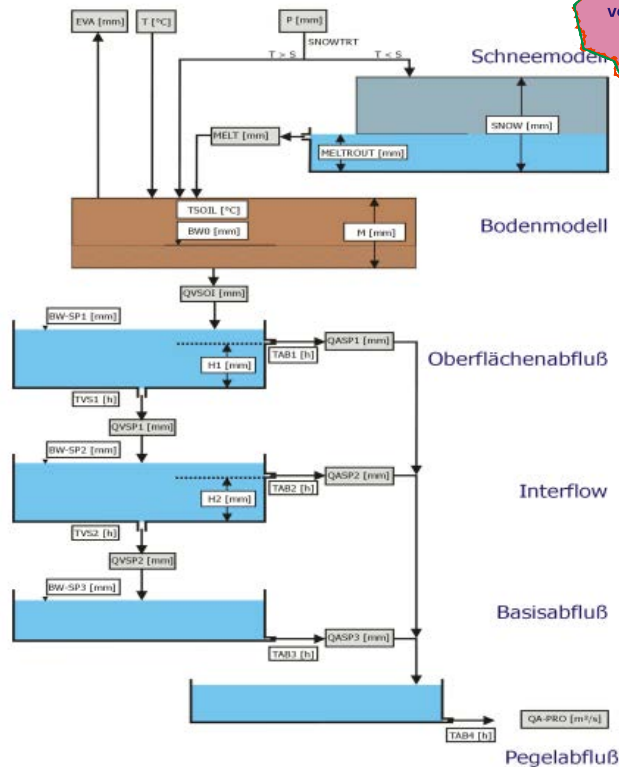
Changes in precipitation due to an increase in CO₂



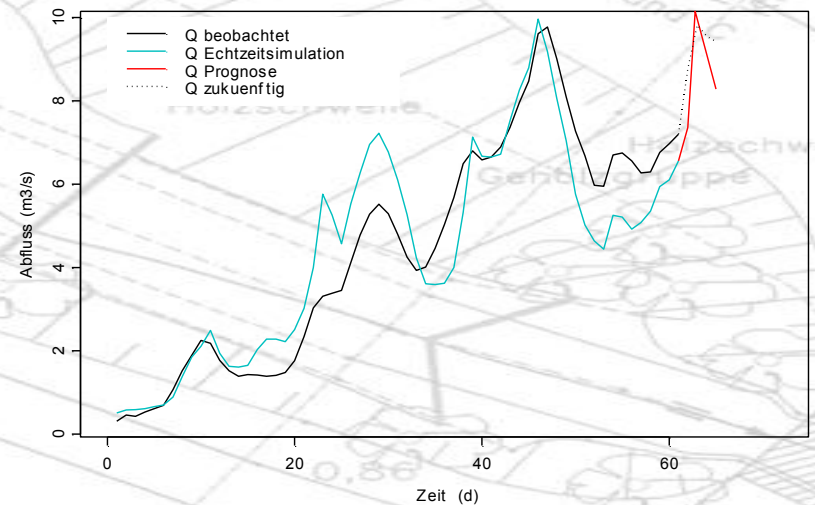
Catchment Structure



Model Structure



Forecasting Runoff

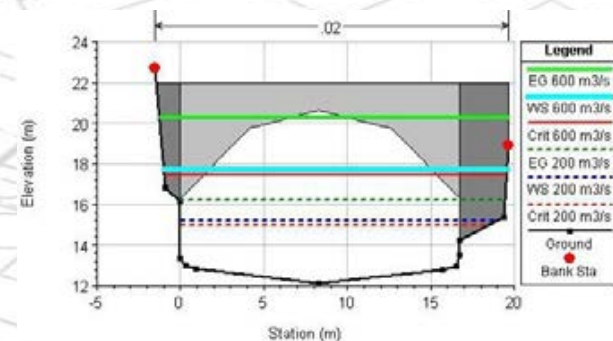
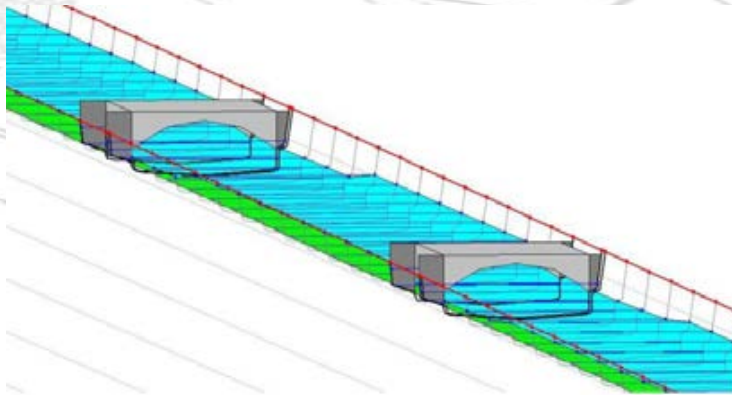


Flood protection of residential areas
Widening of rivers to stop degradation
Initial measures to re-establish a dynamic river system
Improvement of ecological functions of the river



