ÚSTAV
HYDROLÓGIE SAV
INSTITUTE OF HYDROLOGY SAS

Summary of the main activities

Period: January 1, 2012 - December 31, 2015

IH SAS:

- scientific research institution
- research and teaching in the field of ***environmental science*** and ***water management***
- improvement and dissemination of knowledge on the circulation and quality of water in the nature

Summary of the main activities

Period: January 1, 2012 - December 31, 2015

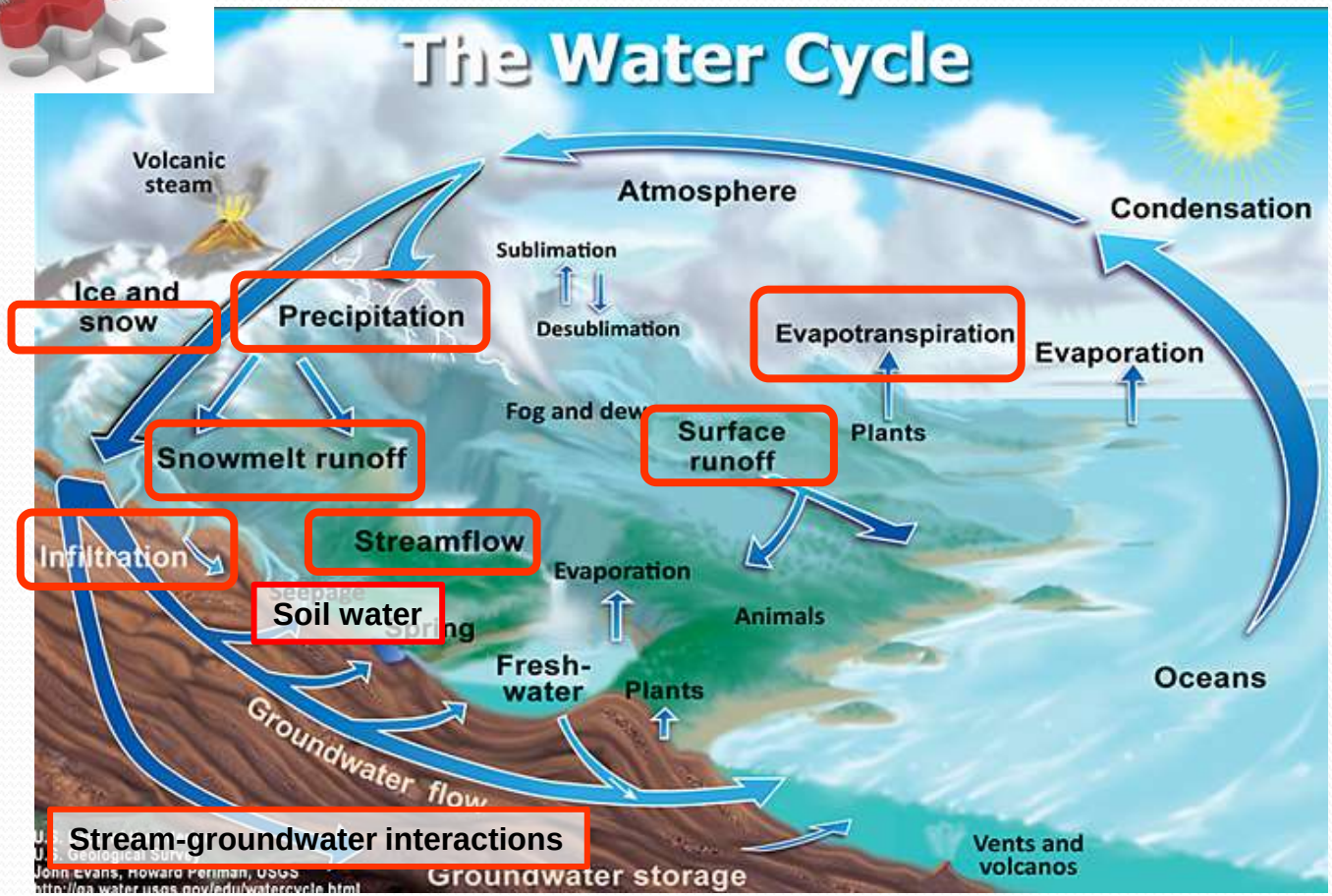
FLOODS

DROUGHTS

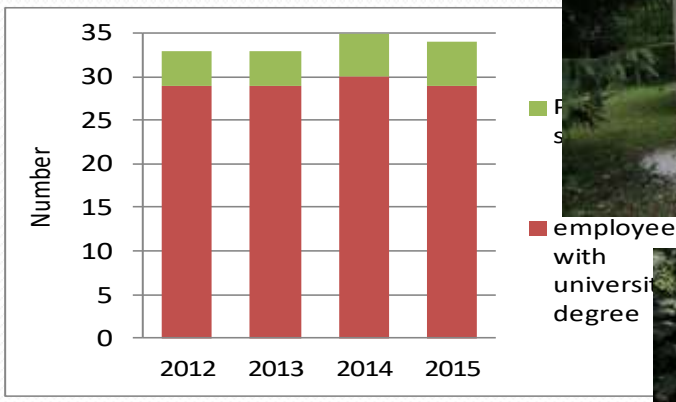
QUALITY

QUANTITY

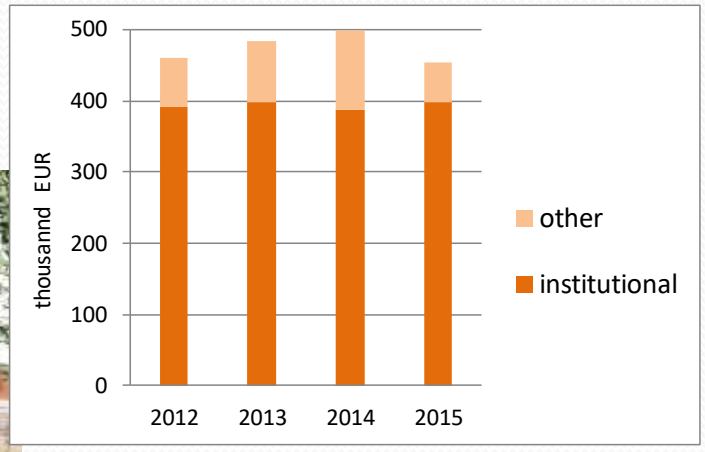
Research focus

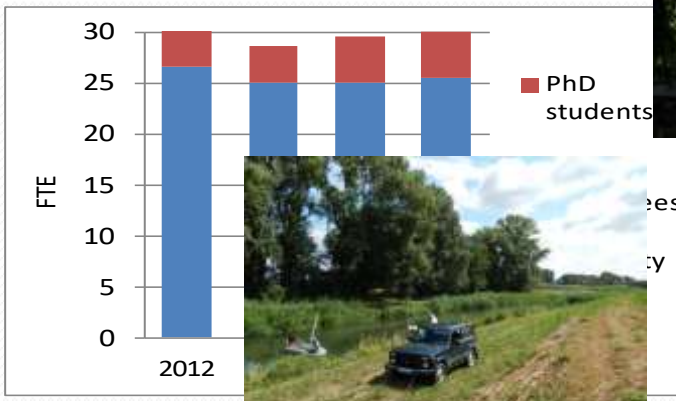


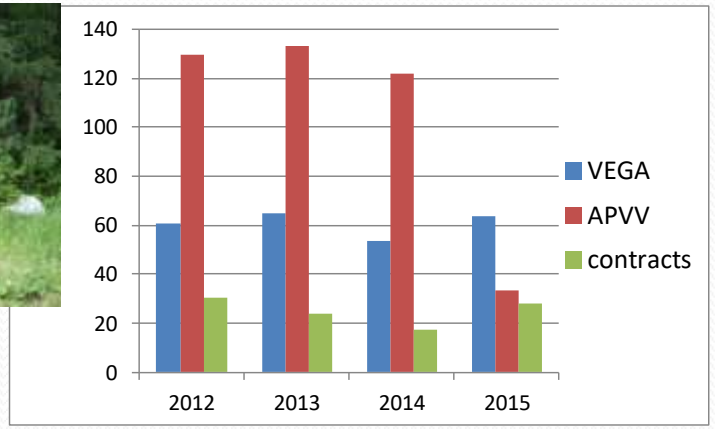
Employee structure, budget



IH SAS = subsidised institution







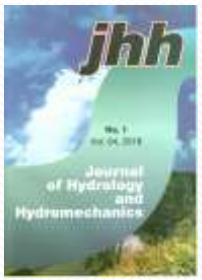
31.12.2015

Female…11 Male…16 (older)

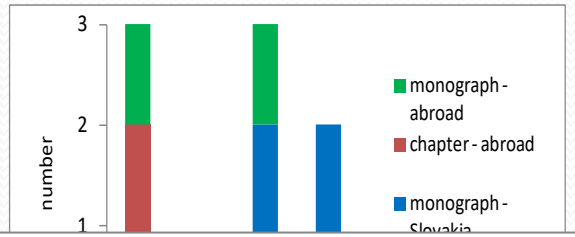
Important information

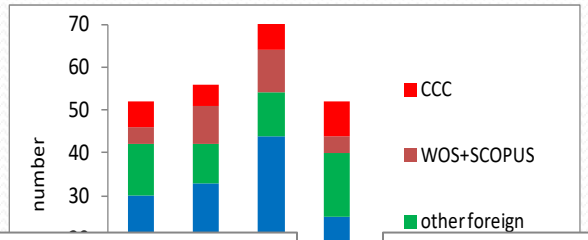
- **new executive body** of IH SAS in June 2012, and now in ***September 2016***
- the end of 2013 – **structure changed** **(4 departments => 2 departments)**
- **younger generation** as ***research leaders*** (overtook the leading positions in the projects)
- **9 staff members** acquired **higher qualification degree** during assessment period
- **PhD study** was **successfully re-accredited** in September 2015

