

# **Agrometeorological conditions in Vojvodina: past, present and future tense**

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## Agrometeorological conditions in Vojvodina: past, present and future tense

1. **ADAGIO** (Adaptation of agriculture in European regions at environmental risk under climate change"; FP6 – ADAGIO – Proj. No SSPE-CT-2006-044210)
2. **RRP CMEP** (" Reinforcement of Research Potential at Center for Meteorology and Environmental Predictions"; FP 6-RRP CMEP – Proj. No. INCO-WBC/SSA-3-043670)
3. **Modeling and Numerical Simulations of Complex Physical Systems** (Ministry of Science and Development of Republic of Serbia, Basic Research Project 2006-2010: OI 141035)

# Agrometeorological conditions in Vojvodina: past, present and future tense

## Overview

1. Past, present and future (according to scenarios) values and trends of agrometeorological indices in Vojvodina (Northern Serbia) region
2. Irrigation network conditions

## Agrometeorological conditions in Vojvodina: past, present and future tense

**Phase I** – Identification and preparation of data and models

**Phase II** – Assessment of CC impact on agrometeorological indices

## **Agrometeorological conditions in Vojvodina: past, present and future tense**

### **Phase I – Identification and preparation of data and models**

#### **Task**

- 1. Data assimilation and critical analysis for a whole region**
- 2. Assimilation of GCM outputs for different scenarios**
- 3. Calibration and validation of WG**
- 4. Selection of GCM, scenario and integration period**

## Agrometeorological conditions in Vojvodina: past, present and future tense

### Phase I – Identification and preparation of data and models

#### What was done?

Data assimilation and critical analysis – 1958-2005 observation period

- daily maximum and minimum temperatures,
- precipitation
- solar radiation
- water vapour pressure

Assimilation of GCM outputs for different integration periods and sensitivities

- three climate scenarios (HadCM3, ECHAM5, NCAR-PCM)
- SRES-A2 GHG emission scenario
- three integration periods (2045, 2085) + standardised scenario

## Agrometeorological conditions in Vojvodina: past, present and future tense

### Phase I – Identification and preparation of data and models

#### What was done?

##### Calibration and validation of WG

- Calibration of Met&Roll WG: 1958-1990
- Validation of Met&Roll WG: 1990-2005

##### Selection of GCM, scenario and integration period

- Average annual and VP\* relative error of maximum (rTmax), minimum (rTmin) and daily temperatures (rTd0) monthly sums averaged over 1990-2005 validation period

\*VP = vegetation period

## Agrometeorological conditions in Vojvodina: past, present and future tense

Scenarios	rmaetmax (%)	rmaetmin (%)	rmaet (%)
H-45MI	3.7	5.9	4.0
H-85MI	4.6	8.8	5.4
<b>H-STD1</b>	<b>3.5</b>	<b>5.4</b>	<b>3.8</b>
M-45MI	3.6	5.5	3.8
M-85MI	4.2	7.6	4.7
<b>M-STD1</b>	<b>3.4</b>	<b>5.2</b>	<b>3.6</b>
N-45MI	3.6	5.6	3.9
N-85MI	4.4	7.7	5.0
<b>N-STD1</b>	<b>3.5</b>	<b>5.3</b>	<b>3.7</b>

**VP average**

Scenarios	rmaetmax (%)	rmaetmin (%)	rmaet (%)
H-45MI	<b>18.2</b>	45.8	<b>11.5</b>
H-85MI	21.1	51.7	16.0
<b>H-STD1</b>	<b>17.6</b>	<b>44.2</b>	<b>11.0</b>
M-45MI	19.2	<b>43.8</b>	14.3
M-85MI	23.3	53.5	20.2
<b>M-STD1</b>	<b>18.2</b>	<b>44.1</b>	<b>13.0</b>
N-45MI	18.8	45.6	13.3
N-85MI	22.0	52.6	18.0
<b>N-STD1</b>	<b>17.9</b>	<b>45.3</b>	<b>12.2</b>

**Annual average**

## **Agrometeorological conditions in Vojvodina: past, present and future tense**

### **Phase II – Assessment of CC impact on agrometeorological indices**

#### **Task**

- 1. Selection of agrometeorological indices and period of interest**
- 2. Calculation of agrometeorological indices time evaluation**
- 3. Analysis of agrometeorological indices trends**

## Agrometeorological conditions in Vojvodina: past, present and future tense

### Phase II – Assessment of CC impact on agrometeorological indices

#### What was done?

##### agrometeorological indices

- summ of temperatures above 0 oC
- cummulative rainfall (H)
- potential evapotranspiration (Wto)
- crop drying day (c1, c2)
- precipitation deficit (H-Wto)
- photothermal unit (PTU)
- heat unit (TU)
- length of growing season (LGS)

##### period of interest

vegetation period

## Agrometeorological conditions in Vojvodina: past, present and future tense

### Phase II – Assessment of CC impact on agrometeorological indices

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##### period of interest

vegetation period

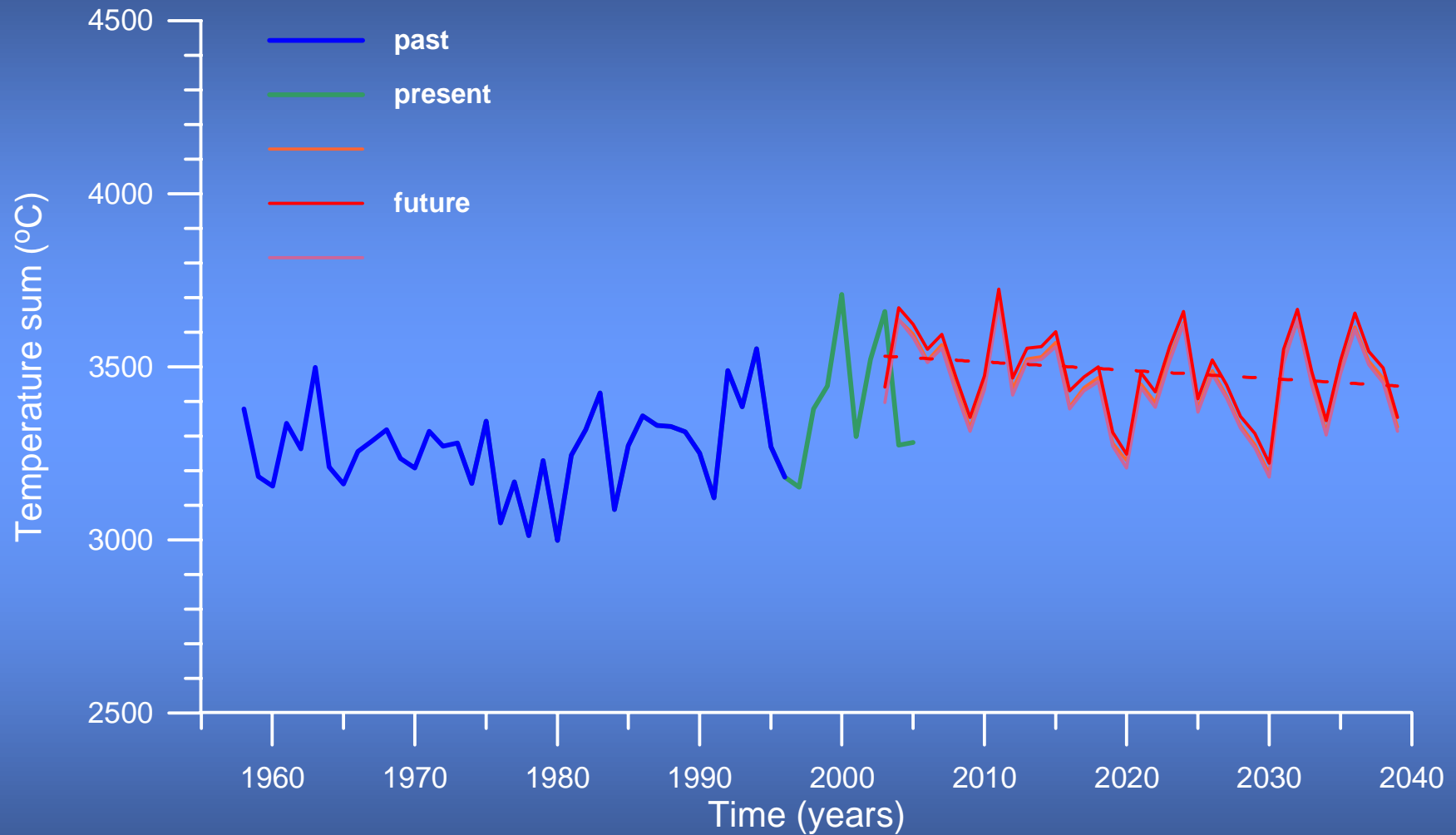
## Agrometeorological conditions in Vojvodina: past, present and future tense

