

ČESKÝ  
HYDROMETEOROLOGICKÝ  
ÚSTAV



# DROUGHT INDECES APPROPRIATE FOR STREAM FLOW DERIVED FROM SPI

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MKOL, Povodí Vltavy, Praha, 2015-12-02

# CONVENTIONAL INDECES

## GOAL: Drought severity evaluation

### Many Indeces

- % of Normal
- Threshold Value – Q355
- Peak Over Threshold (Deficit Volume) – Q70, Q95, Q80  
fixed or monthly variable

→ limited information  
(above or below limit, duration)

Extremity ?    Intensity ?    Which limit to use ?



# RESEARCH

T.G.M Water Research Institute

Security research funded by Ministry of the Interior of the ČR

Project on Hydrological Drought Indices and its limit values  
(2010–2014)

→ methodology for hydrological drought indices



# RESEARCH: SPI

**SPI:** Standardized Precipitation Index (McKee et al., 1993)

- Worldwide used by National Meteo Services
- Recommended by WMO
- Observed values (not models)

**ADVANTAGE:** Description of

- Severity
- Duration
- Intensity

Why not for other variables like **stream flow** ?

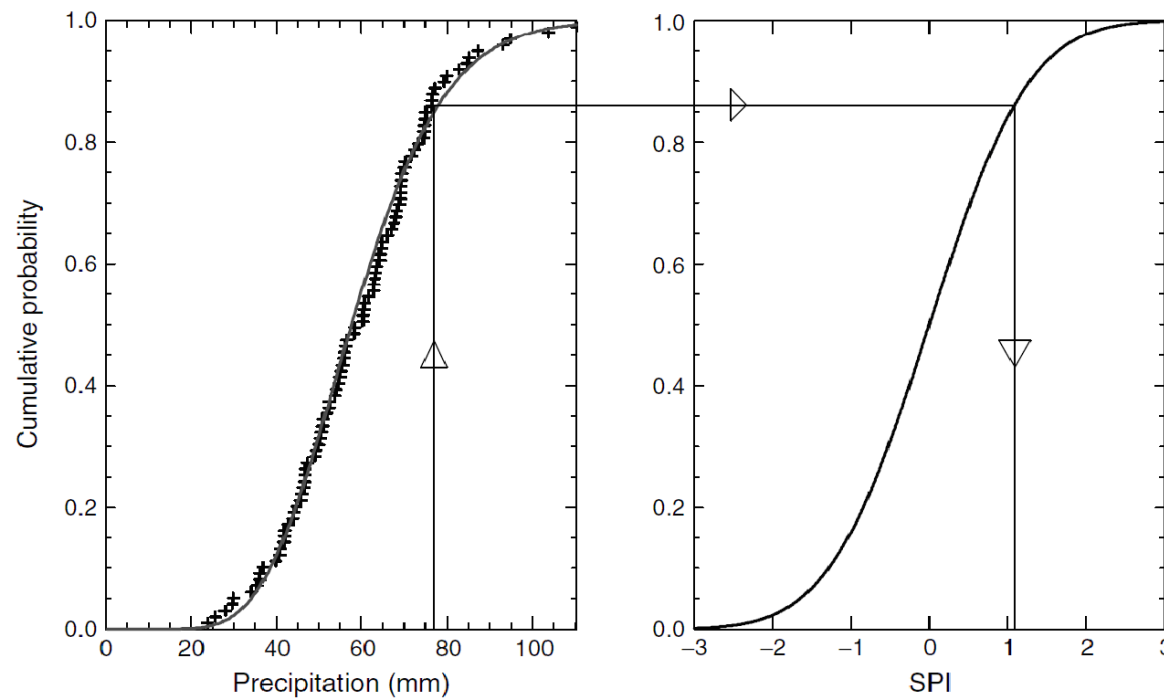


# SRI (Standardized Runoff Index)

(Shukla, Wood, 2008)

