South East European Virtual Climate Change Center

# MOISTURE CONDITIONS - DROUGHT MONITORING SYSTEM OF THE RHMSS

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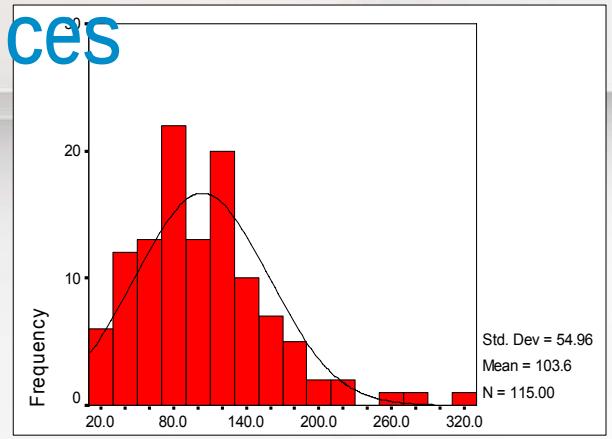
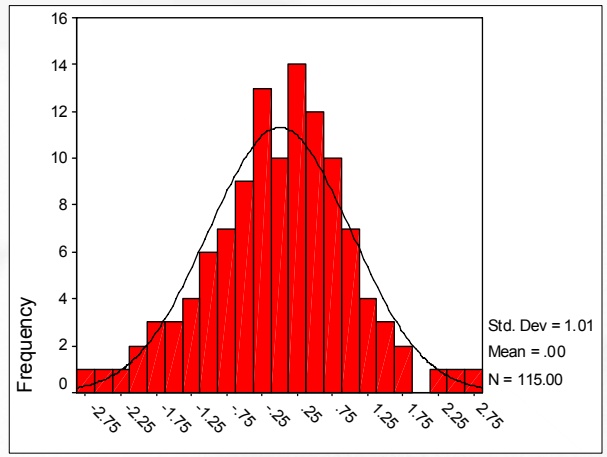
# Moisture conditions/drought indices

- SPI on the basis of precipitation amount during the previous 30, 60 and 90 days, with the calculation time step of one day;
- SPI for 1, 2, 3, 4, 5, 6, 9, 12 and 24 months. Calculation time step is one month, and values related to the last day of each calendar month;
- Palmer Z index, as a measure of the moisture anomaly during the previous month. Z index values are updated at the end of each decade.
- Soil moisture storage in one meter soil layer below grass plant cover. Time step in the water balance calculation is one day.

The selection of indices values based on operative data from approximately thirty meteorological stations appears in agricultural meteorological bulletins. Further increase of the volume and quality of these products which are regularly on disposal to various users is planned.