### Phase II – Assessment of CC impact on agrometeorological indices

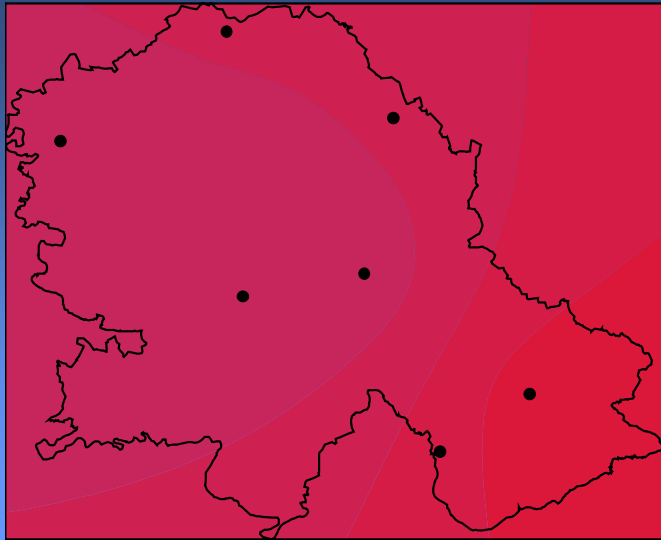
#### Summ of temperature

Monthly summ of daily temperatures above 0 oC

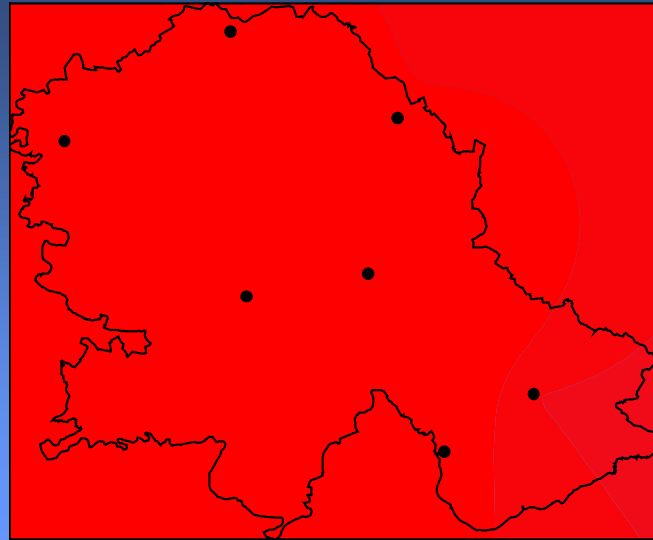
## Agrometeorological conditions in Vojvodina: past, present and future tense



1981-2006

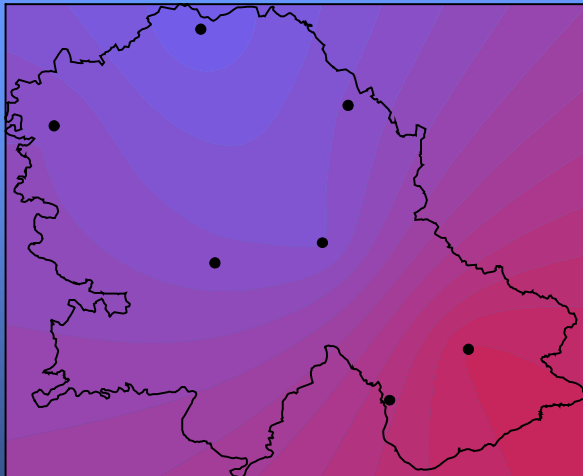


1996-2006

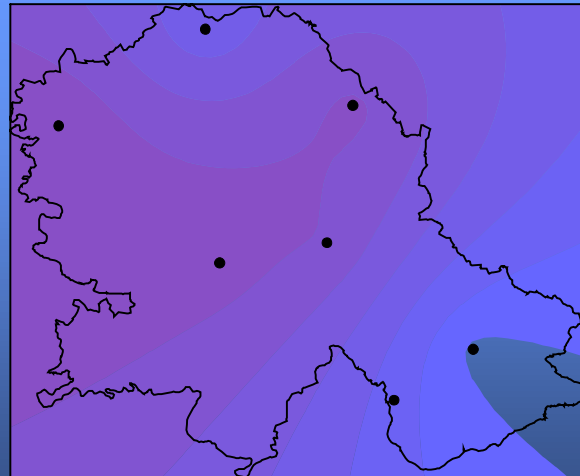


2006-2040

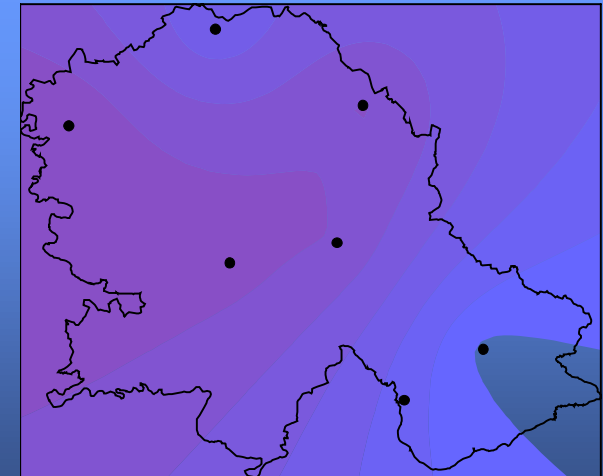
HadCM3



ECHAM5



NCAR-PCM



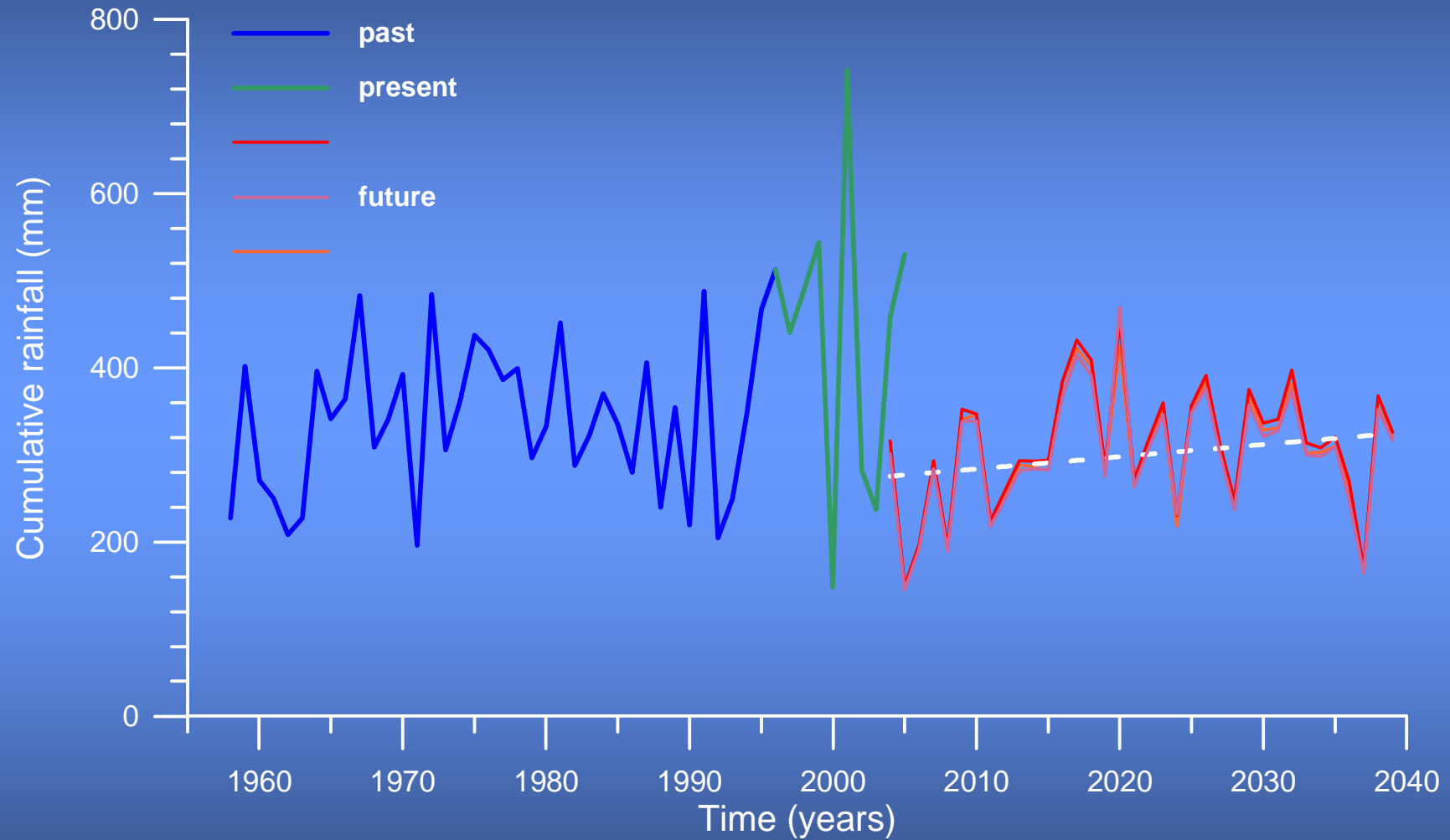
## **Agrometeorological conditions in Vojvodina: past, present and future tense**