**SPI:** 1, 3, 6, 9, 12 months precipitation totals

**SRI:** Mean weekly flow



**z-distribution**

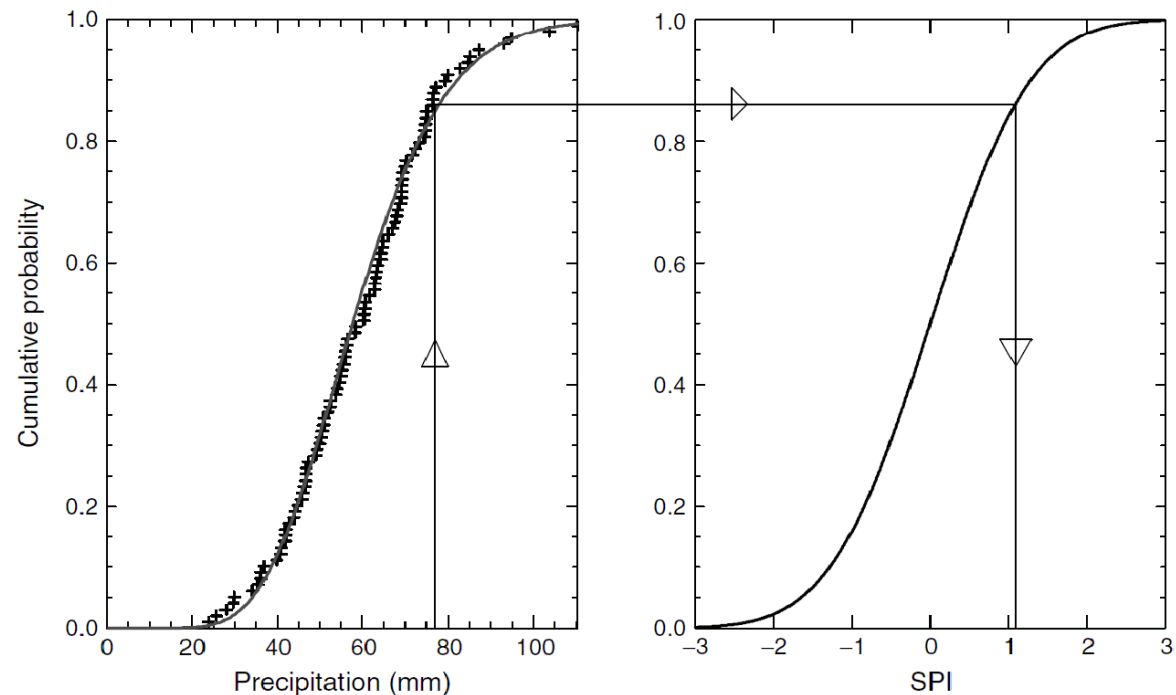
**MEAN = 0**

**SD = 1**

**VALUES  $\approx (-3, 3)$**

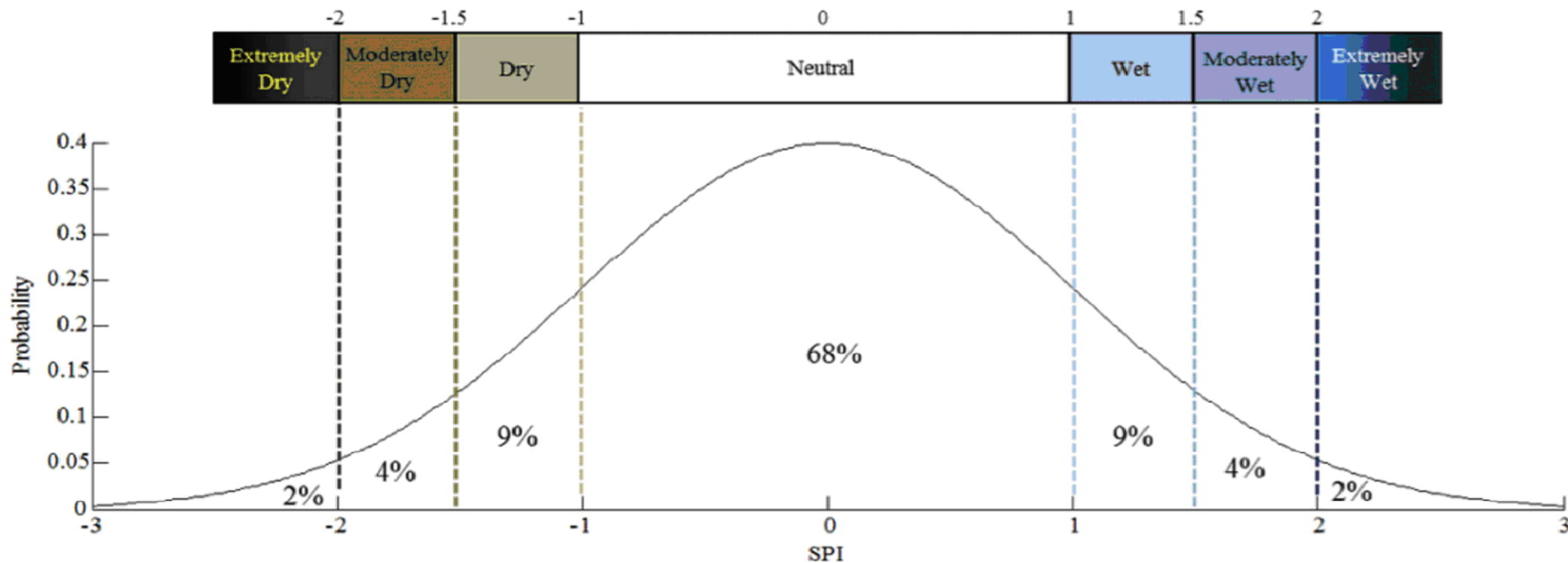
# SRI

1. **Stream Flow Record:** Long-term observation organized to 52 groups according to the ISO week number
2. **Fitting the theoretical distribution function:** Parameters (52 grp.)
3. **Probability**
4. **Transformation to the z-distr.**
5. **Index values**



# DATA PROCESSING

1. **Stream Flow Record:** Long-term observation organized to 52 groups according to the ISO week number
2. **Fitting the theoretical distribution function:** Parameters (52 grp.)