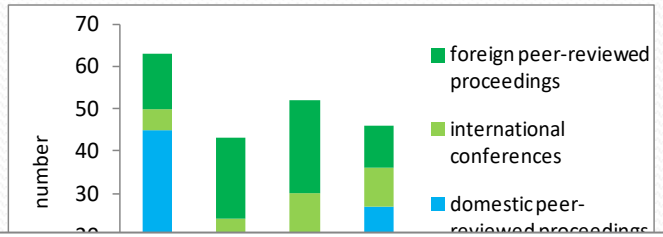
- **Journal of Hydrology and Hydromechanics**
  IF 0.653 1.231 1.486 1.469

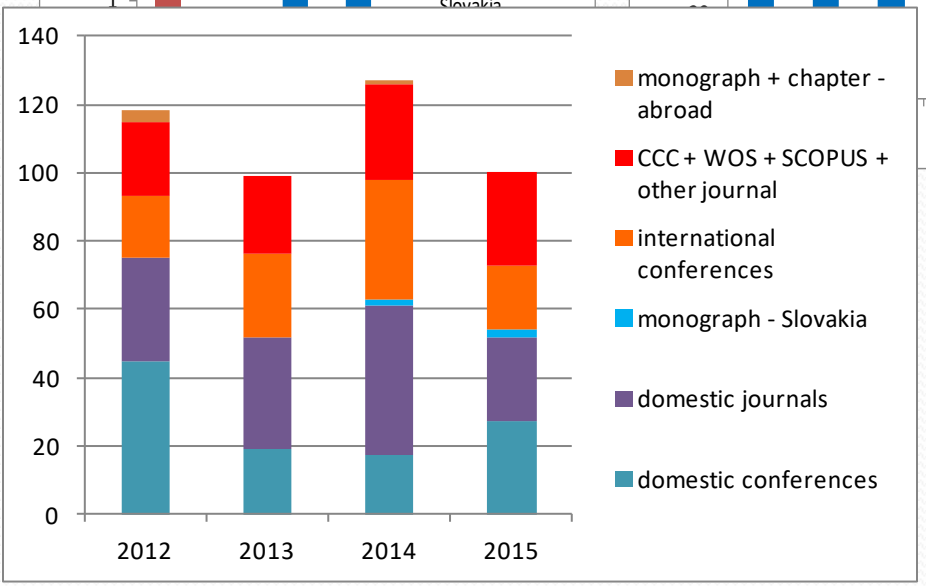


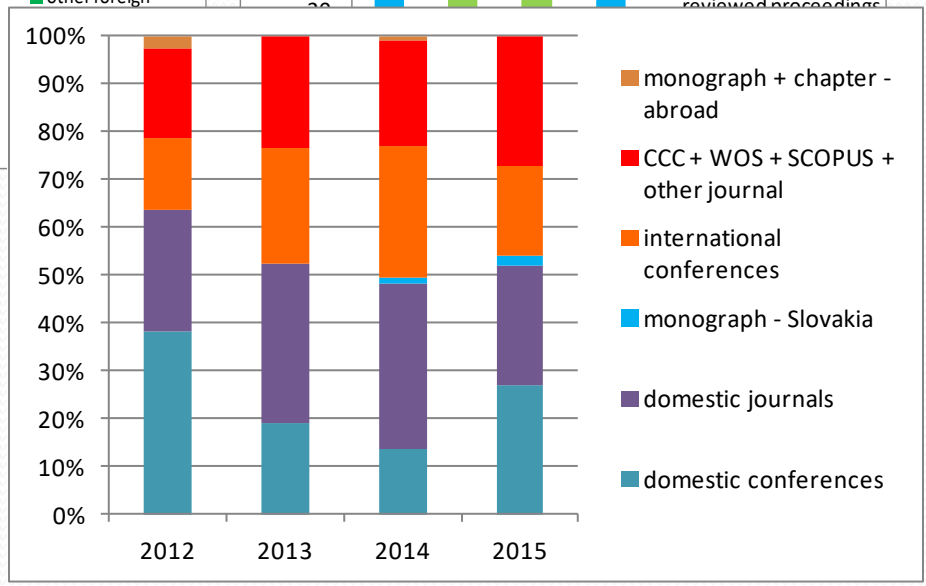
Publications, Citations





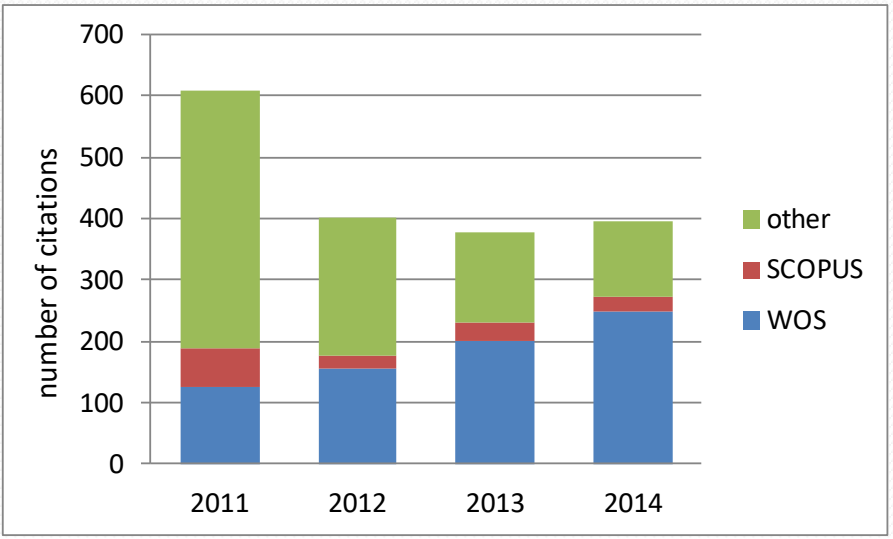


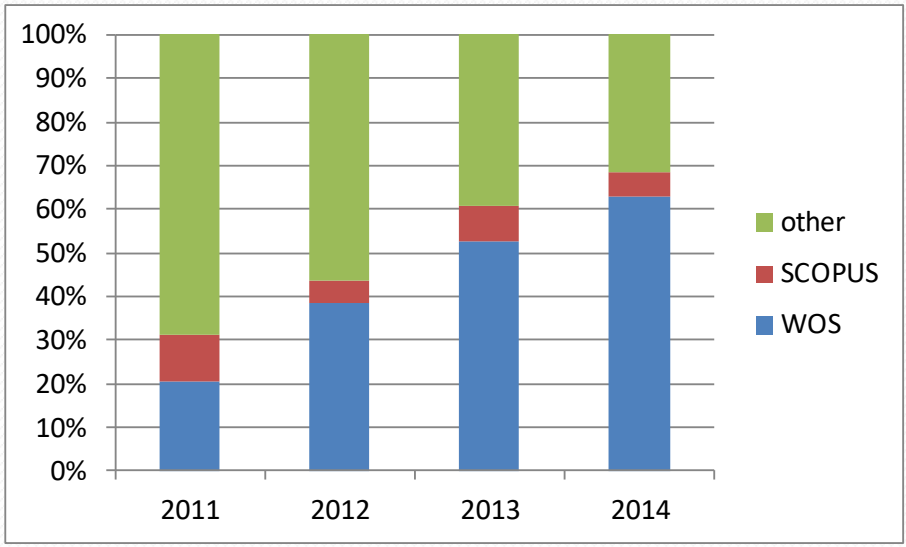




We have strived to ***publish*** **the results of our research in high quality CCC journals.**
However, publication in national journals is also **necessary to transmit the new knowledge to domestic hydrological non-scientific community + documentation of impact of funding from ERDF**

Publications, Citations





Projects - international

FP7 - KORANET 10/2012-9/2013

- GOLDFISH 11/2013-4/2015

Goldfish FP7

International Atomic Energy Agency (IAEA) - 2 projects

EUREKA - 1+1 projects

IHP UNESCO - 2 project

ERB-UNESCO
Global Water Partnership
EUROFRIEND – UNESCO
Danube Countries Cooperation – UNESCO

Collaborations with universities and research institutions in
USA, Russia, Hungary, Austria, Poland, Luxemburg,

Projects - national

SRDA – 3 projects....coordinator
(APVV) 4 projects....investigator
2 projects....bilateral
1 projects.....support FP7

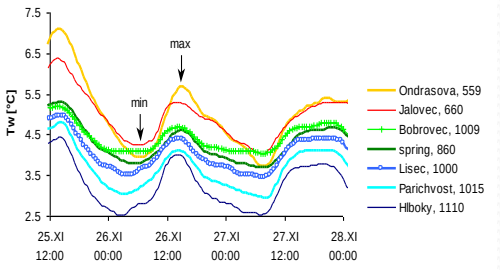
VEGA - 9 projects

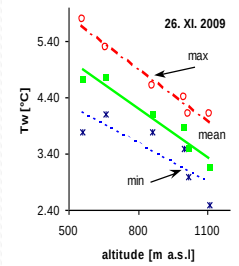
EU Structural Funds (coordinator)

CE for the Integrated River Basin Management in the Changing Environmental Conditions (1 590 612 Eur)

Completion of infrastructure of hydrological research stations (2 924 647 Eur)