### **Phase II – Assessment of CC impact on agrometeorological indices**

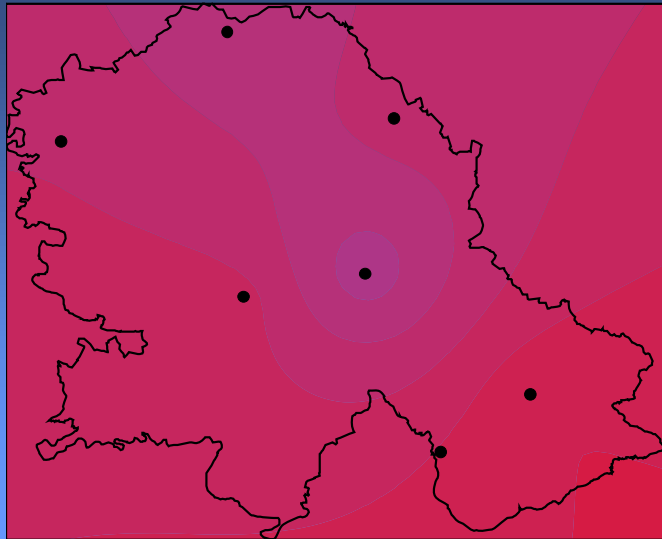
#### **Cumulative rainfall (H)**

Monthly summ of precipitation

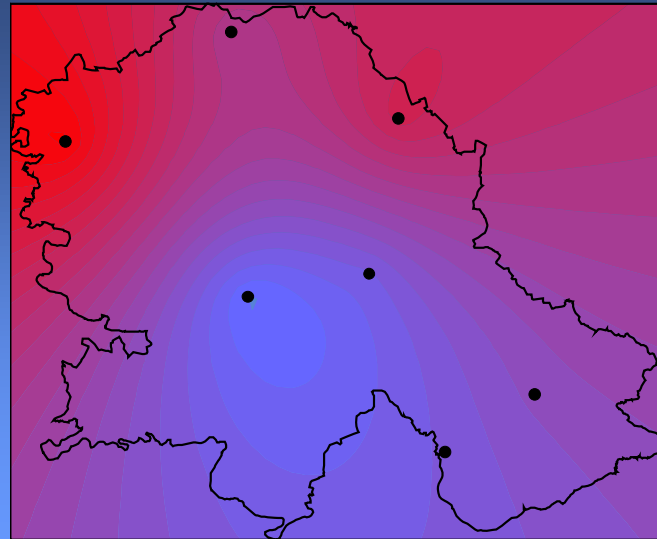
## Agrometeorological conditions in Vojvodina: past, present and future tense



**1981-2006**

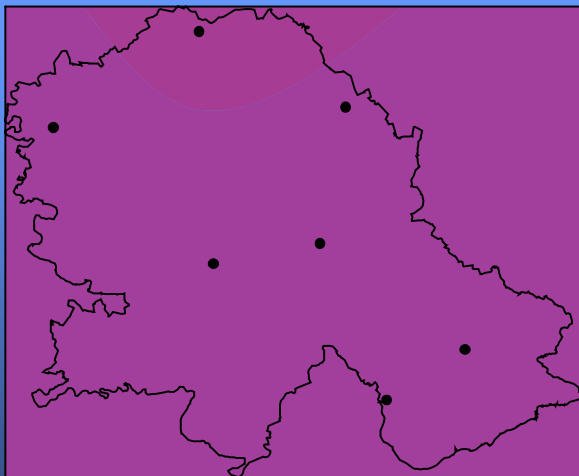


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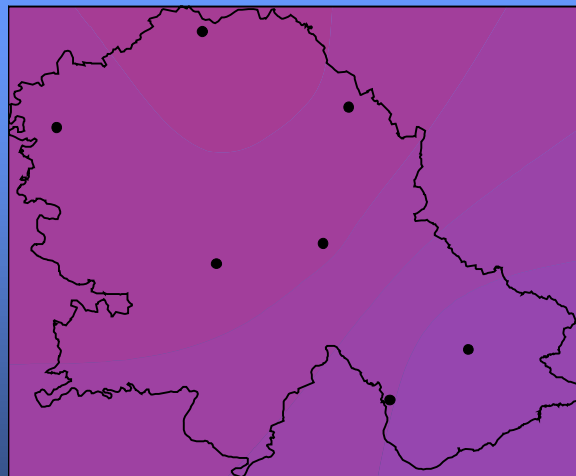


**2006-2040**

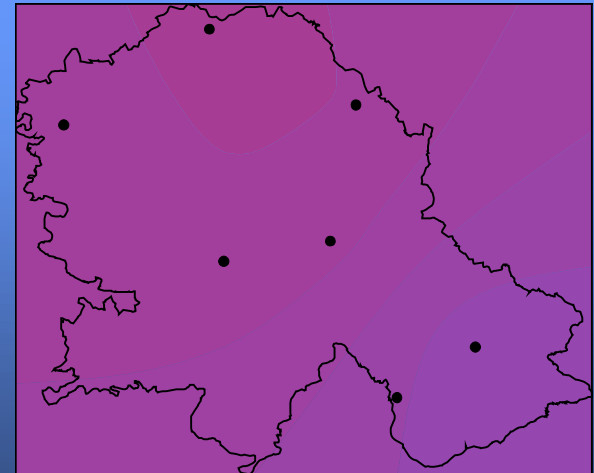
**HadCM3**



**ECHAM5**



**NCAR-PCM**



## Agrometeorological conditions in Vojvodina: past, present and future tense

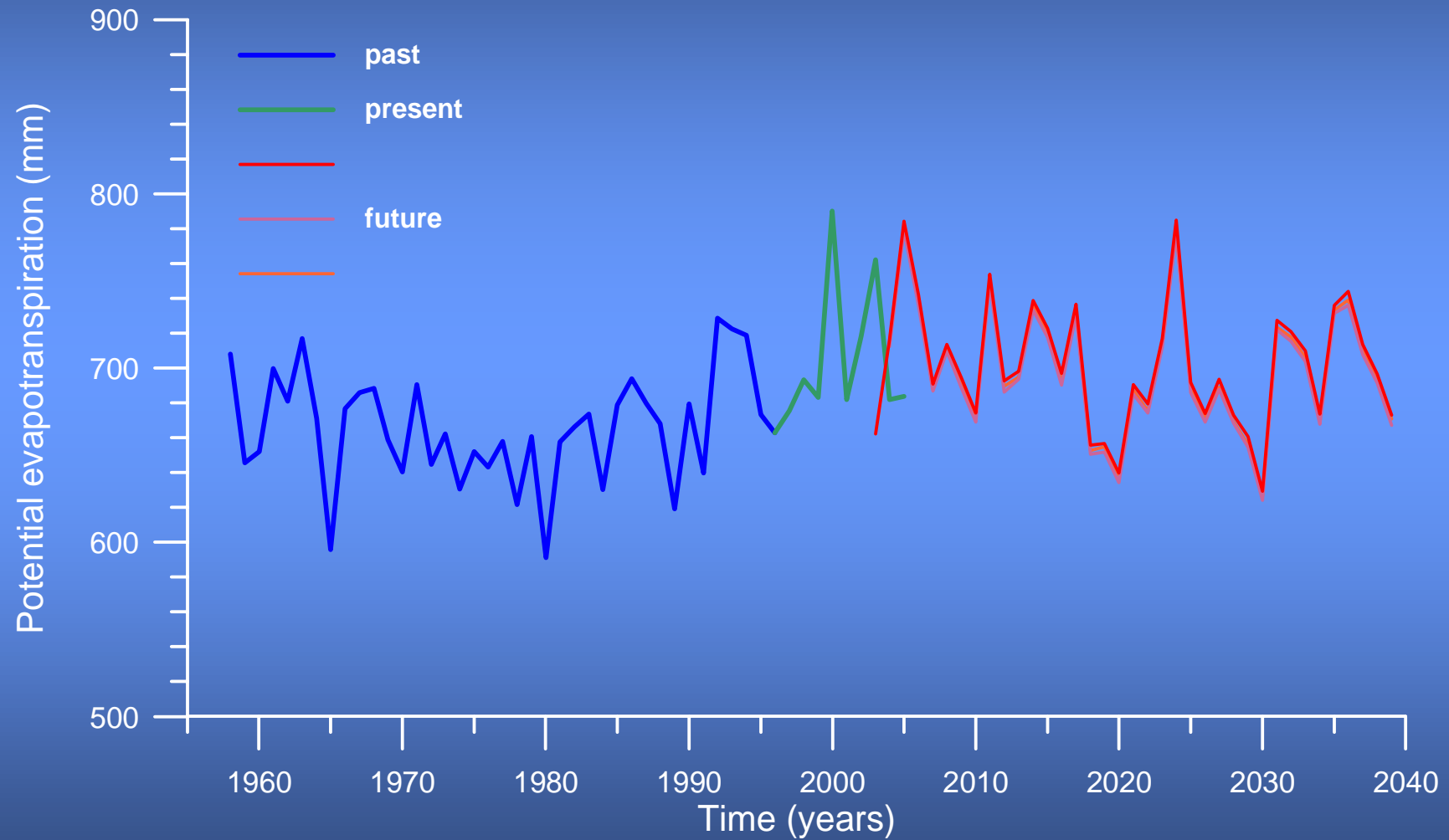
### Phase II – Assessment of CC impact on agrometeorological indices

