ČHMÚ ČMeS SUMAVA.EU - počasí

ŠUMAVA 2019
Meteorologická konference

Hydrologický a hydroekologický výzkum ÚH AV ČR v CHKO a NP Šumava

Miroslav Tesař [1], Miloslav Šír [2], Jan Procházka [3,4]

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[2] Střední škola rybářská a vodohospodářská Jakuba Krčína, Třeboň
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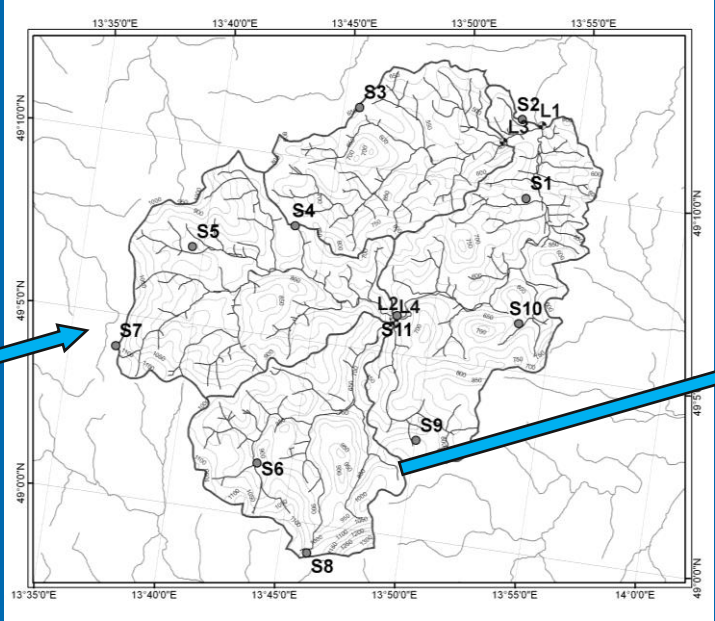
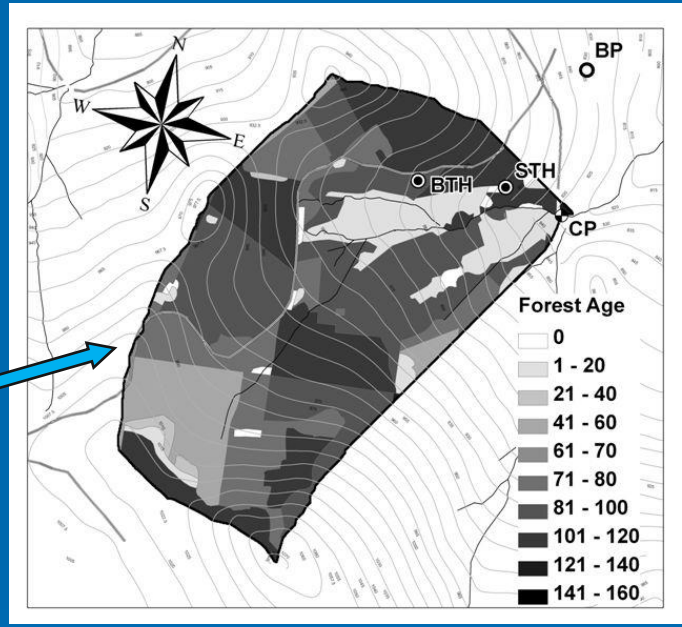
Akademie věd České republiky
SŠRV TŘEBOŇ JAKUBA KRČÍNA
Zemědělská fakulta Faculty of Agriculture

Historie experimentálního hydrologického výzkumu v ÚH AV ČR, v.v.i.

Na počátku šedesátých let bylo prof. Smetanou iniciováno založení výzkumného a reprezentativního povodí Volyňky – následně bylo zapojeno plně do IHD 1965 – 1974.



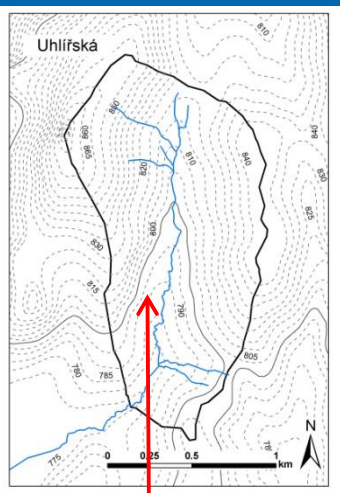


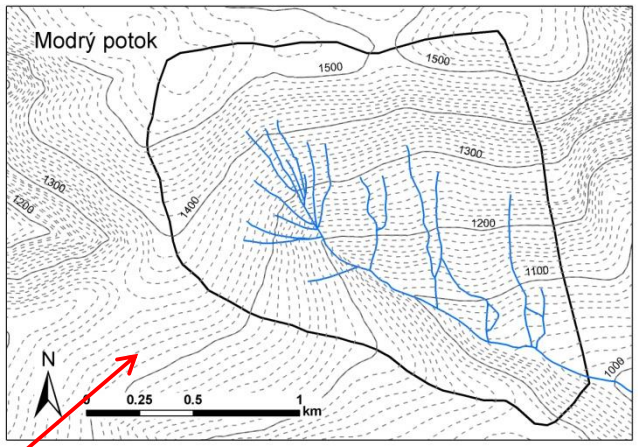
Volyňka 383 km^2, 423 – 1362 m n.m., průměrná výška 725 m n.m., 781 mm, 6,2 ^{o}C

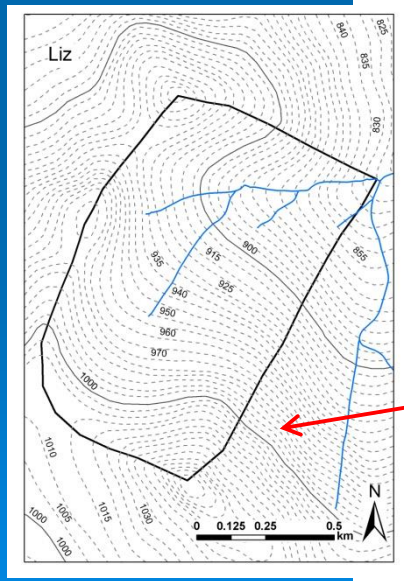
Tesař, M., Balek, J., Šír, M.: Hydrologický výzkum v povodí Volyňky a autoregulace hydrologického cyklu v povodí Liz. *Journal of Hydrology and Hydromechanics*, 54, 2006, 2, 137–150.

