Developing the European Drought Observatory (EDO)

Jürgen Vogt

European Commission Joint Research Centre (JRC)
Institute for Environment and Sustainability (IES)

juergen.vogt@jrc.ec.europa.eu
http://desert.jrc.ec.europa.eu/

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Presentation Structure

1. Background and Political Context

- Why a European Drought Observatory?
- What are the tasks?

2. Current Status

- Multi-scale approach
- Indicators
- Catalogue

3. Drought Monitoring using SPI and fAPAR

- Example of the 2011 spring drought

4. Next Steps

Drought Impacts

Economic Impacts:

- Last 30 years: estimated cost of at least 100 billion Euros
- 2003: estimated 6.7 billion Euros, 1/3 of EU territory affected
- Annual economic impact doubled from 1976-1990 to 1991-2006

Period	Total Impact	Impact/year
1976 – 1980	12 340	2 470
1981 – 1985	4 360	870
1986 – 1990	14 460	2 890
1991 – 1995	23 390	4 680
1996 – 2000	8 060	1 610
2001 – 2006	37 400	6 230
TOTAL	**100 000**	

All figures in million Euros

Environmental Impacts:

- Drought can cause serious long-term environmental impacts (e.g., water quality, salinization, desiccation of wetlands, soil erosion, desertification, …)
- These impacts are difficult to quantify and data are generally lacking

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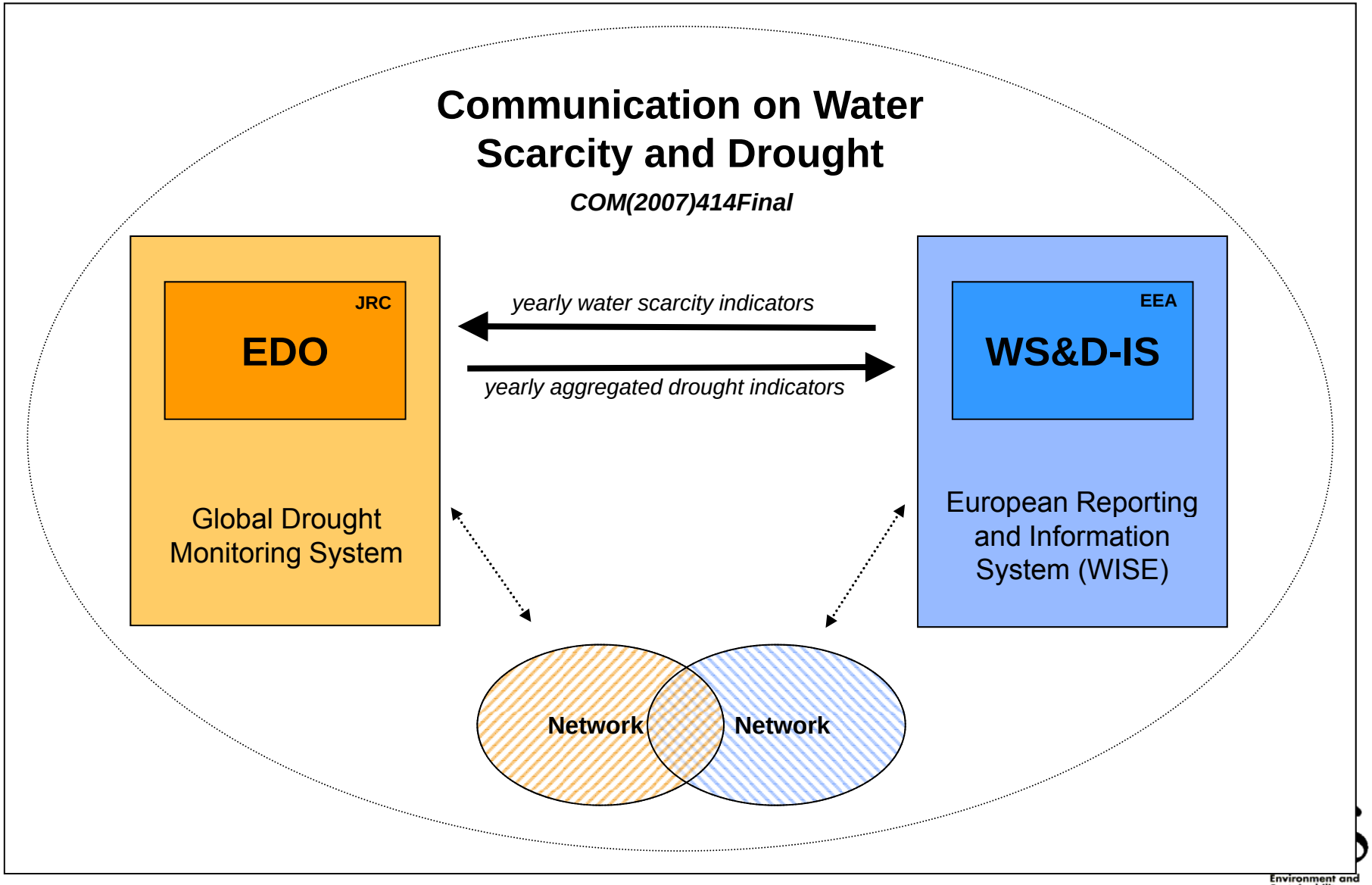
Source: European Commission, 2007 (WS&D, 2nd Interim Report)

