REPUBLIC OF SLOVENIA
MINISTRY OF AGRICULTURE AND THE ENVIRONMENT
SLOVENIAN ENVIRONMENT AGENCY

DMCSEE
Drought Management Centre for Southeastern Europe

DROUGHT MONITORING

In Slovenia and SE Europe

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ARSO

DROUGHT RISK MANAGEMENT IN THE ALPS EXPERT WORKSHOP

September, 14th Ajdovščina, Slovenia

Contents

- Drought monitoring in Slovenia
  - Surface water balance – point calculations
  - Surface water balance – raster layers
  - Drought indices & RS data
- Drought Monitoring in SE Europe

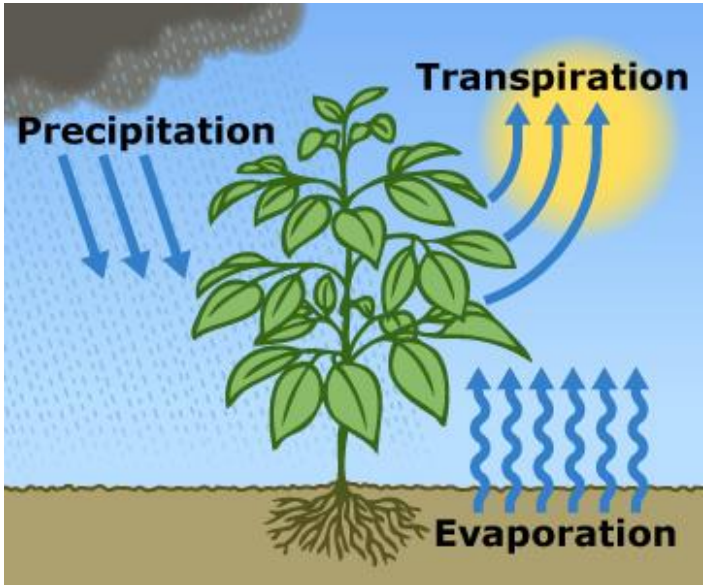
Surface water balance

Difference between precipitation and combined potential water loss from land and plant surface (evapotranspiration)

Reference evapotranspiration (Penman-Monteith formula) is used

Water balance is accumulated:

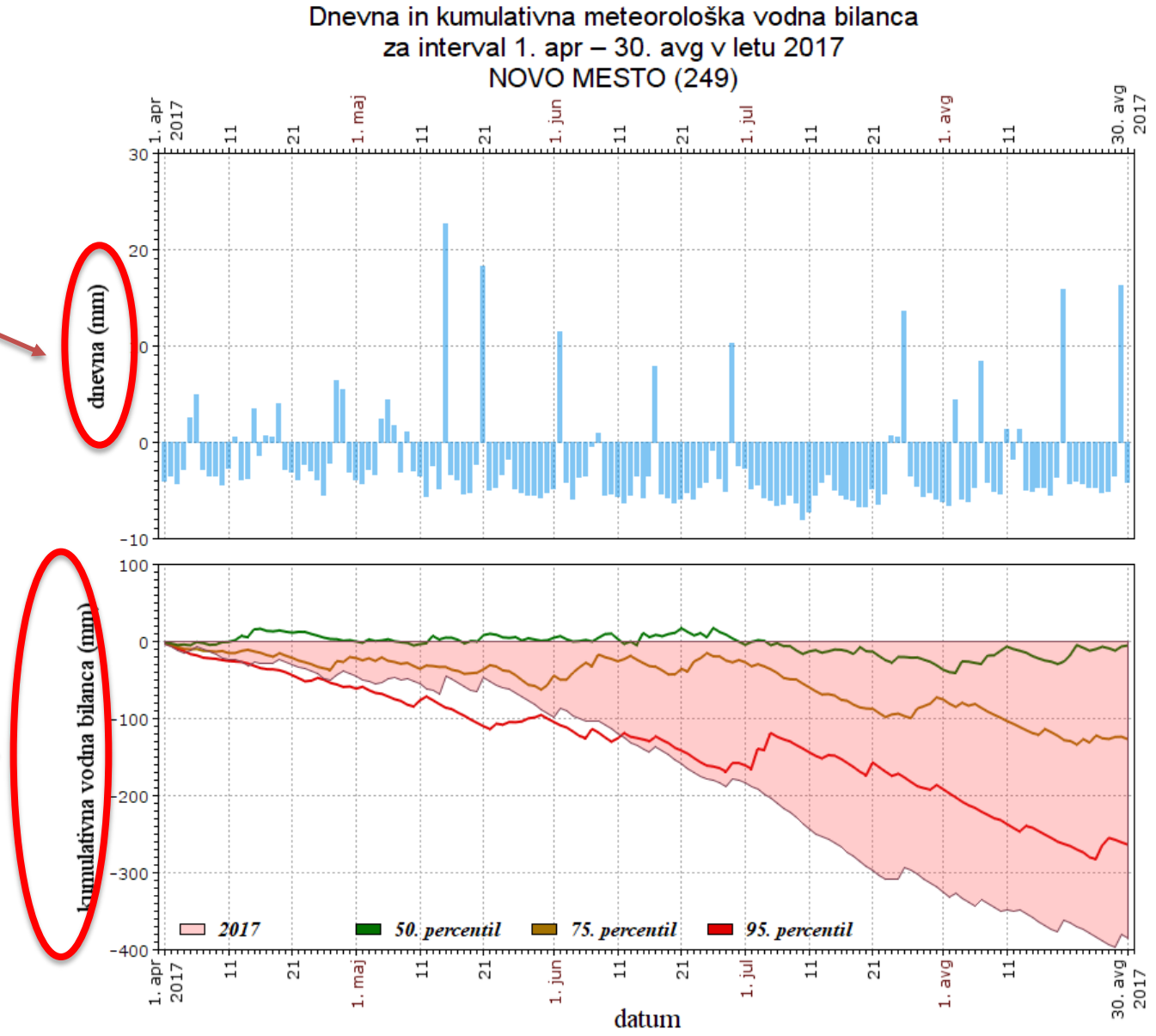
- Since start of vegetation season (1st April)
- Over specified (agreed) period of time



Surface water balance

Daily surface water balance

Accumulated surface water balance



Surface water balance – crop specific

Not reference, but crop specific potential evapotranspiration; growing phases are taken into account

Not surface water balance, but watre content in upper part of soil (root zone)

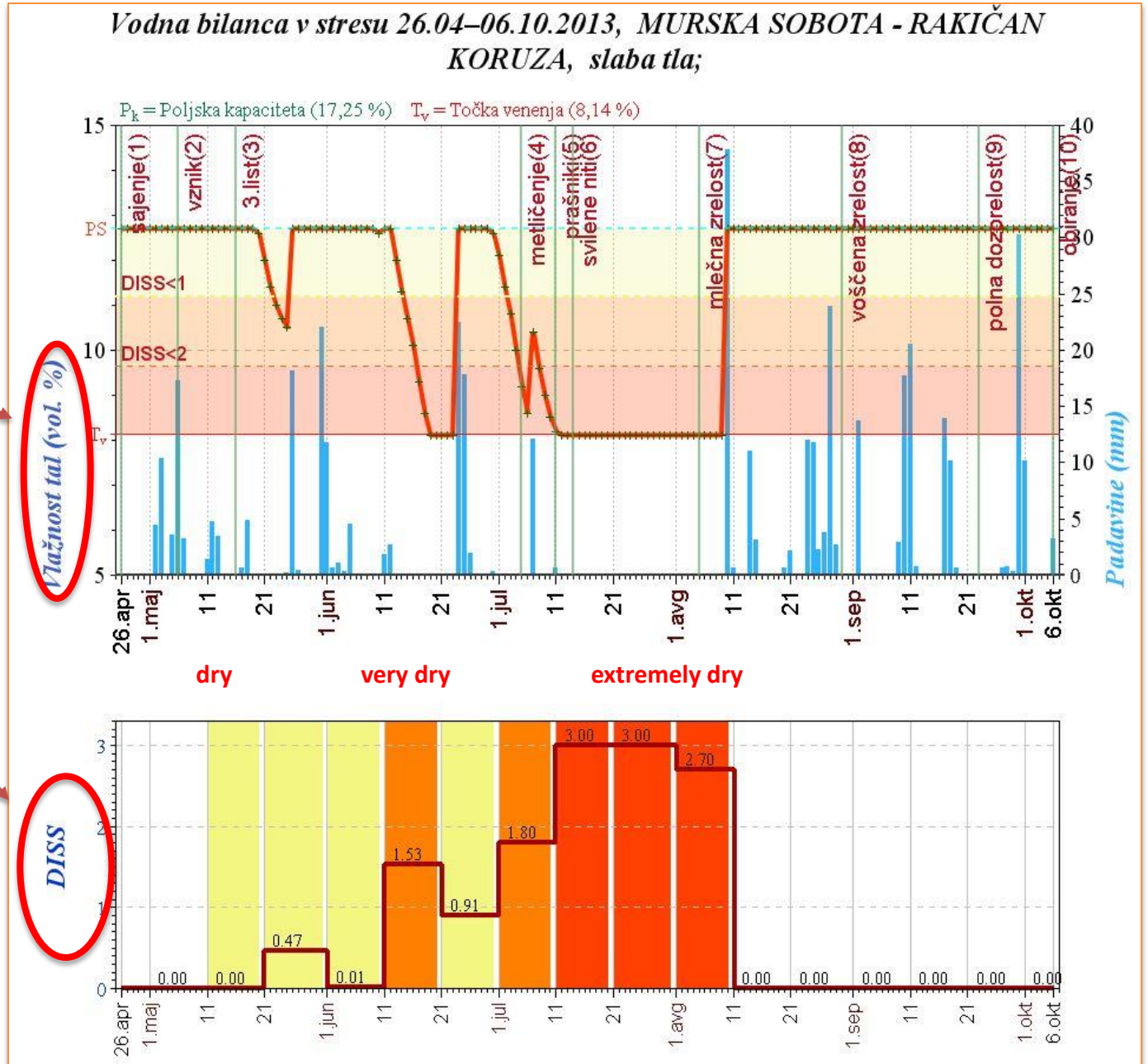
Soil taken into account (two parameters – FC and WP)