3. **Probability**
4. **Transformation to the z-distr.**
5. **Index values**



## SRI EXTENSION: DMRI

**DMRI** (Drought Magnitude Runoff Index)

- SRI : current week severity
- DMRI: total severity since the drought developed

Analogy to Peak Over Threshold:  $DM = koef * Deficit Volume [mil.^3]$

**1. Sums of SRI values** in drought condition ( $SRI < -1$ )

**2.–5. steps SRI likewise** results in negative DMRI values

To obtain positive DMRI values, the  $SRI > 1$  (wet condition) must be summed up





# SRI EXTENSION: DMRI

## DMRI (Drought Magnitude Runoff Index)

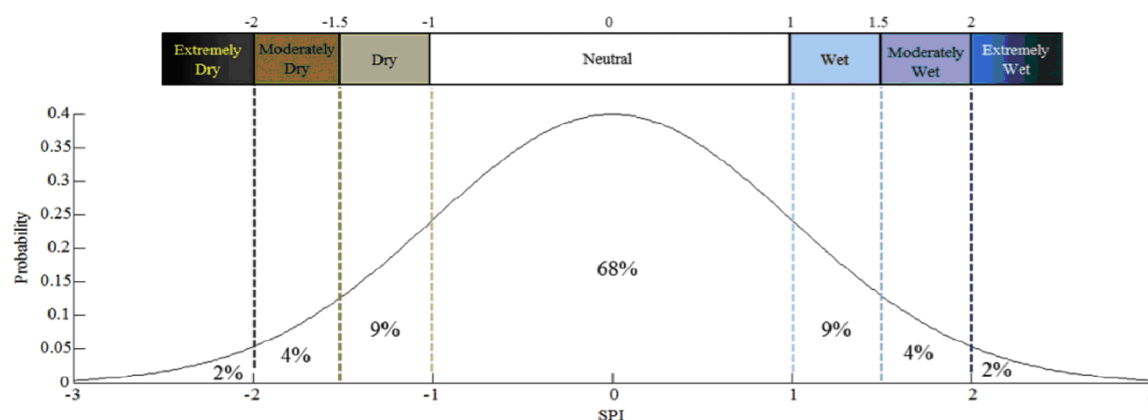
- SRI : current week severity
- DMRI: total severity since the drought developed