Policy Context



Policy Context

EC Communication on Water Scarcity and Drought (COM 2007(414)Final)

- *EDO will integrate relevant data and research results, drought monitoring, detection and forecasting on different spatial scales, from local and regional activities to a continental overview at EU level, and will make it possible to evaluate future events.*
- *By 2012, develop prototypes and set up implementing procedures for an operational European Drought Observatory and early warning system*

EP Report on the EC Communication "Towards a Stronger European Disaster Response" (A-7-0283/2011)

- *… reiterates, …,the importance of establishing the European Drought Observatory, which would be responsible for studying, mitigating and monitoring the effects of drought.*

EDO Key Tasks

Detection | **Monitoring** | **Forecasting** | **Hazard Vulnerability Risk** | **Impact Assessment**

At different spatial scales (i.e. facilitating seamless access to regional, national and local drought information)

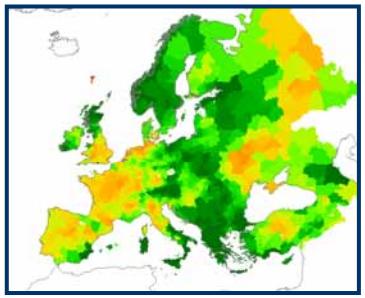
Provides:

- Background information
- Tools for search and query
- Tools for data and map visualization
- Tools for data analysis