Usual suspect: maize

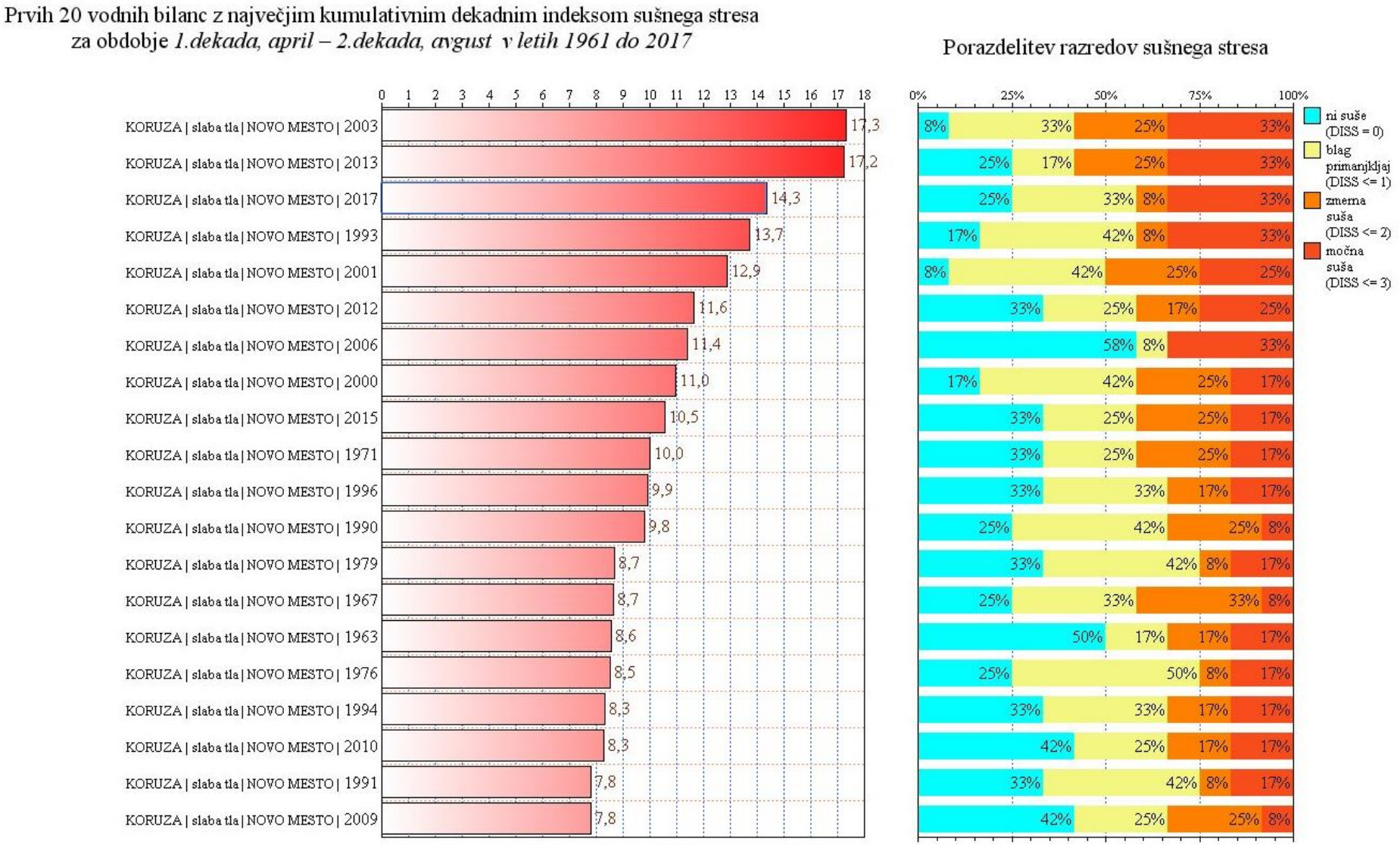
Surface water balance – crop specific

Water content (Vol.%) in root zone

Decadal drought stress index (DISS)



DISS index – Novo Mesto station, shallow soil, maize; top 20 years



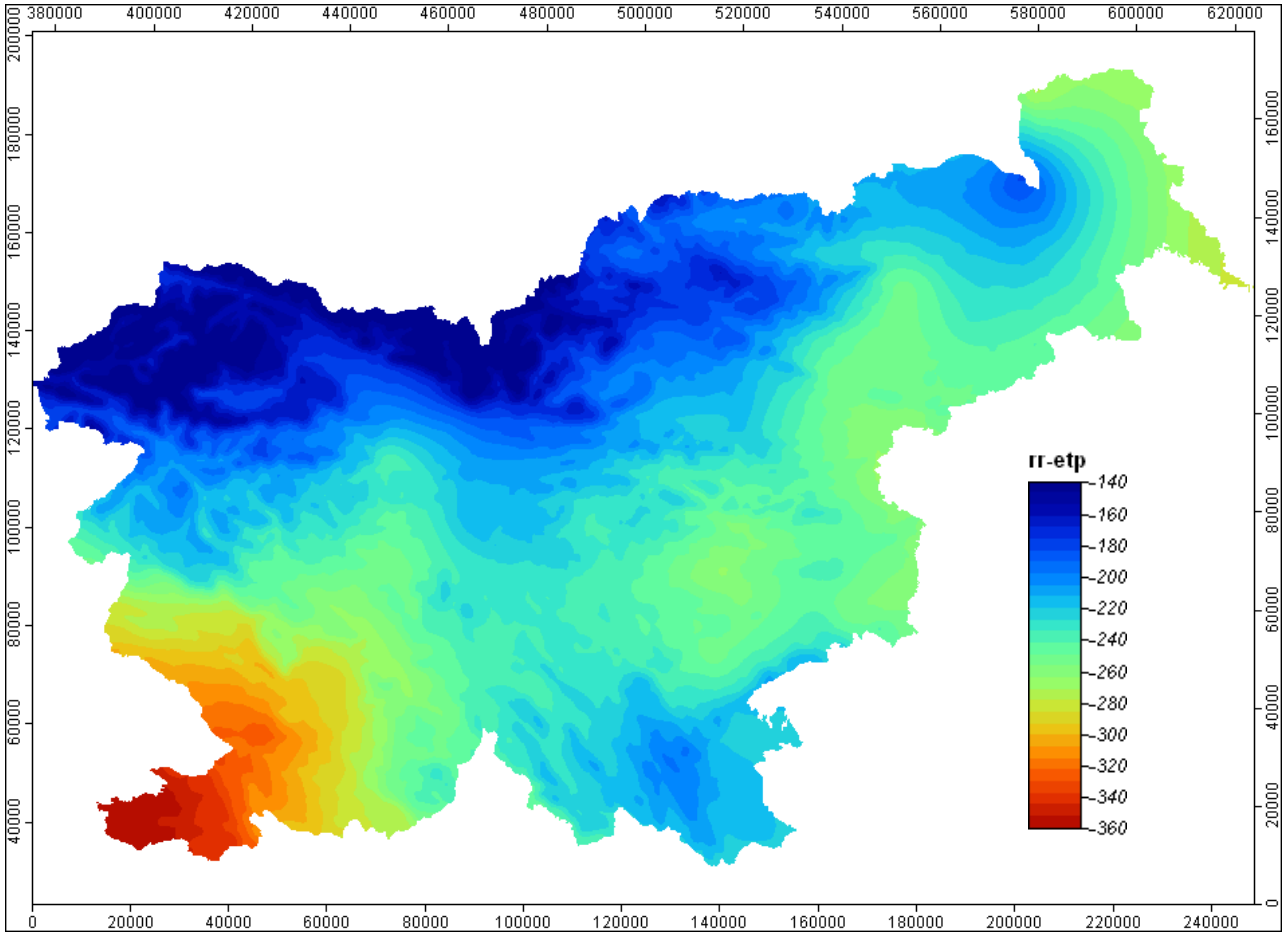
Surface water balance mapping

Mapping is performed using standard geostatistical methods (multivariate kriging)

Case:

11th June-10th August

2013



Surface water balance mapping

Mapping is performed using standard geostatistical methods (multivariate kriging).