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**1. Sums of SRI values** in drought condition ( $SRI < -1$ )

**2.–5. steps SRI likewise** results in negative DMRI values

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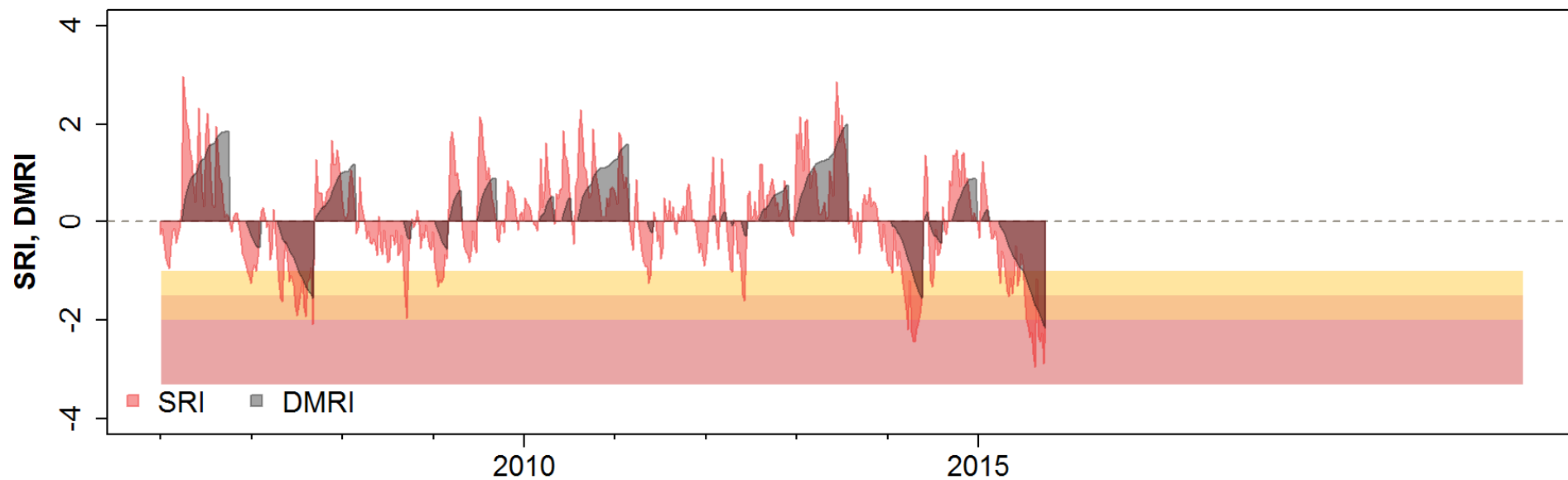


SRI, DMRI	Classification	p
$\geq 2$	Extremely wet	2,3 %
1,5 to 1,99	Severely wet	4,4 %
1 to 1,49	Moderately wet	9,2 %
-0,99 to 0,99	Normal	68,2 %
-1 až -1,49	Moderately dry	9,2 %
-1,5 až -1,99	Severely dry	4,4 %
$\leq -2$	Extremely dry	2,3 %

