Interreg
Danube Transnational Programme
DriDanube

# DriDanube

## "Drought Risk in the Danube Region"

Wolfgang Wagner on behalf of the Project Team

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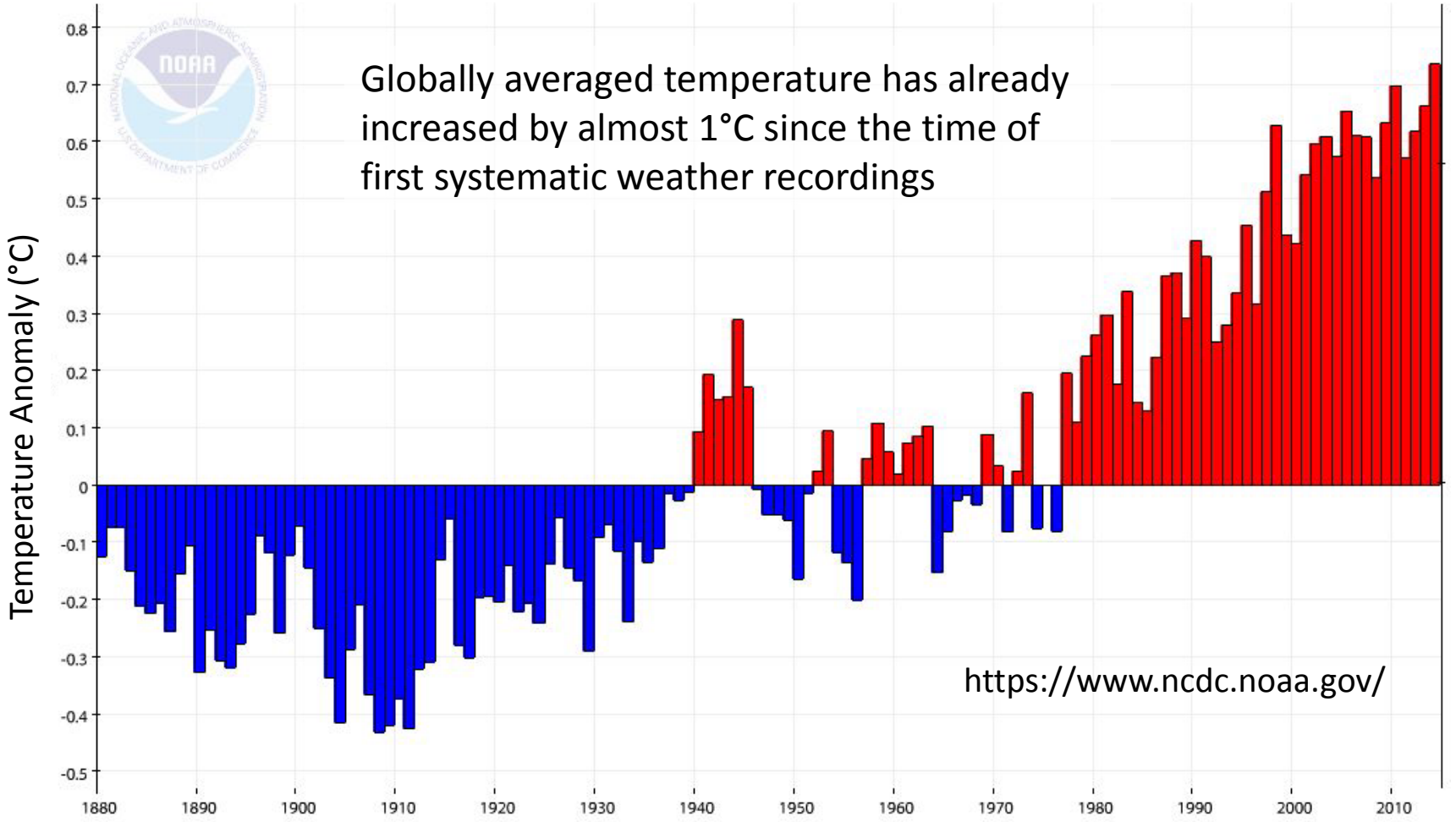
Vienna University of Technology (TU Wien)