Collaborations:
Universities
and
Other Research Institutions

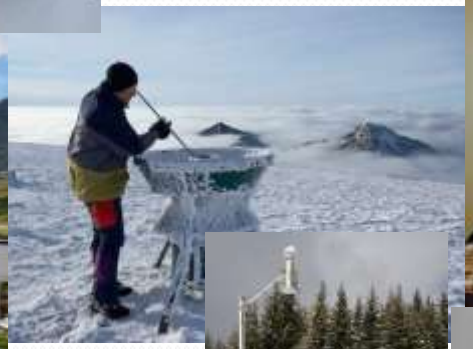


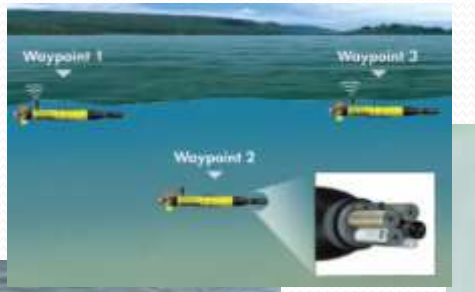


Infrastructure

MODFLOW

GMS SMS WMS

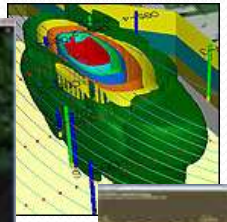




ÚSTAV HYDROLÓGIE SAV

Evaluation panel meeting, 07.11.2016, Bratislava

Infrastructure



ÚSTAV HYDROLÓGIE SAV

Evaluation panel meeting, 07.11.2016, Bratislava

Invited lectures, popularisation activities

Conferences – members of committees

Invited lecture – 23/12

interactive educational programs for primary and secondary schools

experimental snow measurements for students from STU Bratislava

R&D activity

Department of Surface Water Hydrology

Department of Sub-Surface Water Hydrology

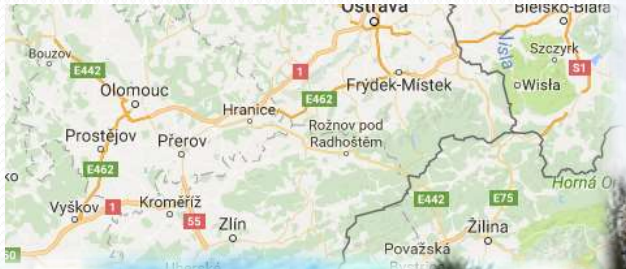
Department of Surface water hydrology

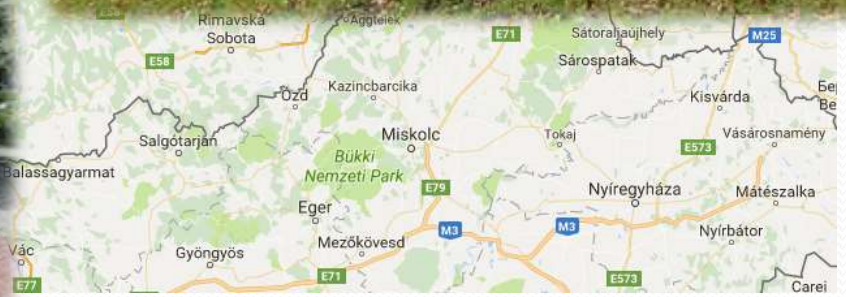
- since 2014, former dept. of Mountain hydrology and dept. of Surface streams and stream water – groundwater interactions

ÚSTAV HYDROLÓGIE SAV

Department of Surface water hydrology

- 13-14 employees with university degree in the evaluation period
- located in Bratislava and in Liptovský Mikuláš





Department of Surface water hydrology

- 8 international projects (FP7, IHP UNESCO, IAEA)
- 9 national projects (VEGA, APVV)

- 2 monographs, 1 chapter in a monograph

Journal publications
- impacted journals (CC, WOS, SCOPUS) 25
- non-impacted journals (WOS, SCOPUS) 6
- other peer-reviewed (domestic) journals 100

Informal collaboration with some leading international teams, e.g. from Technical University in Vienna or Luxembourg Institute of Science and Technology

ÚSTAV HYDROLÓGIE SAV

Department of Surface water hydrology

Our research is focused on :

- better understanding of hydrological balance in catchments (precipitation, runoff, evapotranspiration)
- hydrological processes (runoff formation, snow accumulation and melt, forest transpiration)
- eco-hydrological problems (water quality of the streams, variability of streamflows, stream water-groundwater interactions)

Selected results

Journal of Hydrology 519 (2014) 1769–1778

Contents lists available at ScienceDirect

Journal of Hydrology

journal homepage: www.elsevier.com/locate/jhydrol

Estimation of regional snowline elevation (RSLE) from MODIS images for seasonally snow covered mountain basins

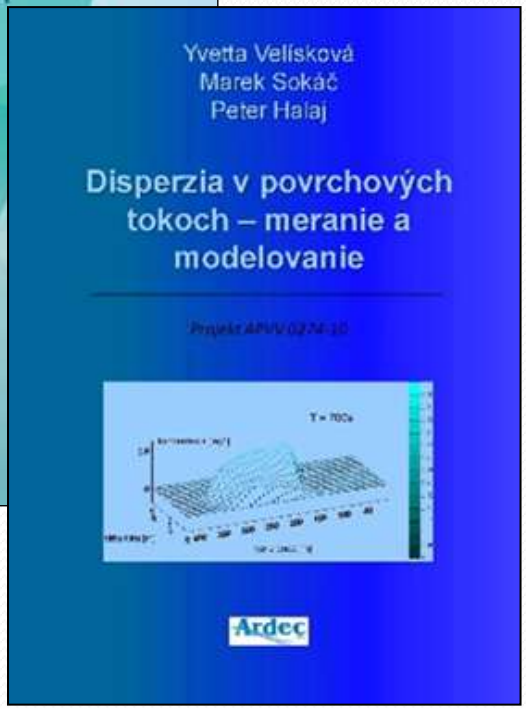
Pavel Krajčí [a,*], Ladislav Holko [a], Rui A.P. Perdigão [b], Juraj Parajka [b,c]

[a] Institute of Hydrology, Slovak Academy of Sciences, Bratislava, Slovakia
[b] Institute of Hydraulic Engineering and Water Resources Management, Vienna University of Technology, Vienna, Austria
[c] Centre for Water Resource Systems, Vienna University of Technology, Vienna, Austria

J. Hydrol. Hydromech., 62, 2014, 3, 177–185
DOI: 10.2478/johh-2014-0030

Influence of surface water level fluctuation and riverbed sediment deposits on groundwater regime

Márta Koczka Bara, Yvetta Velísková*, Renáta Dulovičová, Radoslav Schügerl



HYDROLOGICAL PROCESSES
Hydrol. Process. (2014)
Published online in Wiley Online Library
(wileyonlinelibrary.com) DOI: 10.1002/hyp.10273

A new method of snowmelt sampling for water stable isotopes

D. Penna,[1,2*,†] M. Ahmad,[3] S. J. Birks,[4] L. Bouchaou,[5] M. Brenčič,[6,7] S. Butt,[8] L. Holko,[9] G. Jeelani,[10] D. E. Martínez,[11] G. Melikadze,[12] J. B. Shanley,[13] S. A. Sokratov,[14] T. Stadnyk,[15] A. Sugimoto[16] and P. Vreča[17]

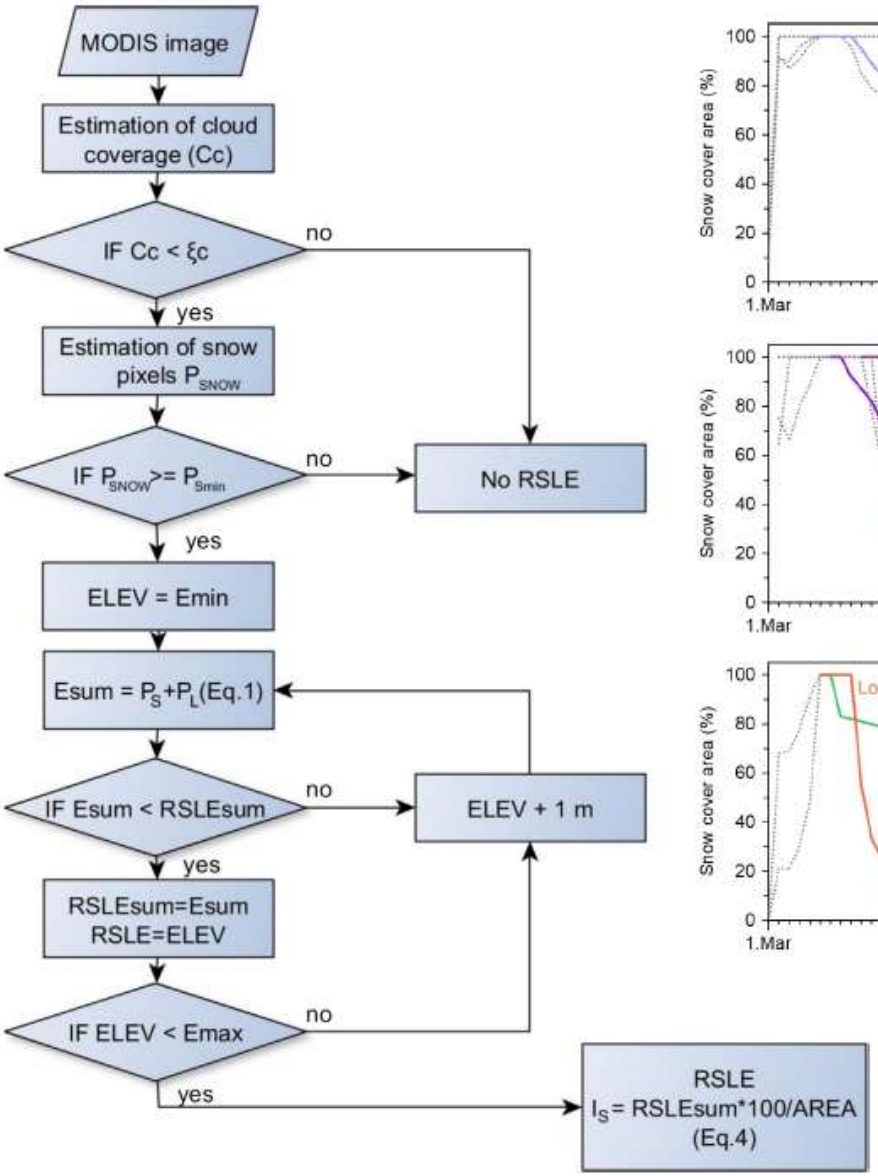
[1] *Department of Land, Environment, Agriculture and Forestry, University of Padova, Legnaro, Italy*
[2] *Faculty of Science and Technology, Free University of Bozen-Bolzano, Bozen-Bolzano, Italy*
[3] *Isotope Hydrology Section, International Atomic Energy Agency, Vienna, Austria*
[4] *Alberta Innovates, Technology Futures, Calgary, Alberta, Canada*
[5] *Faculty of Sciences, Laboratory of Applied Geology and Geo-Environmental, University Ibn Zohr, Agadir, Morocco*
[6] *Department of Geology, Faculty of Natural Sciences and Engineering, University of Ljubljana, Ljubljana, Slovenia*
[7] *Geological Survey of Slovenia, Ljubljana, Slovenia*
[8] *Pakistan Institute of Nuclear Science and Technology, Isotope Application Division, Islamabad, Pakistan*
[9] *Institute of Hydrology, Slovak Academy of Sciences, Liptovský Mikuláš, Slovakia*
[10] *Department of Earth Sciences, University of Kashmir, Srinagar, India*
[11] *CONICET, IIMyC. – Inst. de Geología de Costas y Cuaternario, National University of Mar del Plata, Mar del Plata, Argentina*
[12] *Institute of Geophysics, Tbilisi State University, Tbilisi, Georgia*
[13] *US Geological Survey, Montpelier, VT, USA*
[14] *Faculty of Geography, Natural Risk Assessment Laboratory and Laboratory of Snow Avalanches and Debris Flows, Moscow State University, Moscow, Russian Federation*
[15] *Department of Civil Engineering, University of Manitoba, Winnipeg, Canada*
[16] *Faculty of Environmental Earth Science, Hokkaido University, Sapporo, Japan*
[17] *Department of Environmental Sciences, Jožef Stefan Institute, Ljubljana, Slovenia*