# STREAM FLOW EVALUATION

## Example 1A

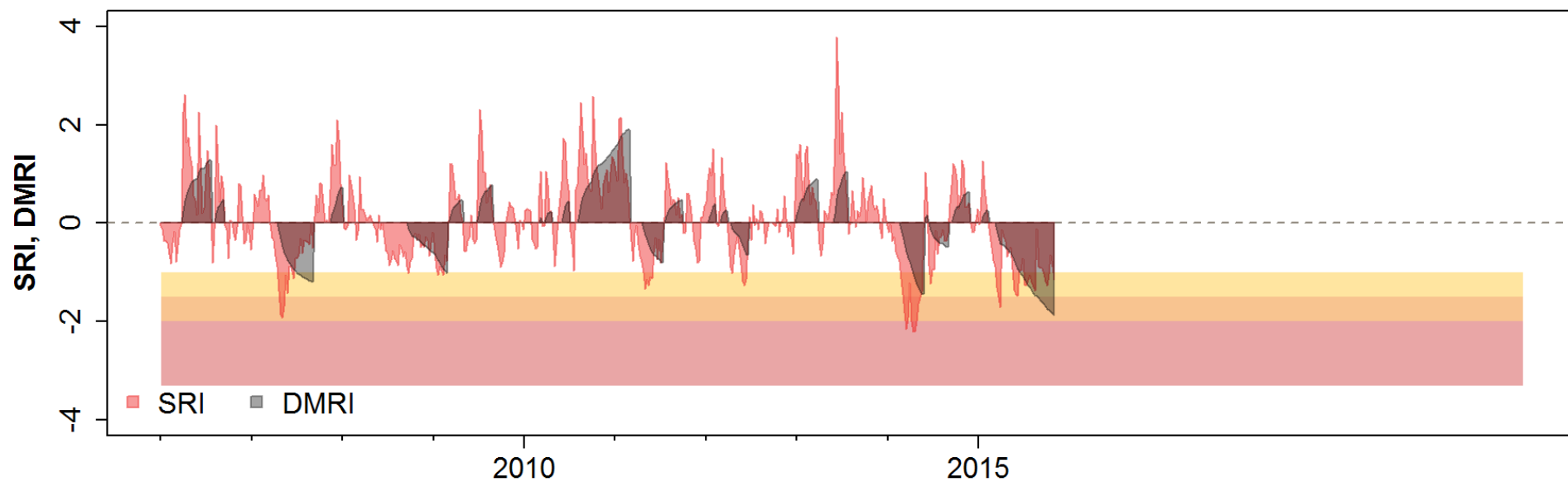
133000 Lužnice (Bechyně)