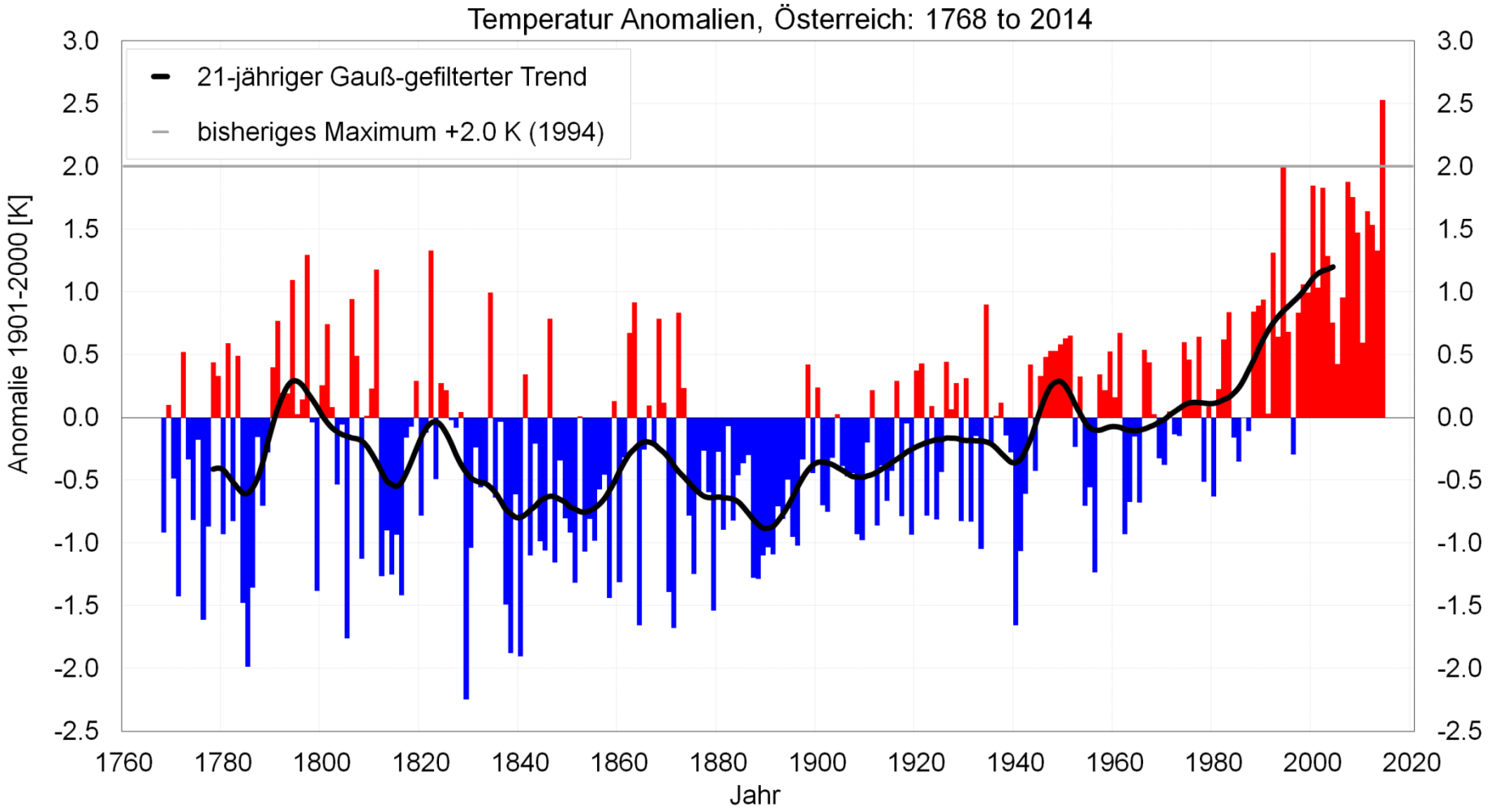
***Budapest, 26 April 2017***


Project co-funded by European Union funds (ERDF, IPA)

