

Ing. Magdalena Mrkvičková

Projects of the T.G.M. WRI, p.r.i. addressing drought and water scarcity

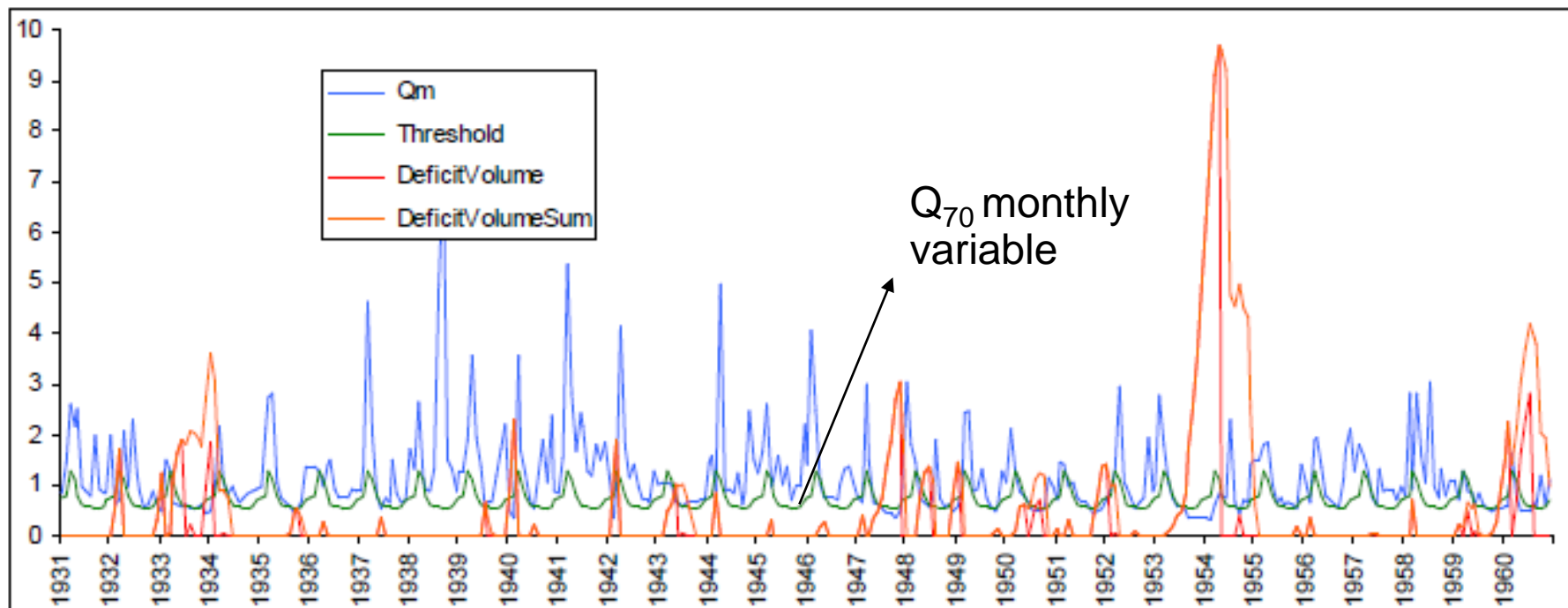
Spatial and temporal variability of hydrological drought in the Czech Republic

SP/1a6/125/08

Ing. Radek Vlnas

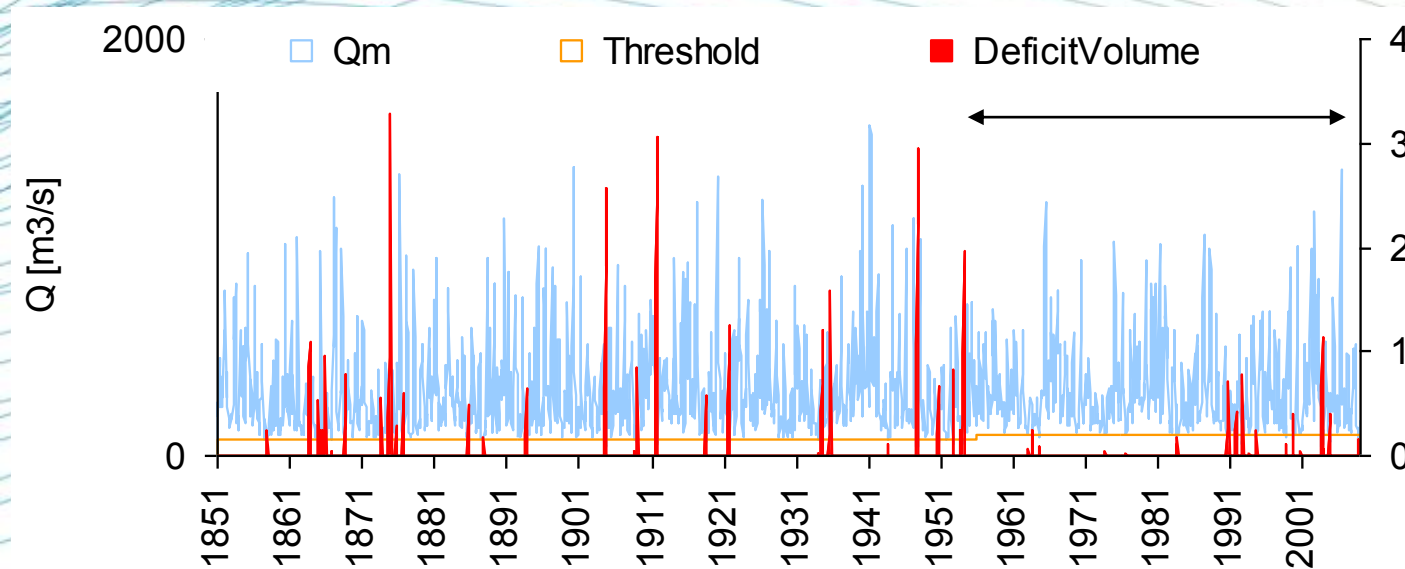
DATA AND METHODS

- **The aim** of the analysis is to provide the basis for developing indices of hydrological drought severity that could be used for purposes of drought management
- Hydrological drought assessment in runoff time series during the period 1931–2007 in 118 gauging stations in the Czech Rep. – parameters: deficit volume, time duration of the deficit
- Q_{95} and Q_{70} discharge were applied as thresholds – as annual constant or monthly variable