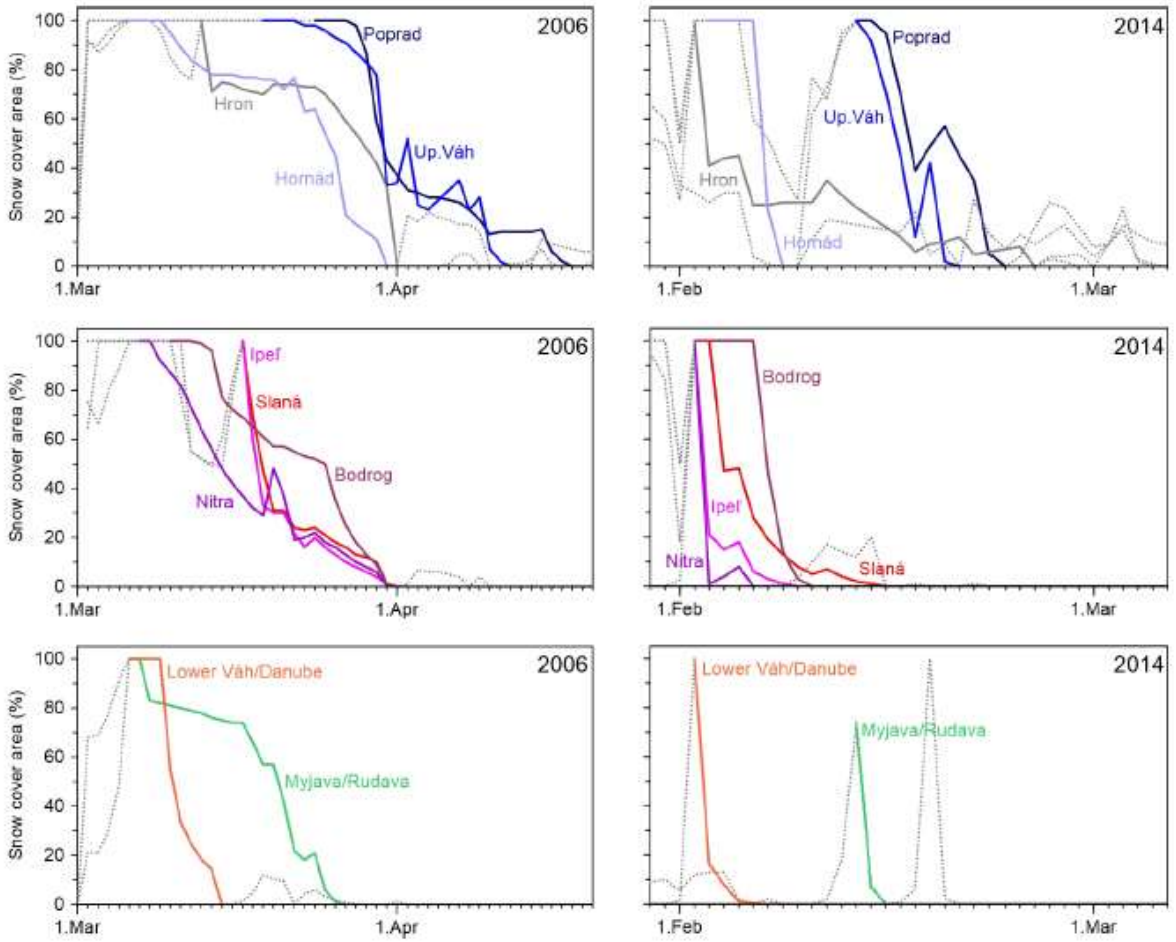
The role of snow in hydrological cycle

How much water is stored in the snow?
How fast does the snow cover melt?
What is the contribution of snowmelt water to rivers and ground-waters (quantity, pathways, timing)?