#### Potential evaporation from vegetated surface ( $W_{to}$ )

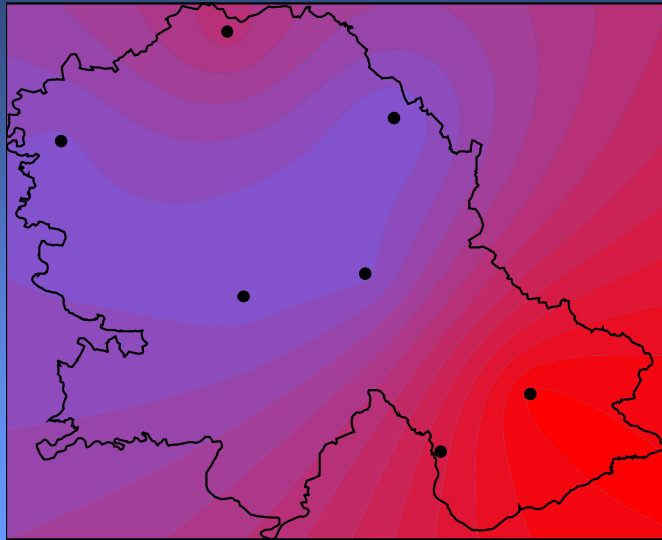
Calculated using Turc's formula

$$W_{to} = k (G + 209.21) \frac{t}{t + 15}$$

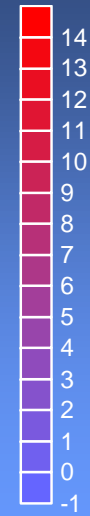
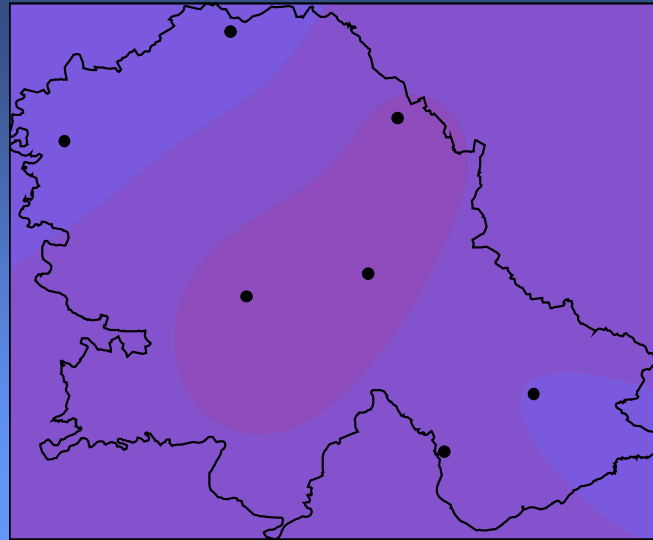
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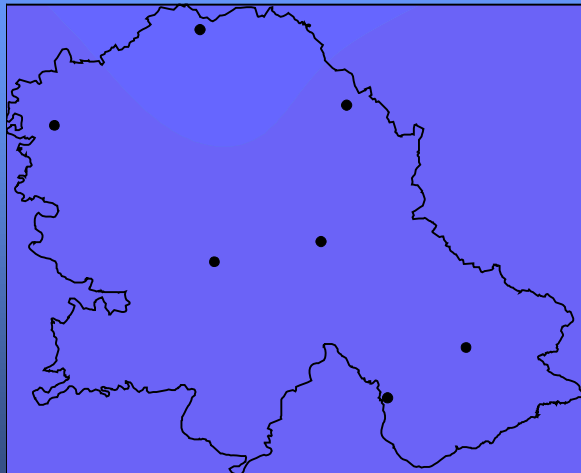


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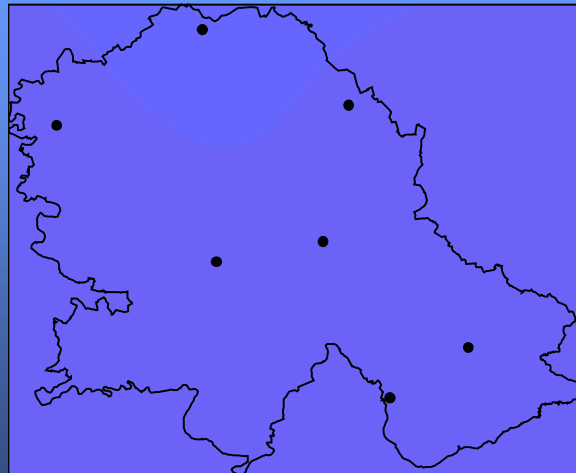


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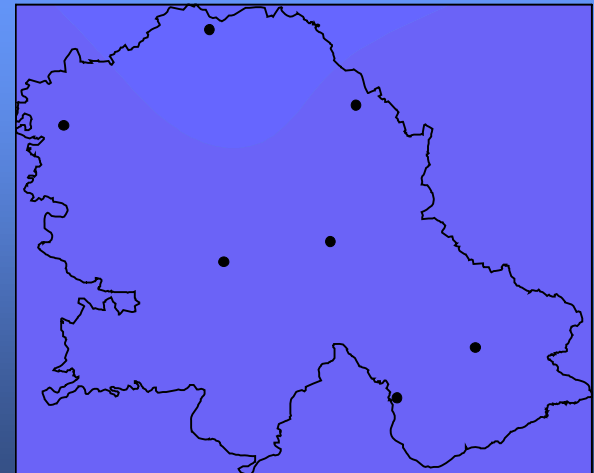
**HadCM3**



**ECHAM5**



**NCAR-PCM**



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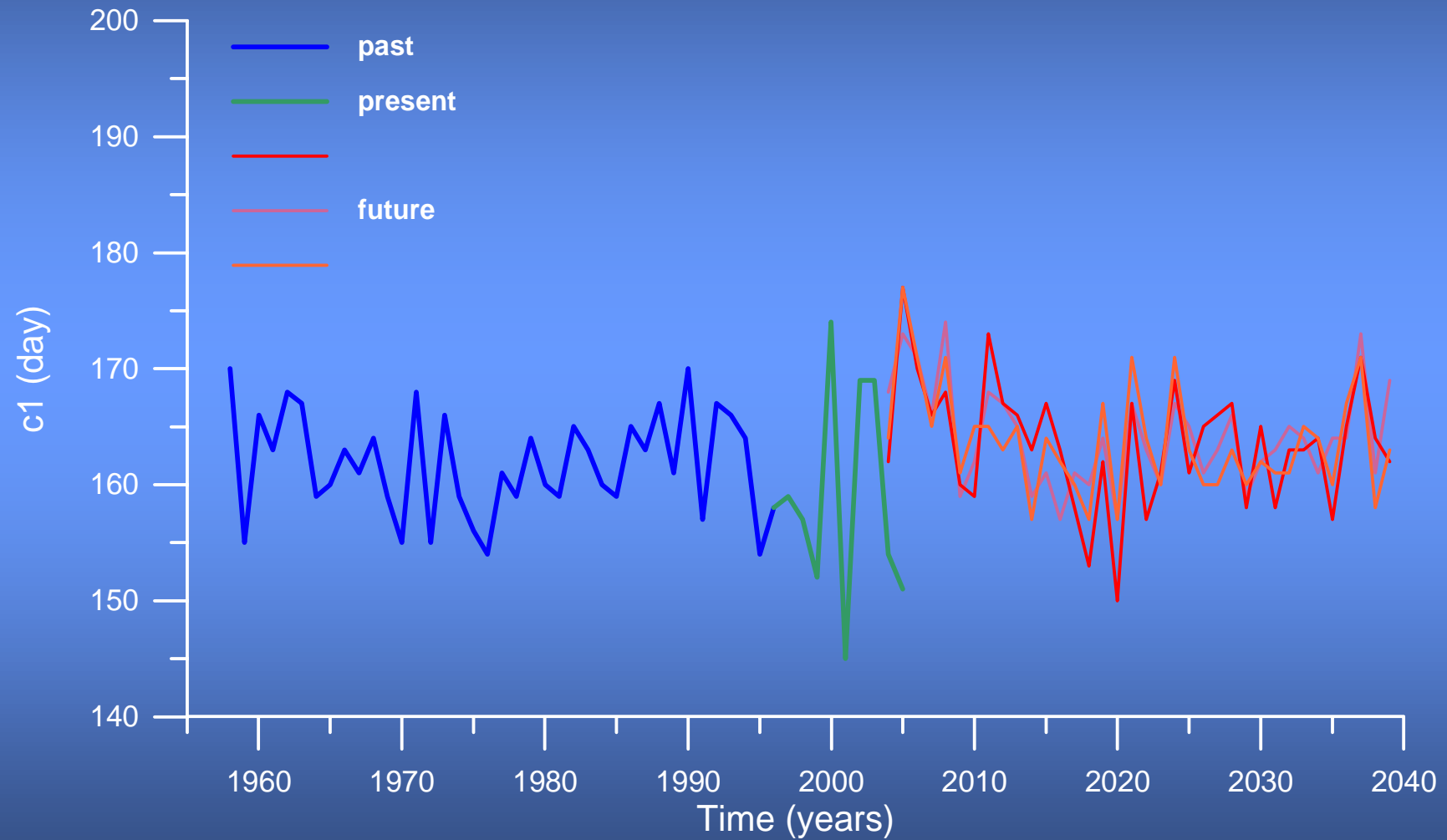
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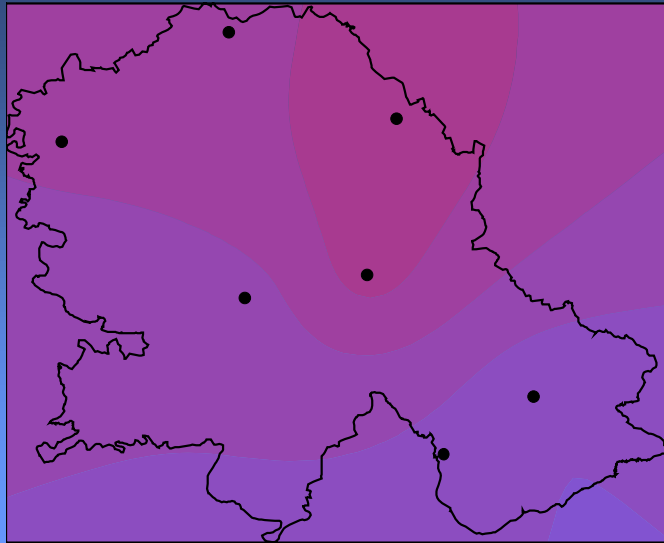
#### Crop drying day (c1, c2)