- *Hazard assessment*
- *Drought forecasting*
- *Analysis of drought impacts*

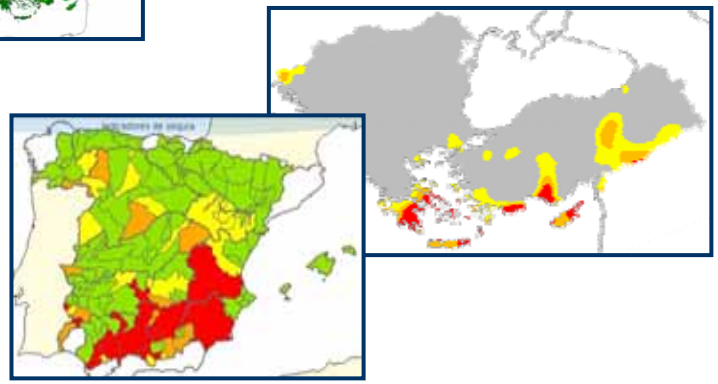
EDO Multi-Scale Approach

→ Continental

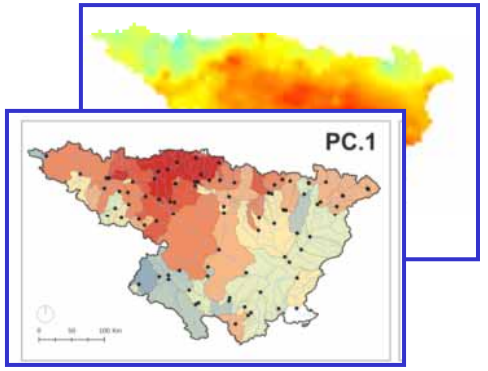


Multi-scale approach based on subsidiarity that integrates drought information from various scales

→ sub-continental & national



→ regional and local (RB)



Interoperability of drought information systems is required !

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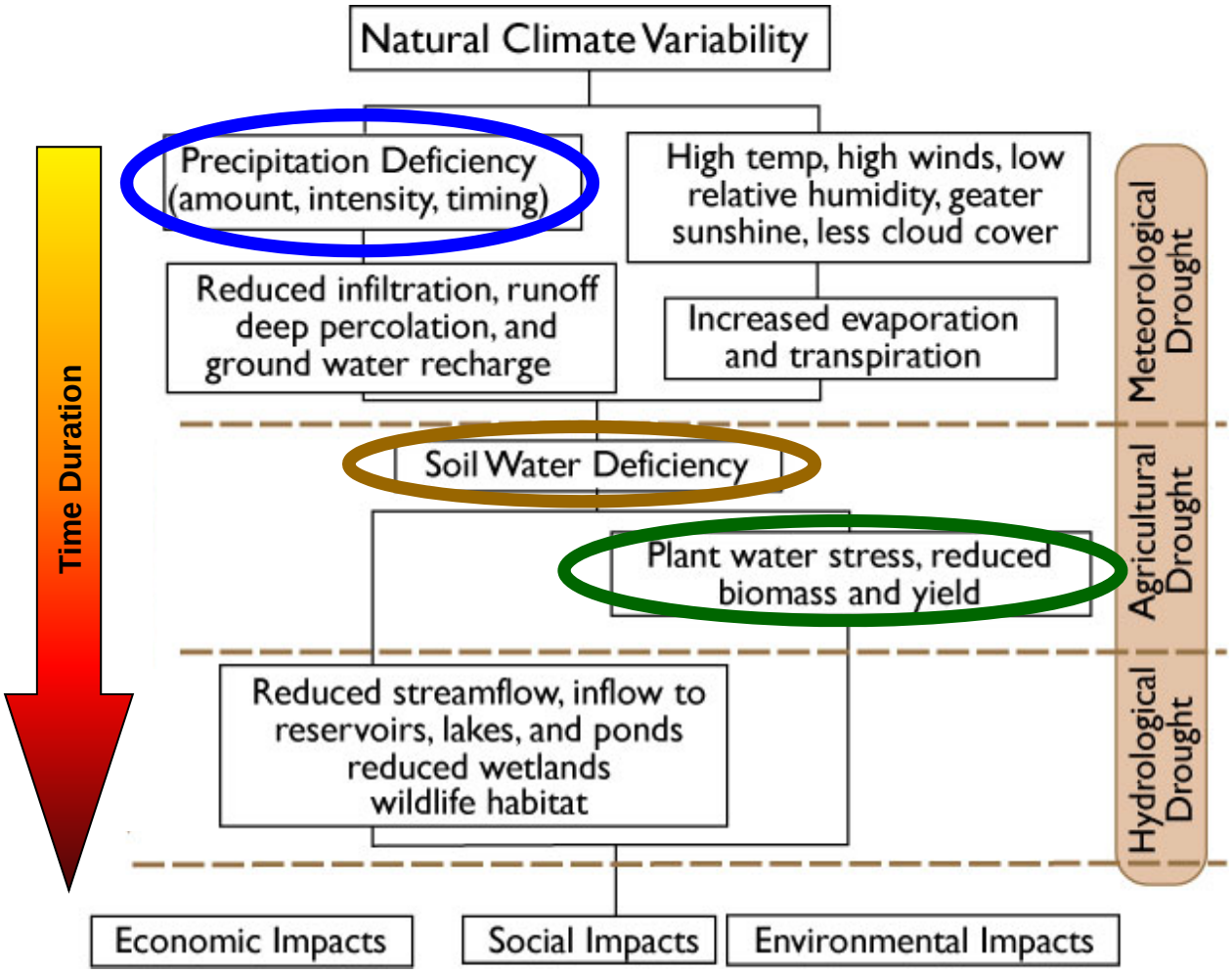
Multi-Indicator Approach