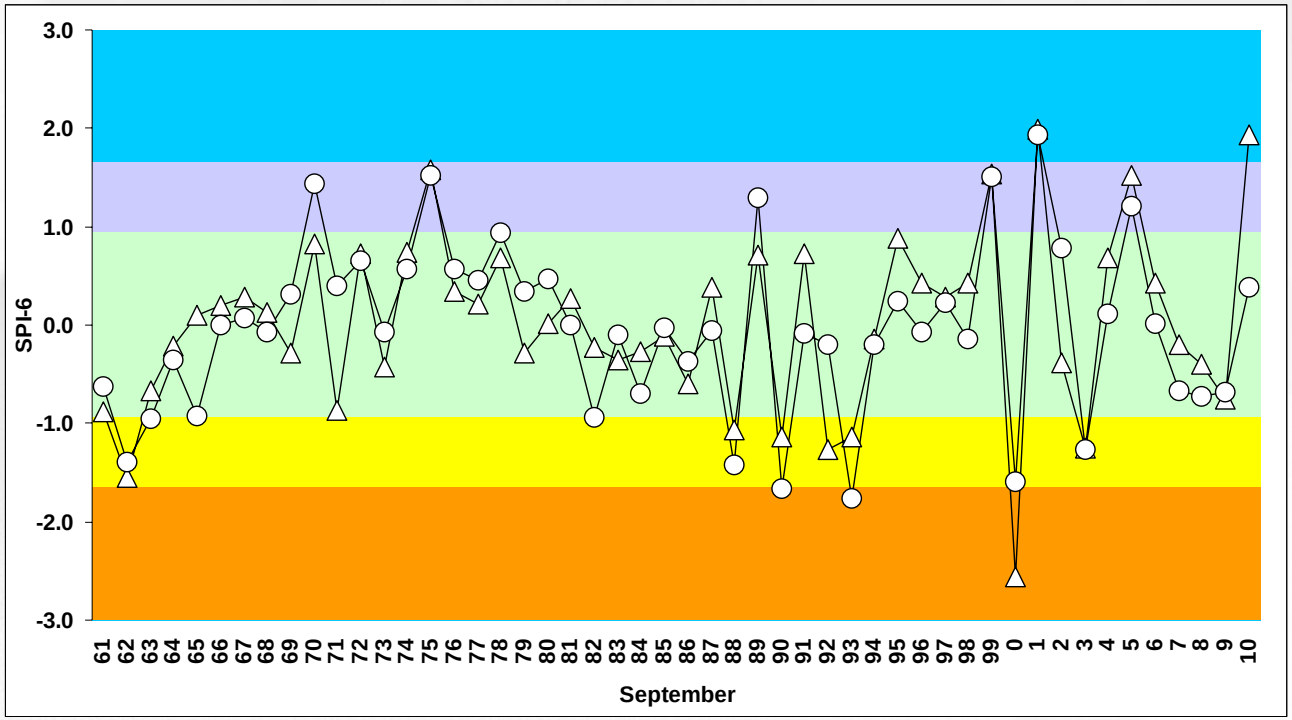



SPI CALCULATION




Absolute frequency distributions of two month precipitation amount (IX-XI) and corresponding values of SPI-2 (Beograd, 1888-2002)

# Moisture Conditions Variability




Six month - SPI for September during the period 1961-2010: enhanced variability of the index values during the second half of the mentioned period is prominent

Moisture conditions:

- *Extremely wet*
- *Moderately/considerably increased moisture*
- *Usual moisture conditions*
- *Moderate/severe drought*
- *Extreme drought*

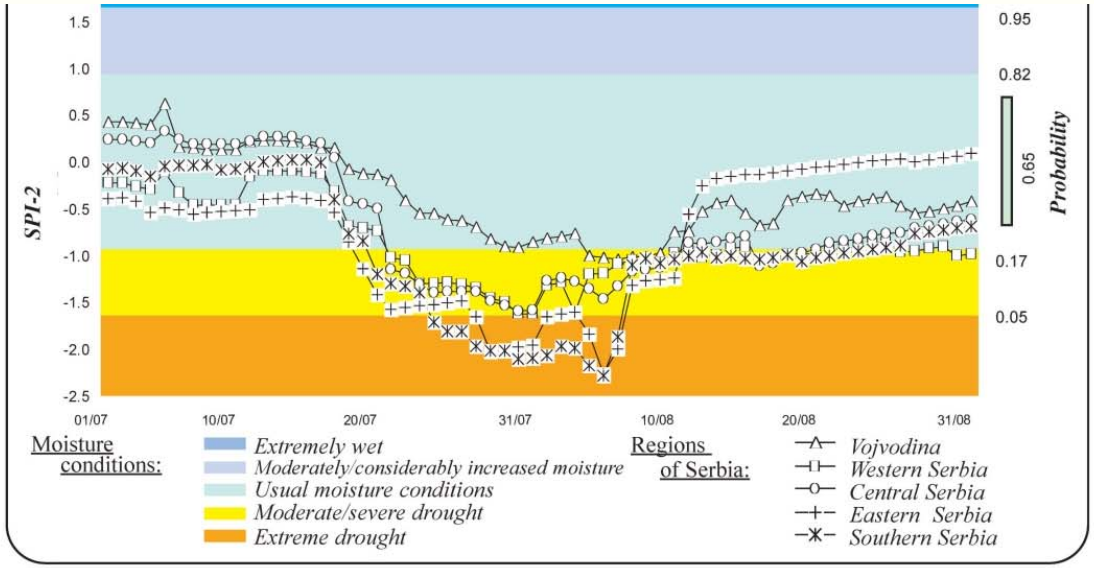
Regions of Serbia:

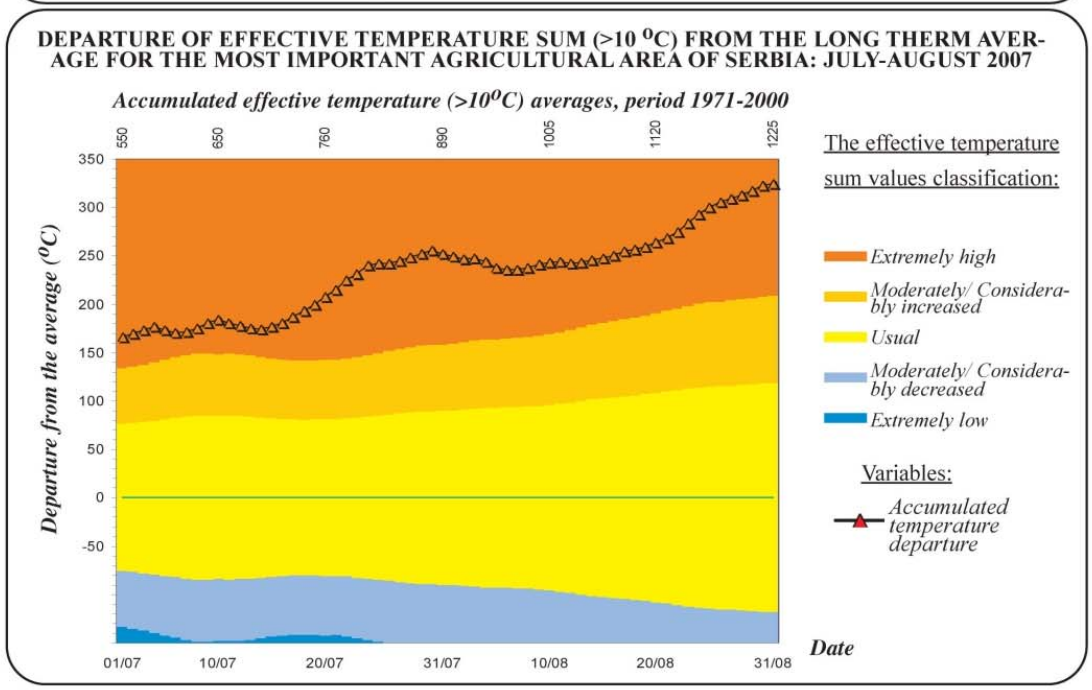
- *Vojvodina*
- *Central Serbia*

# Examples of extreme drought in Serbia

Summer drought in 2007: shortage of precipitation was accompanied with extremely high temperatures. New absolute maximum temperature values exceeded in the most of the country.

Average daily values of two month - SPI for the five parts of Serbia (up) and average value of effective temperature sum (> 10°C) departure from the multiyear average for the most important agriculture region (down) during the period July-August 2007