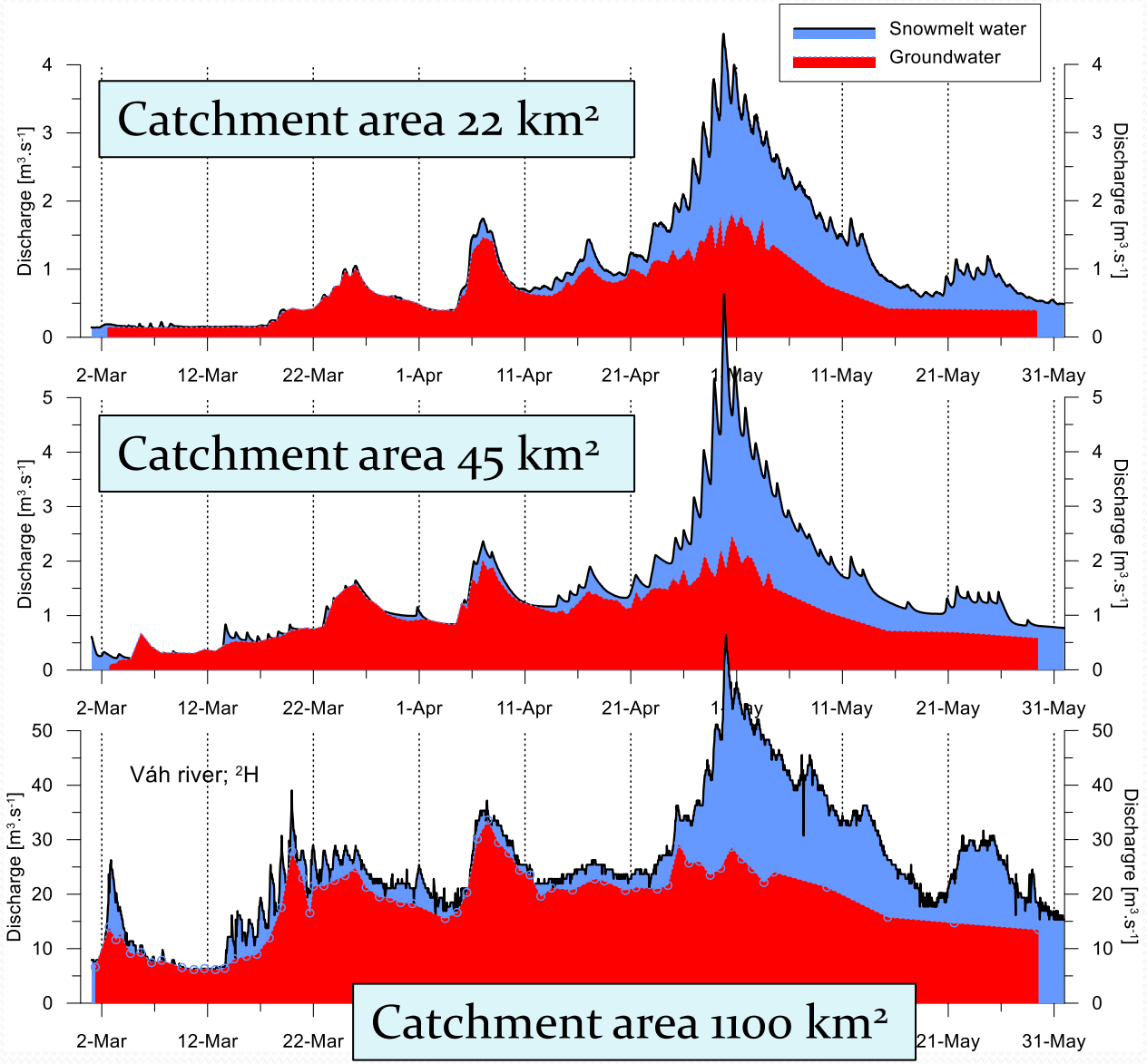



Snow line from remote sensing





Contribution of snow to river discharge



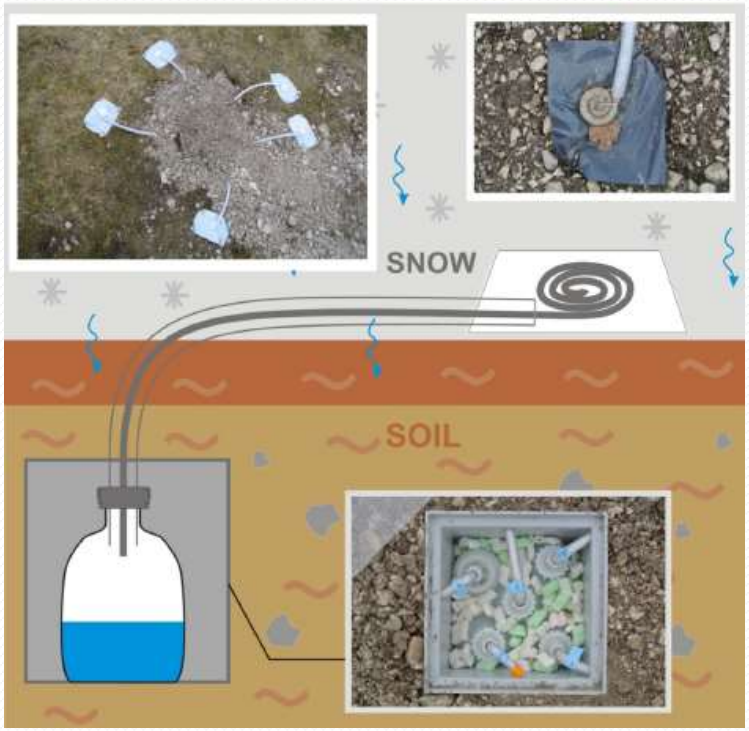
Hydrograph separations for different catchments using stable isotopes

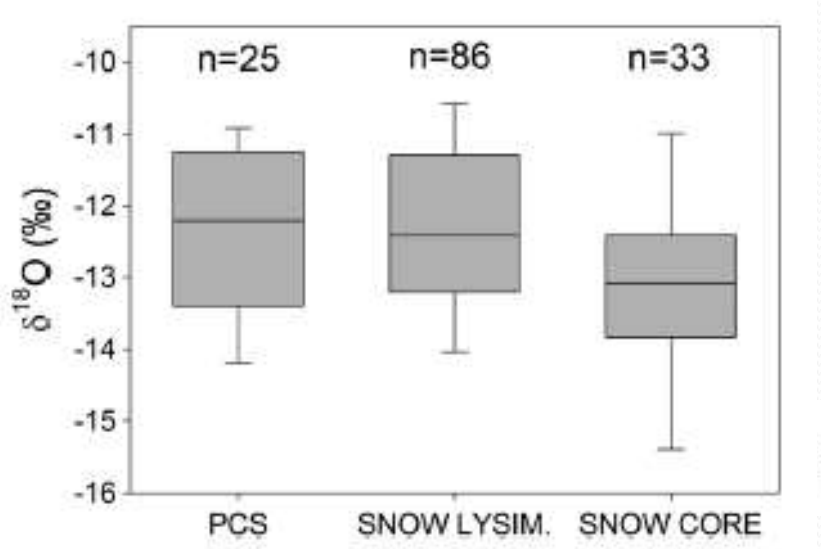
To cite this article: Ladislav Holko (2015): Syringe life and memory effects in isotopic analyses performed by liquid water isotopic analysers – a case study for natural waters from central Europe, Isotopes in Environmental and Health Studies, DOI: 10.1080/10256016.2015.1090987

Little snowmelt water during the first events

Up to 60% of snowmelt water during maximum discharges

Worldwide testing of a new device to collect snowmelt water samples



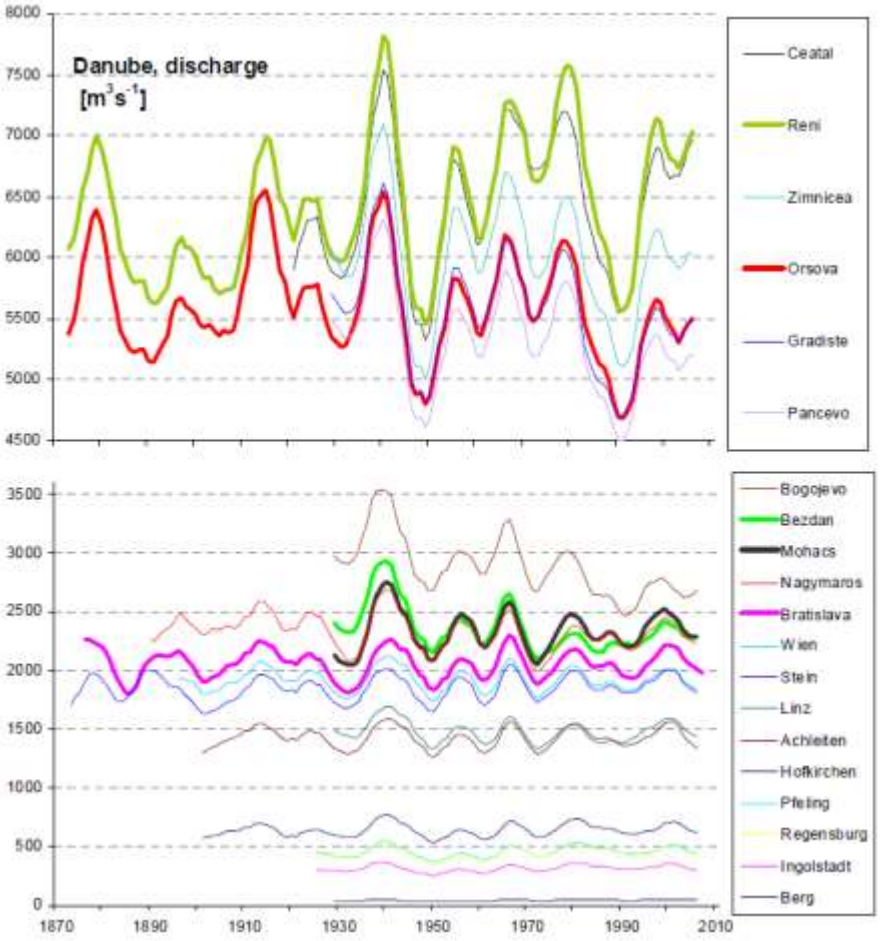


ÚSTAV HYDROLÓGIE SAV

Streamflow variability

- Are the floods (droughts) at present more frequent than before?
- Do we observe trends or rather cycles in the long-term discharge (precipitation) data series?
- Are they linked to other phenomena?

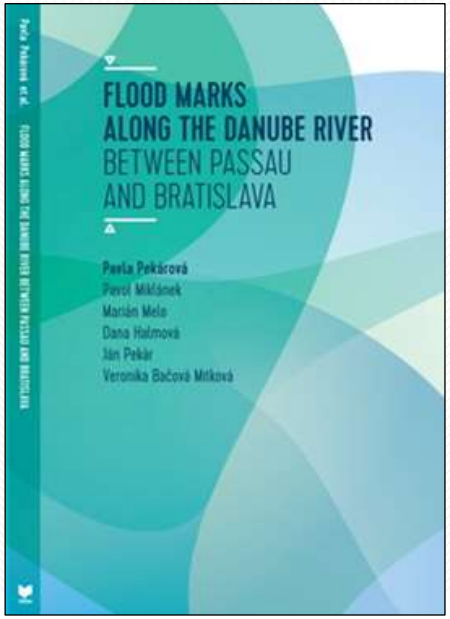
- Danube river
- Slovak rivers



ÚSTAV HYDROLÓGIE SAV

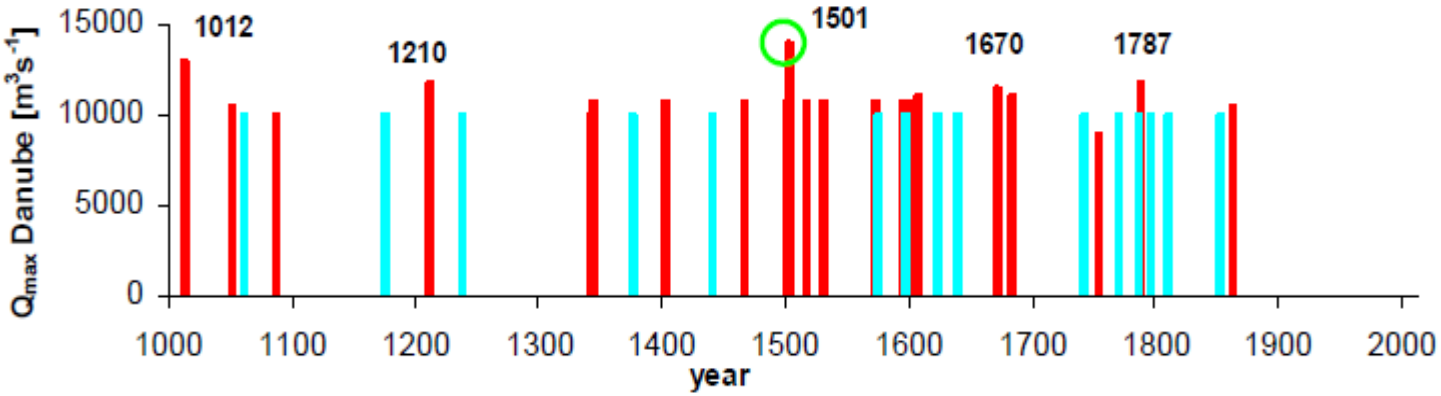
Streamflow variability

- Flood marks between Passau and Bratislava



No increase in floods characteristics in 1876-2013

Significant improvement of design discharges

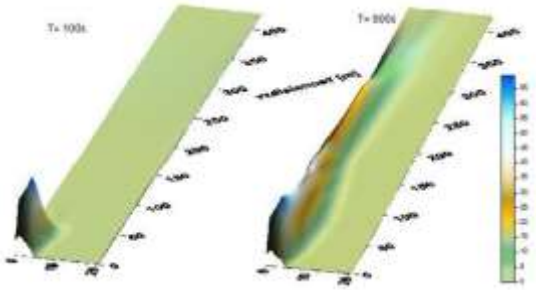


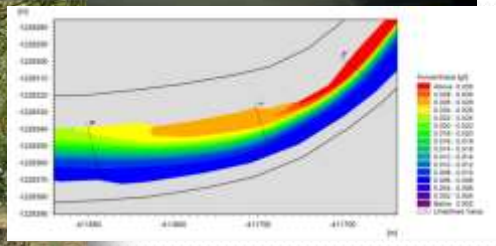
Detection of river water contamination:

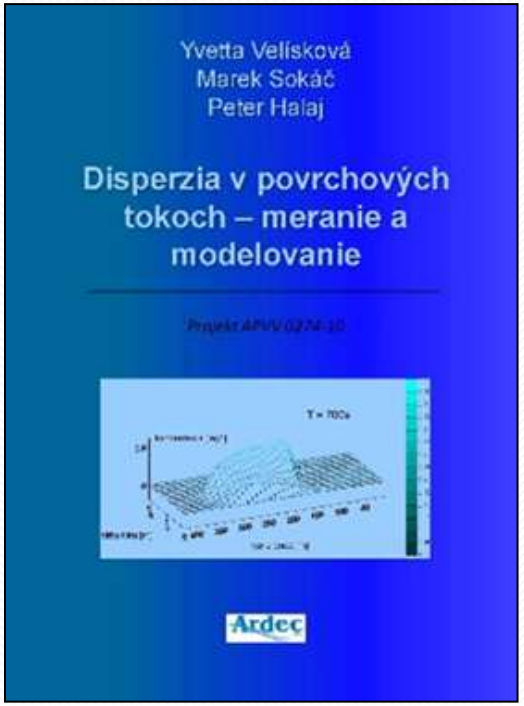
Developed method successfully tested in Slovakia, Poland and Colombia

iver data, 2 – pollution data, 3 - computation parameters, 4 – best actual fit, 5 – mputation progress, 6 – progress bar, 7 –chart area)

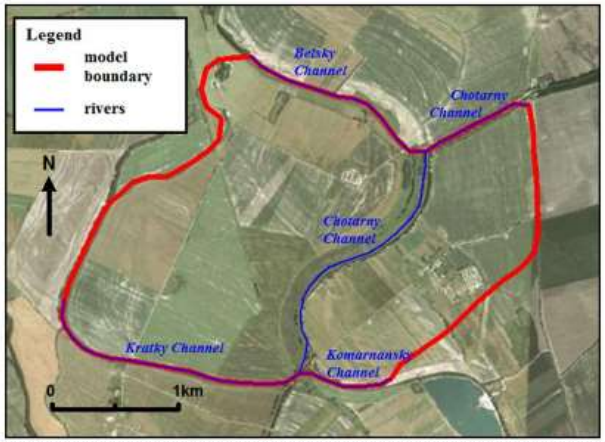
Dispersion in surface streams – measurement and modelling





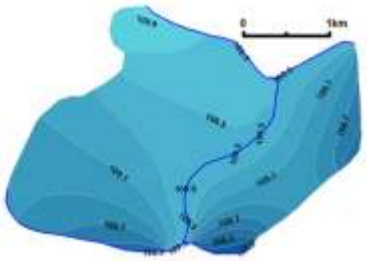


Stream water-groundwater interactions

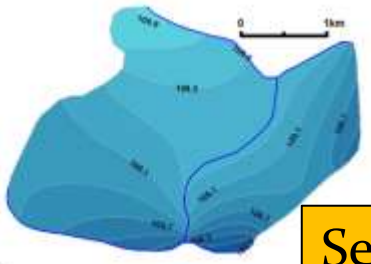


Influence of river water level and channel sediments on ground-water regime

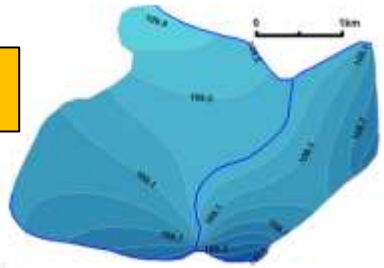
No sediments



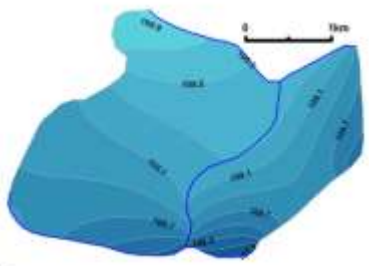
Sediments 1 m



Sediments 0.5 m



Sediments 2 m



ÚSTAV HYDROLÓGIE SAV

Department of Subsurface Water Hydrology

Established in 2014, former Dept. of soil hydrology and Dept. of Lowland hydrology

ÚSTAV HYDROLÓGIE SAV

Department of Subsurface Water Hydrology

- 14-15 employees with university degree during the evaluation period
- located in Bratislava and in Michalovce

ÚSTAV HYDROLÓGIE SAV

Department of Subsurface Water Hydrology

- 8 international projects (EUREKA, GWP, MAD, APVV)
- 13 national projects (VEGA, APVV)

Journal publications
- impacted journals (CC, WOS, SCOPUS) 20
- non-impacted journals (WOS, SCOPUS) 11
- other journals 27+53

Monographs (or chapter in M.): 5

Informal but regular collaboration with some leading international teams, e.g. from USDA Salinity laboratory in Riverside (California), University of Valencia, in BOKU University in Vienna, University of Aberdeen,

ÚSTAV HYDROLÓGIE SAV

Department of Subsurface Water Hydrology

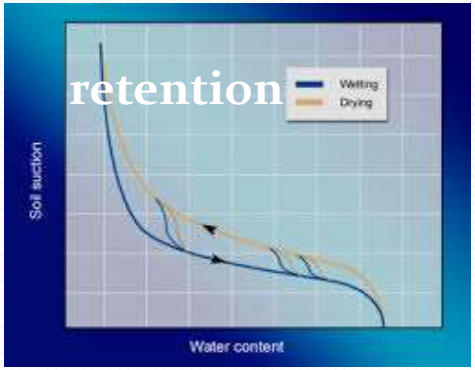
- Understanding of hydrological processes below the ground surface (infiltration, runoff-initiation processes, percolation, GW recharge) and within the Soil-Plant-Atmosphere System (evapotranspiration)

- Regime of subsurface-water resources (in context of climate change, land use changes and other global phenomena), agro-hydrology

- eco- and bio-hydrological problems (GW quality, mutual relationships between SSW and biota, soil degradation)

Department of Subsurface Water Hydrology

Retention



Degradation

(denudation, compaction, erosion,

Exc. pumping, draining)

Extremes

(saturation, GW deplation)

Selected results

Contents lists available at ScienceDirect

Soil & Tillage Research

journal homepage: www.elsevier.com/locate/still

How severe and subcritical water repellency determines the seasonal infiltration in natural and cultivated sandy soils

Tomáš Orfánus[a,*], Pavel Dlapa[b], Nándor Fodor[c], Kálmán Rajkai[c], Renáta Sándor[c], Katarína Nováková[d]

[a] Institute of Hydrology, Slovak Academy of Sciences, Račianska 75, 831 02 Bratislava, Slovakia
[b] Department of Soil Science, Faculty of Natural Sciences, Comenius University, Mlynská dolina B-2, 842 15 Bratislava, Slovakia
[c] Research Institute for Soil Science and Agricultural Chemistry of the Hungarian Academy of Sciences, Herman Ottó út 15, 1022 Budapest, Hungary
[d] Soil Science and Conservation Institute, Račianska 23, 831 04 Bratislava, Slovakia

J. Hydrol. Hydromech., *60*, 2012, 4, 309–318
DOI: 10.2478/v10098-012-0027-y

PLANTS AND BIOLOGICAL SOIL CRUST INFLUENCE THE HYDROPHYSICAL PARAMETERS AND WATER FLOW IN AN AEOLIAN SANDY SOIL

ĽUBOMÍR LICHNER*[1)], LADISLAV HOLKO[1)], NATALIA ZHUKOVA[2)], KARSTEN SCHACHT[3)], KÁLMÁN RAJKAI[4)], NÁNDOR FODOR[4)], RENÁTA SÁNDOR[4)]

[1)]Institute of Hydrology, Slovak Academy of Sciences, Račianska 75, 831 02 Bratislava, Slovakia.
[2)]M. Nodia Institute of Geophysics, 1 Alexidze str., 0193 Tbilisi, Georgia.
[3)]Department of Geography, Ruhr-University Bochum, Universitätsstrasse 150, 44801 Bochum, Germany.
[4)]Centre for Agricultural Research, Hungarian Academy of Sciences, Institute for Soil Science and Agricultural Chemistry, Herman Ottó u. 15, H-1022 Budapest, Hungary.
*[1)]Corresponding author, Mailto: lichner@uh.savba.sk, phone: +421 2 49268227, fax: + 421 2 44259404

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A relatively simple scaling method for describing the unsaturated hydraulic functions of stony soils

Hana Hlaváčiková[1]* and **Viliam Novák[1]**

[1] Institute of Hydrology, Slovak Academy of Sciences, Račianska 75, 83102 Bratislava, Slovakia

Abstract

Few if any methods exist to estimate the effects of stone content (stoniness) on the unsaturated soil hydraulic properties. A relatively simple scaling method is presented to estimate the hydraulic conductivity of unsaturated stony soils having different stone contents. A key assumption of the method is that van Genuchten's water retention parameters α and n of the fine soil fraction are the same as those of the stony soil. The method further assumes a linearly decreasing relationship between the saturated hydraulic conductivity and the stone content, based on previous numerical simulations. Using the proposed method, it is possible to calculate the hydraulic conductivity of unsaturated stony soils, knowing the saturated hydraulic conductivity of the fine soil fraction, the retention curve of the fine soil fraction, and the particular stoniness of the soil.