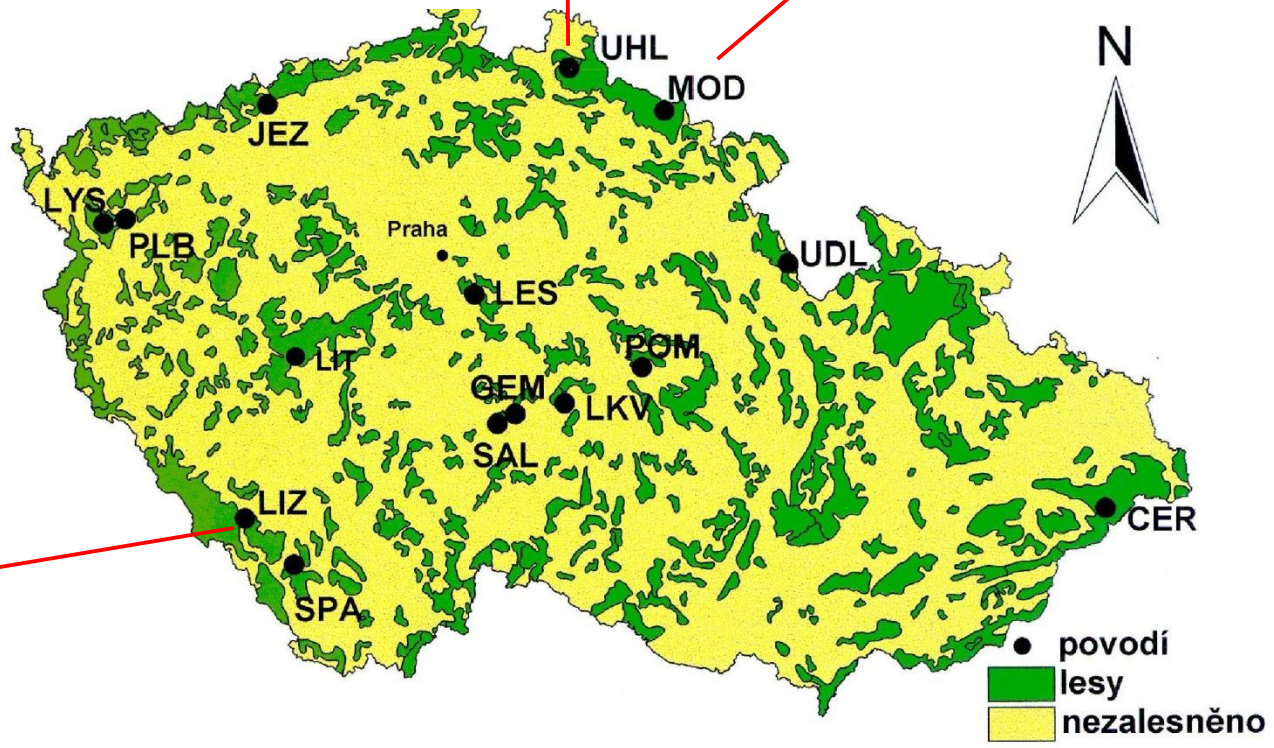
Monitorovací sítě v ČR a v Evropě

- Systém 14 malých lesních povodí koordinovaný **ČGS**;
- v současné podobě provozován od roku 1994;
- jednotná metodika sběru dat a vzorků pro výpočet látkových toků ekologicky významných složek.









Monitorovací síť GEOMON – ČGS Praha

Monitorovací sítě v ČR a v Evropě

ERB (Euromediterranean Network of Experimental and Representative Basins) je volná asociace 22 evropských států, které disponují dobře vybavenými experimentálními a reprezentativními povodími pro dlouhodobý hydrologický a environmentální výzkum (http://erb-network.simdif.com/)

http://www.euro-friend.de/servlet/is/Entry.7397.Display/

EURO-FRIEND | Projects | Catchment Processes | Small hydrological research ba

- EURO FRIEND
- Projects
  - European Water Archive
  - Low Flow and Drought
  - Large Scale Variations
  - Extreme Rainfall and Floods
  - Catchment Processes
    - ERB 2010
    - TRUMPER
    - Activities 2008-2009
    - Activities 2010
    - Recent achievements
    - Small hydrological research basins
- Meetings
- Publications
- Contact
- External links

Small hydrological research basins

This growing inventory of small hydrological research basi
an initiative of the National German FRIEND/ERB working
of the Goslar-Hahnenklee Workshop on Status and Persp

Any new contributions are highly welcome. For this purpos
duly completed copy to **Ulrich Schröder**. The basin inform

Liz experimental catchment

Otava river basin, Czech Republic

Basin characteristics

River Basin / River Basin (according EU-WFD)	Otava river basin / Vltava river basin
Operation (from... to...)	Since 1976, still in operation
Gauge coordinates / Gauge datum:	13°40´56´´E; 49°03´57´´N / 828 m a.s.l.
Catchment area:	0,99 km²
Elevation range:	828 – 1074 m a.s.l.
Basin type: (alpine, mountainous, lowland)	Mountainous
Climatic parameters: (mean precipitation, temperature and others)	861 mm (1976-2008), 6,3 °C (1976-2008)
Land use:	100 % Afforestation (acid spruce beech type of forest)
Soils:	Oligotrophic forest Eutric Cambisol
Geology:	Proterozoic biotite paragneisses and migmatites locally overlain by Holocene deluvial-fluvial loams and deposits
Hydrogeology: (Type of aquifers, hydraulic conductivity)	Fractured rock aquifer with a shallow near-surface aquifer confined to morphological elevations
Characteristic water discharges (Q_{355}, Q_{m}, Q_{max})	1,03 l/s; 207,5 l/s; 10,67 l/s (1976-2008)

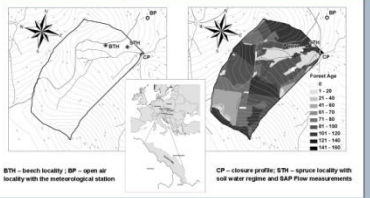
Instrumentation and data

Measured hydrological parameters	Measuring period	Temporal resolution	Number of stations
Stream flow	Nov 1975 – cont.	1h 10 min (since 1993)	1
Precipitation	1975 – cont. 2000 – cont.	Daily Impuls/0,1 mm	2 (17 in growing season)
Air temperature, humidity	1976 – cont.	1h / 10 min.	5
Groundwater level	1976 – cont. 2005 – cont.	Weekly 10 min.	6 4
Sap Flow	2005 – cont.	10 min.	8
Environmental isotope ^{18}O	2007 – cont.	Weekly	2

Applied models

1. SAC – SMA Model 2. RETU Model 3. BROOK 90 Model 4. Micrometeorological Deposition Model

Map of the research basin



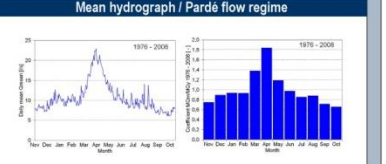
BTH – beech locality ; BP – open air locality with the meteorological station

CP – closure profile; STH – spruce locality with soil water regime and SAP Flow measurements

Main scientific activities and results

1. The soil water movement and retention play the leading role in the runoff formation in Liz catchment.
2. Occult precipitation represents an important factor affecting water and mass balance in the headwater region in the Czech Republic. In the Šumava Mts. fogwater showed high acidity and NH_4^+, SO_4^{2-} and NO_3^- were the dominant species in fog-water.
3. Simulation of phytomass productivity based on the optimum temperature for plant growth in a cold climate was studied and basic conclusions were formulated (e.g. monitoring of the hydrological regime in mountain localities in the Czech Republic and simulation of the phytomass productivity showed that the optimum temperature for plant growth is 25 °C, and that plants growing at this optimum temperature produce the biggest volume of phytomass in the long-term).
4. Improved quantitative understanding of processes controlling the transfer of water near the land surface, including soil-plant-atmosphere interactions.
5. Accurate measurements of transpiration stream in trees (using the method of heat field deformation imaging) with detailed numerical modeling of transient soil water movement in the root zone.
6. Mathematical analysis of the Richards' equation reached a conclusive evidence that the fingering effect is impossible to describe using the standard theory of fluid transport in a porous material, which is based on a diffusion analogy (Richards' flow). It was therefore confirmed that fingering is a new physical phenomenon typical for the gravitationally destabilized flow.