# Global Warming Trend



# Warming Trend in Austria




Tauplitz 28 Dezember 2015
SCHISCHULE VASOLD

Maize field in Upper Austria 31 August 2015

nature climate change

ARTICLES

PUBLISHED ONLINE: 25 MAY 2014 | DOI: 10.1038/NCLIMATE2242

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# Adverse weather conditions for European wheat production will become more frequent with climate change

Miroslav Trnka[1,2*], Reimund P. Rötter[3], Margarita Ruiz-Ramos[4], Kurt Christian Kersebaum[5], Jørgen E. Olesen[6], Zdeněk Žalud[1,2] and Mikhail A. Semenov[7]

**Europe is the largest producer of wheat, the second most widely grown cereal crop after rice. The increased occurrence and magnitude of adverse and extreme agroclimatic events are considered a major threat for wheat production. We present an analysis that accounts for a range of adverse weather events that might significantly affect wheat yield in Europe. For this purpose we analysed changes in the frequency of the occurrence of 11 adverse weather events. Using climate scenarios based on the most recent ensemble of climate models and greenhouse gases emission estimates, we assessed the probability of single and multiple adverse events occurring within one season. We showed that the occurrence of adverse conditions for 14 sites representing the main European wheat-growing areas might substantially increase by 2060 compared to the present (1981–2010). This is likely to result in more frequent crop failure across Europe. This study provides essential information for developing adaptation strategies.**

# General information

| | |
|---|---|
| Project: | **DriDanube - "Drought Risk in the Danube Region"** |
| Reference No: | DTP1-182-2.4 - DriDanube |
| Programme: | **Danube Transnational Programme (DTP)** |
| | *Priority Area 2 (PA2):* ***Environment and culture responsible Danube region*** |
| | *Specific Objective (SO2.4):* ***Improve preparedness for environmental risk management*** |
| Duration: | January 2017 – June 2019 (**30 months**) |
| Project budget: | **1.974.750,00 EUR** |

# Partnership

- **Lead partner: *Slovenian Environment Agency***
- **ERDF & IPA partners (15)**
- **Associated Strategic Partners (ASP) (8)**


**7 EU countries:**
Austria (2)
Czech Republic (1)
Croatia (1)
Hungary (2)
Romania (1)
Slovakia (2)
Slovenia (2)

**3 non-EU countries:**
Bosnia and Herzegovina (1)
Montenegro (1)
Serbia (2)

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## Austria

Vienna University of Technology,**TU Wien**
EODC Earth Observation Data Centre for Water Resources Monitoring GmbH, **EODC**
***(ASP) -*** *Environment Agency Austria,* ***EAA***
***(ASP) -*** *Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management,* ***BMLFUW***
***(ASP) -*** *International Commission for the Protection of the Danube River,* ***ICPDR***

## Slovenia

Slovenian Environment Agency, **ARSO**
Centre of Excellence for Space Sciences and Technologies, **SPACE-SI**
***(ASP) -*** *Administration of the RS for Civil Protection and Disaster Relief,* ***URSZR***

## Croatia

Meteorological and Hydrological Service, **DHMZ**
***(ASP) -*** *Ministry of Environment and Energy, Water management directorate,* ***MZOIE***

## Czech Republic

Global Change Research Centre AS CR, v.v.i., **CzechGlobe**
*(**ASP**) - The State Land Office,* ***SLO***

# Partners

## Slovakia

Global Water Partnership Central and Eastern Europe, **GWP CEE**
Slovak Hydrometeorological Institute, **SHMU**