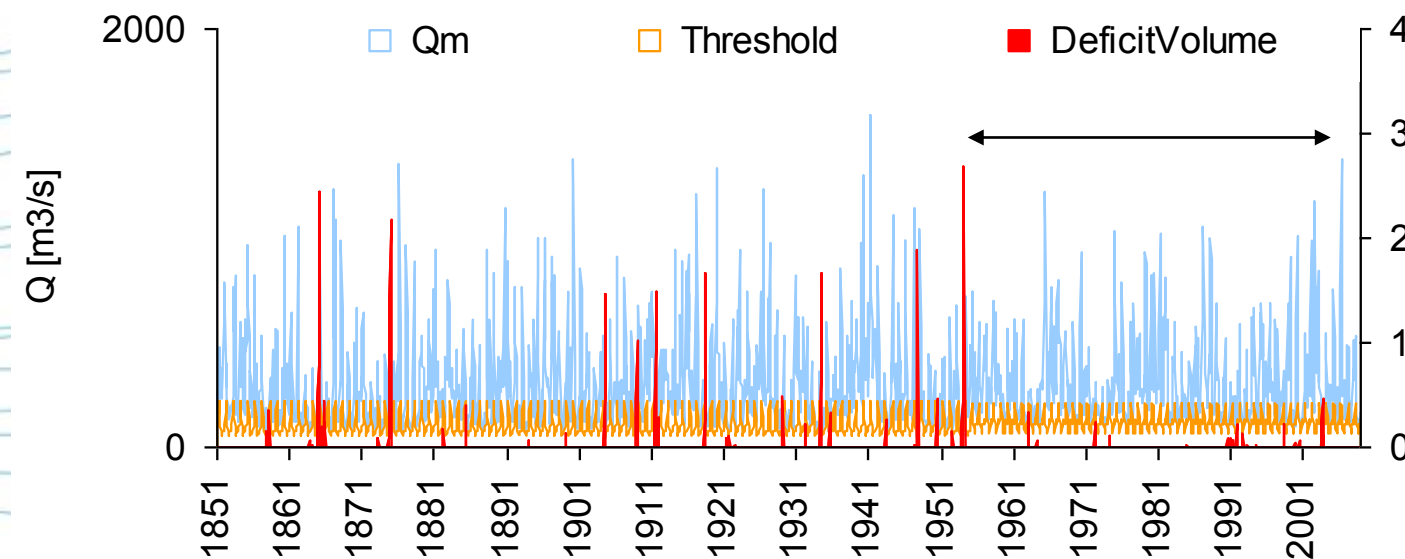
DĚČÍN GAUGING STATION SINCE 1851

VÚV
TGM



1851-1960
1961-2008 reservoirs on
the Vltava river finished

Fixed annual
threshold Q_{95}



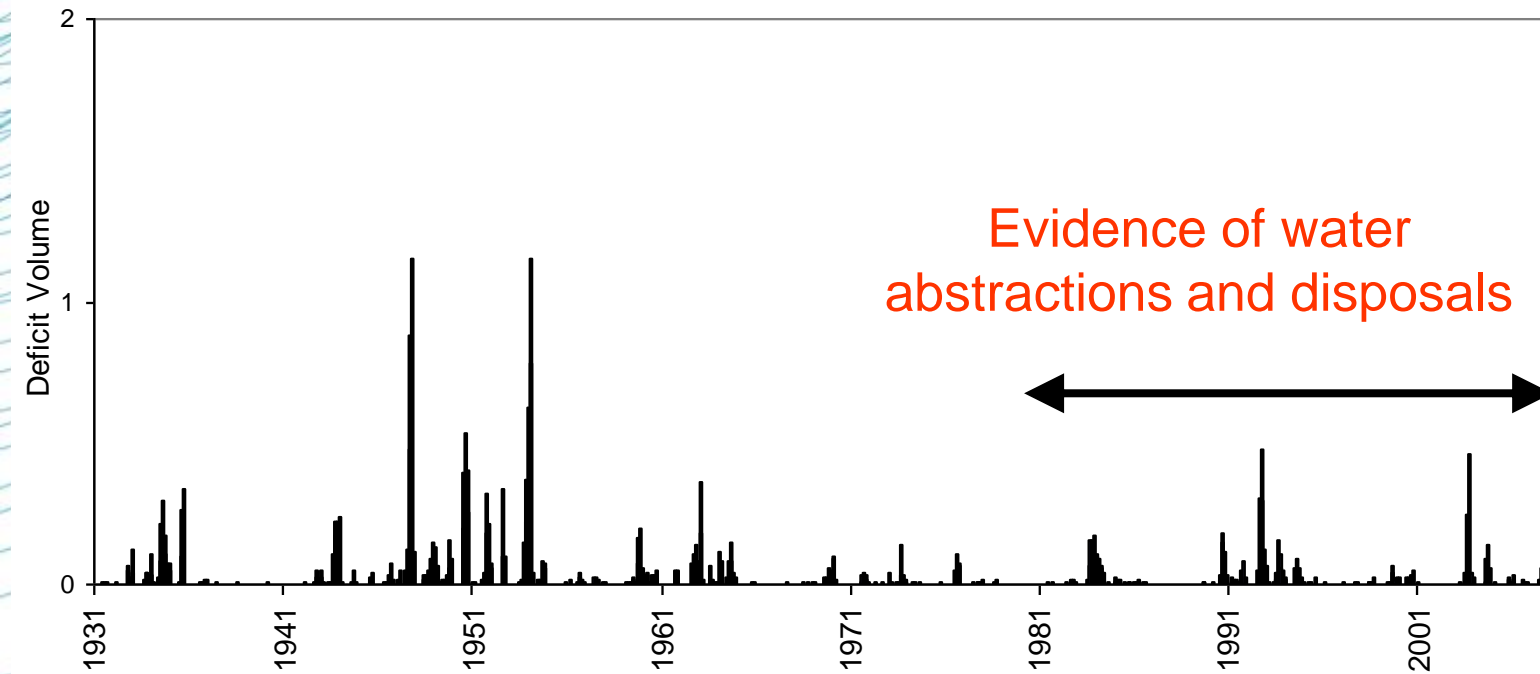
No serious drought spell
after 1955

Monthly variable
threshold Q_{95m}

- No serious drought spell after 1955 detected also in unaffected runoff series

MEAN DEFICIT VOLUME 1931–2007

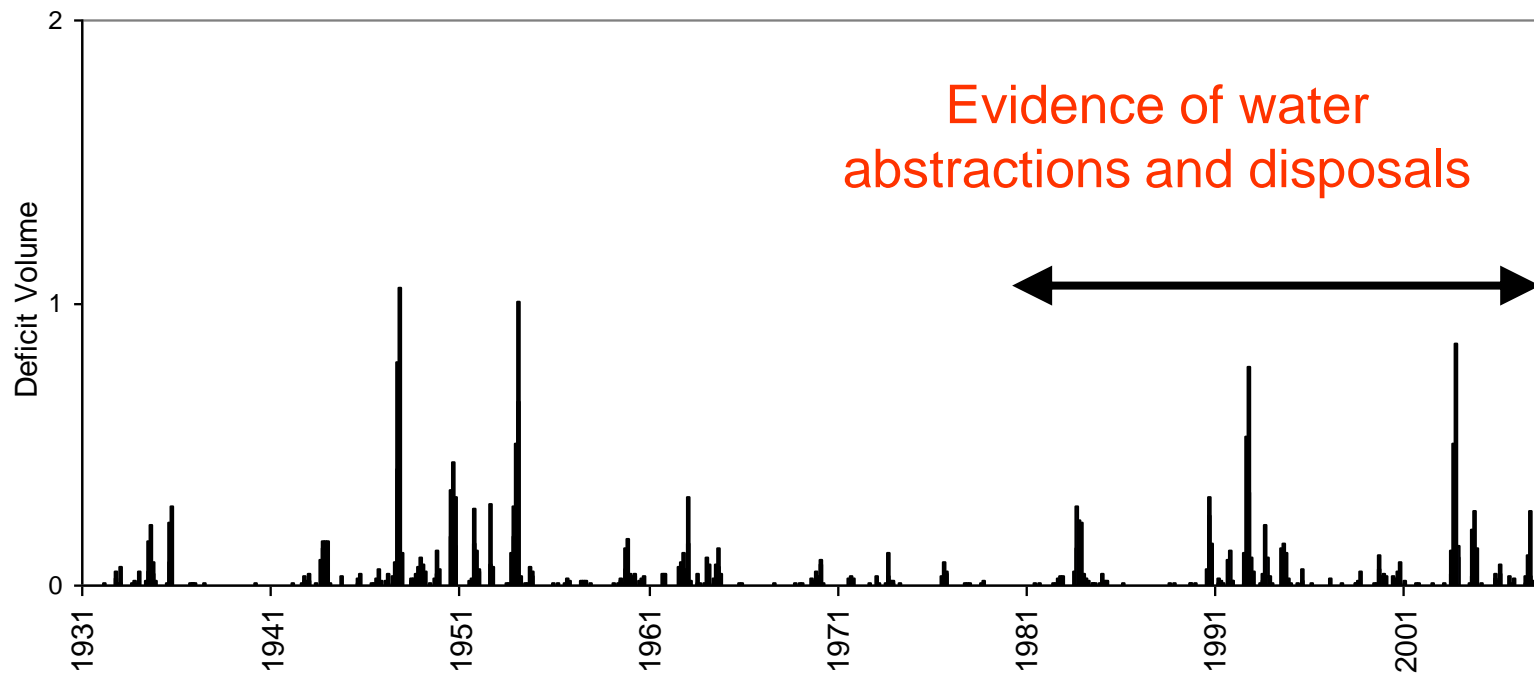
VUV
TGM



Measured
runoff



Unaffected
runoff



RESULTS

- The discharge analysis on station Děčín (Labe) since 1851 revealed the maximum standardized deficit volumes up to 3 – 3,2, **no severe drought after 1955**
- The reservoir manipulation has **positive effects on drought severity** in most cases
- Maximum deficit volumes obtained in **1947, 1953, 1950, 1992, 2003, 1962, 1951, 1943, 1983, 1934** (Q95 threshold) – a tendency to drought occurrence in a ten year cycle
- The trend analysis does not confirmed **any tendency towards more pronounced droughts** as it was recognized in climatic studies by means of temperature and precipitation totals
- The reason why that could be - incomplete database of abstractions and disposals – difficulties with „clearing“ data from impacts of human activities

RESULTS

- From a comparison of deficit volumes derived from daily data and from monthly data - **the weekly time step** was suggested as appropriate for a drought monitoring system
- The severity index for hydrological drought regarding the deficit volume may be proposed on the scale: moderate (0.2–0.8), serious (0.8–1.5), severe (1.5–2.5) and extreme (>2.5).
- The climate change simulations show distinct **tendency towards more pronounced droughts** in terms of both deficit volumes and duration.