Mean hydrograph / Pardé flow regime



Key references for the basin

1. Pražák, J., Šír, M., Tesař, M.: Estimation of plant transpiration from meteorological data under conditions of sufficient soil moisture. Journal of Hydrology 162, 1994, p. 409 - 427.
2. Eliáš, V., Tesař, M., Buchtele, J.: Occult precipitation: sampling, chemical analysis and process modelling in the Šumava Mts. (Czech Republic) and in the Tounse Mts. (Germany). Journal of Hydrology 166, 1995, p. 409 – 420.
3. Pražák, J., Šír, M., Tesař, M.: Parameters determining plant transpiration under conditions of sufficient soil moisture. Journal of Hydrology, 183, 1996, p. 425 - 431.
4. Tesař, M., Šír, M., Syrovátka, O., Pražák, J., Lichner, L., Kubík, F.: Soil water regime in head water regions – observation, assessment and modelling. J. Hydrol. Hydromech., 49, 2001, 6, p. 355 - 375.
5. Tesař, M., Šír, M., Lichner, L.: Runoff formation in a small catchment. IHP –VI Technical Document in Hydrology No. 67, UNESCO Working Series SC-2003/WS/20, ISBN 92-9220-001-1, 2003, Paris, France, 7 – 12.
6. Tesař, M., Šír, M., Pražák, J., Lichner, L.: Instability driven flow and runoff formation in a small catchment. Geologica Acta, Vol. 2, No. 1, 2004, p. 147 – 154.
7. Tesař, M., Šír, M., Lichner, L., Zelenková, E.: Influence of vegetation cover on thermal regime of mountainous catchments. Biologia, 61/Suppl. 19: S311 – S314, 2006.
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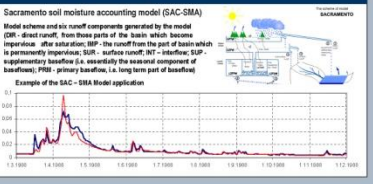
11. Fürst, T., Vedák, R., Šír, M., Bíl, M.: On the incompatibility of Richards' equation and finger-like infiltration in unsaturated homogeneous porous media, Water Resour. Res., 45, W05405, 2009, DOI:10.1029/2008WR007062.
12. Tesař, M., Šír, M., Lichner, L.: Absorption of solar radiation and moist and dry convection in the Šumava Mountains. Status and Perspectives of Hydrology in Small Basins (Proceedings of the Workshop held at Goslar-Hahnenklee, Germany, 30 March-2 April 2009), IAHS Publ. 336, 2010, 121-124.
13. Tesař, M., Šír, M., Krejča, M., Fišák, J., Polívka, J.: Soil water movement during extreme precipitation in the Šumava Mts. And the Krkonoše Mts. in August 2002. Folia Geographica, Series Geographica - Physica, Vol. XLI 2010: 62 – 73, ISSN 0071 – 6715.
14. Nadezhdina, N., David, T.S., David, J.S., Ferreira, M.I., Dohnal, M., Tesař, M., Gartner, K., Leitgeb, E., Nadezhdin, V., Cermak, J., Jimenez, M.S., Morales, D.: Trees never rest: The multiple facets of hydraulic redistribution. Ecohydrol. (2010), Publisher online in Wiley InterScience (www.interscience.wiley.com) DOI: 10.1002/eco.148
15. Lichner, L., Hallet, P.D., Orfánus, T., Czachor, H., Fajkus, K., Šír, M., Tesař, M.: Vegetation impact on the hydrology of an aeolian sandy soil in a continental climate. Ecohydrol. (2010), Publisher online in Wiley InterScience (www.interscience.wiley.com) DOI: 10.1002/eco.153

Special basin characteristics (hydrogeology, lakes, reservoirs etc.)

Sacramento soil moisture accounting model (SAC-SMA)



Contact

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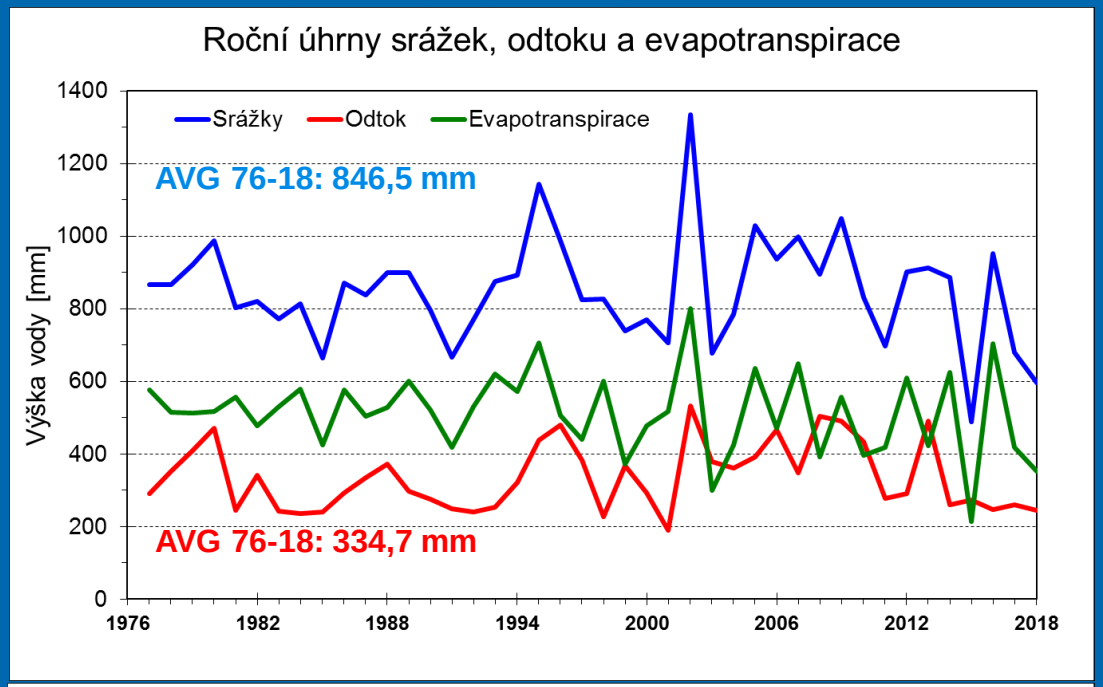
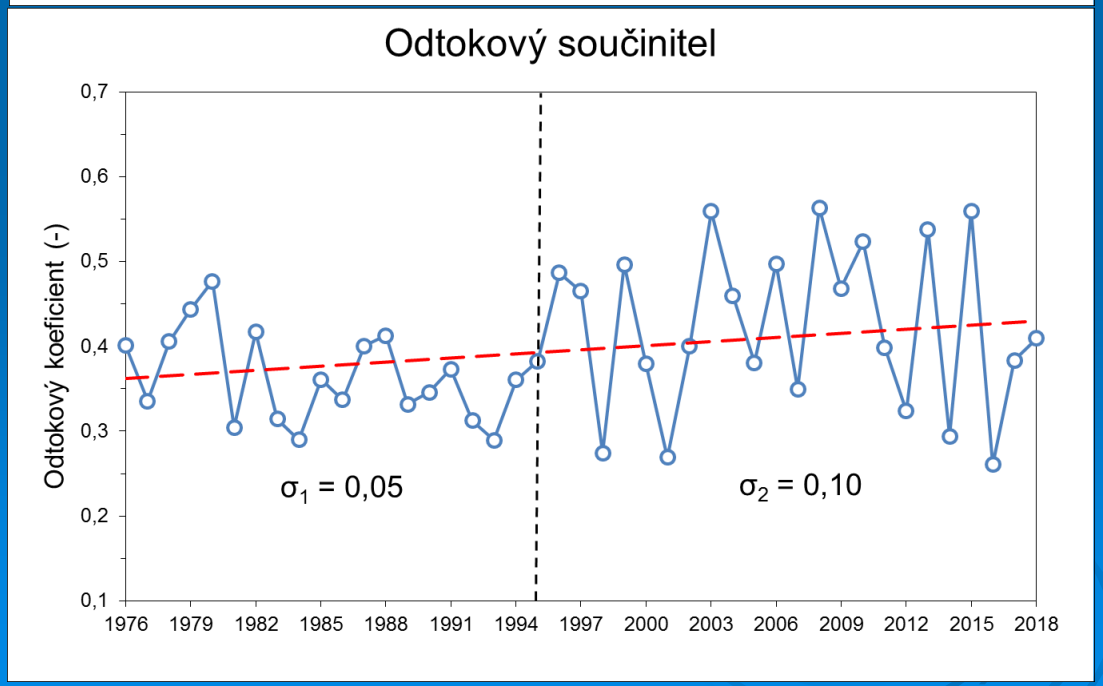
Czech Republic