## Hungary

Hungarian Meteorological Service, **OMSZ**
Szent Istvan University, **SZIU**,
***(ASP)*** *- Ministry of Agriculture,* ***FM***

## Romania

National Meteorological Administration, **NMA**

## Serbia

***(IPA)*** Faculty of Agriculture, University of Novi Sad, **FAUNS**
***(IPA)*** Republic Hydrometeorological Service of Serbia, **RHMSS**
***(ASP) -*** *Agricultural Station/Forecasting and Warning Service of Serbia in plant protection,* ***PIS***

## Bosnia and Herzegovina

***(IPA)*** *Republic Hydrometeorological Service of Republic of Srpska,* ***RHMZ RS***

## Montenegro

***(IPA)*** *Institute of Hydrometeorology and Seismology,* ***IHMS***

# Project: aim and objectives

- Project **aims** to increase the capacity of the Danube region to adapt to climatic variability by **enhancing resilience to drought** with recently developed tools and data sets;

- **Objectives**:
  - Develop a new operational drought monitoring service;
  - Prepare a unified drought risk protocol based on the Civil Protection Mechanism;
  - Improve drought emergency response in the Danube region.

# Project: target groups

- Hydro-meteorological national services
- Emergency response authorities
- Non-governmental organisations
- Water and farmer communities/chambers
- Industries

# Project: outcomes

## Main deliverables:

- Drought User Service
- Methodology for drought impact assessment and forecast
- Methodology for drought risk assessment
- Strategy to improve drought response

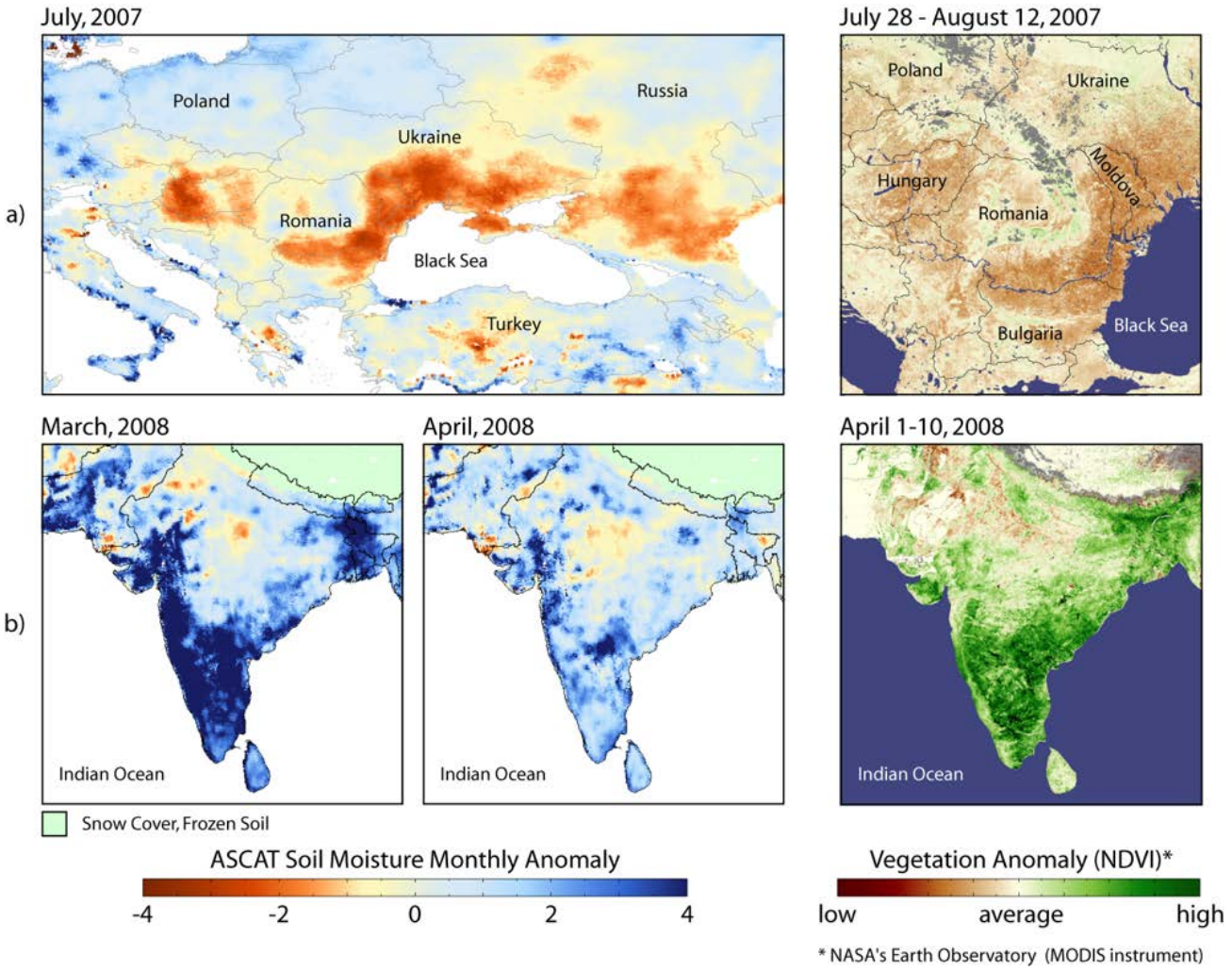
*Improve drought emergency response and enhance the cooperation between operational services and decision making authorities in the Danube region.*