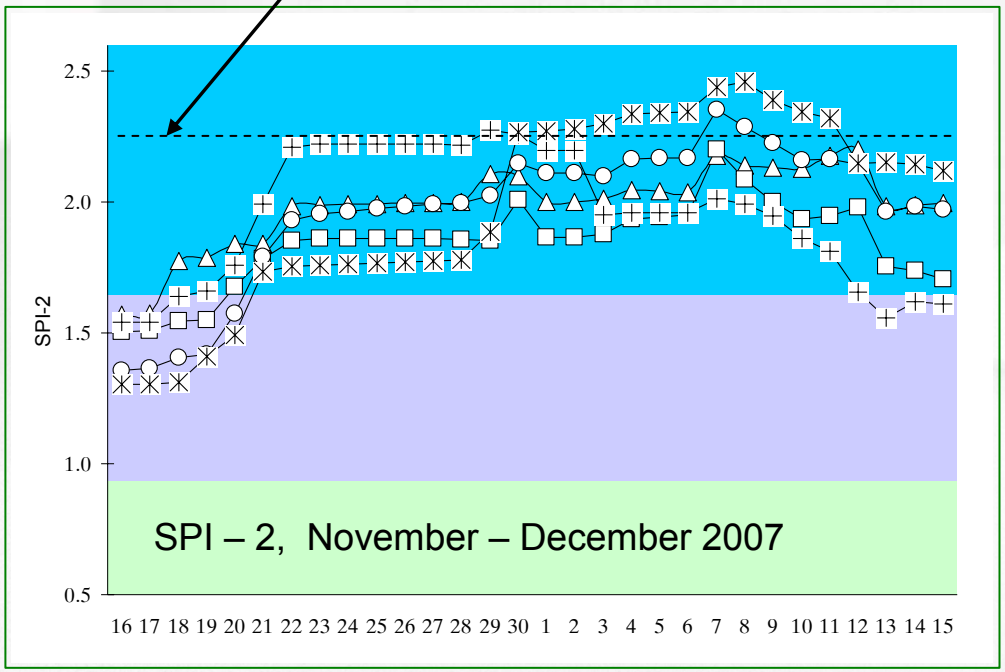


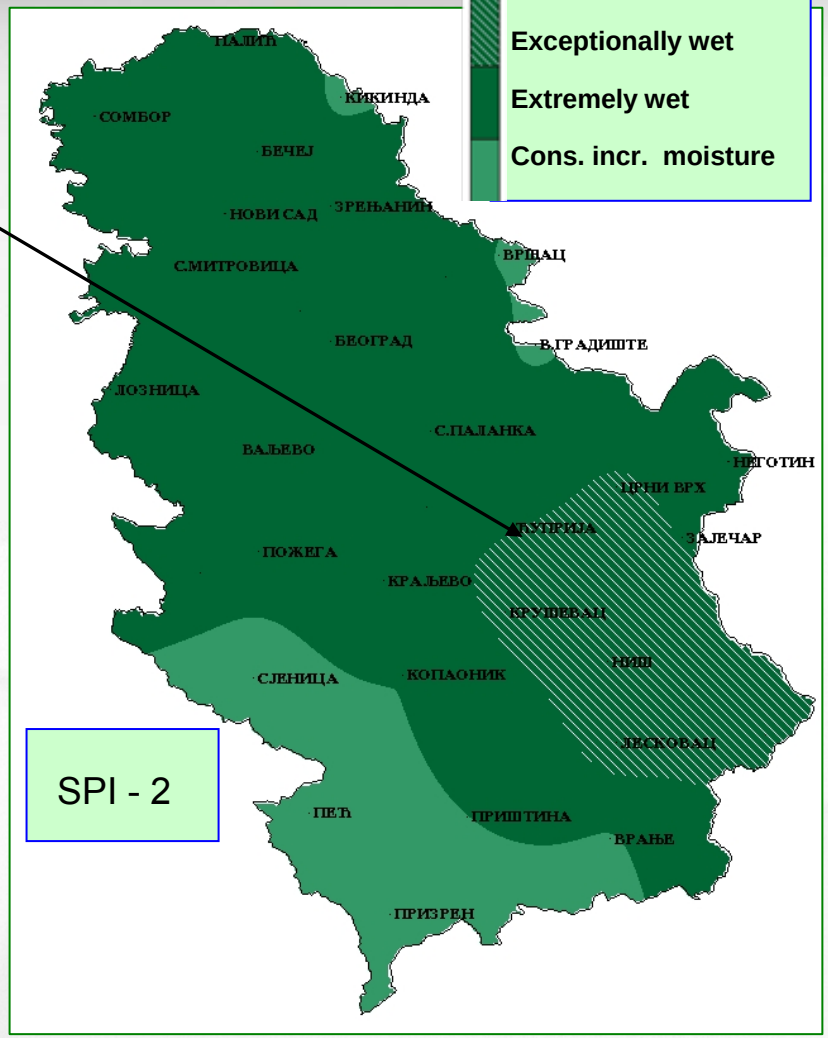



# Examples of extremely wet autumn 2007

SPI - 2 > 2.326
Exceptional wetness boundary

Heavy floods occurred



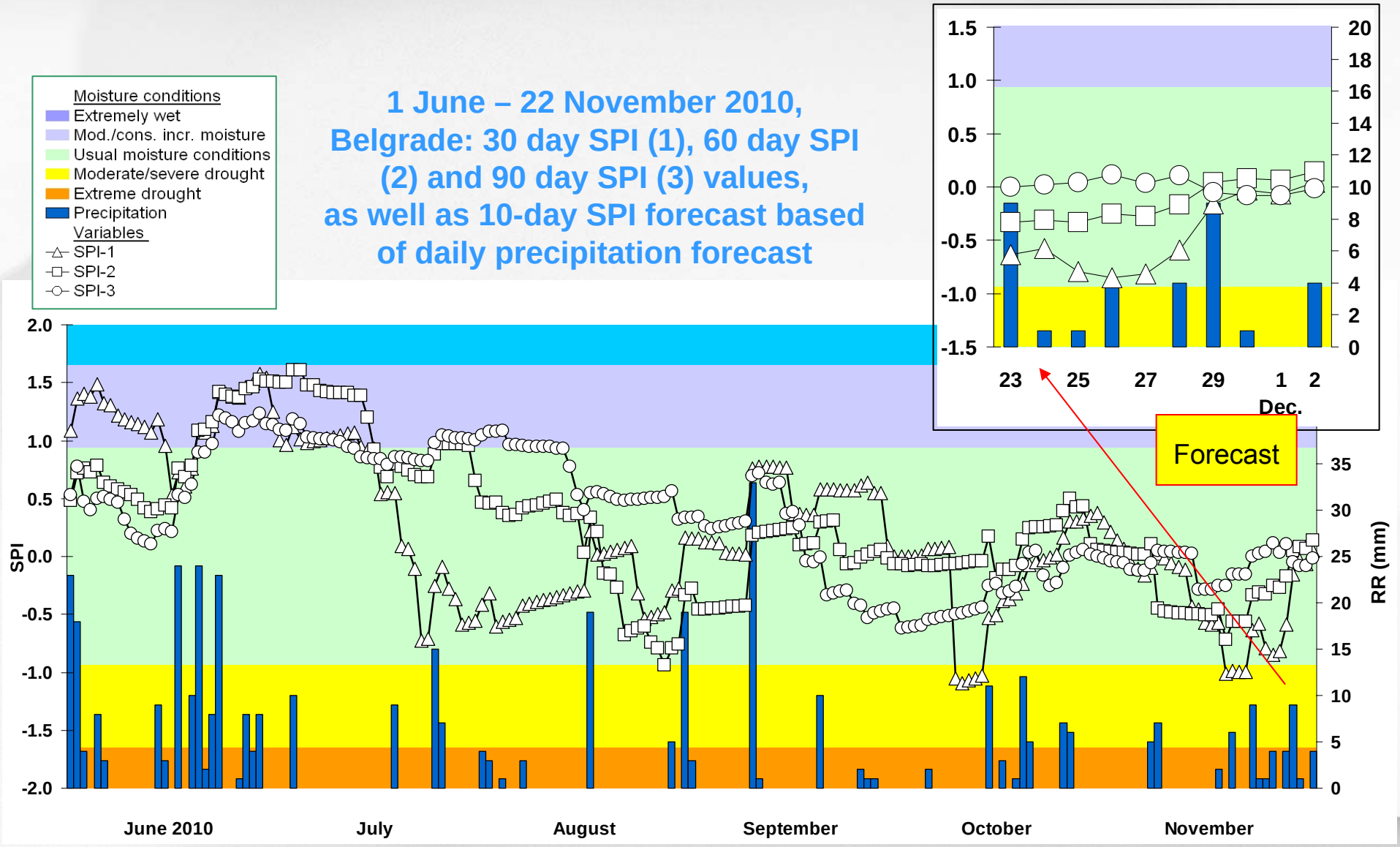




Moisture conditions:
- Extremely wet
- Moderately/considerably increased moisture
- Usual moisture conditions
- Moderate/severe drought
- Extreme drought

Regions of Serbia:
- Vojvodina
- Western Serbia
- Central Serbia
- Eastern Serbia
- Southern Serbia