# STREAM FLOW EVALUATION

## Example 1B

240000 Labe (Ústí n. L.)

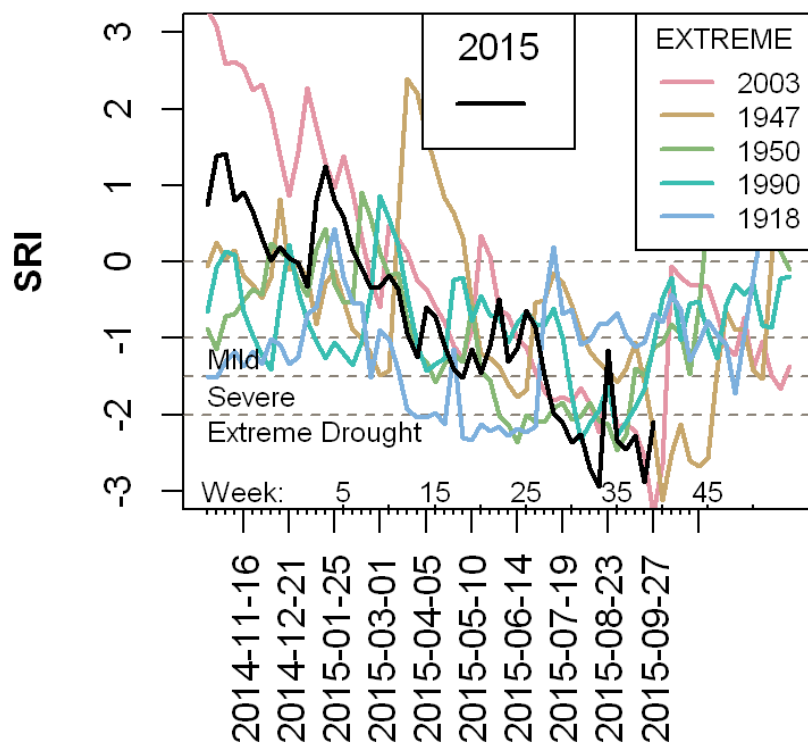


# STREAM FLOW EVALUATION

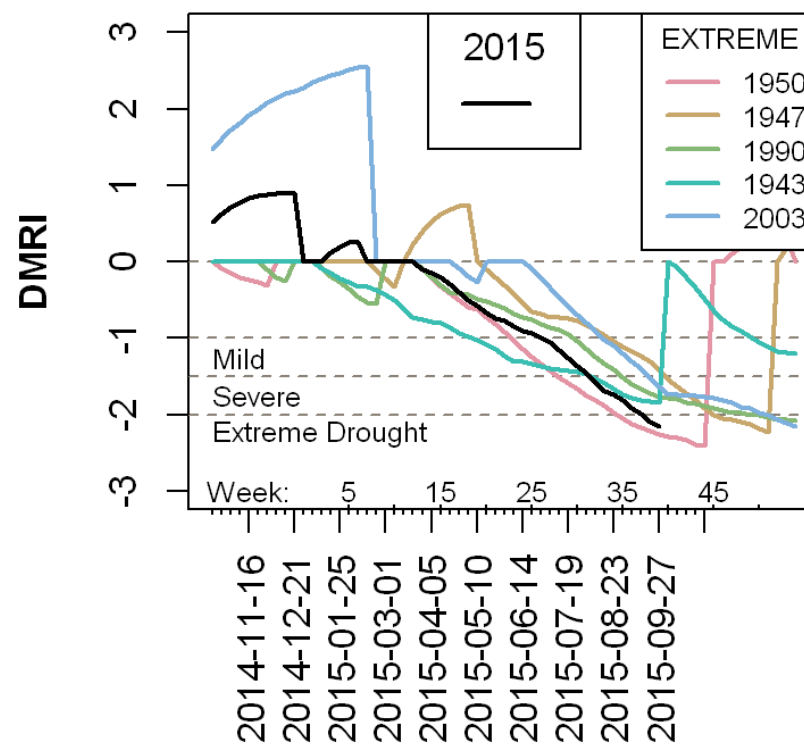
## Example 2A

133000 Lužnice (Bechyně)

**SRI - 133000**  
**Lužnice - Bechyně**



**DMRI - 133000**  
**Lužnice - Bechyně**

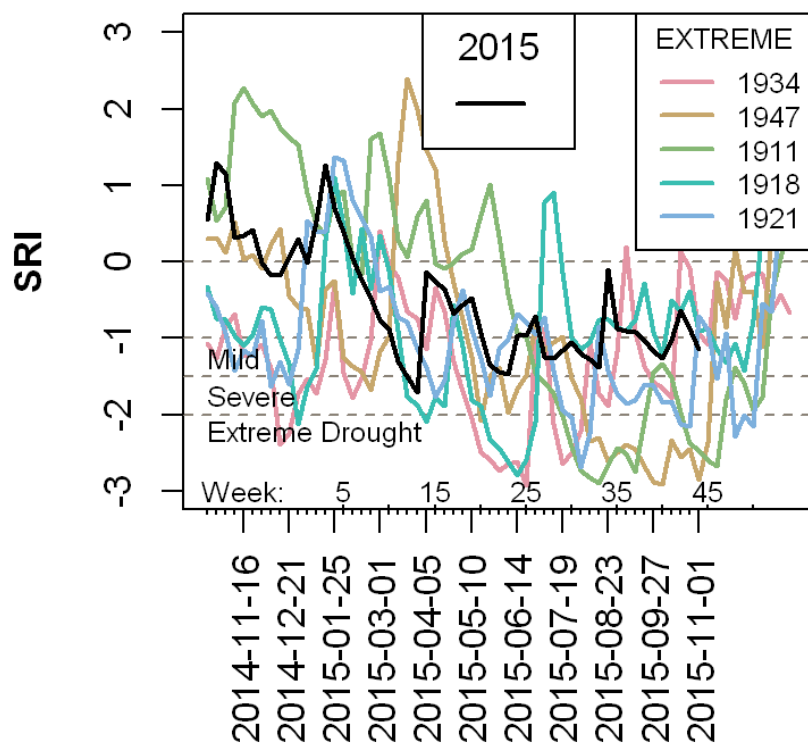