Povodí Liz – výsledky hydrologické bilance 1976 – 2018





Hydr. rok	Srážky [mm]	Odtok [mm]	ET [mm]	Od. souč. [-]
1976	742,0	297,7	444,3	0,40
1977	866,2	290,5	575,7	0,34
1978	866,7	351,4	515,3	0,41
1979	920,9	408,6	512,3	0,44
1980	986,5	470,3	516,2	0,48
1981	801,7	244,0	557,7	0,30
1982	820,5	341,9	478,6	0,42
1983	771,9	242,7	529,2	0,31
1984	814,4	236,1	578,3	0,29
1985	664,7	240,0	424,7	0,36
1986	870,7	293,4	577,3	0,34
1987	838,7	335,7	503,0	0,40
1988	898,8	371,1	527,7	0,41
1989	898,4	298,1	600,3	0,33
1990	796,7	275,6	521,1	0,35
1991	665,9	248,4	417,5	0,37
1992	770,6	240,9	529,7	0,31
1993	874,5	253,1	621,4	0,29
1994	892,9	321,9	571,0	0,36
1995	1142,0	437,1	704,9	0,38
1996	986,4	479,9	506,5	0,49
1997	824,8	383,5	441,3	0,46
1998	826,6	226,9	599,7	0,27
1999	739,0	366,9	372,1	0,50
2000	770,2	292,3	477,9	0,38
2001	707,0	190,2	516,8	0,27
2002	1333,3	533,5	799,8	0,40
2003	677,1	378,4	298,7	0,56
2004	784,7	360,6	424,1	0,46
2005	1028,1	391,6	636,5	0,38
2006	937,2	466,2	471,0	0,50
2007	997,2	348,6	648,6	0,35
2008	894,7	503,9	390,8	0,56
2009	1048,3	491,0	557,3	0,47
2010	830,6	434,5	396,1	0,52
2011	697,1	277,9	419,2	0,40
2012	900,8	291,5	609,3	0,32
2013	912,8	491,1	421,7	0,54
2014	885,3	260,3	625,0	0,29
2015	487,6	272,9	214,7	0,56
2016	951,2	248,0	703,2	0,26
2017	679,4	260,7	418,8	0,38
2018	596,5	244,3	352,2	0,41

Transpirace a evapotranspirace

ELSEVIER

Journal of Hydrology 162 (1994) 409–427

Journal of Hydrology

Estimation of plant transpiration from meteorological data under conditions of sufficient soil moisture

J. Pražák[a,*], M. Šír[b], M. Tesař[c]

ELSEVIER

Journal of Hydrology 183 (1996) 425–431

Journal of Hydrology

Parameters determining plant transpiration under conditions of sufficient soil moisture