Results filtered over land with agricultural use

Case:

11th June-10th August

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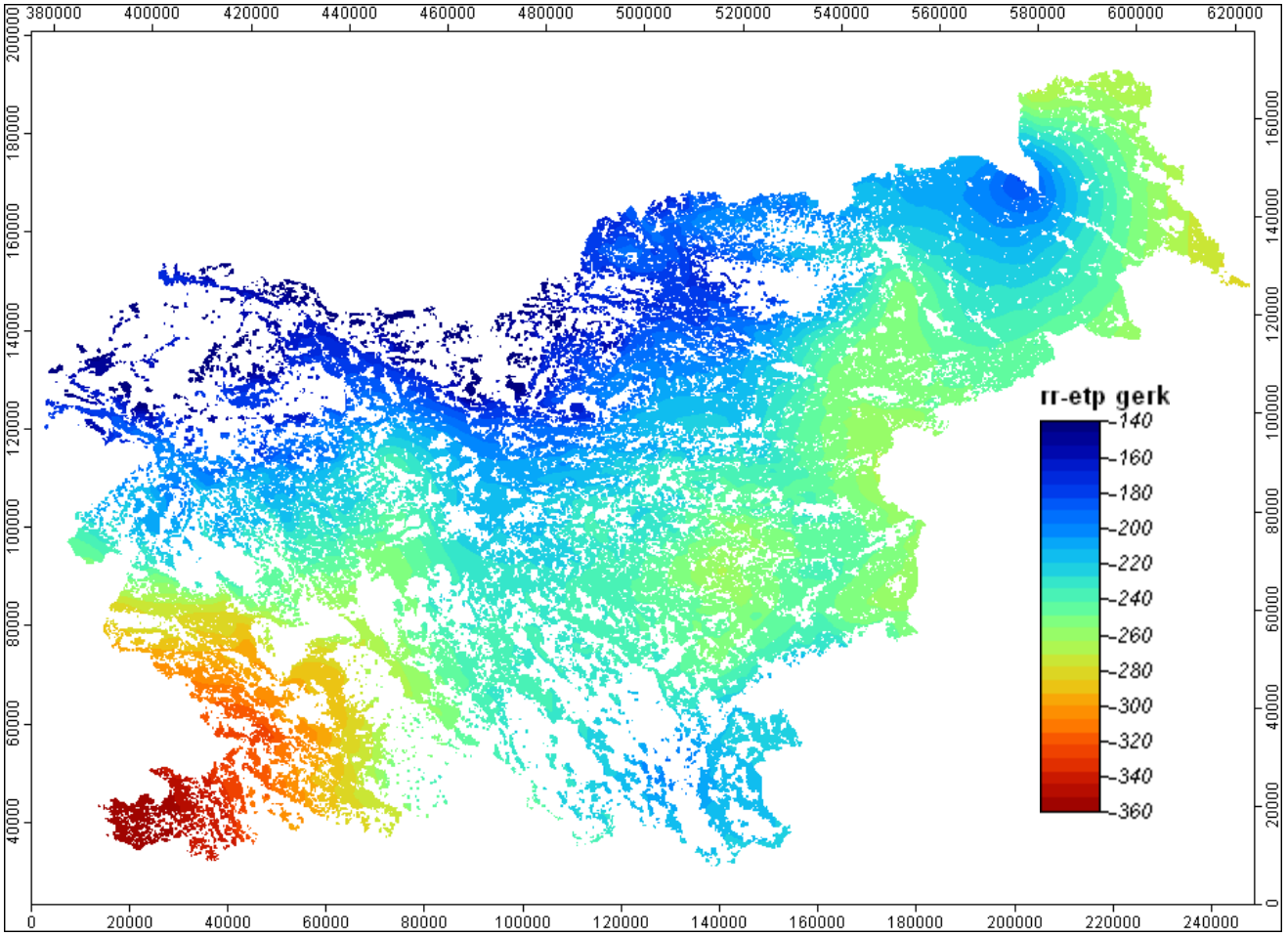

Surface water balance mapping

Mapping is performed using standard geostatistical methods (multivariate kriging).

Results filtered over land with agricultural use (and added to soil water holding capacity)

Case:

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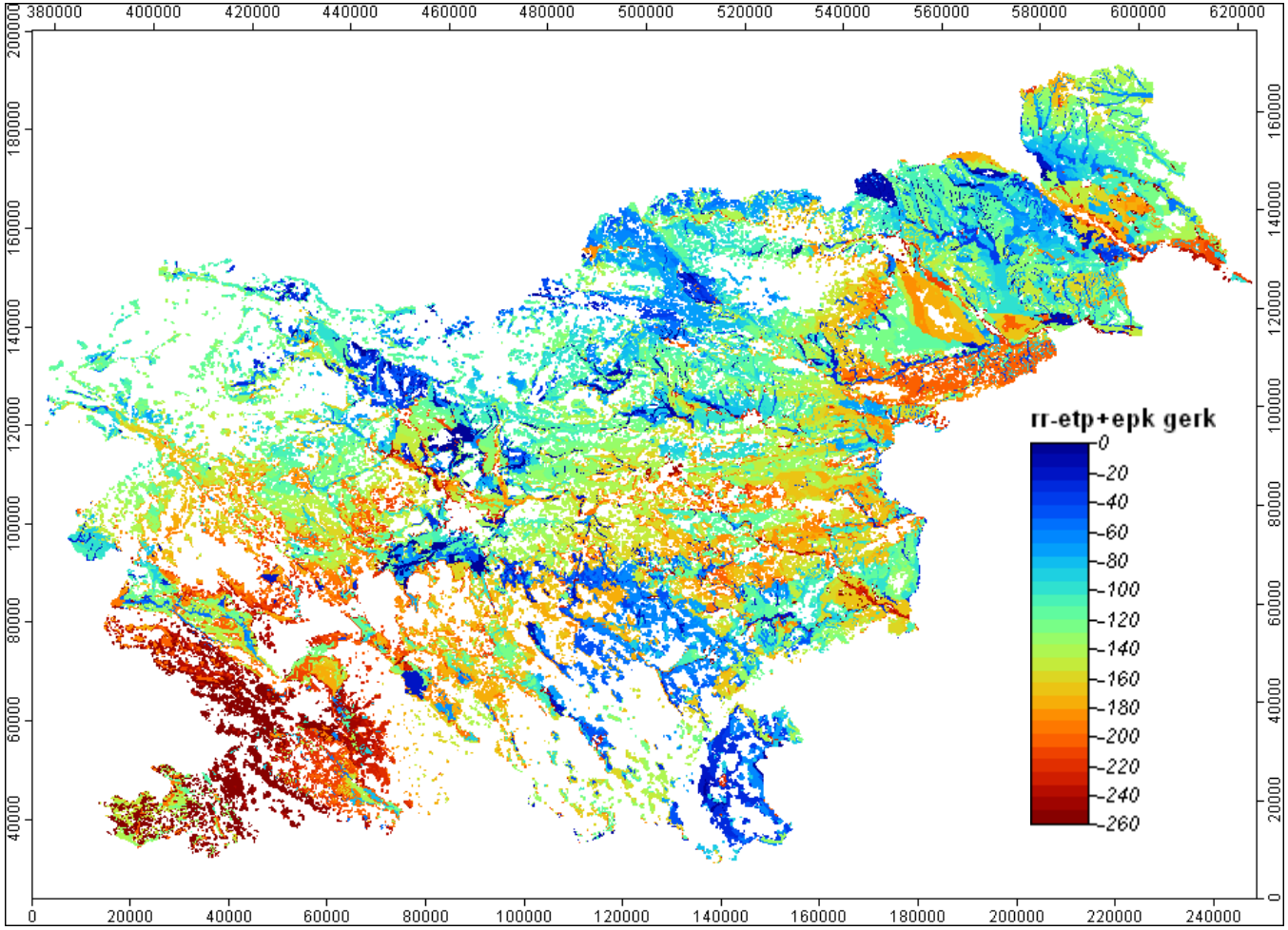