# Drought User Service

## An operational service based on exploitation of Earth Observation (EO) data:

- Easy-to-use interface:
  - Access in browser (operating system-independent)
  - Responsive interface (selecting different products, dates, geographic region)
- Functionality:
  - Display a suite of drought-related Earth Observation indices (vegetation, soil moisture, yield forecast, etc.)
  - Visual comparison between different products
- Specifications:
  - Region: Danube catchment
  - Temporal resolution: weekly images
  - Spatial resolution: 12.5km to 1km

# Drought EO-based characterisation




Monthly anomalies of **soil moisture** (ASCAT, EUMETSAT) and **NDVI** (Modis, NASA)

**(a) Moldova**

- Year 2007 with the most severe drought ever recorded
- Cereal production ~70% lower than average of previous 5 years (FAO)

**(b) India**

- Wet soil provided suitable condition for plant growth,
- Lead to record harvest yield in April

Naeimi, V., W. Wagner (2010). C-band Scatterometers and their Applications, Chapter 13 of "Geoscience and Remote Sensing New Achievements", Pasquale Imperatore and Daniele Riccio (Ed.), INTECH, Vukovar, Croatia, 230-246.

# Drought User Service - **EO data sets**

**Input data:**

**METOP-A/B ASCAT**

- Surface Soil Moisture data, 12.5km Swath Grid
- 2007-now
- Originating from EUMETSAT

**Sentinel-1A/B CSAR L1**

- Radar backscatter data, 25x25m pixel spacing
- 2015-now
- Originating from Copernicus Global Land Service

**TERRA MODIS**

- Surface Reflectance, 250m
- 2000-now
- Originating from NASA

**Auxiliary data:**

**Sentinel-2A MSI L1C**

- Top of atmosphere reflectance
- 10m spatial resolution
- 2016-now
- Originating from Copernicus Global Land Service

**HWSD (Harmonised World Soil Database) v1.2**

- Global
- Vector format
- Originating from FAO

**Output/Results:**

**Soil Water Index (SWI) images**

- Plant Available Water (in %), including anomaly from long-term mean minimum: 10-day product ("dekadal") at 12.5 km resolution, optimum: daily product, at 1km resolution