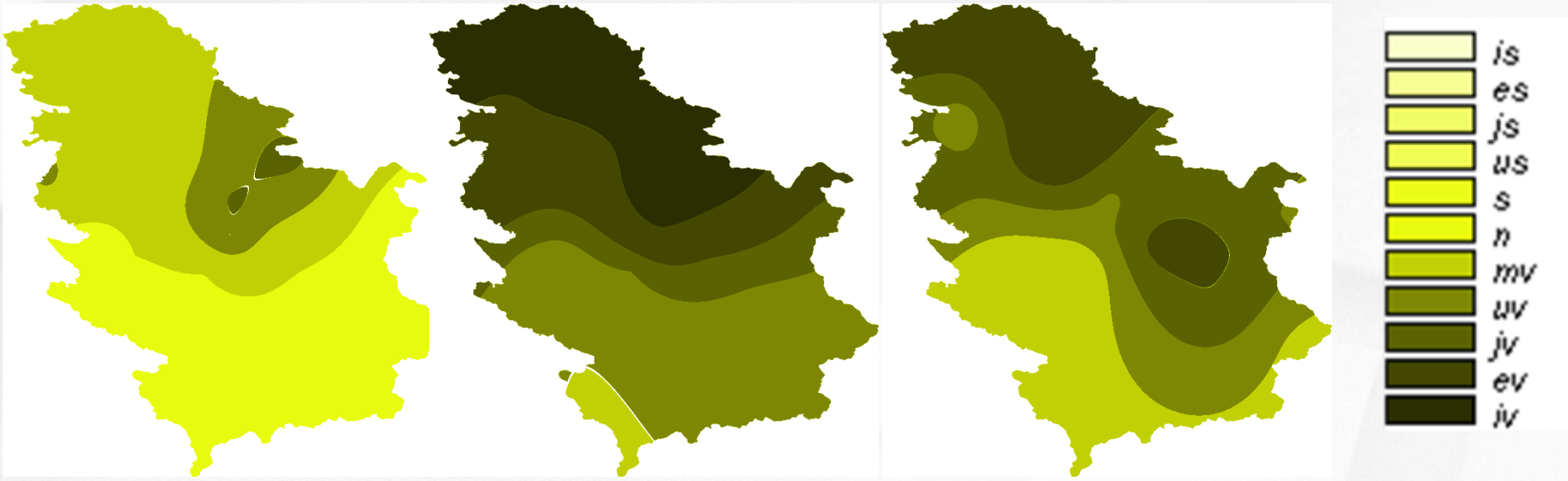
**SPI - 2 on November 30th**

# Current and forecasted moisture conditions in different time scales



# Examples of RCM-SEEVCCC LRF products

- Example of special use of LRF precipitation results: SPI2 for February 2010 using January 2010 LRF