Surface water balance mapping

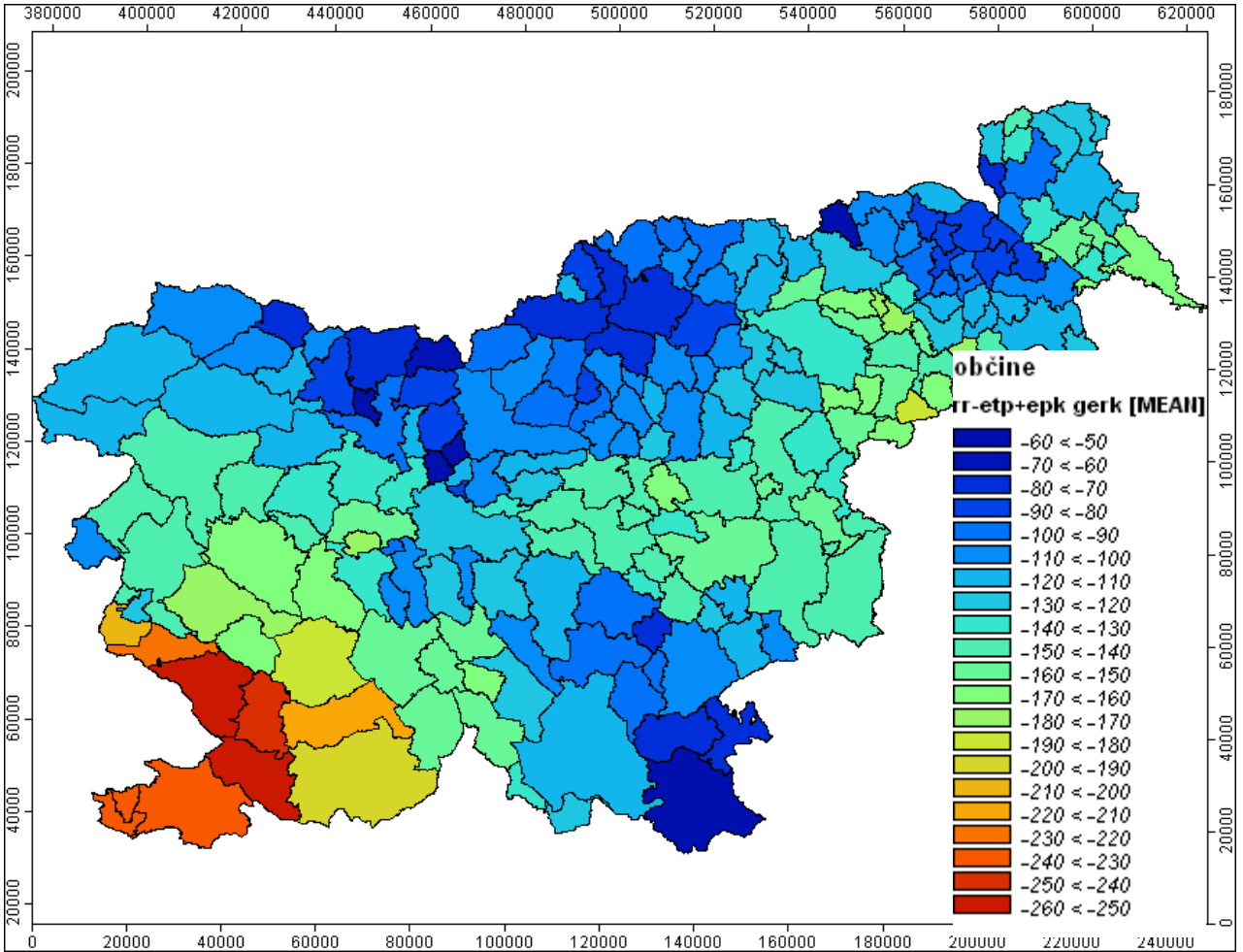
Mapping is performed using standard geostatistical methods (multivariate kriging).

Results filtered over land with agricultural use (and added to soil water holding capacity). Resulty can be aggregated over spatial units (mostly municipalities).

Case:

11th June-10th August

2013



Drought monitoring
application of remote sensing data

Monitoring response of vegetation (not meteorological conditions)

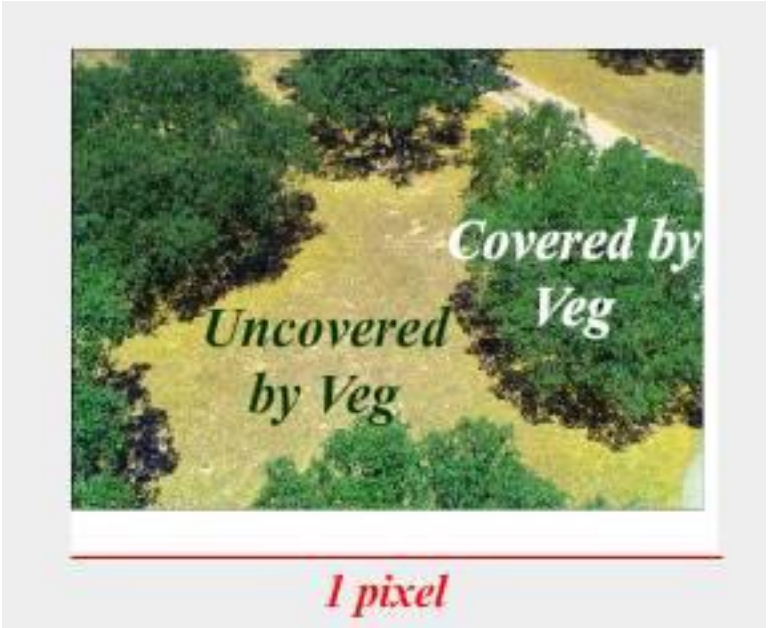
Vegetation indices are composed from multi-channel measurements:

- NDVI (Normalized Difference Vegetation Index) – most basic, 2 channels
- FVC (Fraction of Vegetation Cover) – derived, 3 channels
- LAI (Leaf Area Index) – derived, 3 channels
- FAPAR (Fraction of Absorbed Photosynthetically Active Radiation) derived

Drought monitoring
application of remote sensing data

Fraction of Vegetation Cover
[0 – 1]:
fraction of the surface within satellite pixel covered by green vegetation

Leaf Area Index
total area occupied by the leaves per unit area [m2/m2]
It provides complementary information to the FVC, accounting for the surface of leaves contained in a vertical column normalized by its cross-sectional area.



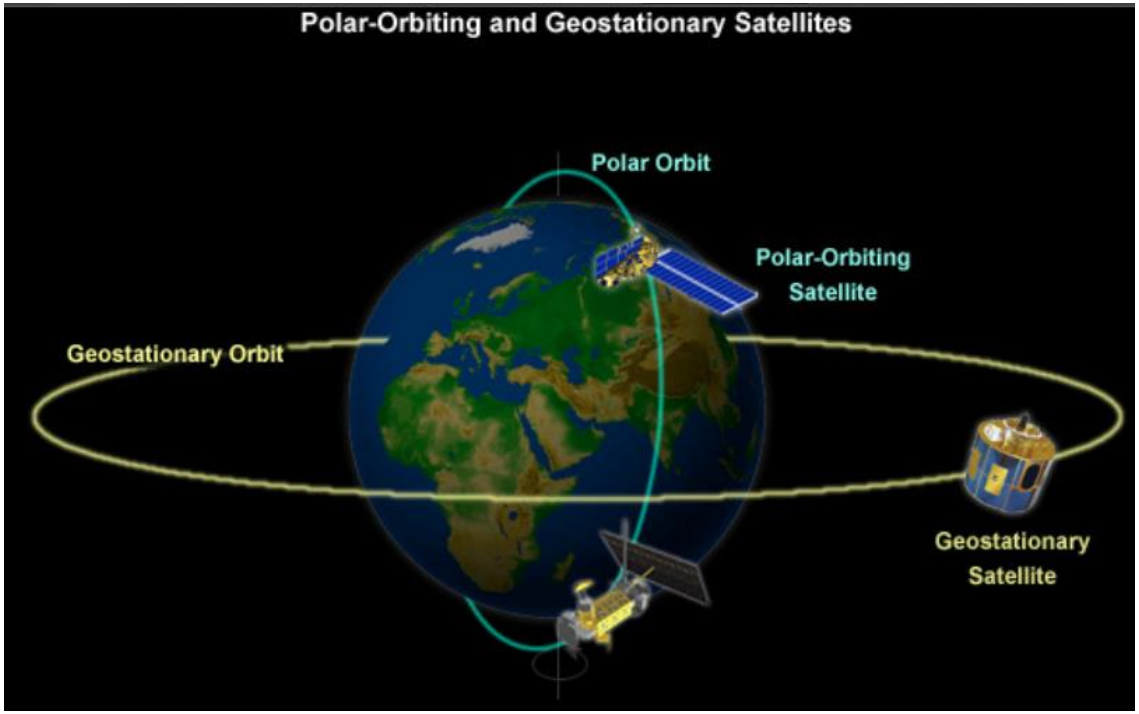
Drought monitoring
application of remote sensing data