**Normalised Difference Vegetation Index (NDVI) and Enhanced Vegetation Index (EVI)**

- Weekly images
- 5 km resolution
- With difference maps to previous week

**Yield forecast maps**

- 7-day trend, 5 km resolution
- Based on vegetation indices (e.g. NDVI, EVI)

# Drought User Service

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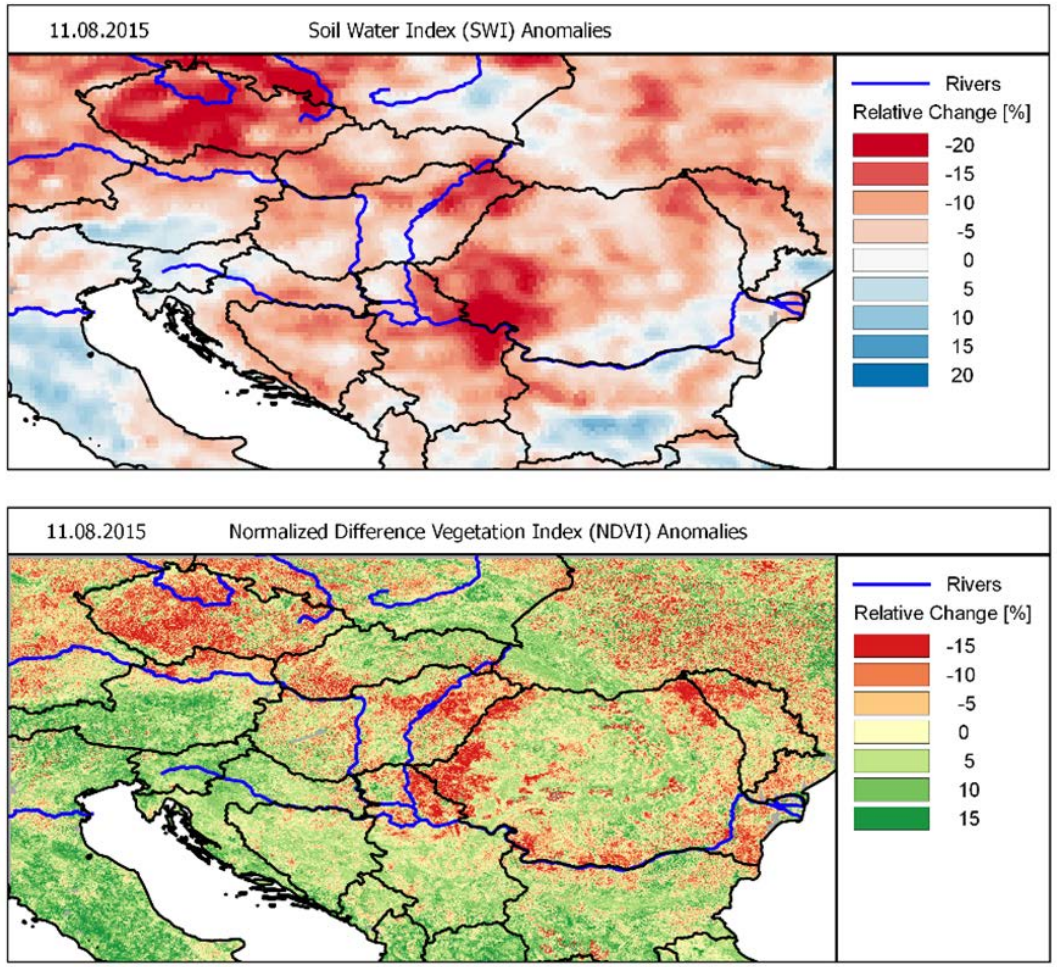