Number of days with total daily precipitation bellow 5 mm (c1), i.e. 10 mm (c2)

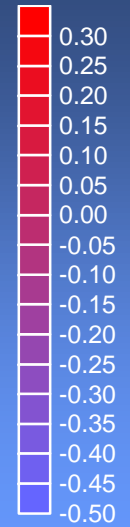
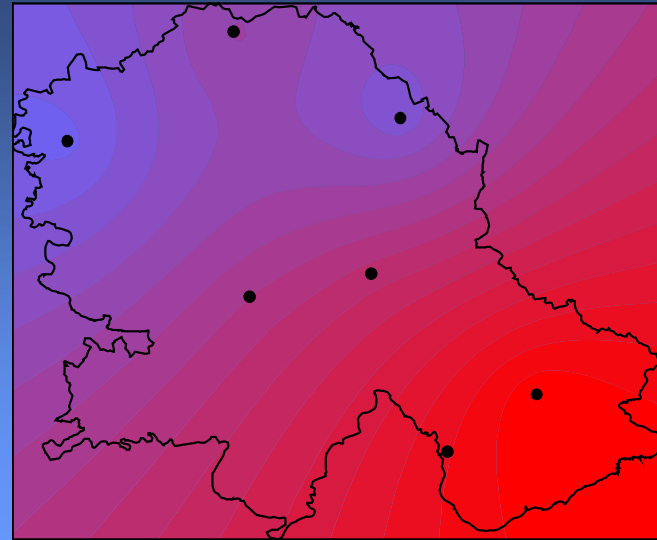
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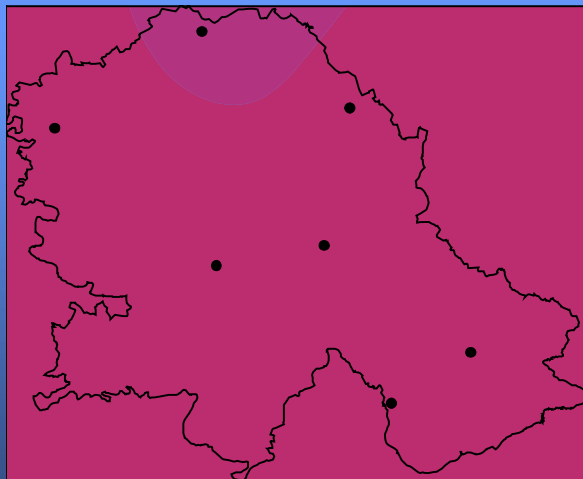


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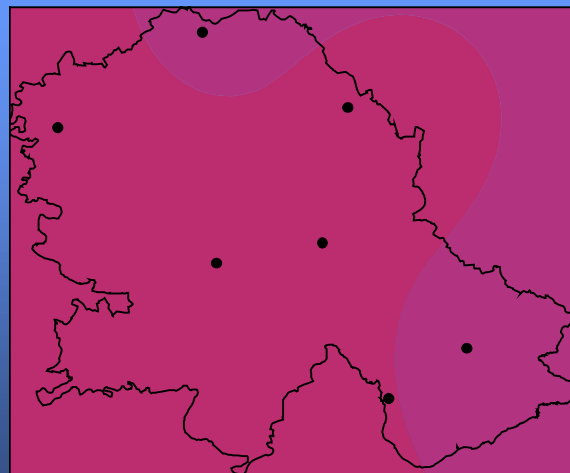