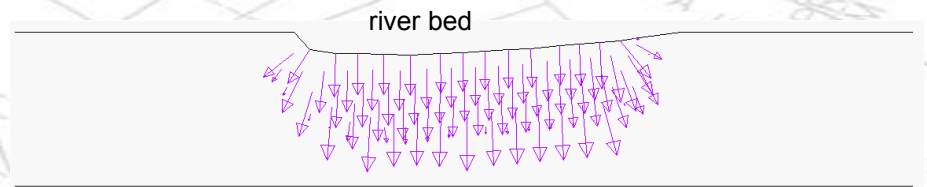
Flood Risk in Urban Areas

- Estimation of Occurrence Probabilities of Extreme Floods
- Estimation of Potential Flood Damages
- Impacts of Urbanisation on Flood Formation
- Consideration of Various Sources of Uncertainties in Flood Risk

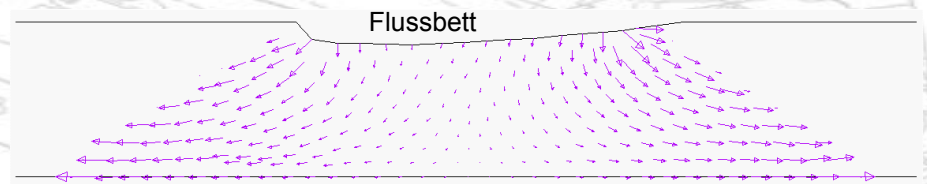




Infiltrationsprocesses



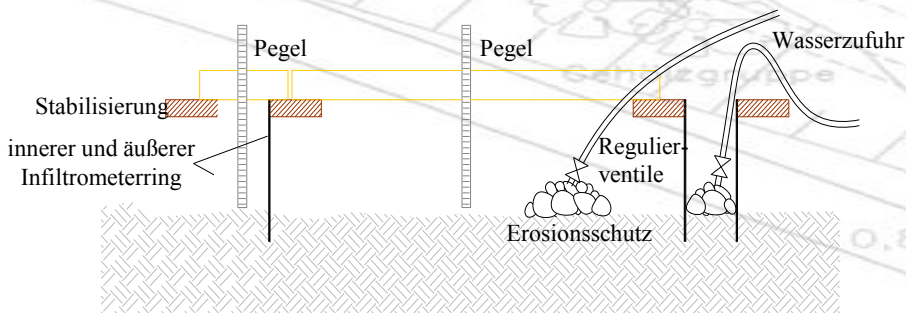
Vertikal Infiltration in the initial phase



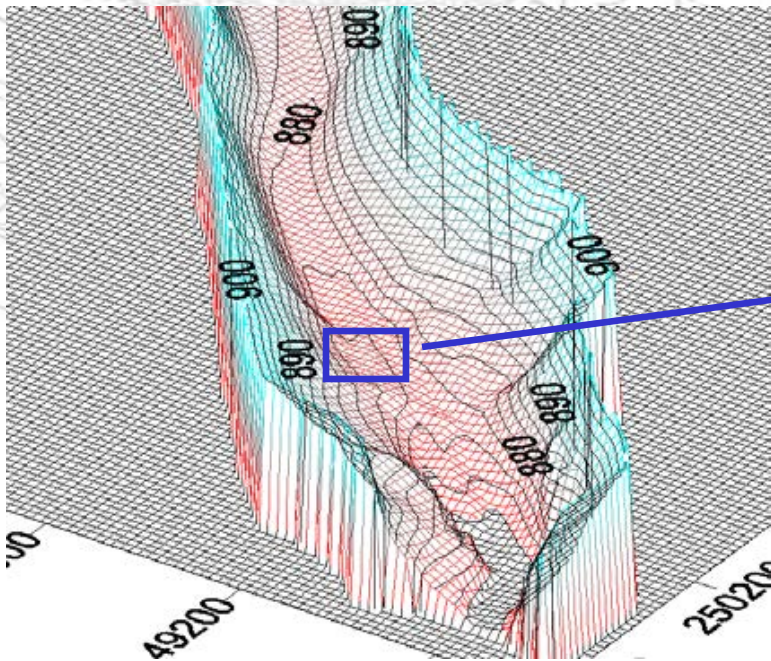
Lateral flow when groundwater table is reached

Infiltrometer

in the river bed to measure the infiltration capacity of the river bed



Monitoring
Sediment balances
Transport of sediments



Recent Projects

- Hydrological modelling of glaciated catchments
- WLS Report: Flood protection and sediment transport in an alpine basin
- Curricula Development for Integrated Water Resources Management
- DNEPR - Developing Network of Educators for Professionals Retraining on Transboundary Water Resources Management
- DANUBE - River engineering project east of Vienna
- EU-Project ILUP - Sediment Budget Raab/Styria
- EWASIA - Development of International MSc Program on Environment and Water Resources Management in Central Asia
- Investigation on the thermal balance and preparation of a thermal pollution map for the Traun- Ager-Riverbasin in Upper Austria
- Development of a monitoring concept for the Integrated River Engineering Project in the Alluvial Zone National Park
- European Aquatic Modelling Network (EAMN)
- Bedload Transport Measurements at the river Drau.
- Field monitoring of hydrological processes
- Hydrological modelling and runoff forecast systems (flood warning)



Find more about IWHW in
<http://www.wau.boku.ac.at/en/iwhw/>

Thank you for your attention