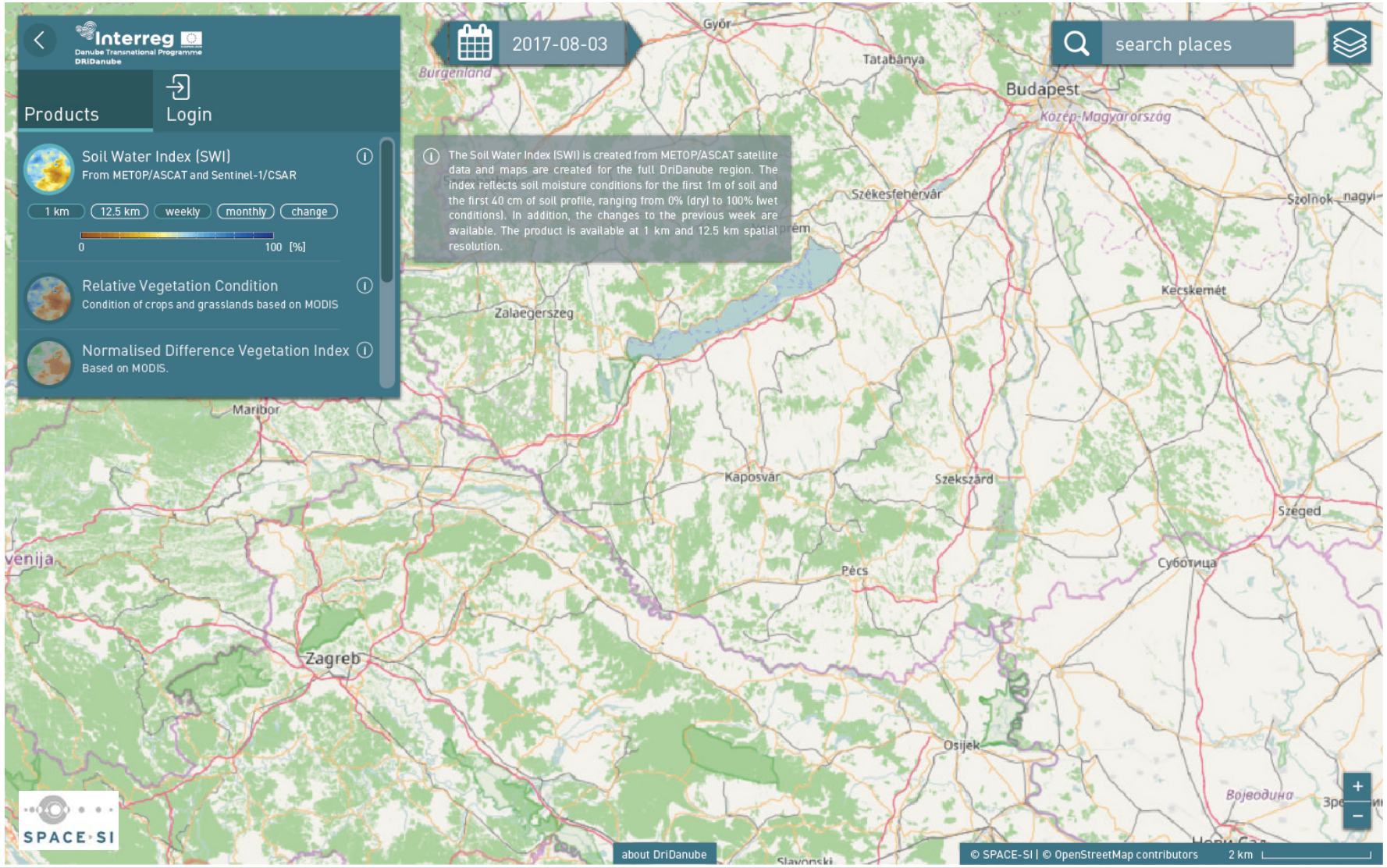
## Example output:

- **Major drought event reported in the Danube region in August 2015**
- SWI anomaly image (difference from long-term mean value) with a spatial sampling of 0.1 degrees (top)
- NDVI anomalies with a spatial sampling of 1/112 degrees (~1km) (bottom)