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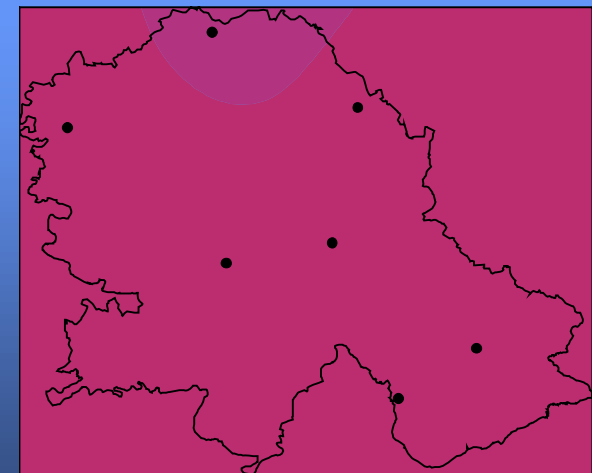
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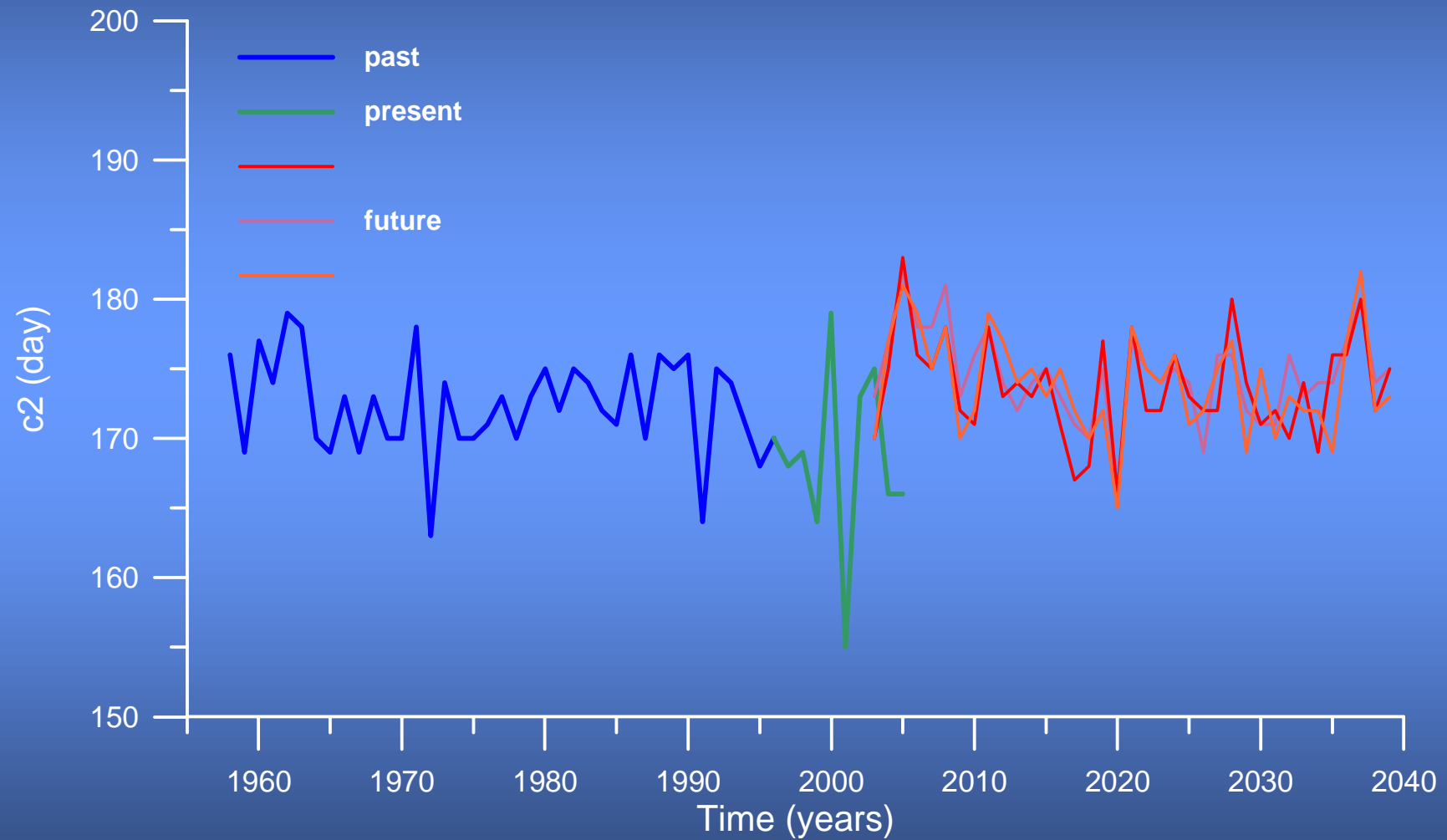
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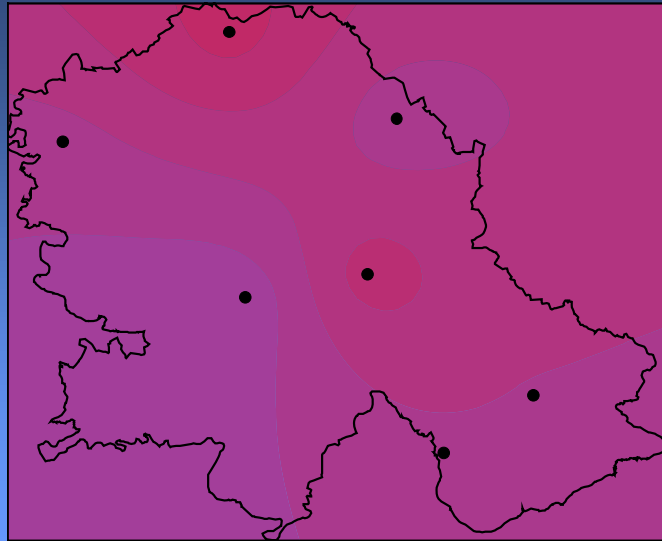
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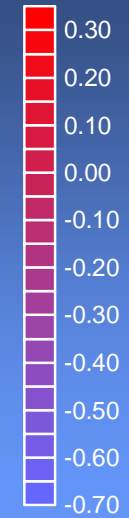
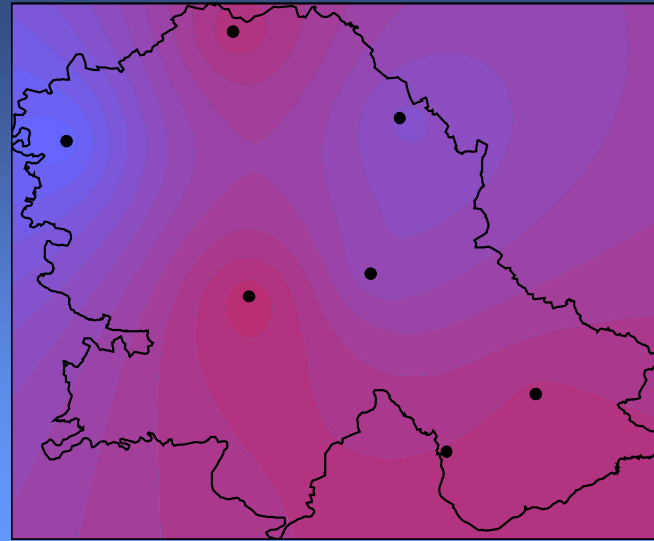
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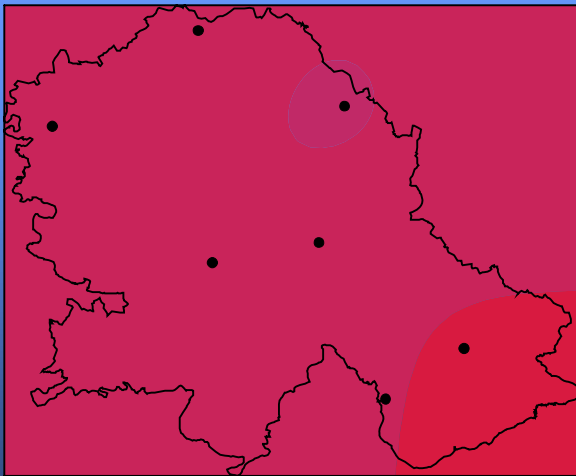


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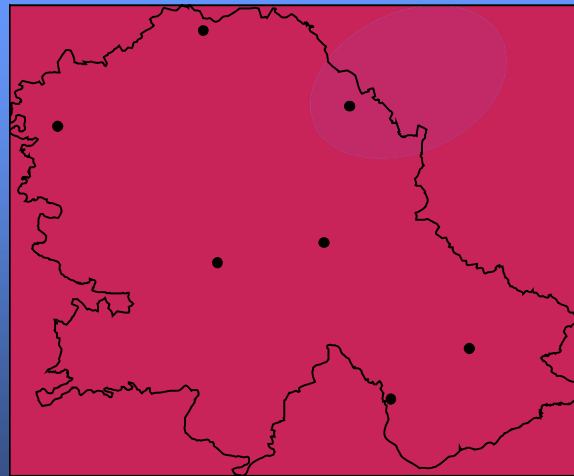


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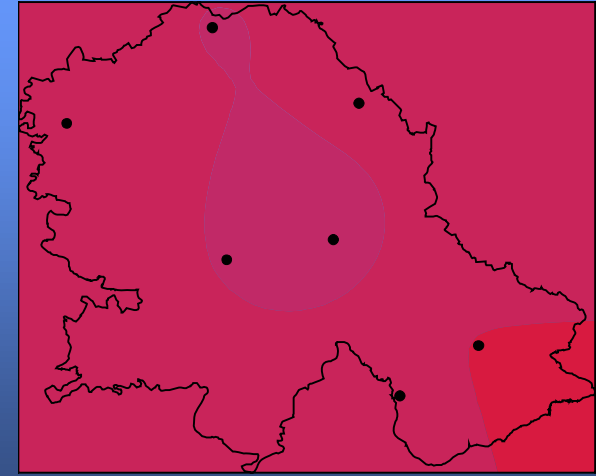
**HadCM3**