J. Pražák[a,*], M. Šír[b], M. Tesař[b]

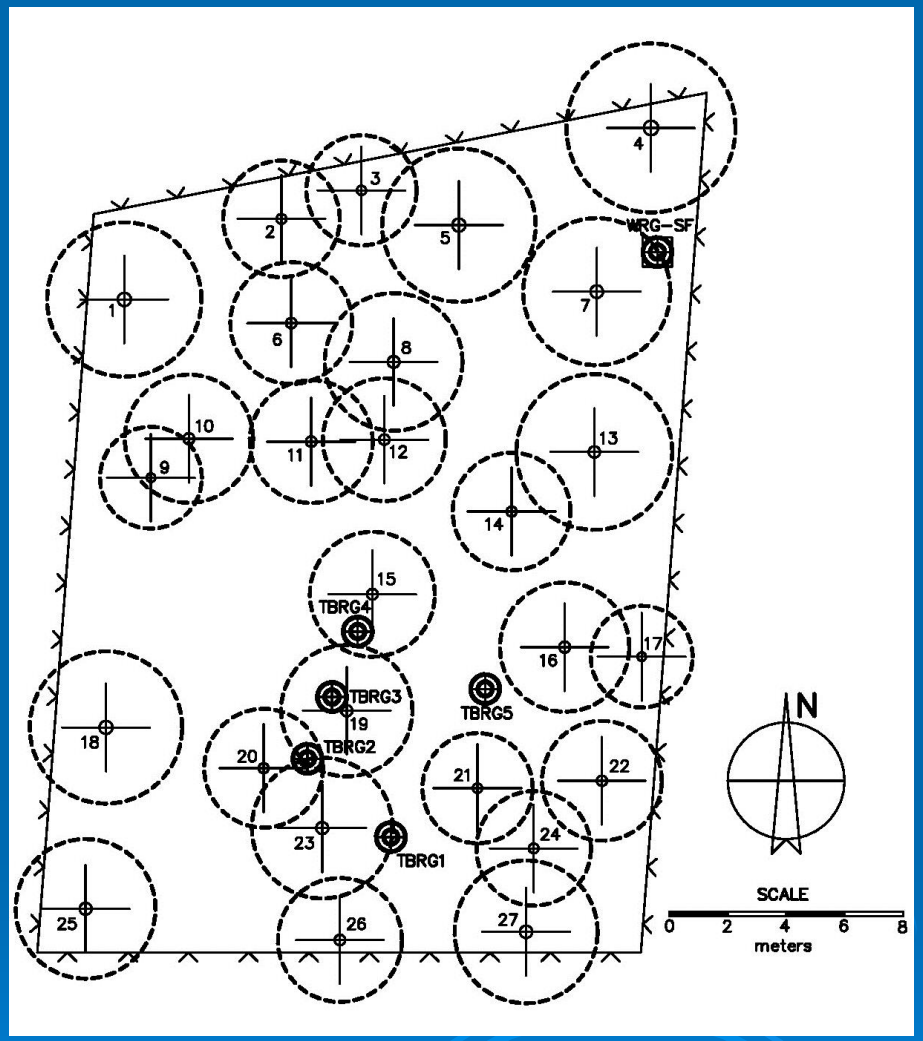
Mízní tok (SAP Flow) smrkového porostu

- Nadezhdina, N.; David, T. S.; David, J. S.; Nadezhdin, V.; Čermák, J.; Gebauer, R.; Ferreira, M. I.; Conceicao, N.; Dohnal, M.; Tesař, M.; Gartner, K.; Ceulemans, R.: Root function. In situ studies through sap flow research. In Mancuso, S. (ed.). *Measuring Roots. An Updated Approach*. Berlin Heidelberg: Springer-Verlag, 2012. pp. 267-290. ISBN 978-3-642-22066-1.
- Nadezhdina, N.; David, T. S.; David, J. S.; Ferreira, M. I.; Dohnal, M.; Tesař, M.; Gartner, K.; Leitgeb, E.; Nadezhdin, V.; Čermák, J.; Jimenez, M. S.; Morales, D.: Trees never rest: the multiple facets of hydraulic redistribution. Ecohydrology. 2010, vol. 3, no. 4, pp. 431-444. ISSN 1936-0584.

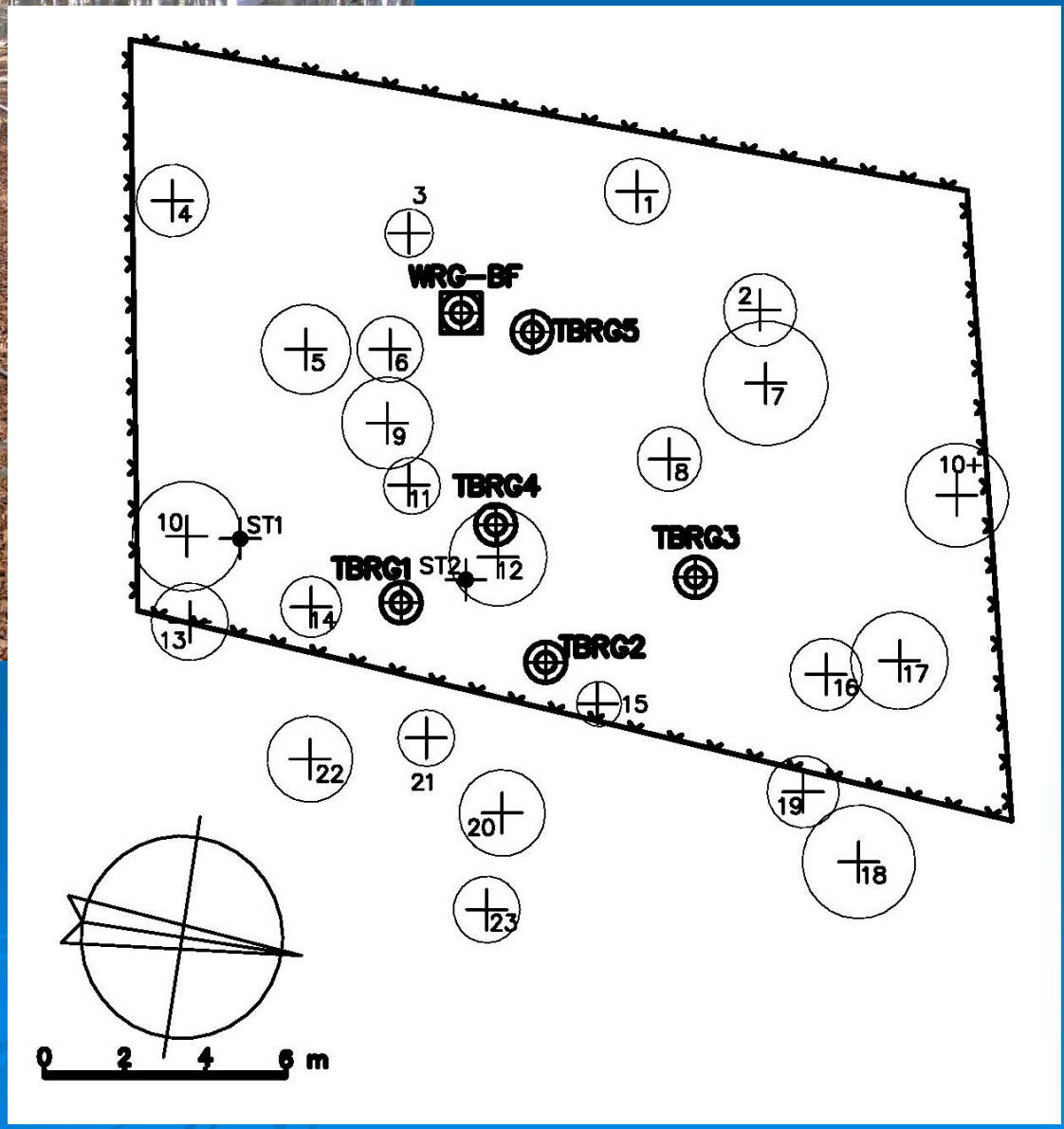
Intercepce lesního porostu - smrk

Name	Location	Type	Catchment area (cm^2)	Altitude of the top edge (m a.s.l.)
WRG-SF	forest floor	weighing*	500	860,1
WRG-OA	open area	weighing*	500	830,2
TBRG1	forest floor	tipping bucket	500	857,1
TBRG2	forest floor	tipping bucket	500	857,4
TBRG3	forest floor	tipping bucket	500	857,9
TBRG4	forest floor	tipping bucket	500	858,2
TBRG5	forest floor	tipping bucket	500	857,7

*The rain gauge is heated.