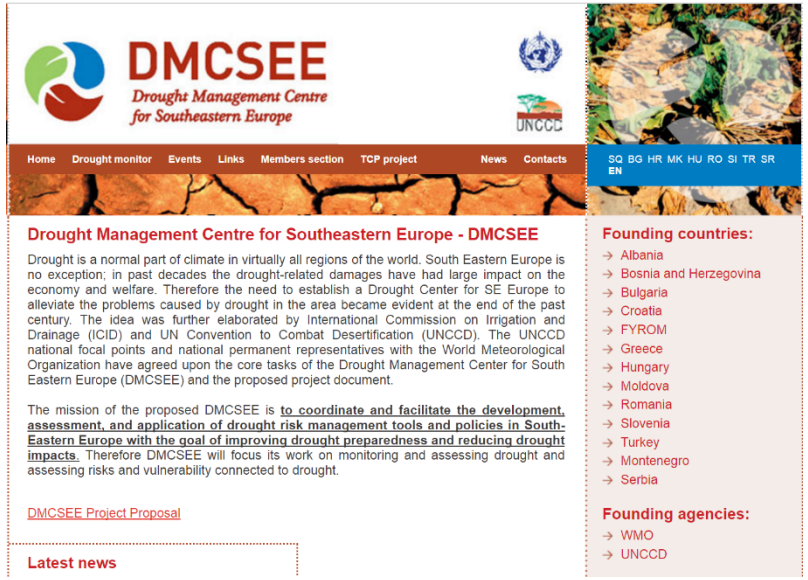
*(WGS84/Pseudo Mercator projection (EPSG: 3857))*



# Drought User Service (draft design)

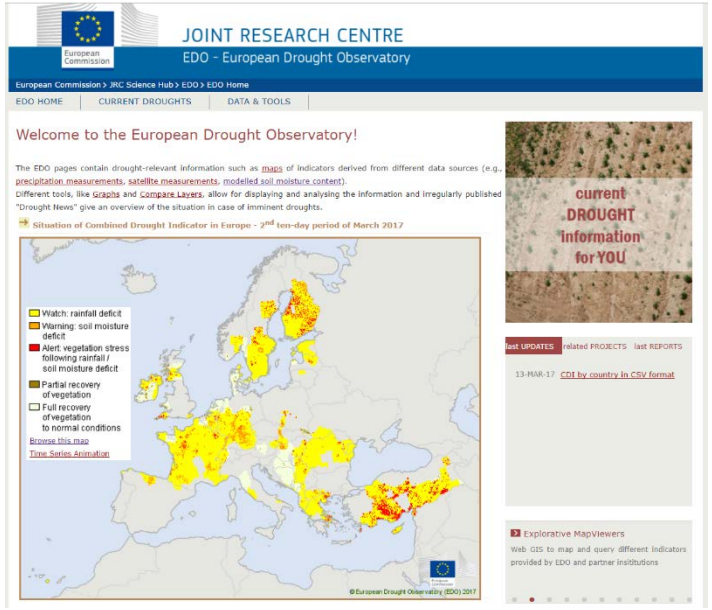


# Build on previous developments




Drought Management Centre for Southeastern Europe


INTERSUCHO




JRC European Drought Observatory

# Summary

## Improve drought emergency response in the Danube region:

- With an operational monitoring service based on EO data
  - New EO-based data included: soil moisture from ASCAT
- Take advantage of the technological development, e.g. cloud services:
  - Process, analyse and display results of multiple large data sets (EO, meteorological data, in-situ data) and their combination
  - Facilitate interaction between stakeholders
- Facilitate trans-border information exchange on good practices in drought management between all stakeholders at national and regional level
- Implement drought management policies in the existing frameworks (e.g. in the Danube River Basin Management Plan)

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Info and updates:
***www.interreg-danube.eu/dridanube***


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