geostationary satellites

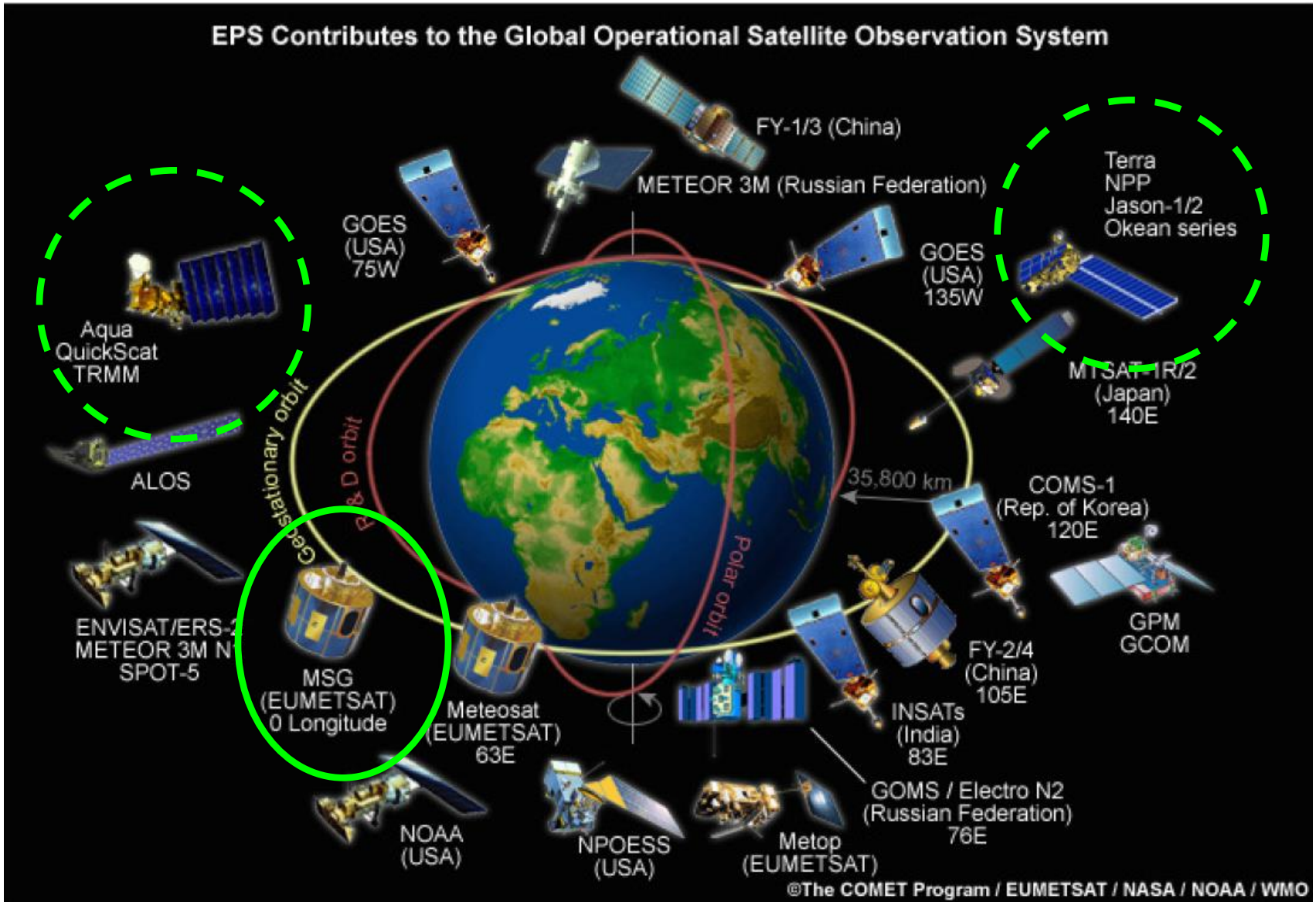
+ virtually above same location on Earth
+ large temporal frequency
- poor spatial resolution

polar-orbiters

+ high spatial resolution
- long return time



Drought monitoring
application of remote sensing data



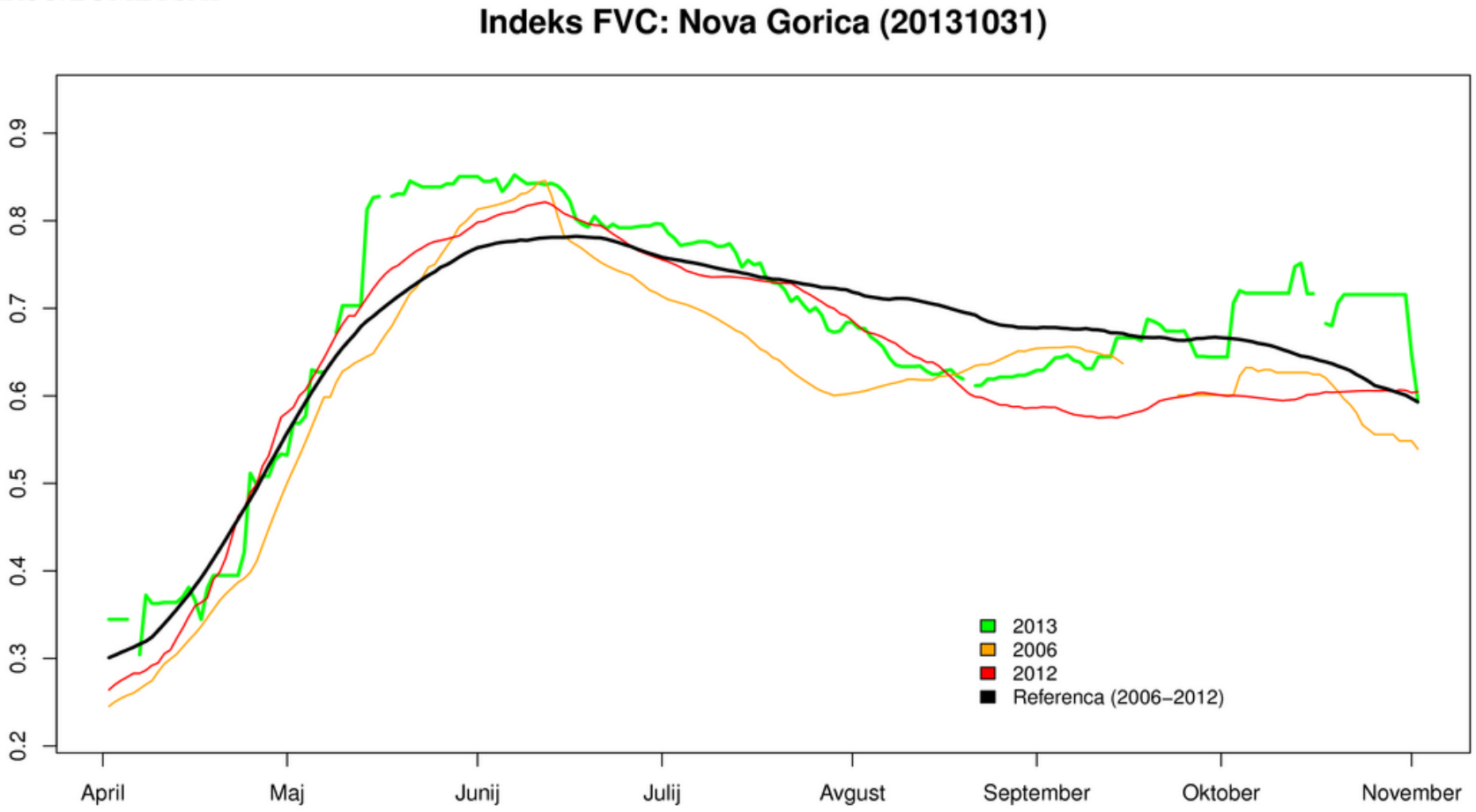
Drought monitoring
application of remote sensing data