Drought severity	Stand. def. volume	Time duration
Moderate	0,2 - 0,8	0 - 2
Serious	0,8 - 1,5	3 - 4
Severe	1,5 - 2,5	5 - 6
Extreme	> 2,5	> 6

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Refining of current estimates of climate change impacts on water management, agriculture and forestry and adaptation measures proposal

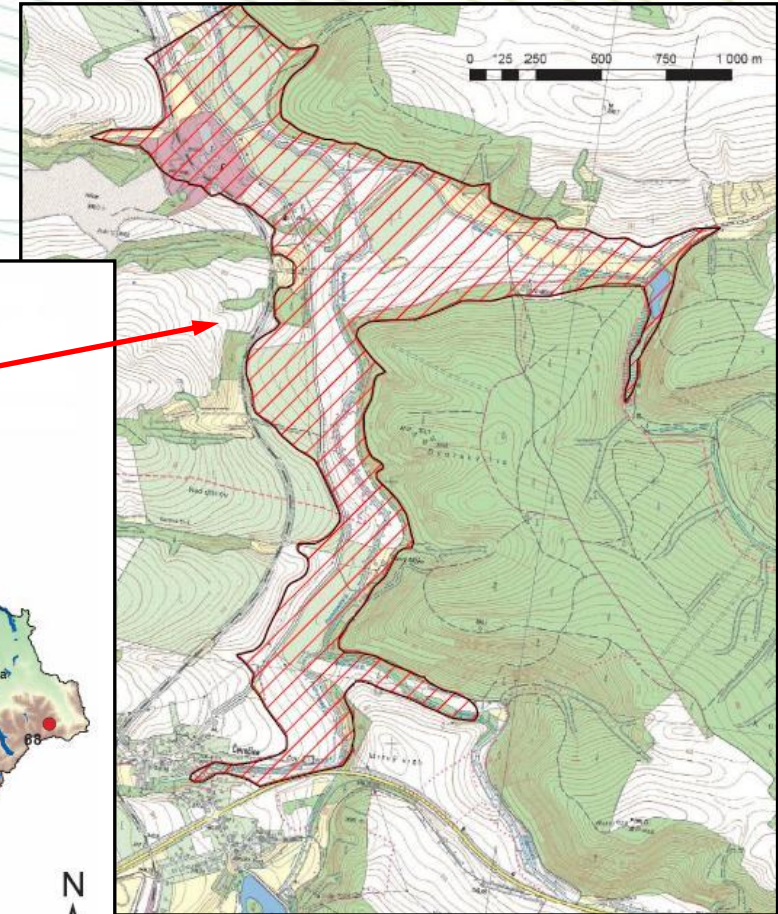
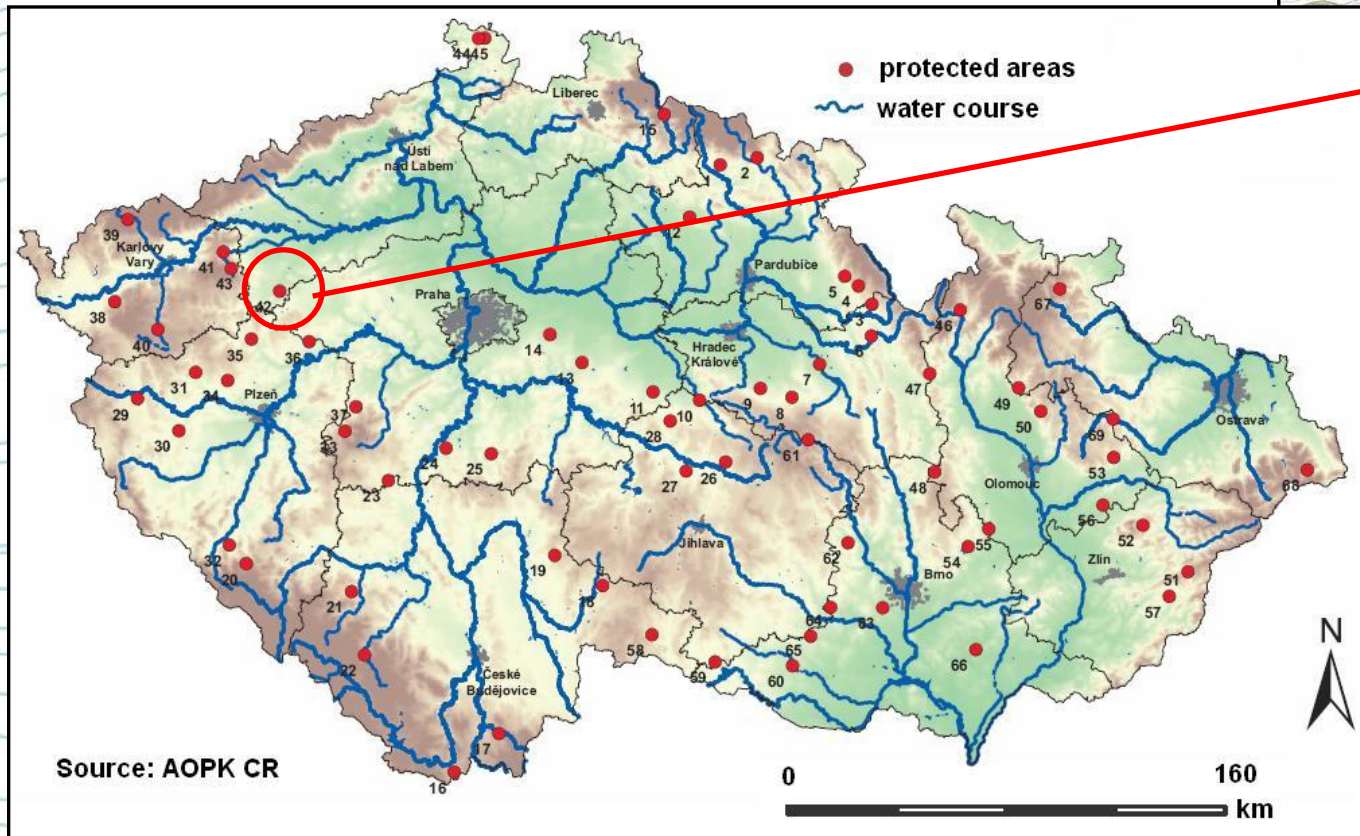
VaV SP/1a6/108/07