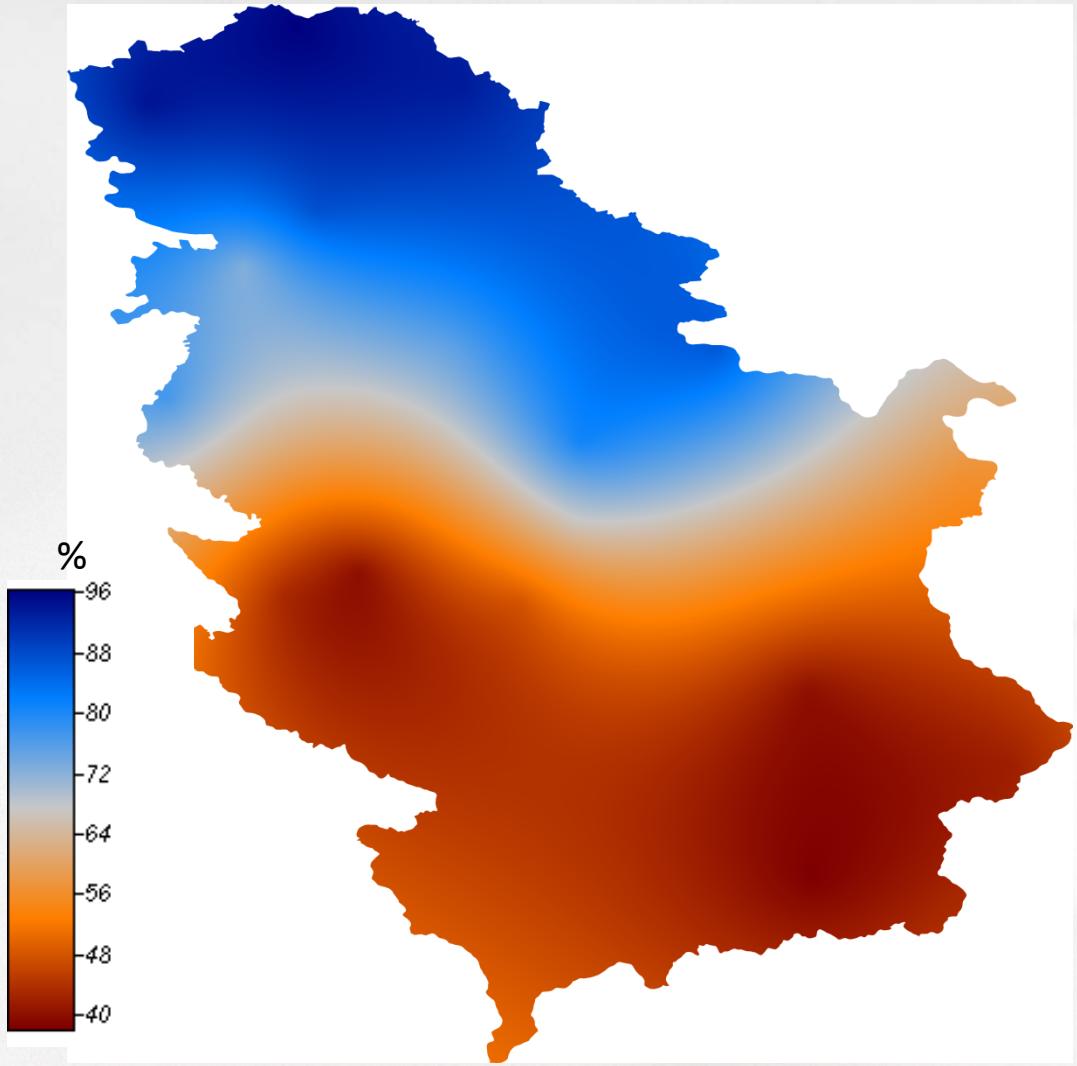

**RCM-SEEVCCC ensemble forecast**

**corrected LRF RCM-SEEVCCC ensemble forecast**

**observed**

**Since large part of the SEE region is place of "Summer Drying Problem" and no model climatology is available, for some special use of LRF products (obtained from precipitation data), such is SPI2 forecast, Statistical BIAS Correction based on daily climatology is applied on ensemble LRF.**

# LRF – probability SPI forecast




- Forecast issued January 1st 2010.
- Ensemble probability of SPI2>1.282 (considerably increased moisture) for **February 2010**
- SPI2 well correlated to floods and drought

# Crop Model Application

REPUBLIC HYDROMETEOROLOGICAL SERVICE OF SERBIA, Department for Agricultural meteorology is preparing a ten days bulletins based on the selected products obtained by the use of the Cropsyst Model

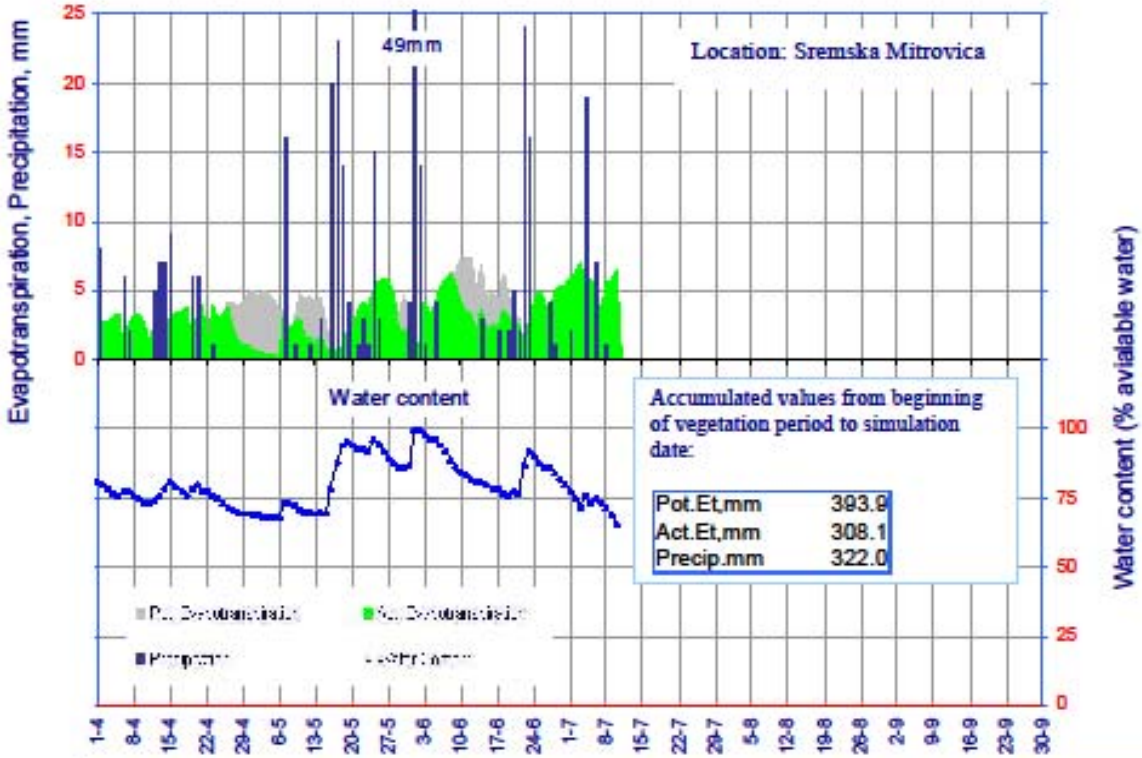
Crop models are the preferred choice of analysis for their ability to simulate yield response to alternate management conditions, such as planting date, plant population, irrigation and cultivar choice, over many years of historical weather records.