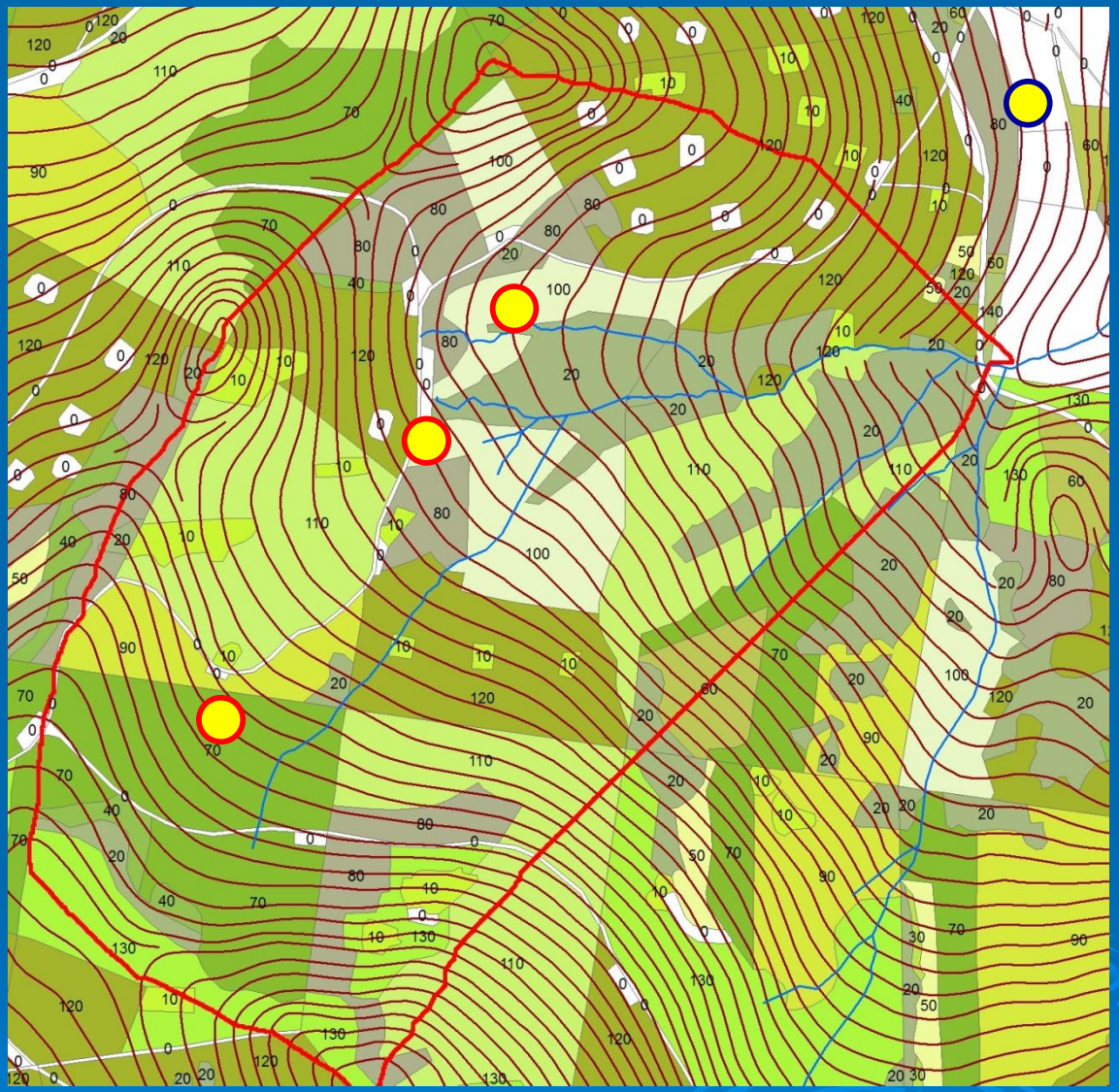


Dohnal, M. ; Černý, T.; Votrubová, J.; Tesař, M.: Rainfall interception and spatial variability of throughfall in spruce stand. *Journal of Hydrology and Hydromechanics*. 2014, vol. 62, no. 4, pp. 277-284. ISSN 0042-790X.



Intercepce lesního porostu - buk

Akumulace a tání sněhu



Šípek, V.; Tesař, M.: Seasonal snow accumulation in the mid-latitude forested catchment. *Biologia*, 2014, vol. 69, no. 11, pp. 1562-1569. ISSN 0006-3088.

Procesy v systému půda – rostlina - atmosféra

- Vogel, T.; Dohnal, M.; Dušek, J.; Votrubová, J.; Tesař, M.: Macroscopic Modeling of Plant Water Uptake in a Forest Stand Involving Root-Mediated Soil Water Redistribution. *Vadose Zone Journal*. 2013, vol. 12, no. 1. ISSN 1539-1663.

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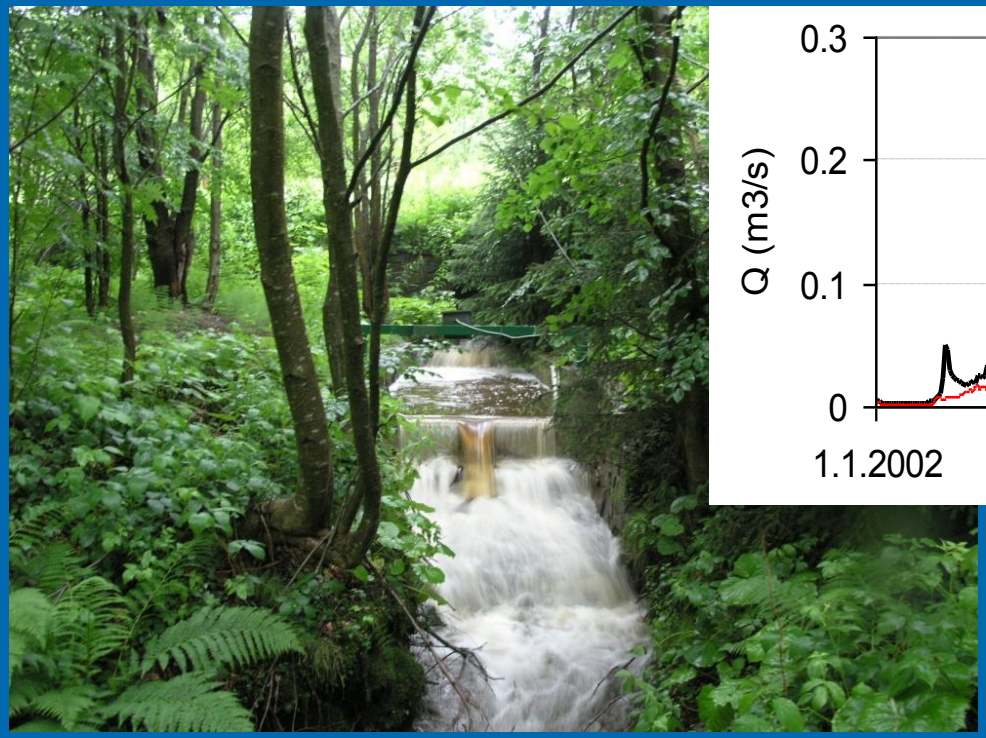
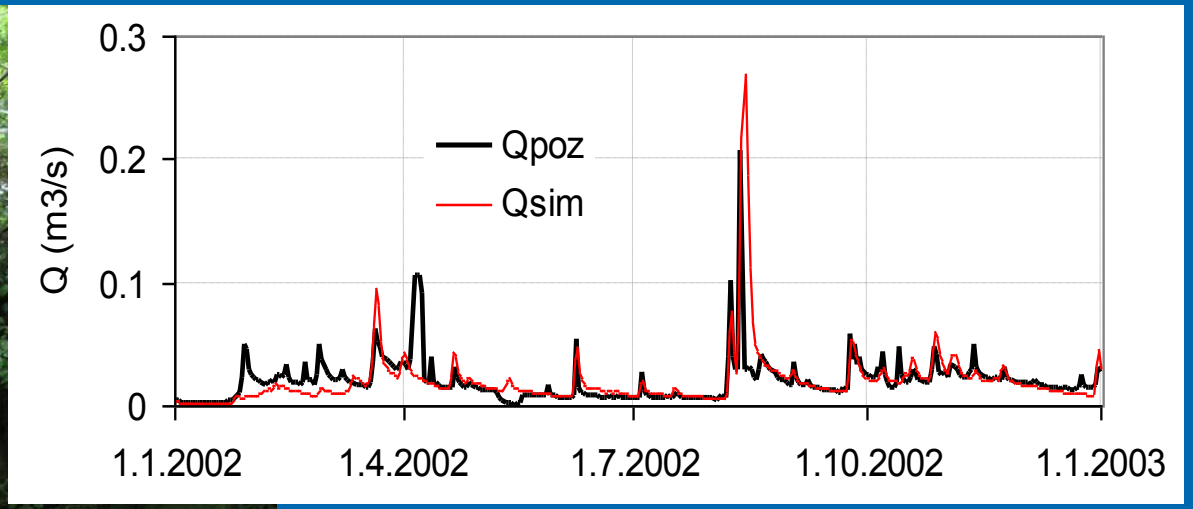
Vodní režim povodí, vodní režim půd – hodnocení a modelování