Possibilities of adaptation to CC
by construction of new reservoirs

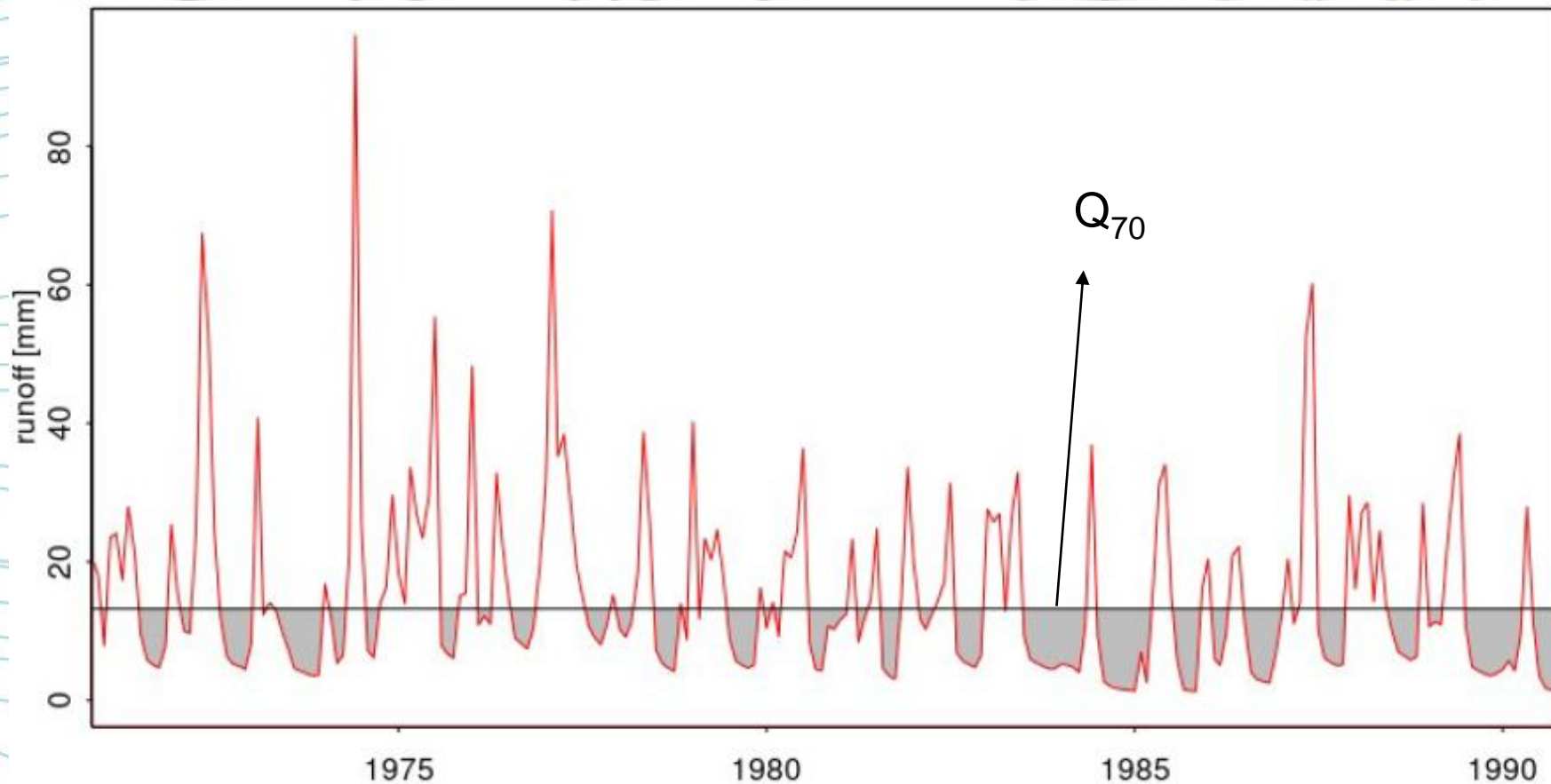
Ing. Martin Hanel, Ph.D.