**ECHAM5**



**NCAR-PCM**



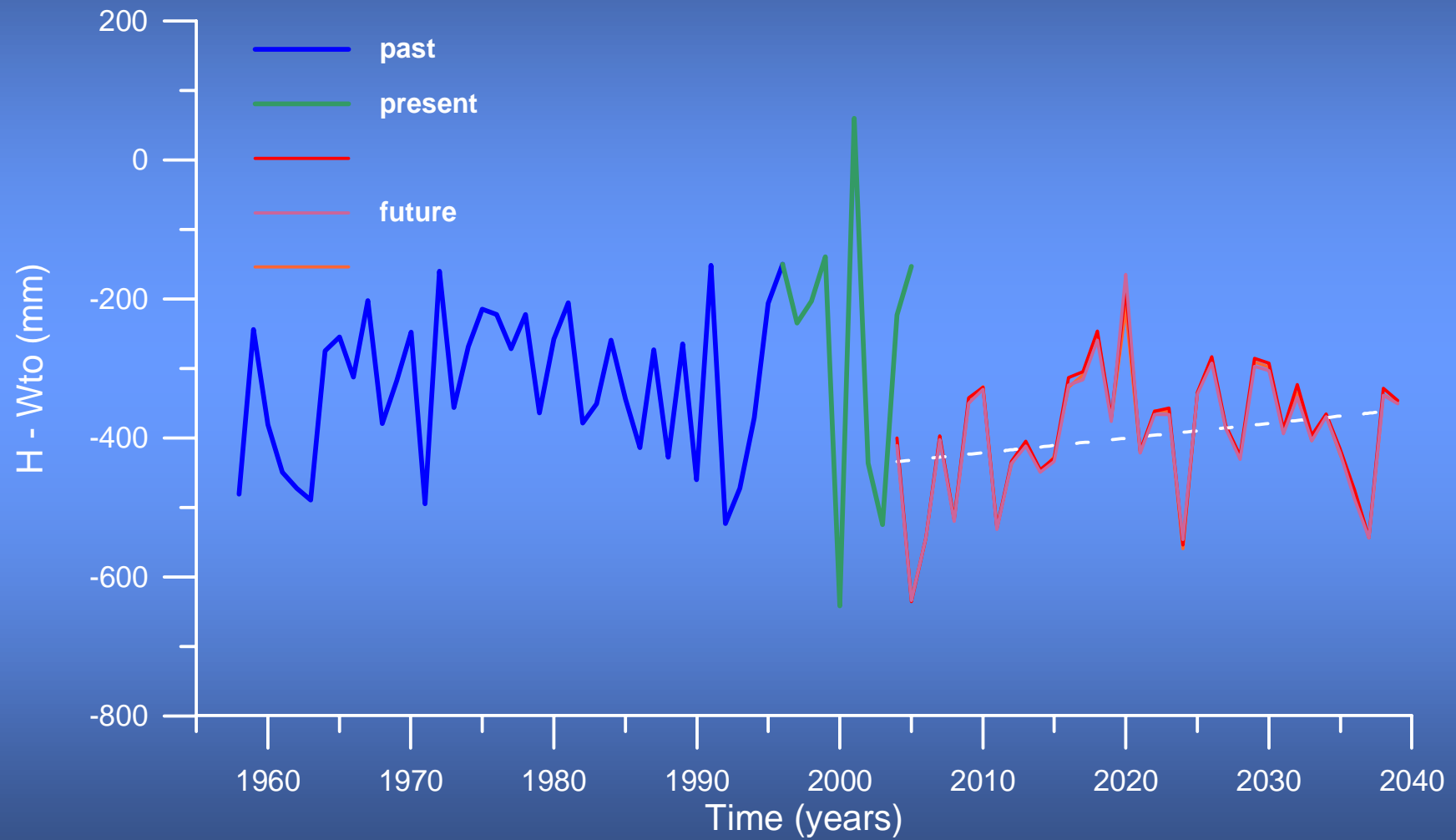
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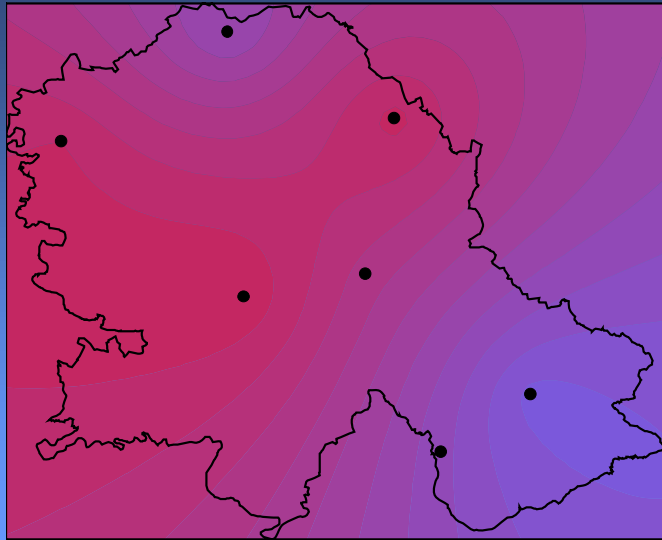
#### Precipitation deficit (H - Wto)

Difference between monthly amount of precipitation and potential evapotranspiration

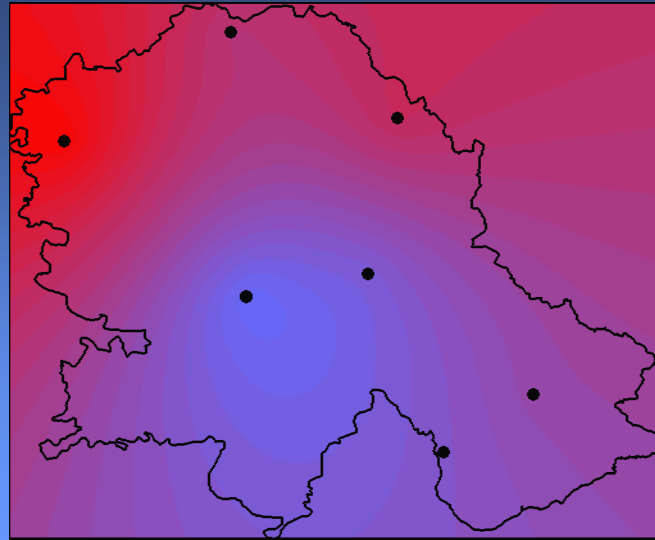
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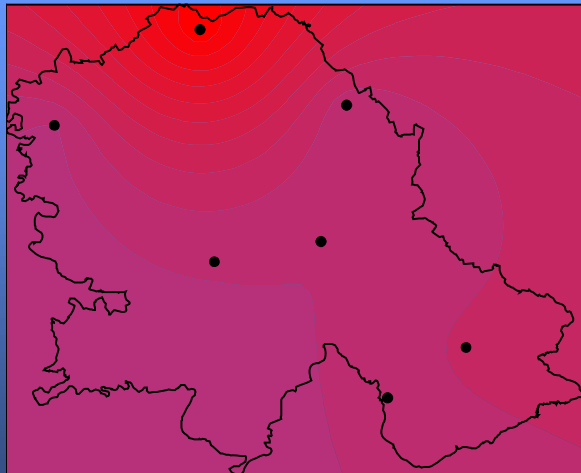


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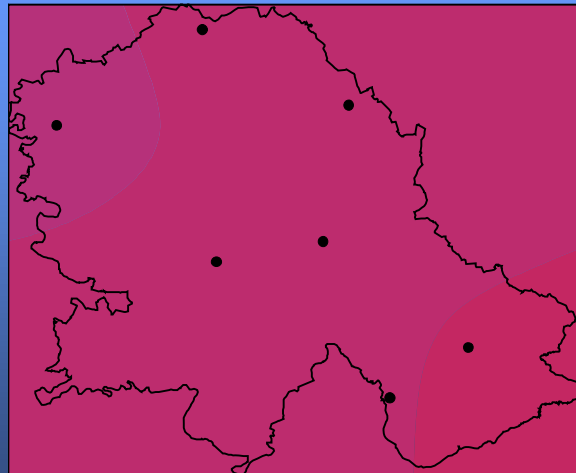


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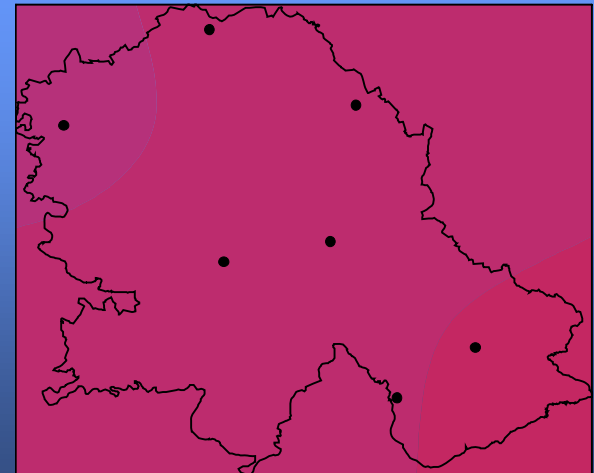
**HadCM3**