at continental scale



Standardized Precipitation Index

Soil Moisture Anomaly

Vegetation Response

Source: National Drought Mitigation Center, University of Nebraska-Lincoln, USA

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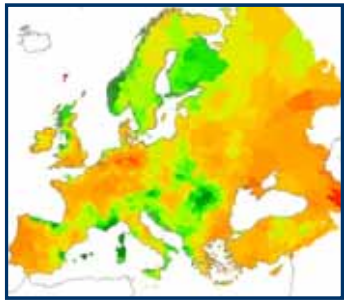
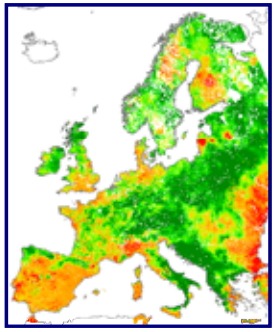
Multi-Indicator Approach

- **Precipitation (SPI)**
  - ✓for aggregation periods of 1, 3, 6, 9, 12, 24 months



- **Soil Moisture**
  - ✓Daily soil moisture
  - ✓Daily soil moisture anomaly
  - ✓Forecasted soil moisture anomaly (7days)
  - ✓Forecasted soil moisture trend



- **Vegetation status**
  - ✓NDWI 10-day composites
  - ✓NDWI anomalies
  - ✓fAPAR 10-day composites
  - ✓fAPAR anomalies

Composite Drought Indicator (Drought Alert)