A general plan for surface water accumulation

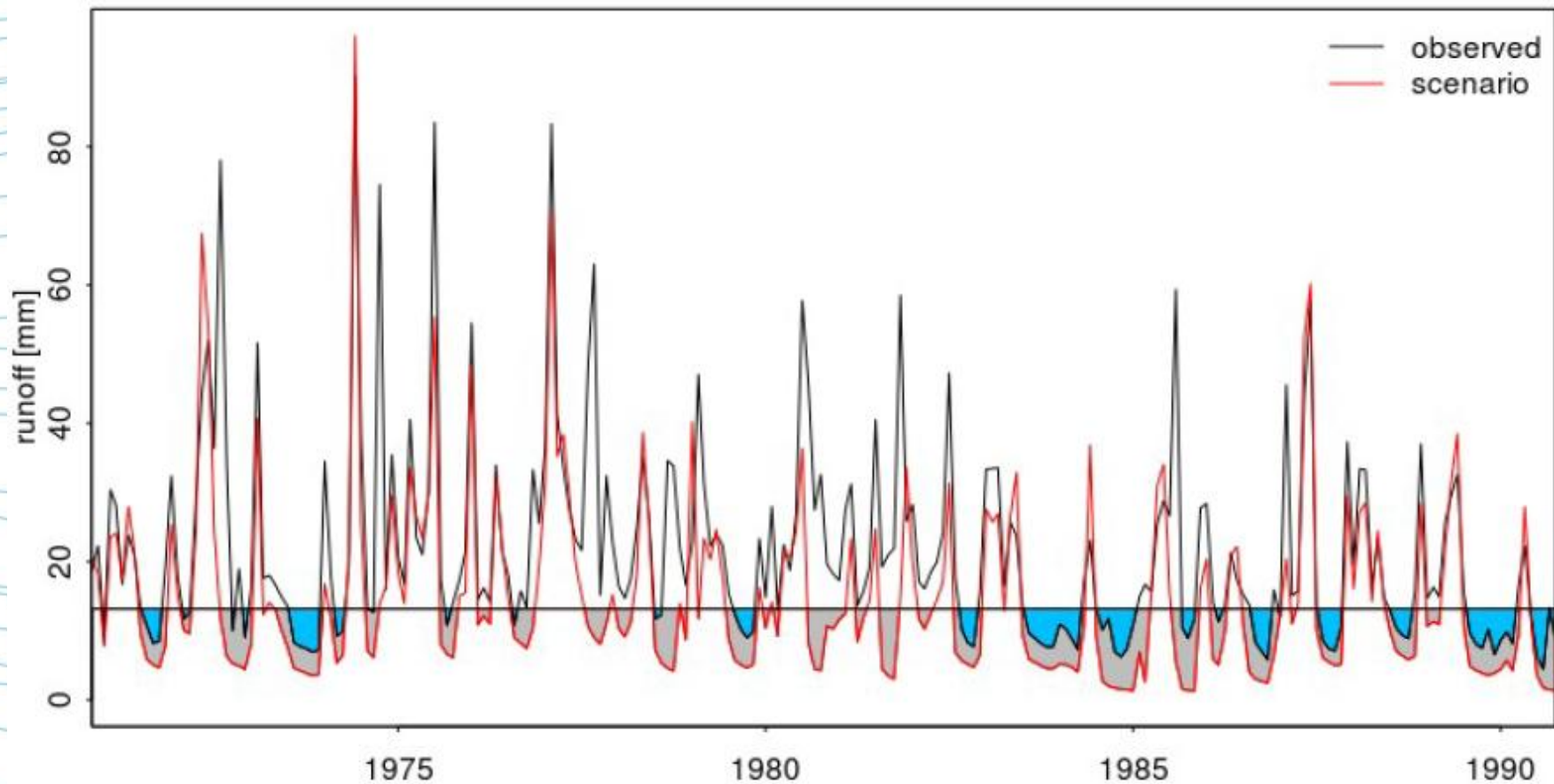
A list of areas with suitable morphological, hydrological and geological conditions for a possible future surface water storage



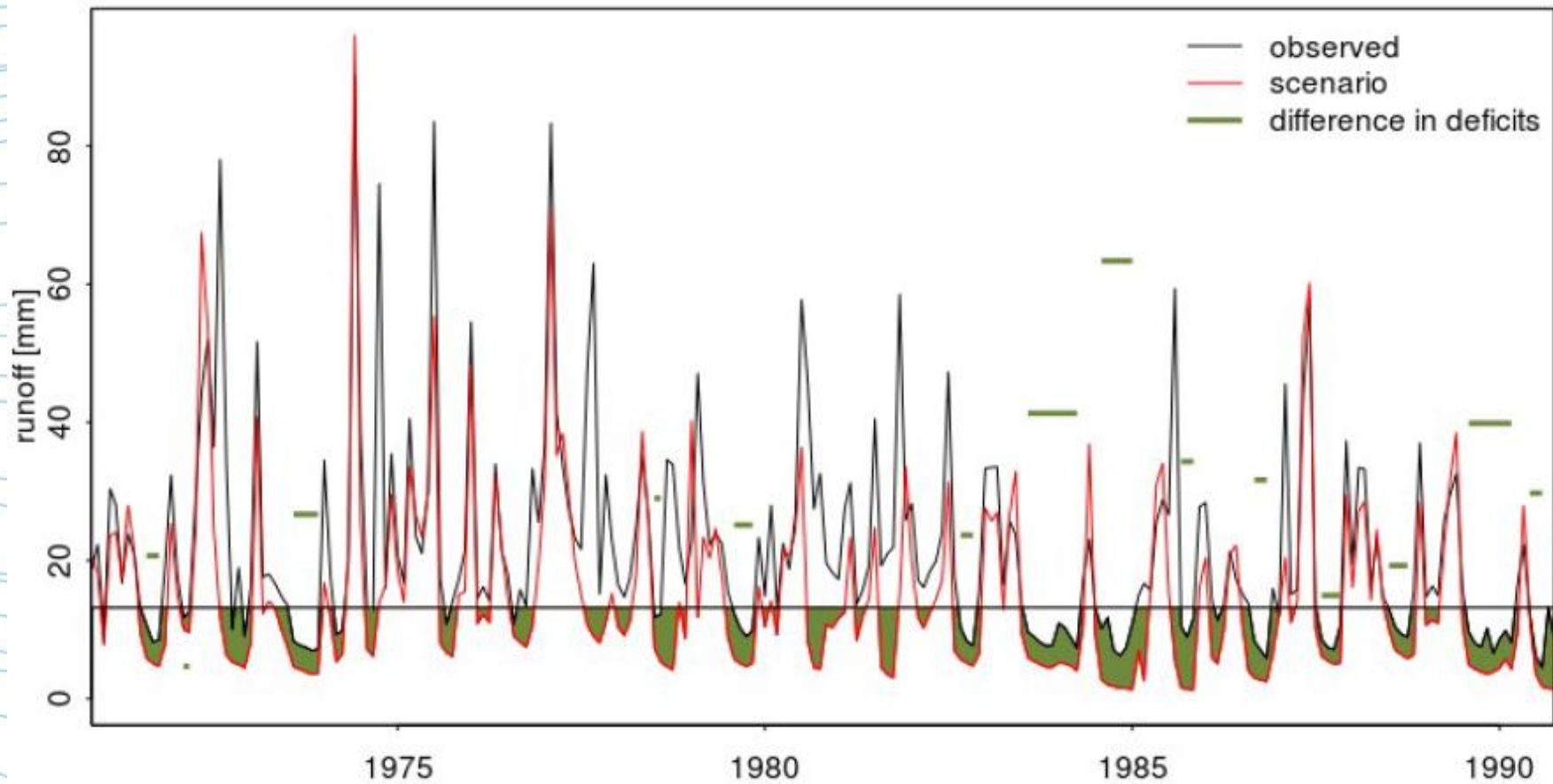
Deficit volume defined for a scenario time series