**The values of actual and potential evapotranspiration, daily precipitation sum and soil moisture up to 1m depth, since the beginning of the vegetation until date of simulation, are presented in the bulletin in a graphic form.**

**Also, in the bulletin are given estimation impacts of different weather condition (dry and hot, normal, cool and wet) on the corn growth and yield on the remaining vegetation period after date of simulation.**

REPUBLIC HYDROMETEOROLOGICAL SERVICE OF SERBIA
Department for Agriculture Meteorology
*E mail:agromet@hidmet.gov.rs*

# AGRICULTURAL METEOROLOGY BULLETIN WITH MAIN COMPONENTS OF WATER BALANCE AND ASSESSMENT OF THE INFLUENCE OF WEATHER CONDITIONS ON GROWING STAGE AND CROP YIELD




| Simulation date | | 10-July-2010 |
|---|---|---|
| Dry and hot | Date: | |
| | Grain filling | 01.06. |
| | Maturity | 20.08. |
| | Harvest | 05.09. |
| | Yield Assesment,kg/ha: | 2830 |
| | Accum. in vegetation period: | |
| | Pot.Et,mm | 718.7 |
| | Act. Et,mm | 446.8 |
| | Precipitation,mm | 357.6 |
| Normal | Date: | |
| | Grain filling | 06.06. |
| | Maturity | 01.09. |
| | Harvest | 17.09. |
| | Yield Assesment,kg/ha: | 4766 |
| | Accum. in vegetation period: | |
| | Pot.Et,mm | 729.6 |
| | Act. Et,mm | 522.4 |
| | Precipitation,mm | 443.4 |
| Cool and Wet | Date: | |
| | Grain filling | 12.06. |
| | Maturity | 25.09. |
| | Harvest | 11.10. |
| | Yield Assesment,kg/ha: | 8318 |
| | Accum. in vegetation period: | |
| | Pot.Et,mm | 759.8 |
| | Act. Et,mm | 622.3 |
| | Precipitation,mm | 537.6 |

Republic Hydrometeorological Service, Department for Agrometeorology is preparing on a regular basis a ten days bulletin based on the selected products obtained by the use of the Cropsyst Model (Cropping Systems Simulation Model; O. Stocle, R. Nelson, 1994.). The agrometeorological conditions necessary for the growth of the corn yield are analyzed and monitored according to actual weather data during the period April-October. The values of actual and potential evapotranspiration, daily precipitation sum and water content in soil up to 1m depth, as well as cumulative values of actual and potential evapotranspiration and daily precipitation sum since the beginning of the vegetation until date of simulation, are presented in the bulletin in a graphic form. In the bulletin are given estimation impacts of different weather (dry and hot, normal, cool and wet) on the corn growth and yield on the approaching vegetation period.

# Future work

- Agro-meteorological  Department of the RHMSS and SEEVCCC have selected, as the focus for further investigation, applications of long range forecasts (LRF) in crop simulation models
- Results from the integration of climatic monthly and seasonal forecasts in crop yield modeling suggest that reliable crop yield predictions can be obtained using an ensemble multi-model system
- Ddevelopment and provision to the users concise and understandable climate early warning information at weekly, 10-day, monthly and seasonal time scale, as well as other information to support adaptation in agriculture sector