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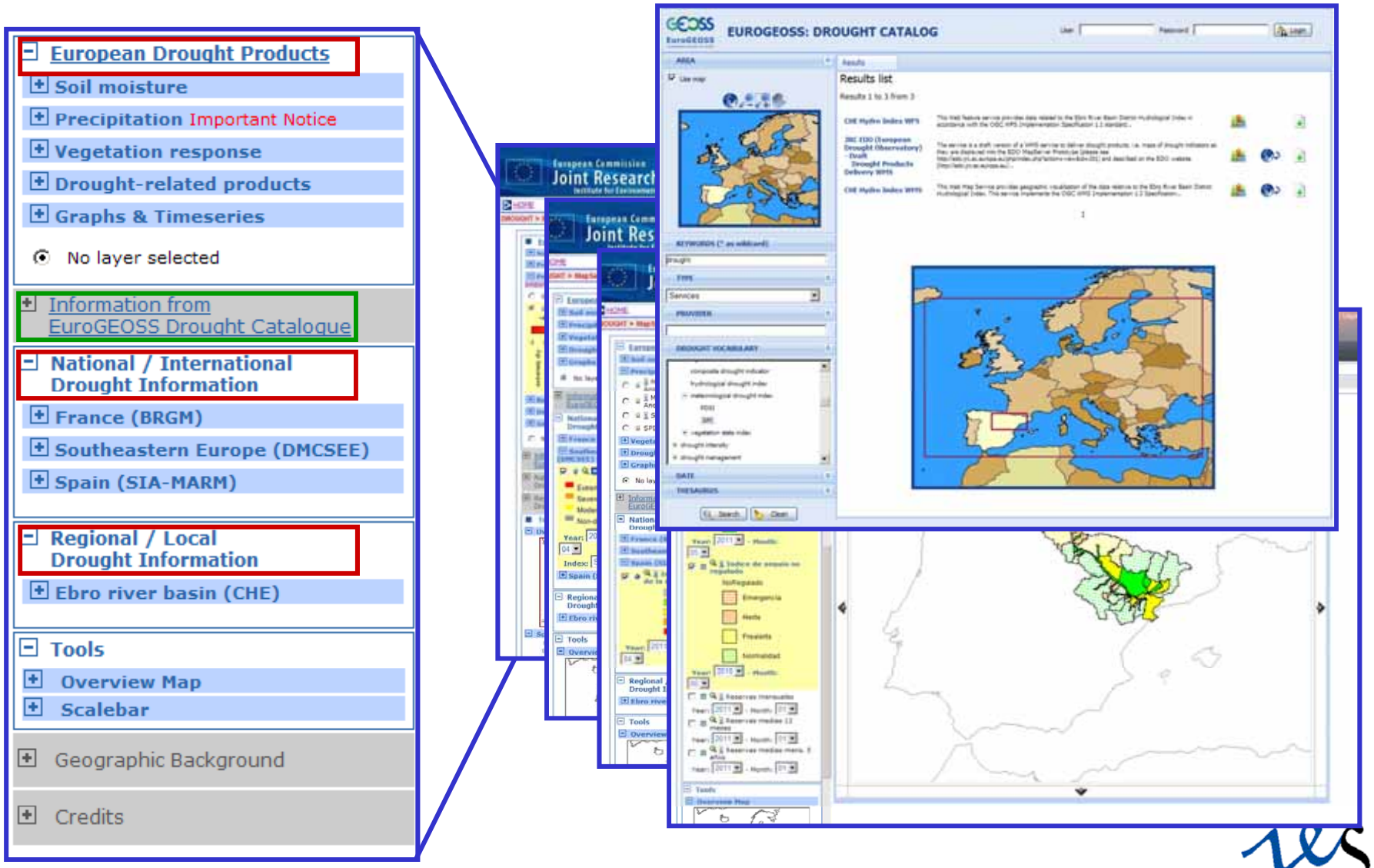
EDO Multi-Scale Approach