Key words: soil hydrology / stoniness / soil characteristics / fine soil fraction / rock fragments

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ÚSTAV HYDROLÓGIE S

Selected results

DE GRUYTER

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Effects of vegetation at different succession stages on soil properties and water flow in sandy soil

Peter ŠURDA[1*], Ľubomír LICHNER[1], Viliam NAGY[1], Jozef KOLLÁR[2], Massimo IOVINO[3] & Ágota HOREL[4]

[1] *Institute of Hydrology, Slovak Academy of Sciences, Račianska 75, SK-83102 Bratislava, Slovakia; e-mail: surda@uh.savba.sk*
[2] *Institute of Landscape Ecology, Slovak Academy of Sciences, Štefánikova 3, SK-81499 Bratislava, Slovakia; e-mail: j.kollar@savba.sk*
[3] *Università degli Studi di Palermo, Dipartimento di Scienze Agrarie e Forestali, Viale delle Scienze, I-90128 Palermo, Italy; e-mail: massimo.iovino@unipa.it*
[4] *Soil Science and Agricultural Chemistry Institute, Hungarian Academy of Sciences, Herman Ottó út 15, H-1022 Budapest, Hungary; e-mail: horel.agota@agrar.mta.hu*

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ORIGINAL PAPER

The influence of stoniness and canopy properties on soil water content distribution: simulation of water movement in forest stony soil

Viliam Novák · Karol Kňava

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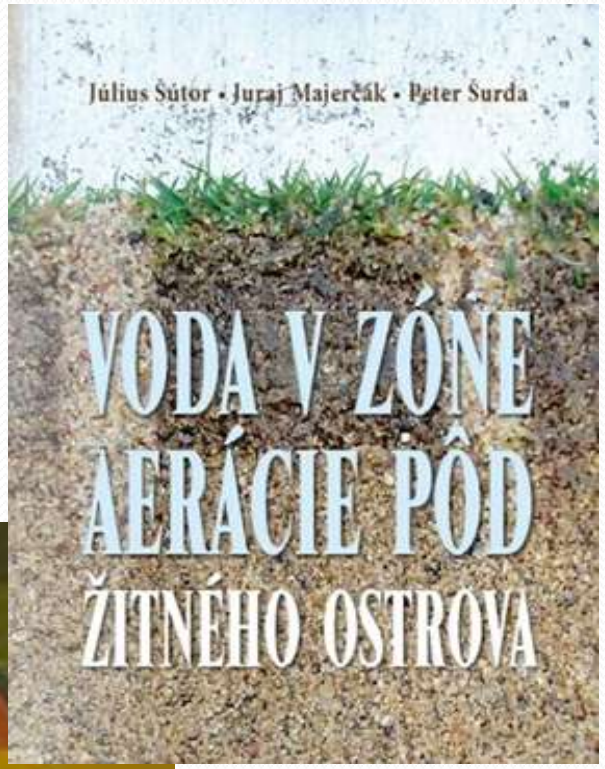
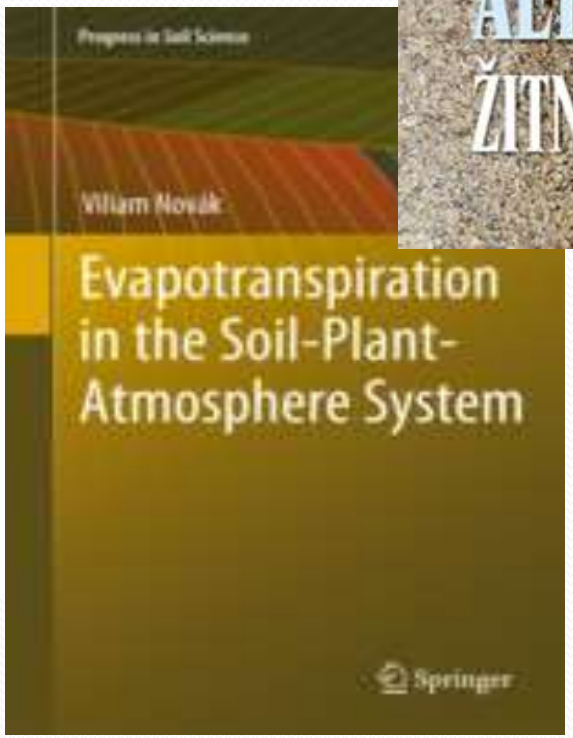




ÚSTAV HYDROLÓGIE SAV

How water repellency determines the seasonal infiltration in natural and cultivated sandy soils

Wetting pattern after the first 10 ml infiltrated

Wetting pattern after the second 10 ml infiltrated

Wetting pattern after the third 10 ml infiltrated

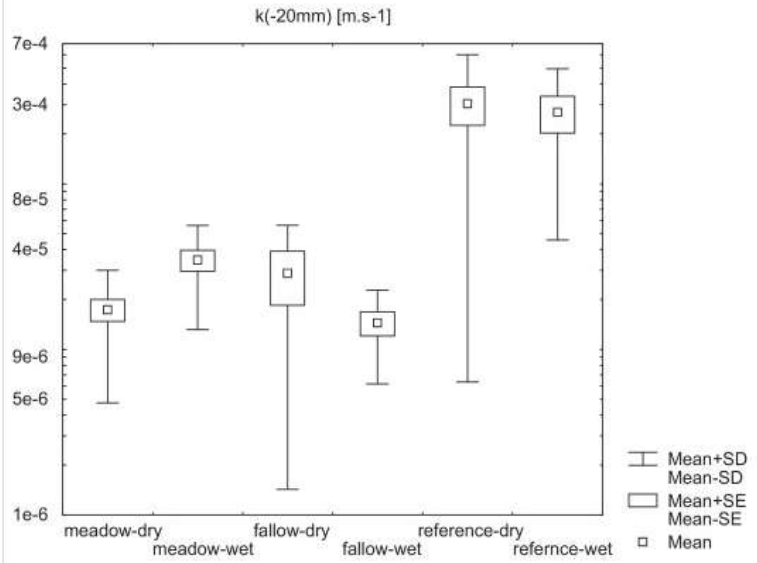
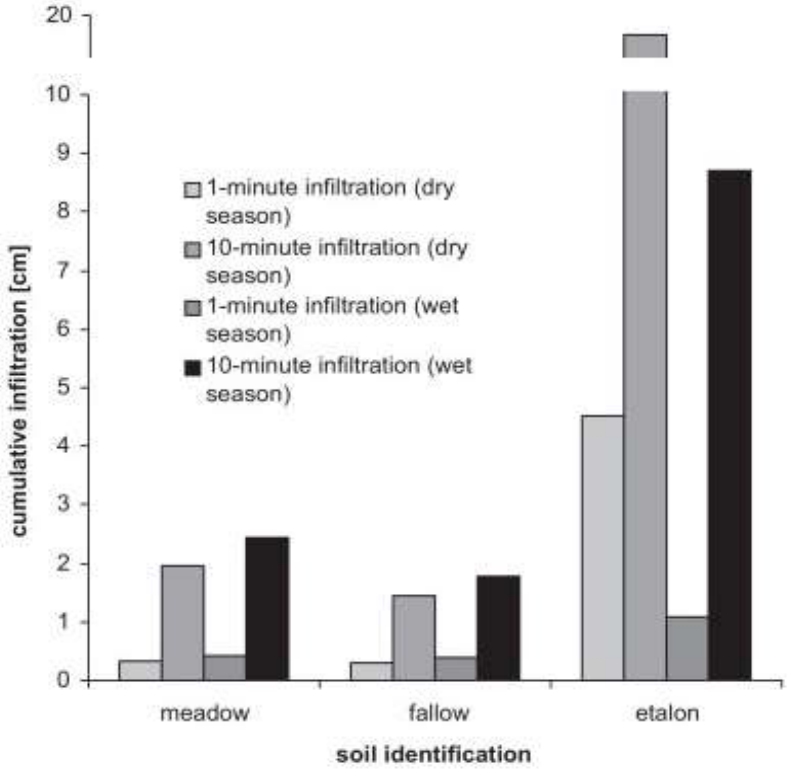
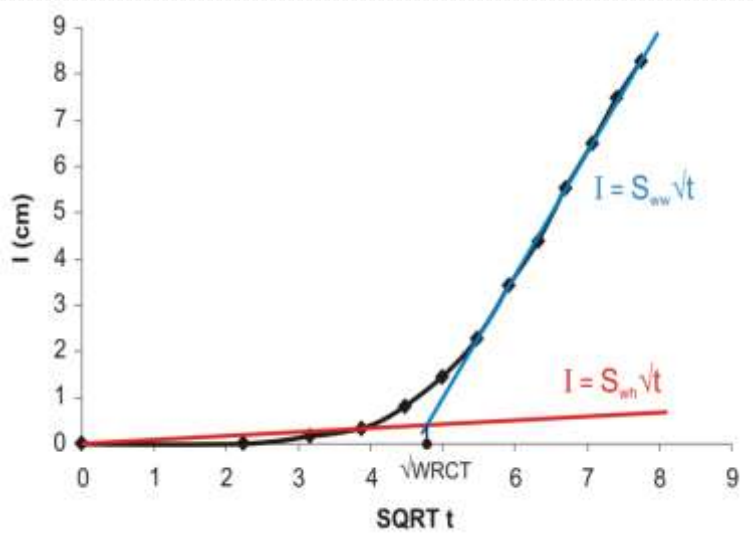