Deficit volume defined for observed data



Differences in deficits



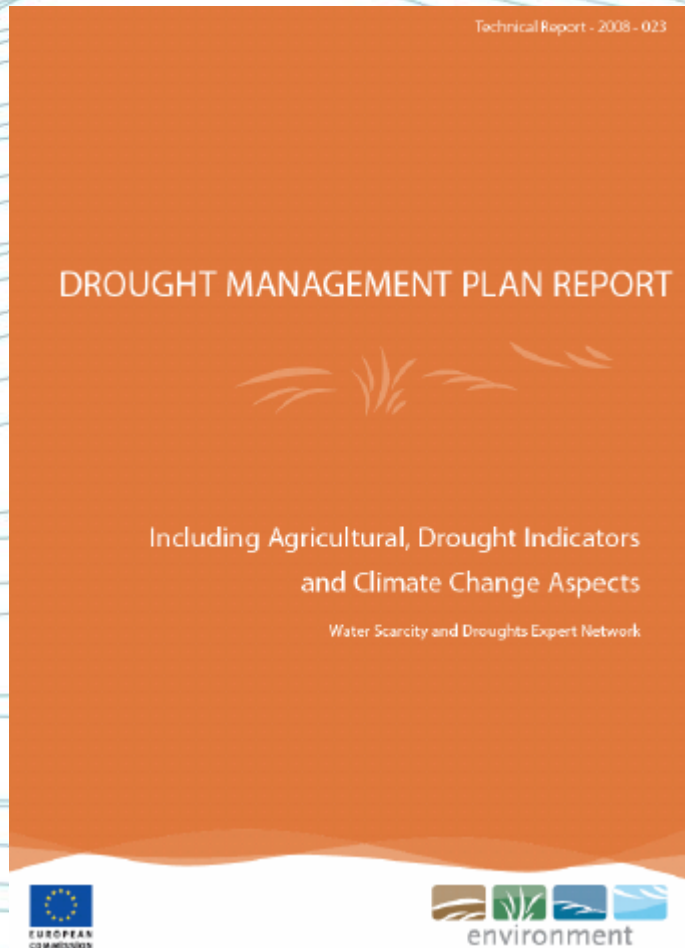
Results for the Elbe river basin

- Accumulation in preserved localities insufficient to saturate medians of differences in deficit volumes on the Czech part of the Elbe river basin to compensate impact of CC
- It is necessary to combine different adaptation measures – structural measures and measures to reduce water demand

River basin district	Volume available	2025		2055		2085	
		$\Delta\text{DEF}_{\text{MED}}$	diff.	$\Delta\text{DEF}_{\text{MED}}$	diff.	$\Delta\text{DEF}_{\text{MED}}$	diff.
Upper and M. Elbe	149.2	41.86	107.3	133.19	16.01	144.7	4.5
Upper Vltava	72.4	45.09	27.31	209.22	-136.8	302.5	-230.1
Berounka	233.2	12.73	220.5	68.72	164.48	76.47	156.73
Vltava	56.9	18.6	38.3	74.26	-17.36	94.83	-37.93
Ohre and Lower Elbe	98.8	29.55	69.25	118.29	-19.49	171.59	-72.79

Proposal of a concept for managing emergency situations associated with drought and water scarcity in the Czech Republic

2010 - 2014



- The aim is to work out guidelines for a drought management plan preparation
- Three basic elements of a plan: – a system of drought statuses and related indicators, a forecasting system and measures applied during a drought event (a hierarchy of water supply restrictions, drought management working groups...)
- Guidelines for indicator thresholds setting for different drought statuses
- Proposal of a drought management legislation – definitions, management ...