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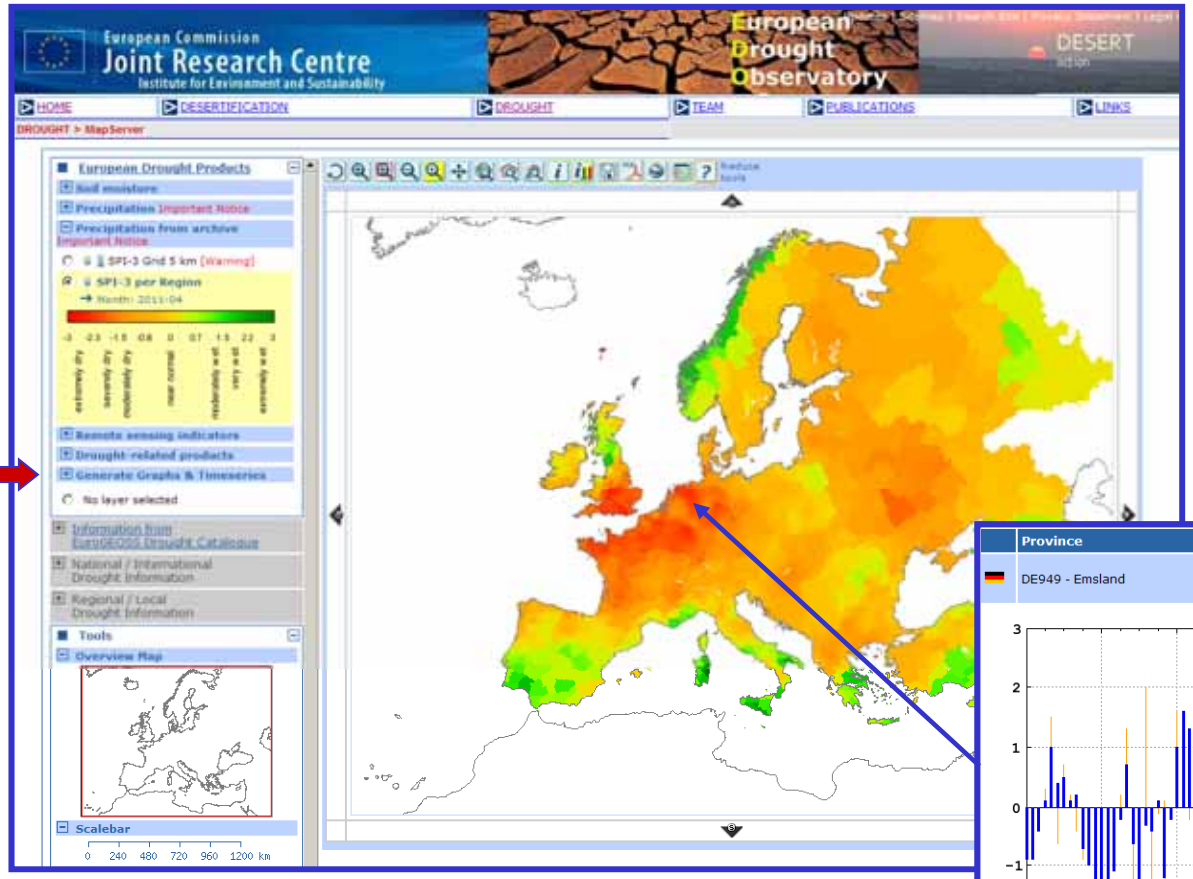
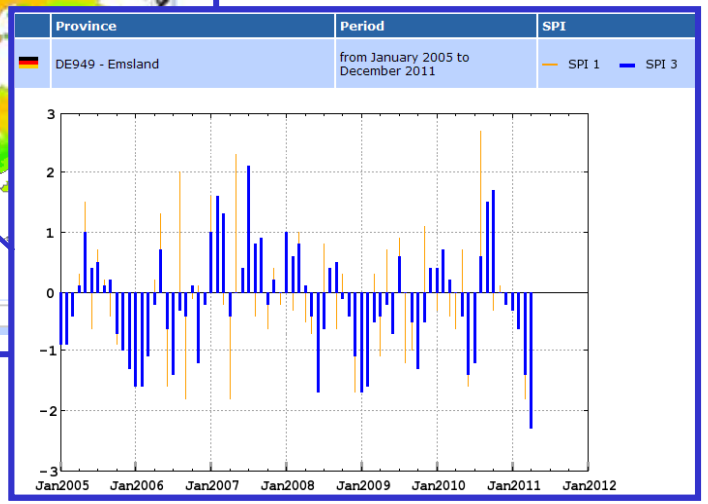
EDO: Standardized Precipitation Index



SPI-3

Spring 2011

Emsland (DE)



3-month Standardized Precipitation Index (SPI-3)
February to April 2011, aggregated to regional level