Implementation in Slovenian Environmental Agency:
FVC –data provided by EUMETSAT (satellite MSG, processing done by LSA-SAF)

Spatial resolution is limiting factor– homogenious surface ~ 1500 ha
-> vineyards around Gorica (W Slovenia)

Drought monitoring
application of remote sensing data

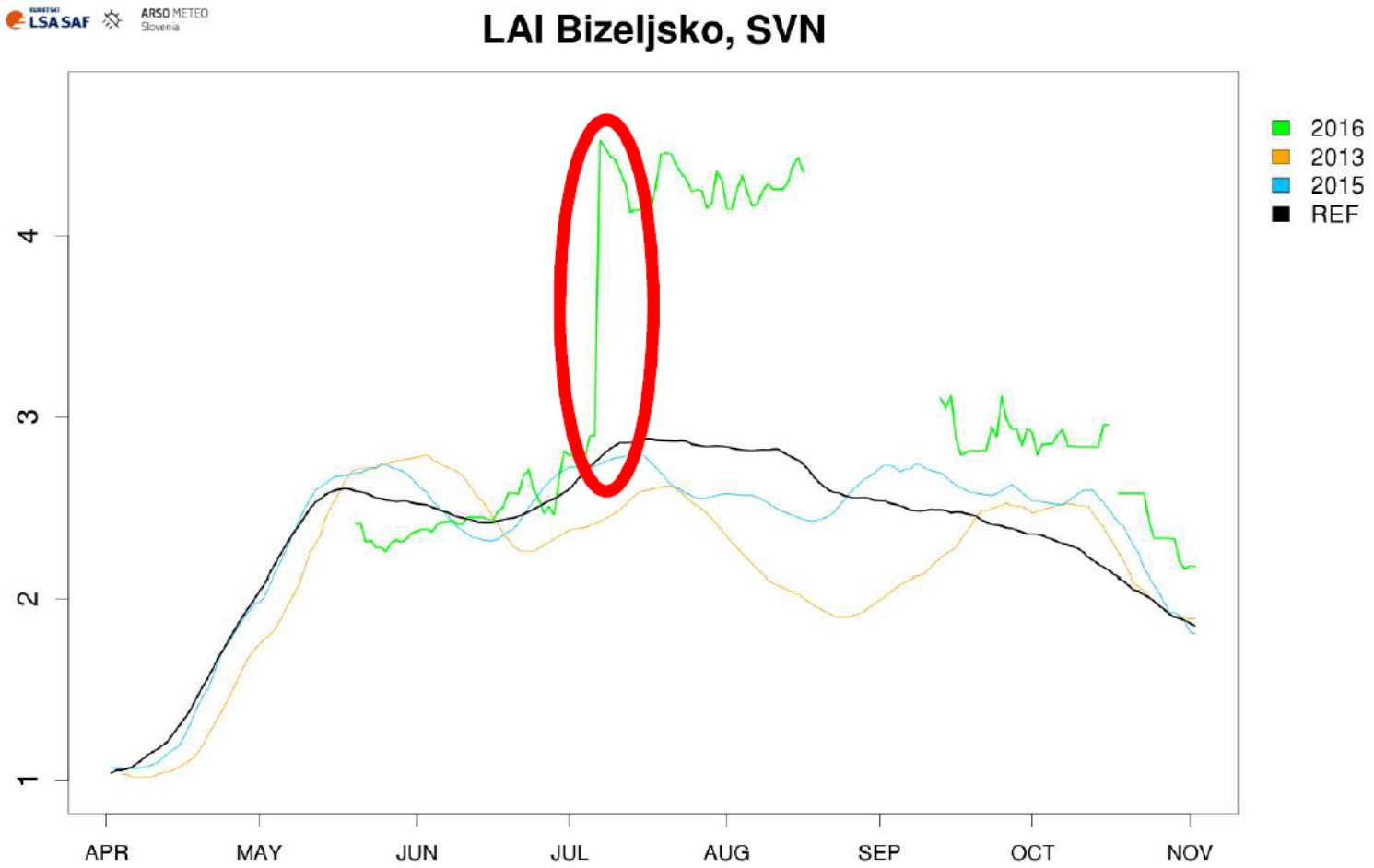
Implementation in Slovenian Environmental Agency:
FVC –data provided by EUMETSAT (satellite MSG, processing done by LSA-SAF)



Drought monitoring
application of remote sensing data

On 6 Jul 2016 LSA SAF switched to a new FVC and LAI vegetation algorithms.

Currently, production is switched off



need for Balkan subregional center

1998

Center initiative – **"top-down" approach**
International Commission on Irrigation and Drainage (ICID) adopted a declaration which expressed the need to establish this centre to alleviate problems caused by drought in the area "Balkan Drought Workshop" in Poiana/Brasov (RO), co-sponsored by the UNCCD

2004

triangle approach: UNCCD focal points, permanent representatives with the WMO + observers from UNCCD and WMO)
Workshop for national experts and representatives of National Meteorological and Hydrological Services where they agreed on DMCSEE within context of UNCCD

2006

decision on DMCSEE host institution (procedure led by WMO)

advocacy, management, steering committee, active institutions in consortium

2007

political commitment of Slovenian government (permanent budget for the governance)

first drought monitoring products, fund raising

2009

Transnational cooperation programme (TCP), cooperation with Eurogeoss project and European Drought Observatory portal

2013

GWP project

G-WADI

2014

2015

ad hoc group - project preparation

Application of DRiDanube project (Danube TP)

2016

DMCSEE domain & activities 2006-2016

DMCSEE
Drought Management Centre for Southeastern Europe

Why DMCSEE and our products?

- SE Europe regional overview of information on drought,
- Tools (models) for visualization and analysis of drought event,
- Set of information resources organized for the collection, processing, maintenance, transmission, and dissemination of information in accordance with defined procedures to meet specific regional/national needs;
- Access to regional and national drought information;
- New approaches: development in RS in comparison to conventional measurements available in global/regional exchange trigerred common approaches;
- but country drought products prepared from local measurements are crucial for drought status assessment.
- DMCSEE support to stakeholders
  - EDO is developed by of Joint Research Centre (JRC)/a department of the European Commission providing independent scientific and technological support for EU policy-making: **http://edo.jrc.ec.europa.eu/edov2/**

Drought Management Centre for Southeastern Europe - DMCSEE

Drought is a normal part of climate in virtually all regions of the world. South Eastern Europe is no exception; in past decades the drought-related damages have had large impact on the economy and welfare. Therefore the need to establish a Drought Center for SE Europe to alleviate the problems caused by drought in the area became evident at the end of the past century. The idea was further elaborated by International Commission on Irrigation and Drainage (ICID) and UN Convention to Combat Desertification (UNCCD). The UNCCD national focal points and national permanent representatives with the World Meteorological Organization have agreed upon the core tasks of the Drought Management Center for South Eastern Europe (DMCSEE) and the proposed project document.

The mission of the proposed DMCSEE is **to coordinate and facilitate the development, assessment, and application of drought risk management tools and policies in South-Eastern Europe with the goal of improving drought preparedness and reducing drought impacts.** Therefore DMCSEE will focus its work on monitoring and assessing drought and assessing risks and vulnerability connected to drought.

DMCSEE Project Proposal

Latest news

Drought bulletin 16th May 2016 (16.05.2016)

DMCSEE in Tbilisi (Georgia) on EUMETSAT/WMO trainig course (13.05.2016)

DMCSEE in economic delegation of the Slovenian Ministry for Foreign Affairs in the Kingdom of Morocco (11.04.2016)

Links

›› UNCCD
›› WMO
›› SEE TCP

Founding countries:

- Albania
- Bosnia and Herzegovina
- Bulgaria
- Croatia
- FYROM
- Greece
- Hungary
- Moldova
- Romania
- Slovenia
- Turkey
- Montenegro
- Serbia

Founding agencies:

- WMO
- UNCCD

www.dmcsee.org

Short term forecast

Outlook (up to 10 days ahead)
NWP model forecast

Real time monitoring

SPI index (GPCC)
Station data (Slovenia only)
NWP analysis:
- precipitation anomaly
- water balance anomaly

Remote sensing: LSA-SAF

Long term forecast

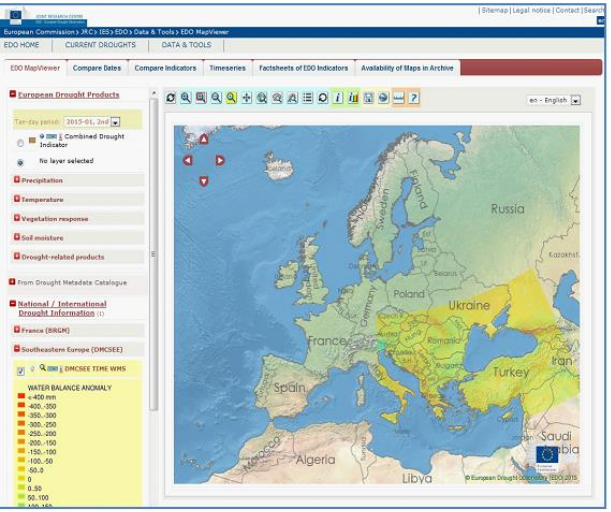
Not operational
Cooperation with VCCC (Serbia)