- Buchtele, J.; Eliáš, V.; Tesař, M.; Herrmann, A.: Runoff components simulated by Rainfall-Runoff Models. *Hydrological Sciences Journal*. 1996, vol. 41, no. 1, s. 49-60. ISSN 0262-6667.
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Ekohydrologie – bilance látkových toků; význam usazených srážek

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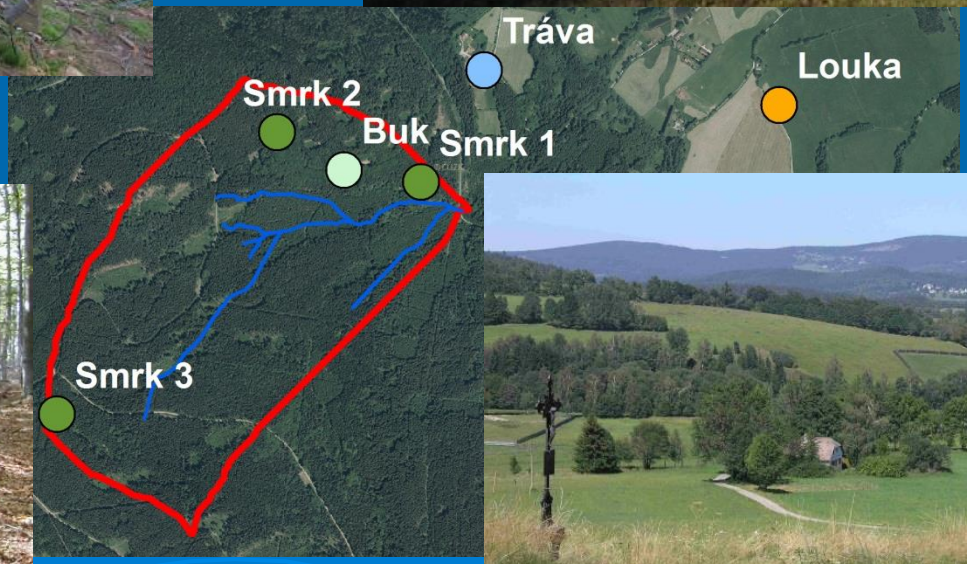
- Fišák, J.;; Tesař, M.; Řezáčová, D.; Eliáš, V.; Weignerová, V.; Fottová, D.: Pollutant concentrations in fog and low cloud water at selected sites of the Czech Republic. *Atmospheric Research*. 2002, vol. 64, -, pp. 75-87. ISSN 0169-8095.

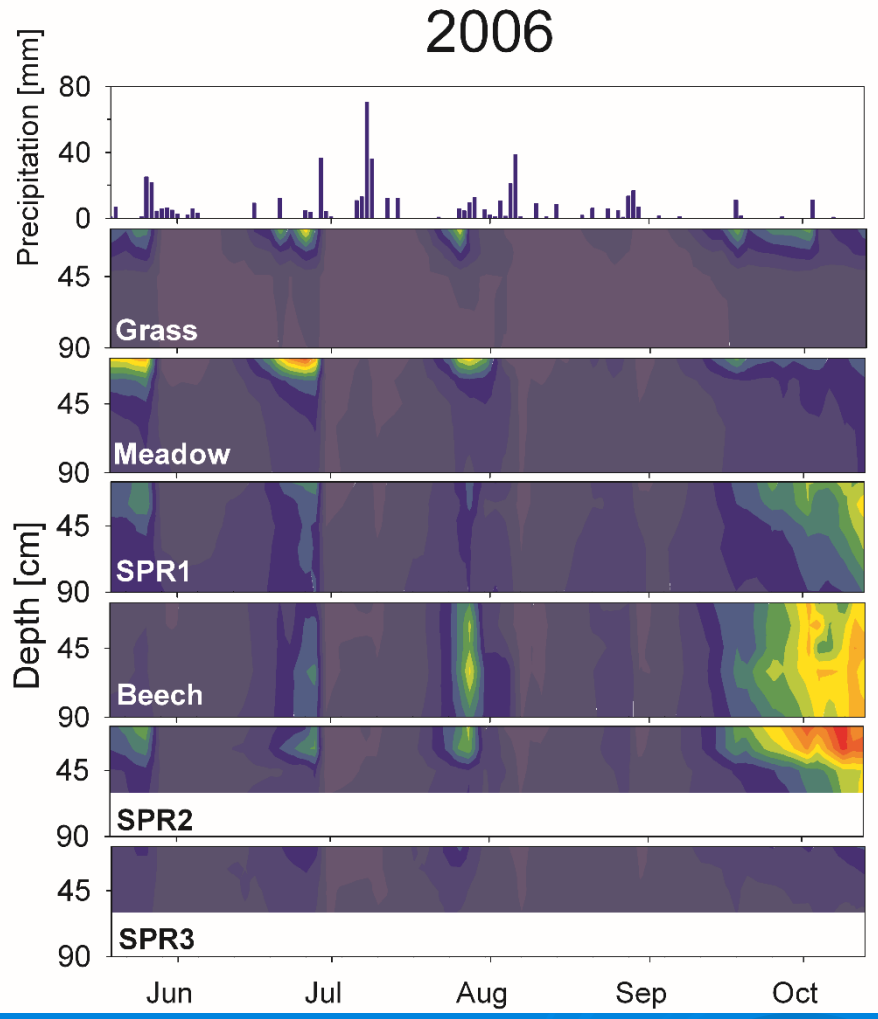
Fišák, J., Tesař, M.: Evaluation of the Contribution of Deposited Precipitation. *Advances in Meteorology.* 2015, Article ID 472963, 7 pages, 2015. doi:10.1155/2015/472963.