Determination of minimum residual flows

Ing. Pavel Balvín, Ing. Petr Vyskoč, Mgr. Pavel Rosendorf
Ing. Arnošt Kult

Ministry of the Environment

- Based on not effected values of Q330d, Q355d, Q364d

Discharge Q355d	MRF
smaller than $0,05 \text{ m}^3 \cdot \text{s}^{-1}$	Q330d
$0,05 - 0,5 \text{ m}^3 \cdot \text{s}^{-1}$	$(\text{Q330d} + \text{Q355d}) \cdot 0,5$
$0,51 - 5,0 \text{ m}^3 \cdot \text{s}^{-1}$	Q355d
bigger than $5,0 \text{ m}^3 \cdot \text{s}^{-1}$	$(\text{Q355d} + \text{Q364d}) \cdot 0,5$

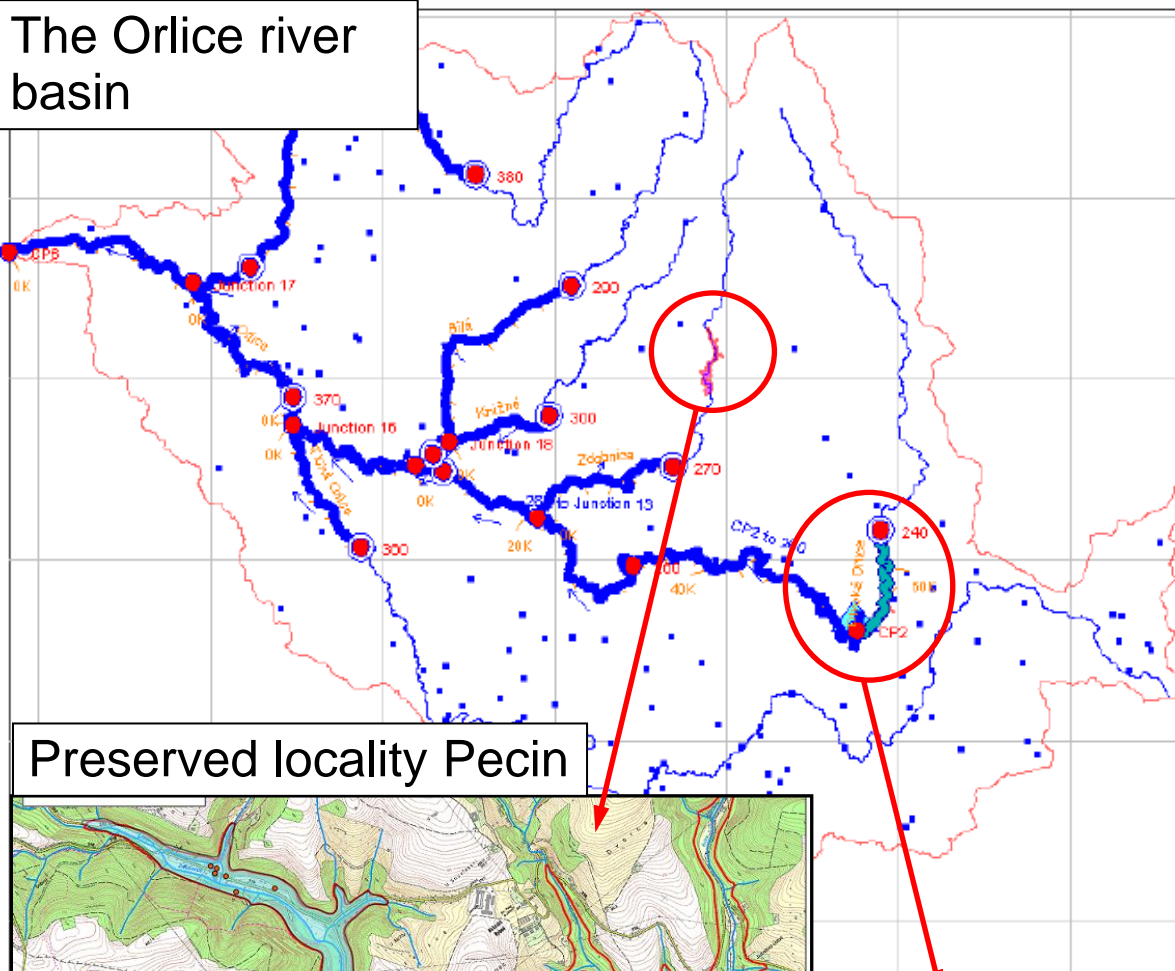
- 1 value of MRF for whole year
- No season diversity



Thank you for your attention

Guidance for Adaptation Measures Proposal

The Orlice river basin



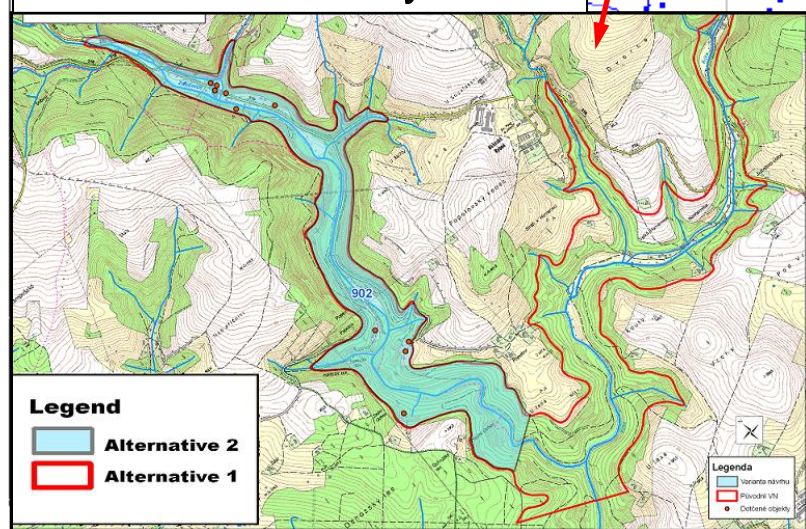
A research of adaptation measures to minimise climate change impacts on water resources in the Czech Rep.

The aim – to define guidelines for proposal of adaptation measures on water resources and to estimate the effectiveness of measures applied in water reservoir management

As a framework – CIS guidance No. 24 and a methodology of risk assessment

Tools for modeling – BILAN, HECResSim

Preserved locality Pecin



Pastviny reservoir