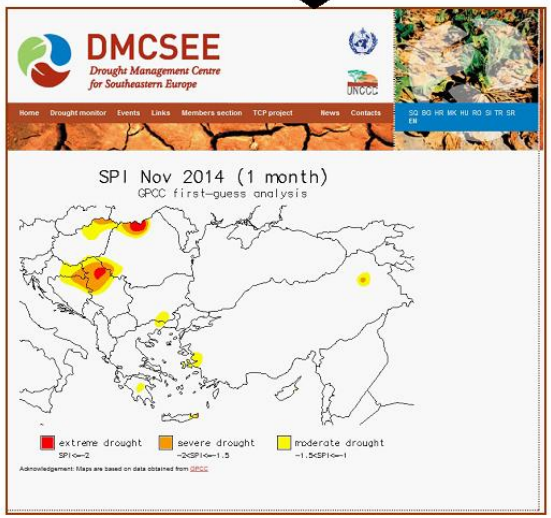
International exchange (EDO)

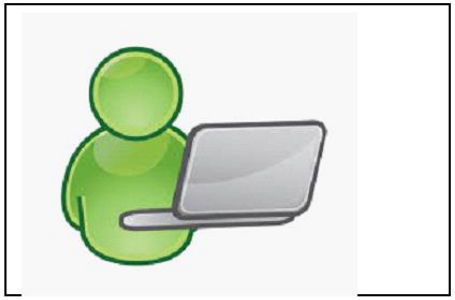
Database Map server

Historical reconstruction

Station and raster archive
Impact archive







Drought bulletin

- ü **Implementation of standardized precipitation index**
- ü Maps of SPI, percentiles and precipitation for the SEE region
- ü **Historical maps (record 1951-2000)**
- ü **Data origin: GPCC data/ update once per month**

DROUGHT MONITORING PRODUCTS

Using GPCC data, some preliminary maps of the SPI, Percentiles and Precipitation for the region were prepared.
Maps are updated twice per month. Final data maps with two months delay are available after 20th day of the current month. First-guess maps are available after 5th day of the next month.
Final data are available from *January 1986*, first-guess from *August 2004*. For period 1951-2000 maps are avaialable here.
Latest maps for **2010** are available below.

SPI

One of the most robust drought indices is so called Standardized Precipitation Index (SPI). The SPI can be calculated at various time scales which reflect the impact of the drought on the availability of water resources. The SPI calculation is based on the distribution of precipitation over long time periods (30 years (1961-1990) was used). The long term precipitation record is fit to a probability distribution, which is then normalised so that the mean (average) SPI for any place and time period is zero.

SPI values above zero indicate wetter periods and values less than 0 indicate drier periods.

Please select year, month, time scale and data type:
2014 | January | 1 month
○ first-guess
○ final
Submit>>>

Percentiles and precipitation

Another way to define drought are percentiles. A percentile is the value of a variable below which a certain percent of observations fall. Long term precipitation record is sort by rank by month; 50 years period (1951-2000) was used. The 5th (10th, 15th etc.) percentile is the value below which 5 (10, 15 etc.) percent of the observations may be found. The 25th percentile is also known as the first quartile; the 50th percentile as the median.

Percentile values above 50 indicate wetter periods and values less than 50 indicate drier periods.

Please select data, year, month and data type:
Percentiles | 2014 | January
○ first-guess
○ final
Submit>>>

DMCSEE
Drought Management Centre for Southeastern Europe

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Drought bulletins and maps

RASTER DATA DOWNLOAD

WCS enables you to download raster data in TIFF and PNG format. These services are useful for performing analyses of drought-related resources in specific software as the functionality of analysing raster maps in a map viewer is limited. You can select SPI on different time scales and WBA (Water balance anomaly) on two months time-scale, provided by NWP.

DROUGHT BULLETINS

Basic information on drought in the current season are summarized in drought bulletin for SE Europe. Drought bulletin is being published since spring 2010 and can be found by following this link:

Drought Bulletin for SE Europe

DROUGHT MONITORING PRODUCTS

Drought Bulletin for SE Europe

- **Hot spot** - short summary, short insight of possible circumstances of drought at the time of issue.
- Additional and auxiliary information (such as methodology used, more detailed information on water balance or temperature situation)
- **Report on drought impacts (more about agricultural drought impacts is missing!)**
- **Outlook**

Check new bulletin issued on May 16, 2016 on web page

SOUTH EAST EUROPE
jointly for our common future

DMCSEE
Drought Management Centre for Southeastern Europe

Programme co-funded by the EUROPEAN UNION

DROUGHT MONITORING BULLETIN

16th May 2016

HOT SPOT

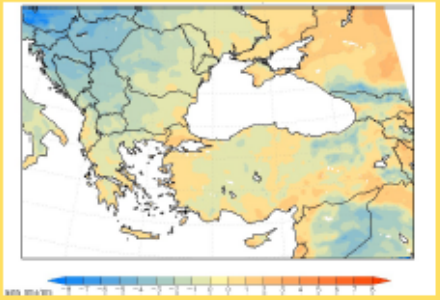
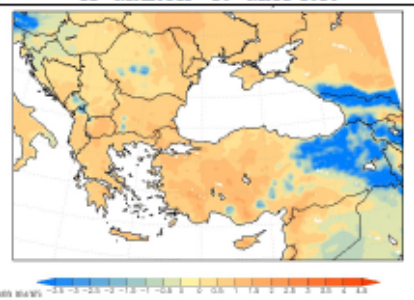


Figure show 10-day anomalies of average minimum air temperatures from April 21-30, 2016.
Extremely cold air mass spread across central Europe and major part of Balkan in third decade in April, after unusually warm period in April, which causes fast vegetation development. Air temperatures anomalies were negative almost in the whole region. The largest deviations were detected at the north-west, where minimum air temperature anomalies were from 2 to 5 °C. In some areas cold spell causes damages due to the frost.

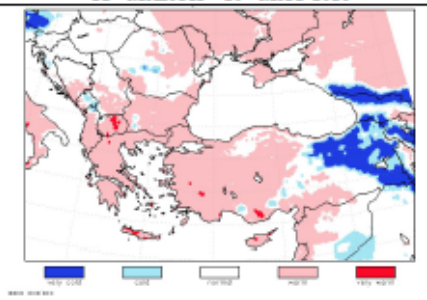
AIR TEMPERATURES AND SURFACE WATER BALANCE

Figures in this section present anomalies of the average air temperature and accumulated water balance and classified values of average air temperature and water balance in percentile classes for 60-days period from 12th March to 10th May 2016.

AVERAGE AIR TEMPERATURE ANOMALY (°C)
12th MARCH – 10th MAY 2016

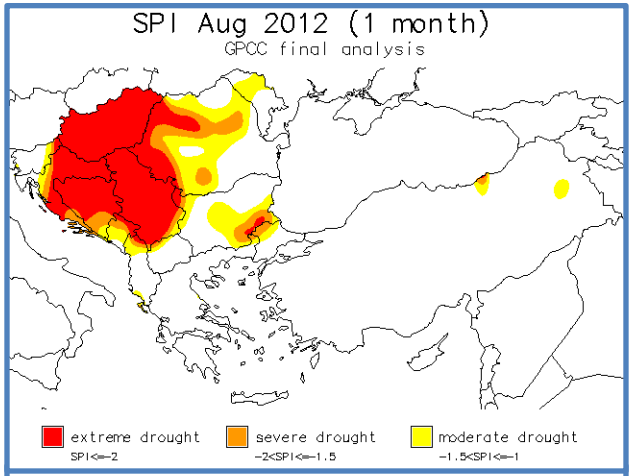


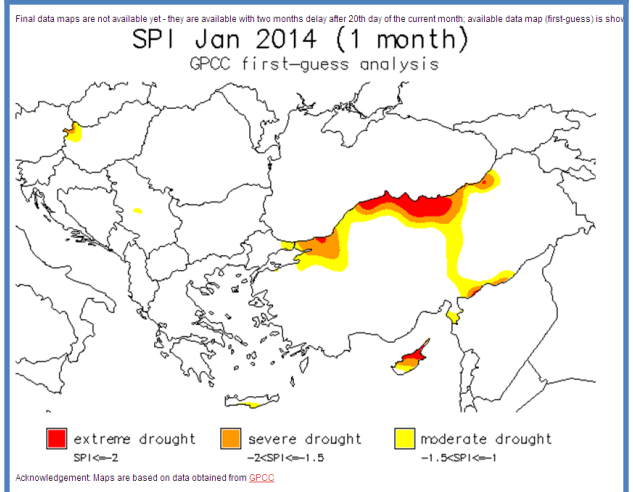
AVERAGE AIR TEMPERATURE PERCENTILE CLASSES
12th MARCH – 10th MAY 2016