**ECHAM5**



**NCAR-PCM**



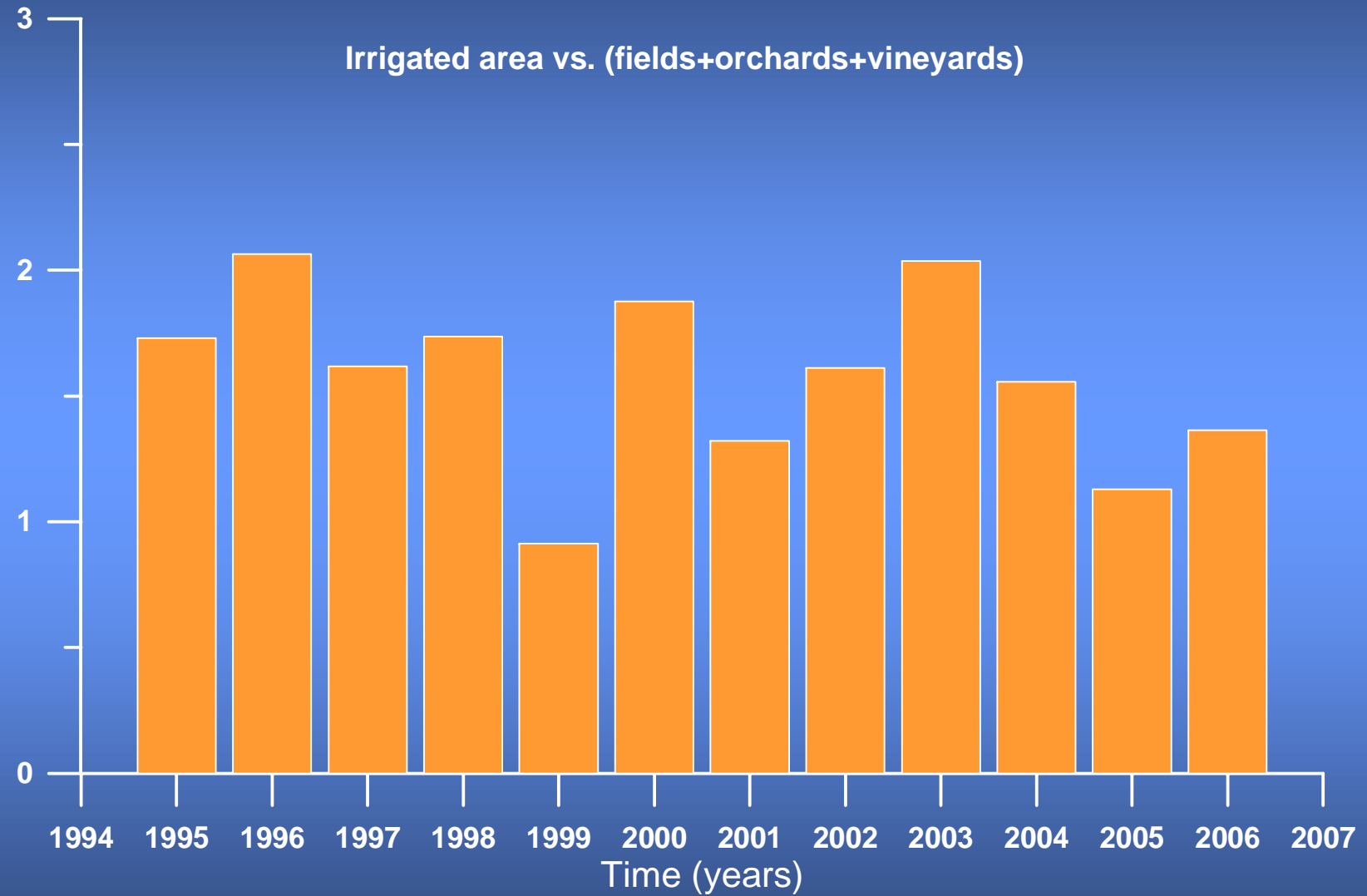
**Agrometeorological conditions in Vojvodina: past, present and future tense**

**Irrigation – how much we need it?**

**MORE THAN IT LOOKS?**

**What is the current status of irrigation network?**

## Agrometeorological conditions in Vojvodina: past, present and future tense



## Agrometeorological conditions in Vojvodina: past, present and future tense

### DTD HYDRO SYSTEM

#### DANUBE-TISA-DANUBE

DTD Hydro-system has got a significant position in the development of economy of Backa and Banat, but also of a wider region. The DTD Hydro-system has got a multiple purpose:

- Acceptance and distribution of external waters (waters coming from territories of other states) - about 3,0 billion m<sup>3</sup>/year;
- **Acceptance** and transfer of waters from the irrigation systems on agricultural and other land (the surface of about 1.085.000 ha);
- **Bringing of water for the needs of irrigation, fishponds, farms, industry and settlements** - about 270 million m<sup>3</sup>/year;
- Acceptance, distribution and dilution of used water from industry, farms and settlements - 1,0 billion m<sup>3</sup>/year;
- Navigation along the canals for vessels with 200 to 1.000 tons of capacity;
- Flood protection and control;
- Fishing, recreation and tourism.

There are **694 km of canals** within the DTD Hs (600 km of which are navigable), 25 sluices (water intaking, regulations and safety), 17 ship locks, 5 pump stations etc.

## **Agrometeorological conditions in Vojvodina: past, present and future tense**

### **CONCLUDING REMARCS**

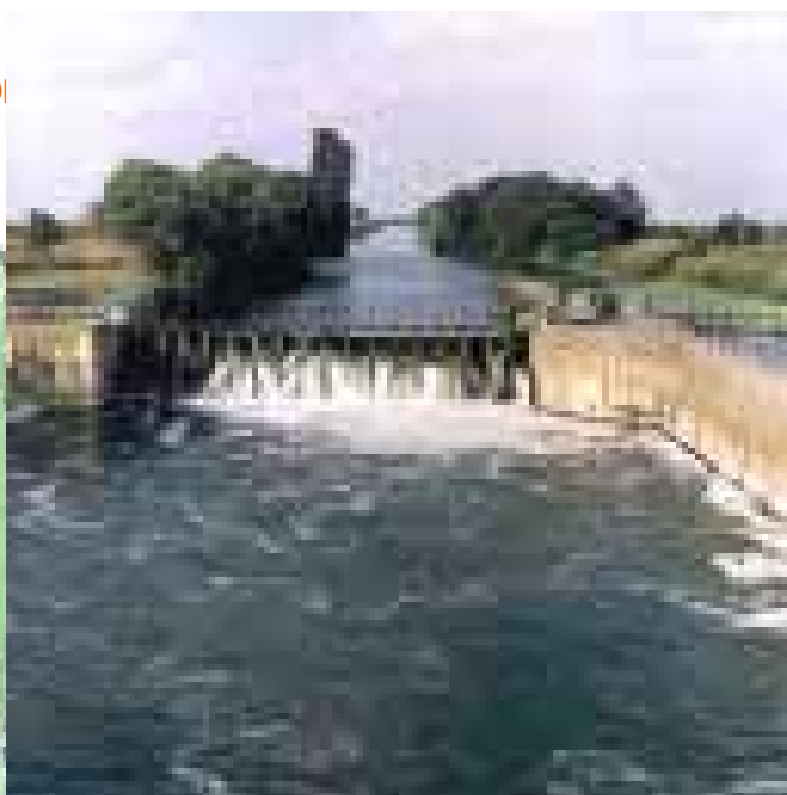
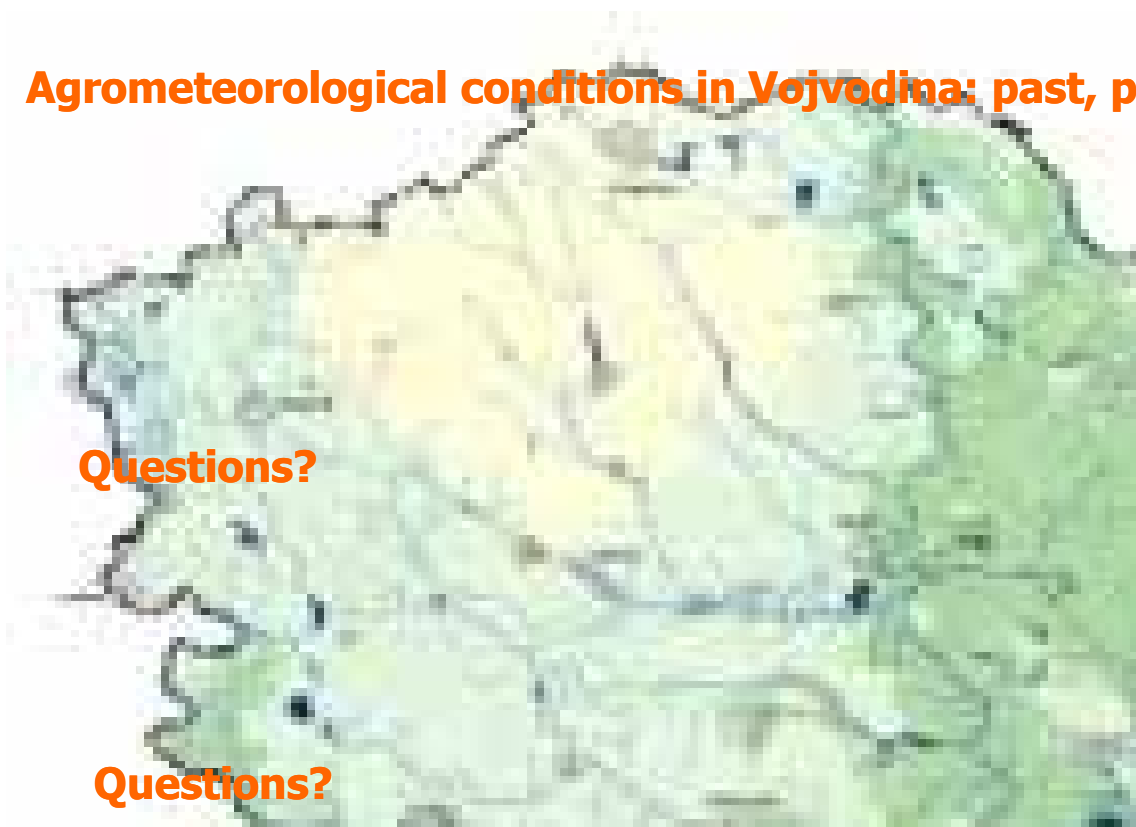
#### **Precipitation:**

- **lack or distribution?**
- **amount or intensity?**
- **crop drying days.**

#### **Temperature:**

- **amplitude and frequency of variation**
- **anomalies**
- **heat vawes**

**Agrometeorological conditions in Vojvodina: past, p**



**Questions?**

**Questions?**

**Comments?**

**Thank you for your time**