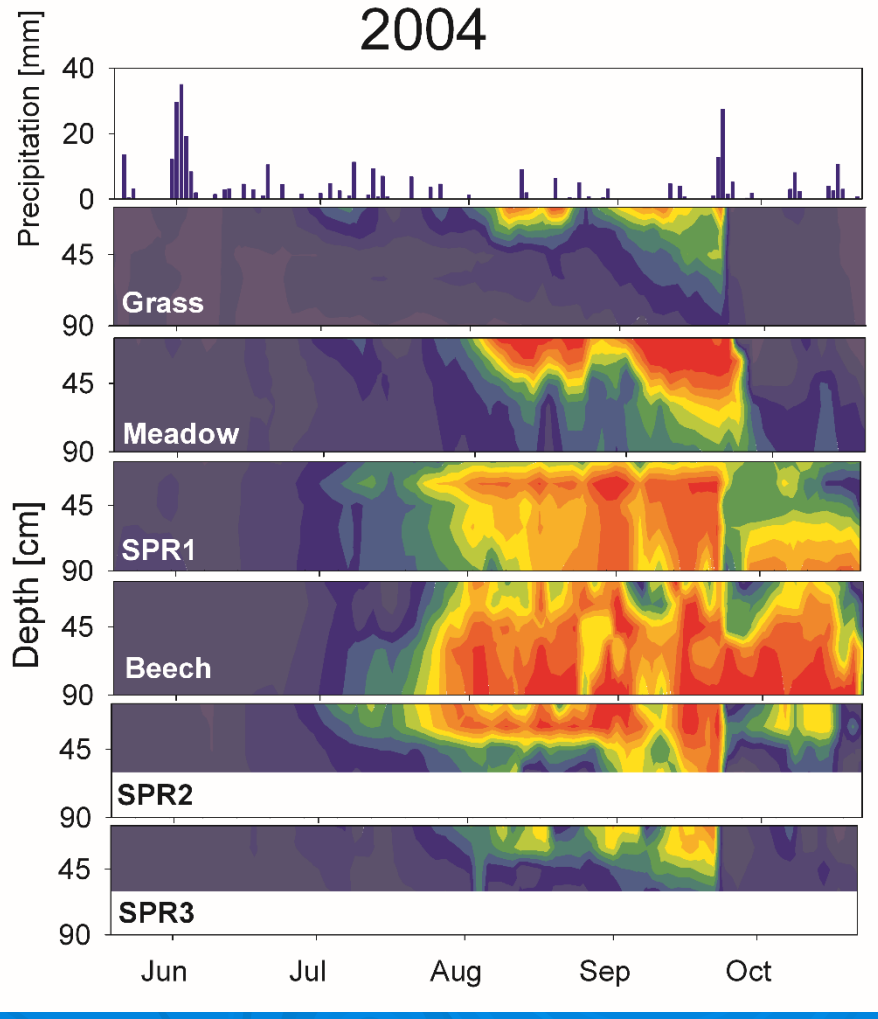
Vliv vegetace na retenci vody



Vlhký rok (2006)

Suchý rok (2004)

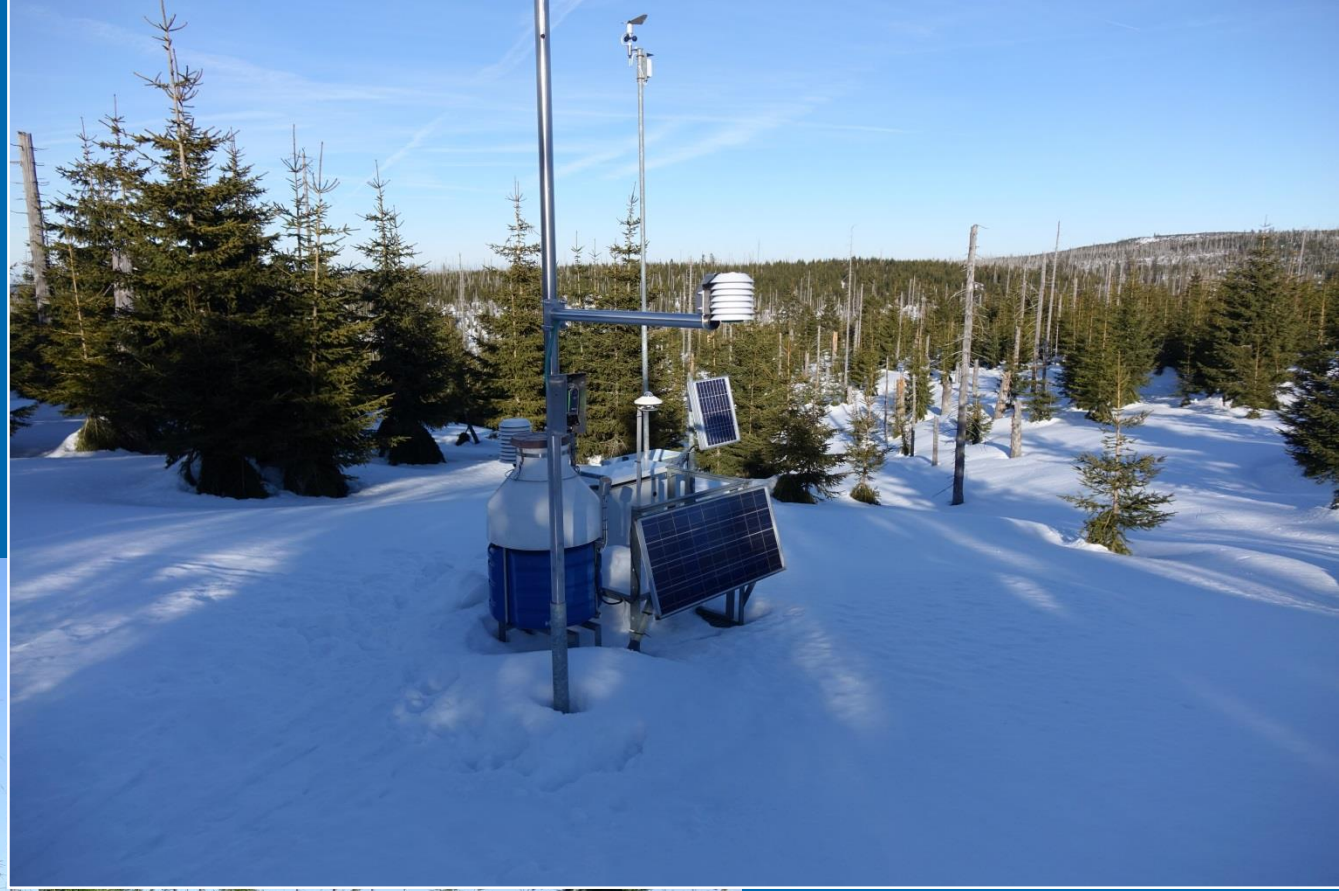




Jezerní hora 1307 m n. m.

Vysoký Stolec 1231 m n. m.

Roklan 1224 m n. m.



Malá Mokrůvka 1259 m n. m.


Děkuji za pozornost ....