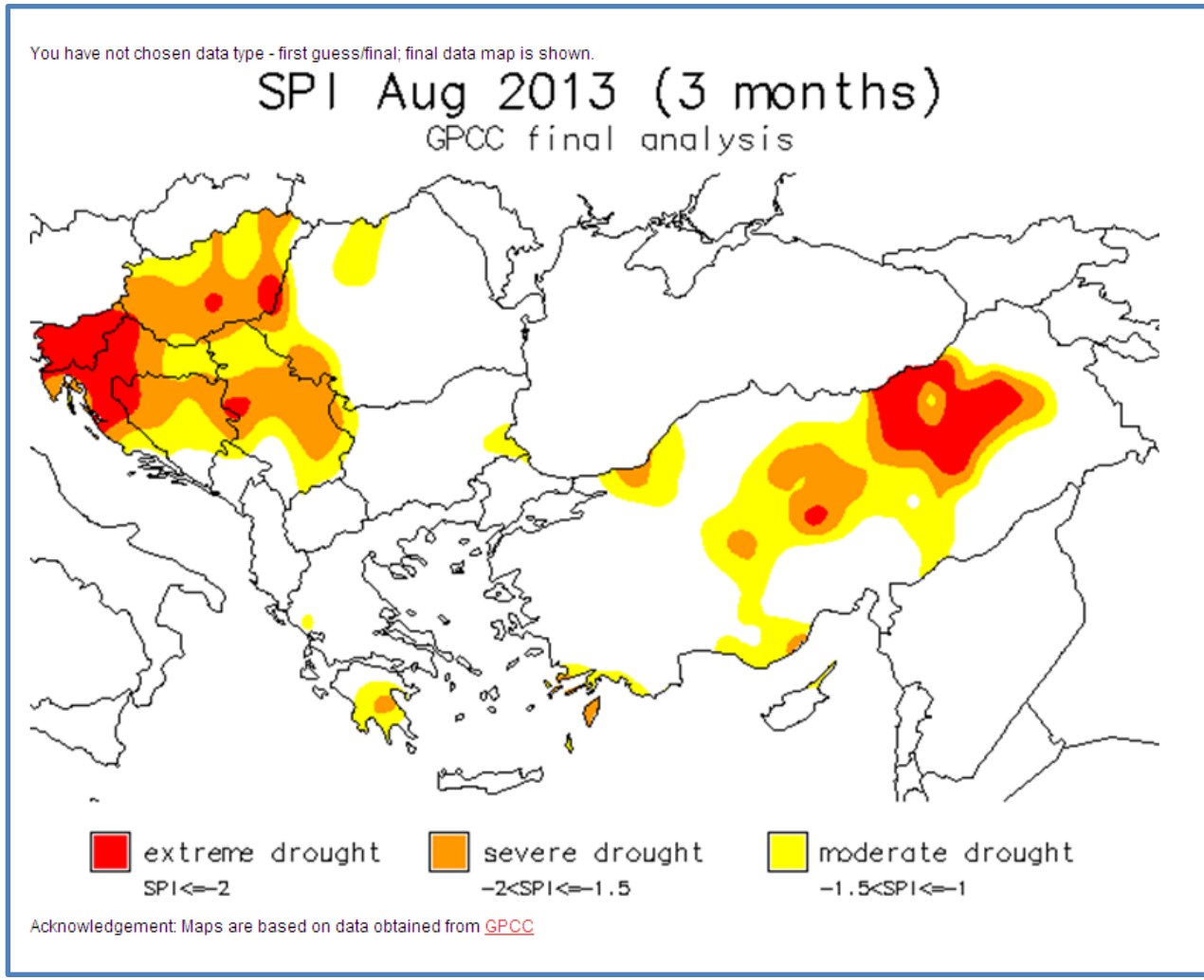


Figures of 60-day accumulated average air temperatures (from 12th March to 10th May) showed positive anomalies at the southern part of Balkan Peninsula and western part of Turkey. Despite the very cold spell at the end of April, first two Aprils decades were unusually warm, which predominate in this 60-days period. Air temperature anomalies in the southern Balkan Peninsula were up to 1 °C above the long term average, in western Turkey up to 1.5 °C. Meanwhile eastern part of Turkey was very cold, up to 3.5 °C below the ordinary values, mainly due to the very cold March and first decade in April.

Drought monitor – meteorological drought: SPI







Drought monitoring application of remote sensing data

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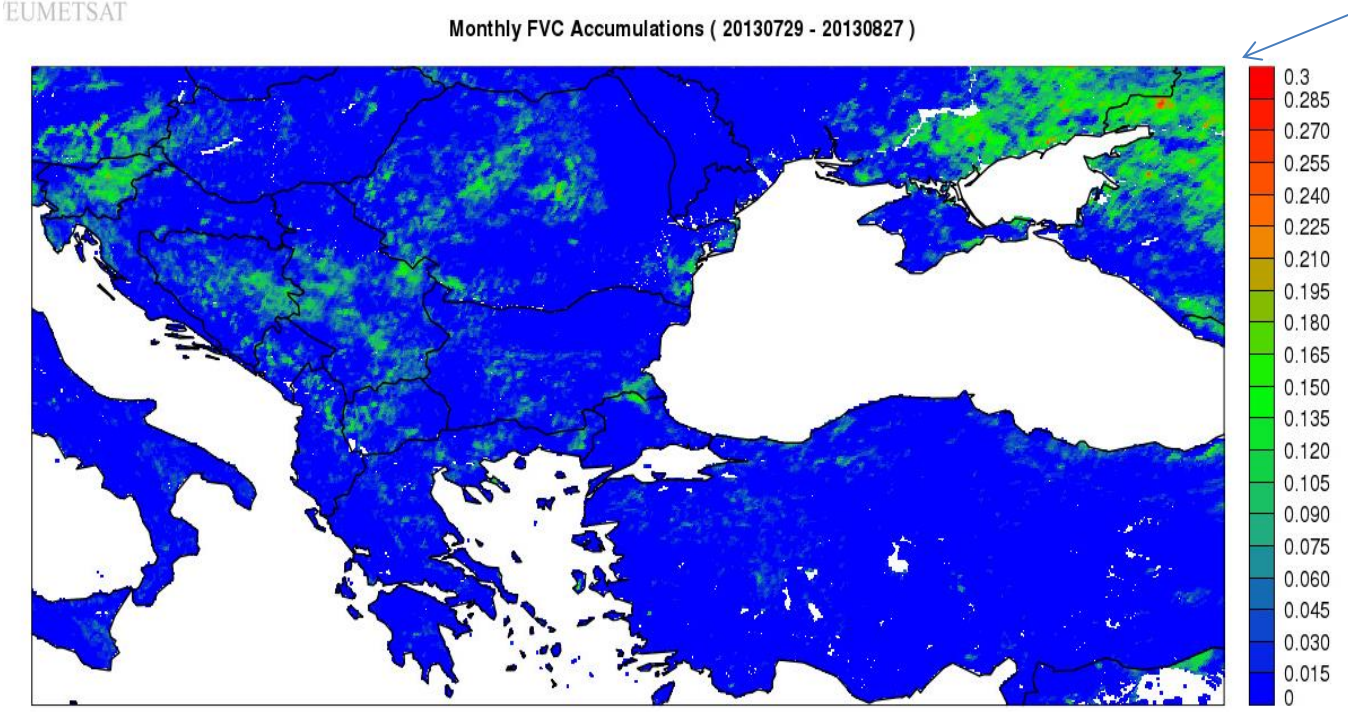
Accumulation of FVC anomaly – example of drought 2013

Summer 2013



Up to 30 % deviation of vegetion cover

- difference to last 5 year average-computed from available archive (Fraction of vegetation) EUMETSAT's LandSAF
- shows the (difference to 5 year average) – eastern Slovenia.

- mapping on DMCSEE domain
- no separation between agricultural pixels and other land use

Check on the web FVC situation in May 2016

Concluding remarks

- Drought is by definition a departure of current state from a „reference“ state => reference state equally important as current state)
- Standardization in progress; simplicity&universality / complexity&specificity dilemma
- International cooperation – sharing resources