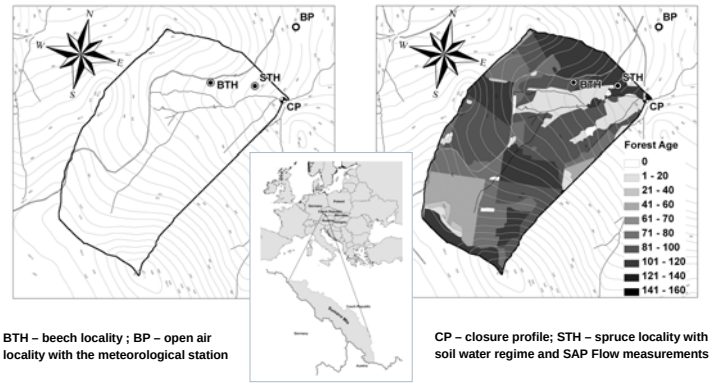
Liz experimental catchment

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 km^2
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_{min}, Q_{max}, Q_{mean})	1,03 l/s; 207,5 l/s; 10,67 l/s (1976-2008)

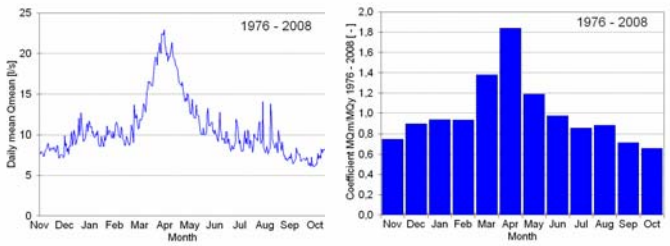
Map of the research basin



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

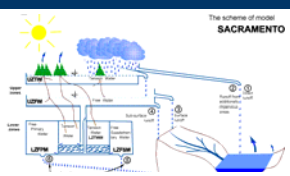
Mean hydrograph / Pardé flow regime



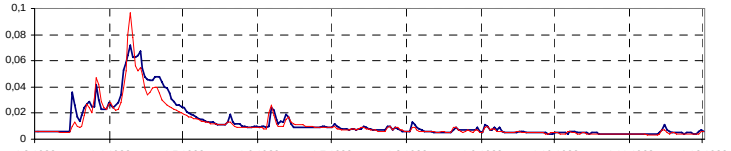
Special basin characteristics (hydrogeology, lakes, reservoirs etc.)

Sacramento soil moisture accounting model (SAC-SMA)

Model scheme and six runoff components generated by the model (DIR - direct runoff, from those parts of the basin which become impervious after saturation; IMP - the runoff from the part of basin which is permanently impervious; SUR - surface runoff; INT – interflow; SUP - supplementary baseflow (i.e. essentially the seasonal component of baseflows); PRM - primary baseflow, i.e. long term part of baseflow)



Example of the SAC – SMA Model application



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
Air temperature, humidity	1976 – cont.	1h / 10 min.	1
Groundwater level	1976 – cont. 2005 – cont.	Weekly 10 min.	6 4
Sap Flow	2005 – cont.	10 min.	6
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

Main scientific 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 Sumava 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:
   - The optimum temperature of 25 °C for plant growth in the present day conditions in the cold climate areas lowers both risks of reduction or cessation of plant growth.
   - In the case of lower optimum temperatures for plant growth, higher consumption of water for transpiration could result in a depletion of water sources, increases in plant temperature owing to a drop in transpiration, and finally a reduction or cessation of plant growth as a consequence of the high temperature of the plant.
   - In the case of higher optimum temperatures for plant growth, the heat from solar radiation is not sufficient for heating up the plants to this temperature, resulting in a reduction or cessation of plant growth as a consequence of the low temperature of the plant.
   - We can conclude that 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.

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 Sumava Mts. (Czech Republic) and in the Taunus 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, Ľ., 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, Ľ.: Runoff formation in a small catchment. IHP –VI Technical Document in Hydrology No. 67, UNESCO Working Series SC-2003/WS/30, ISBN 92-9220-001-1, 2003, Paris, France, 7 – 12.
6. Tesař, M., Šír, M., Pražák, J., Lichner, Ľ.: Instability driven flow and runoff formation in a small catchment. Geologica Acta, Vol. 2, No. 1, 2004, p. 147 – 156.
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.
8. Tesař, M., Šír, M., Lichner, Ľ., Čermák, J: Plant transpiration and net entropy exchange on the Earth's surface in a Czech watershed. Biologia, 62/5: 547 – 551, 2007.
9. Tesař, M., Šír, M., Krejča, M., Váchal, J.: Influence of vegetation cover on air and soil temperatures in the Šumava Mts. (Czech Republic). 2008 IOP Conf. Ser.: Earth Environ. Sci. 4 012029 (7pp) doi: 10.1088/1755-1307/4/1/012029
10. Šír, M., Tesař, M., Lichner, Ľ., Hallett, P.D., Marinková, M.: Simulation of phytomass productivity based on the optimum temperature for plant growth in a cold climate. Biologia,64/3: DOI: 10.2478/s11756-009-0109-4, 2009, in print.

Contact

Dr. Miroslav Tesař
Institute of Hydrodynamics ASCR, v.v.i.
Dept. Hydrology and Ecology
Pod Pat'ankou 30/5
166 12 Praha 6
Czech Republic

miroslav.tesar@iol.cz