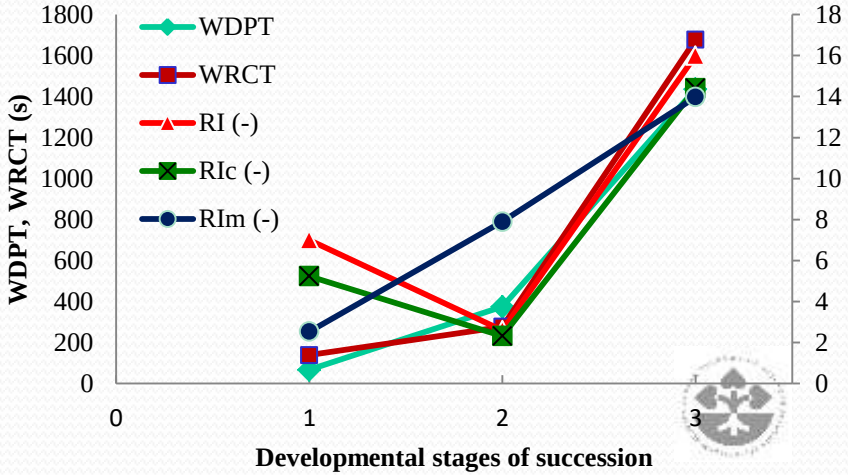
Fig. 9.
The variability of $k_{(-20\ mm)}$ data distributed into six groups according to location and prevailing weather conditions (wet or dry) preceding the infiltration measurements.



Evaluation of water infiltration into soils covered with biological soil crust

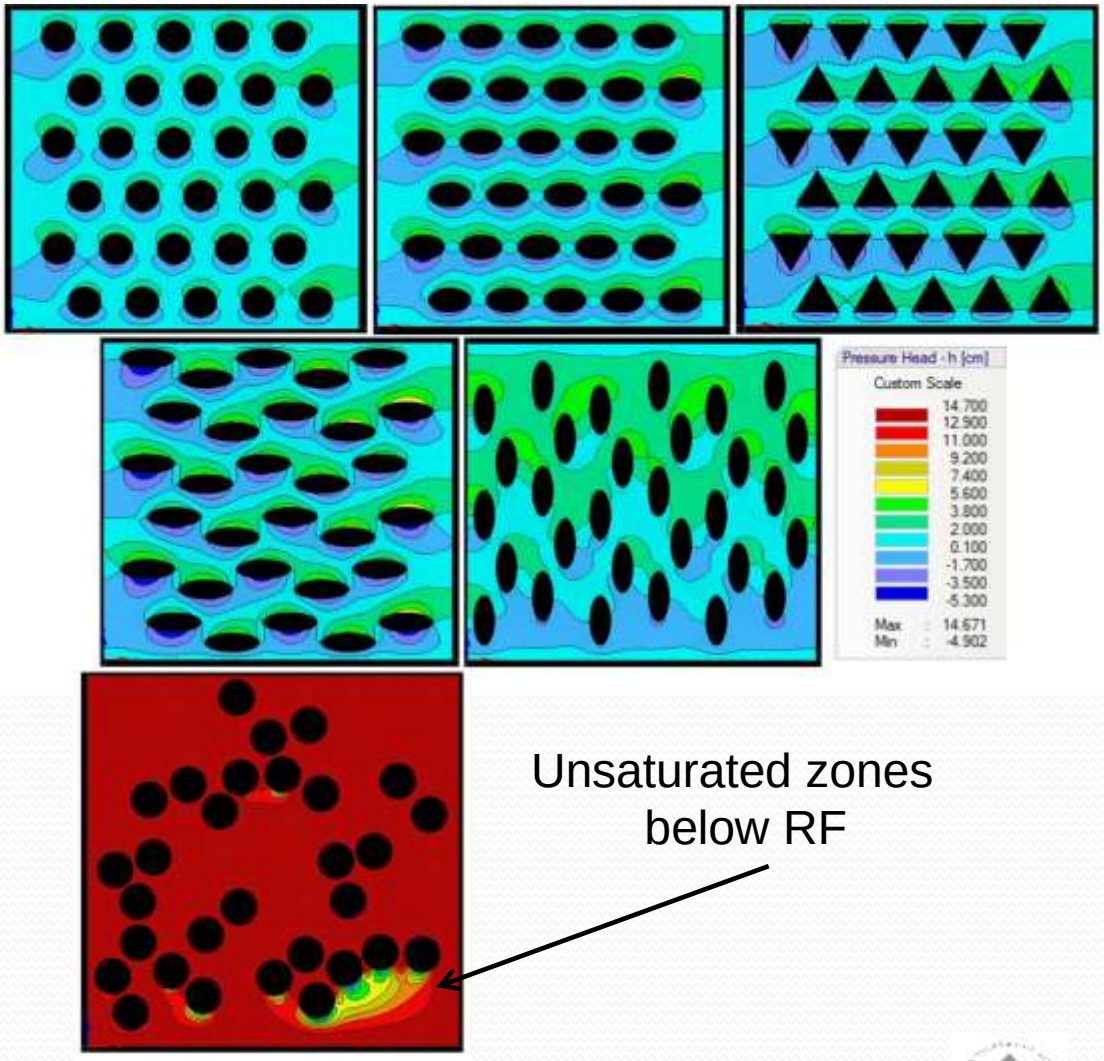


Primary succession in Sekule, Slovakia



ÚSTAV HYDROLÓGIE SAV

Hydraulic functions of stony soils

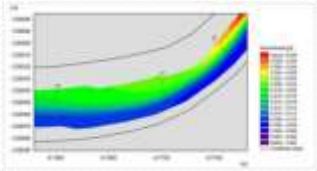


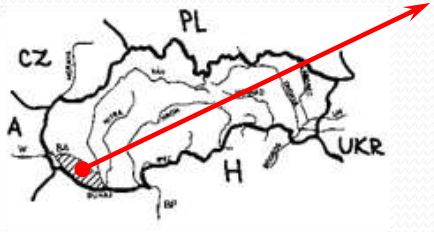
Unsaturated zones below RF

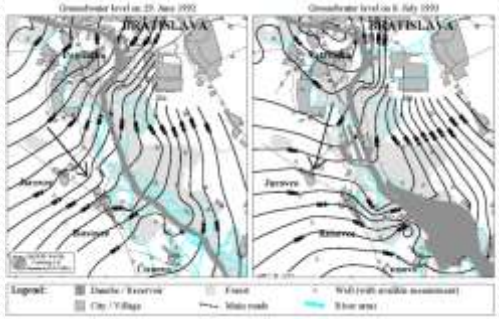
social impact

improvement of water management practice in Slovakia

Impact of Gabčíkovo Hydropower Plant on GWL







review of Standards, participation in think-tanks

PhD study, cooperation with universities

study programme
Water Management Engineering, study field 5.1.6

In 2015 we were reaccredited up to August, 31, 2020.

PROBLEM: *Decrease in the number of educated specialists – hydrologists, water managers, meteorologists*

Currently, there is no PhD study program in hydrology accredited at any university in Slovakia



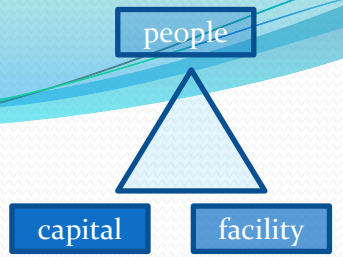




Joint Research Laboratory/Facilities with universities...3x

Centre of Excellence of Integrated Flood Protection Systems
Centre of Excellence for Protection and Use of Landscape and for Biodiversity
Centre of Excellence for the Integrated River Basin Management in the Changing Environmental Conditions

Future, research strategy



WATER

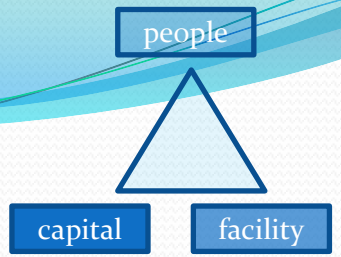
Antropocene

Humans significantly affect the water cycle

Greater demand on water resources

EU legislation

Future, research strategy



international

IH SAS – participate in European Network of Experimental and Representative Basins (20 countries)

– in the framework of the International Hydrological Programme of UNESCO project EUROFRIEND (39 countries)

– continue the project Flood Regimes of Rivers in the Danube Basin (14 countries)

HORIZON 2020, COST,.....

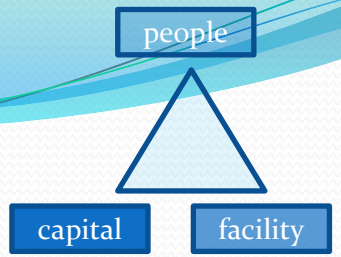
national

IH SAS – the leader in experimental hydrology and tracer hydrology

– principal research organization for solution of pollutant dispersion in SW from the hydrodynamic point of view

– the process of water, energy and dissolved substances transport in the soil, as part of (GW-S-P-A) system

Future, research strategy



Improved *quality of instrumentation*

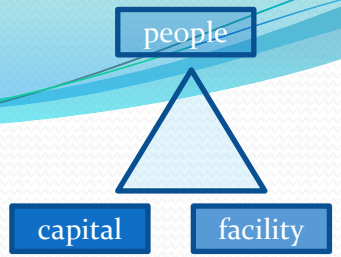
modern methods application, faster and more effective processing of the collected data

basis for excellent research in the next period

CCC, WOS, SCOPUS

domestic scientific journals

Future, research strategy



reflect the worldwide trends in hydrology and effectively contribute to the international hydrological research with new knowledge

from *our country*

And

for *our country*

be active in international collaborations

be active in national collaborations

cooperation with private sector

impact on decision makers

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