# STREAM FLOW EVALUATION

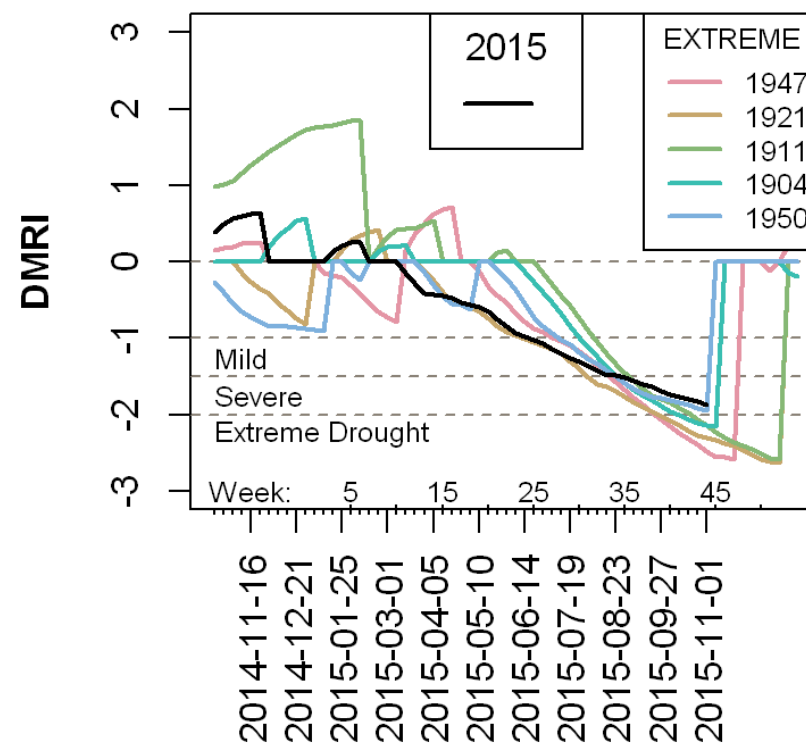
## Example 2B

240000 Labe (Ústí n. L.)

**SRI - 240000**  
Labe - Ústí n.L.

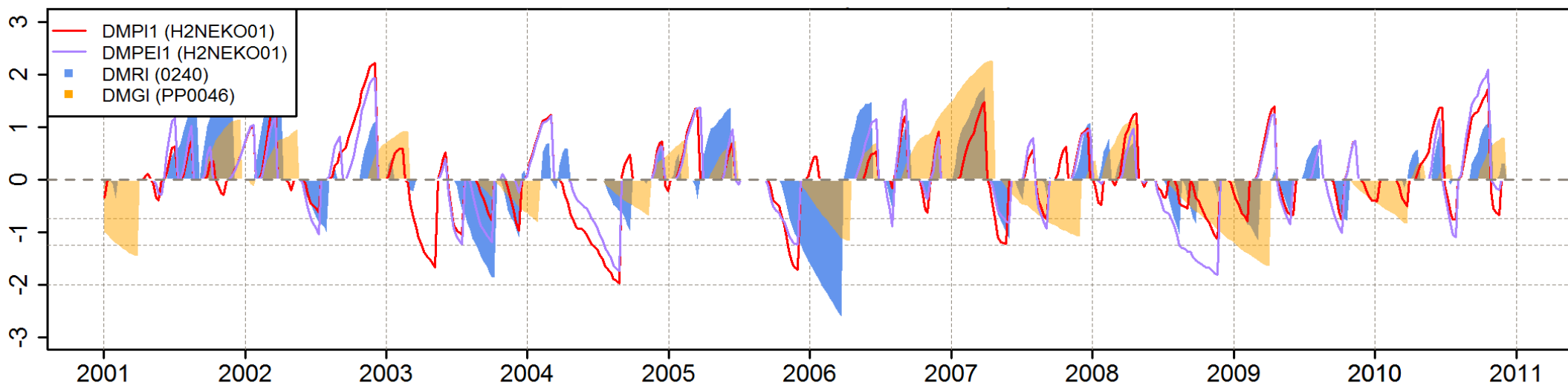


**DMRI - 240000**  
Labe - Ústí n.L.

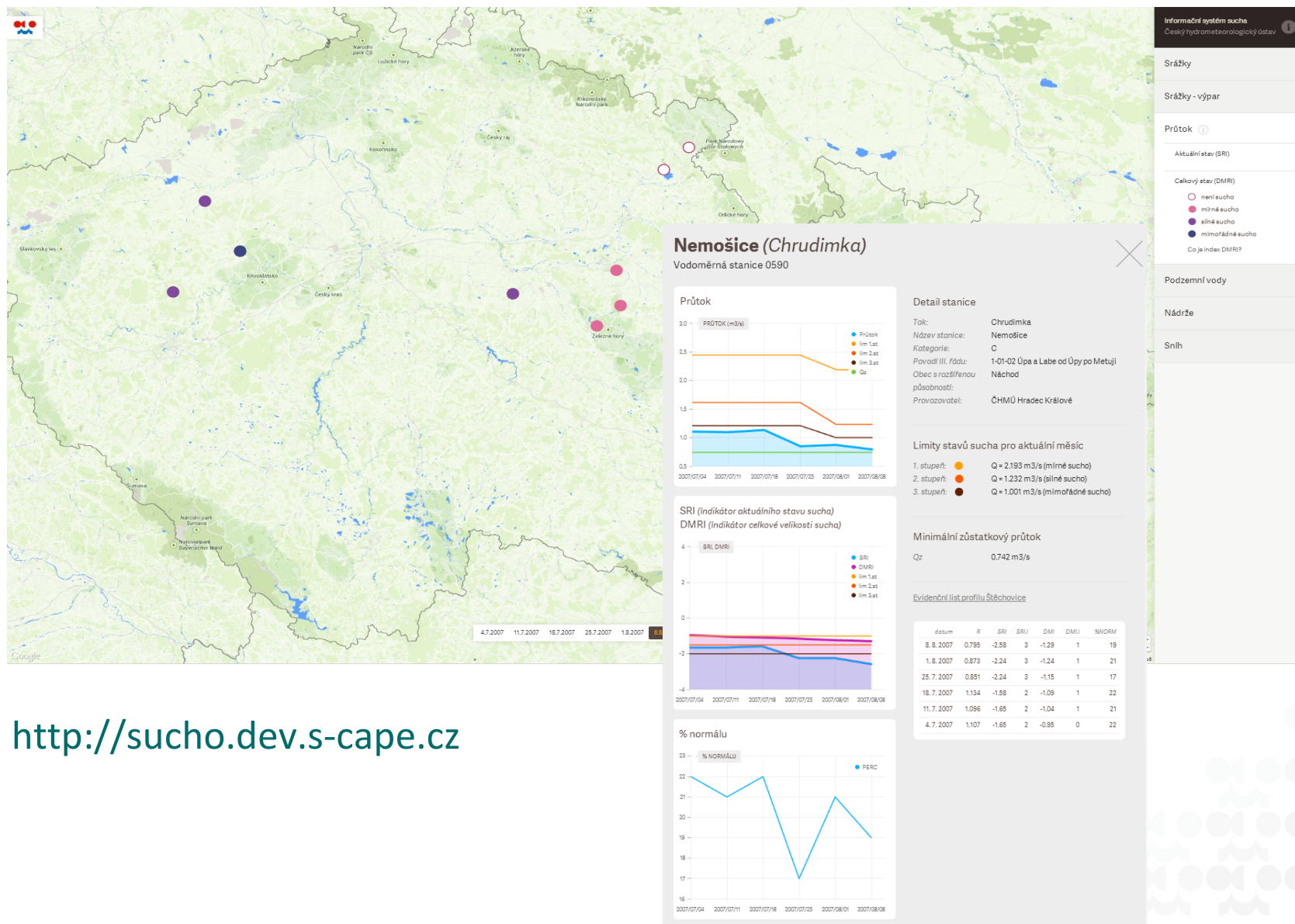


# EVALUATION OF: Precipitation – Stream flow – Ground Water Levels Example 3

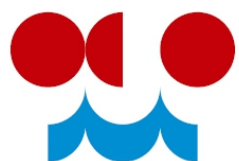
024000 Divoká Orlice (Kláštorec n. O.)



# WEB APPLICATION







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Thank you for your attention

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