http://edo.jrc.ec.europa.eu/

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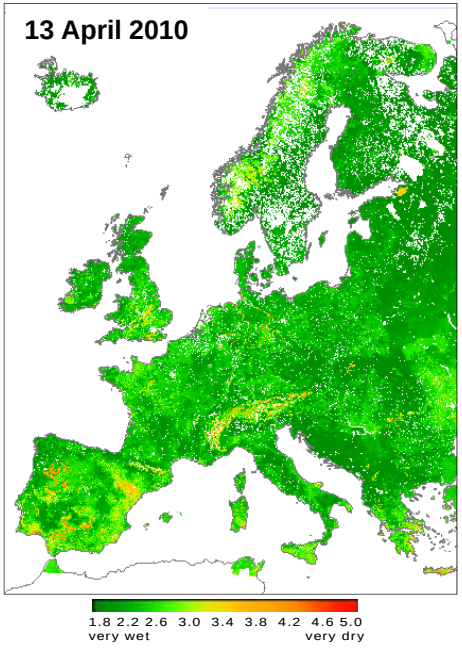
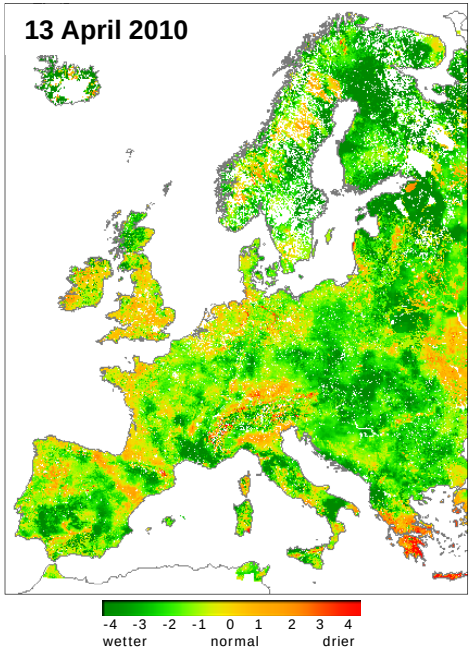
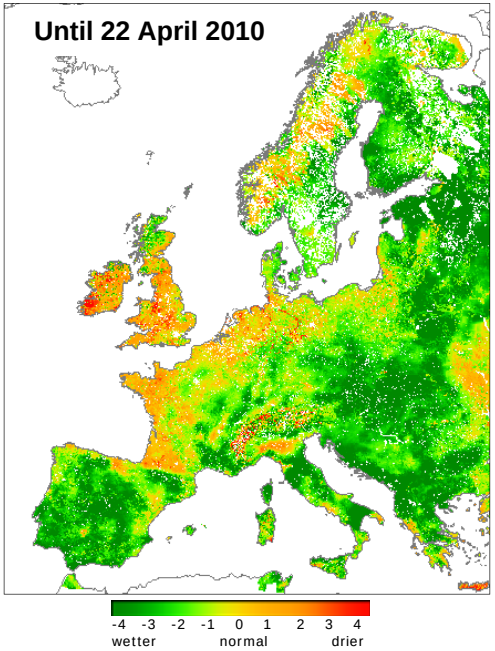
EDO: Daily Soil Moisture Information



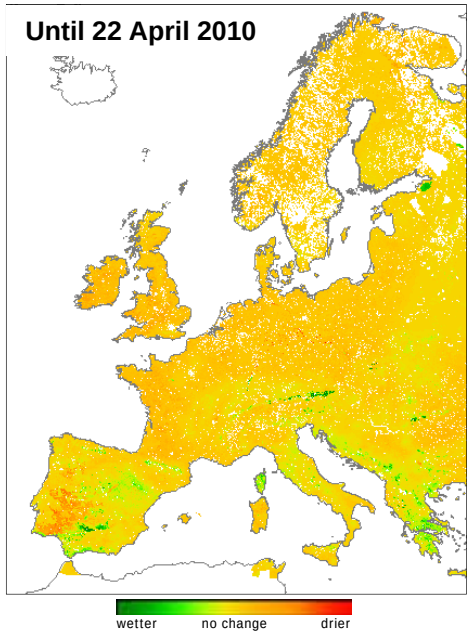
Soil Moisture



Soil Moisture Anomaly



Soil Moisture Anomaly Forecast (7 days)



Soil Moisture Trend (7 days)

Modelled
5km spatial resolution

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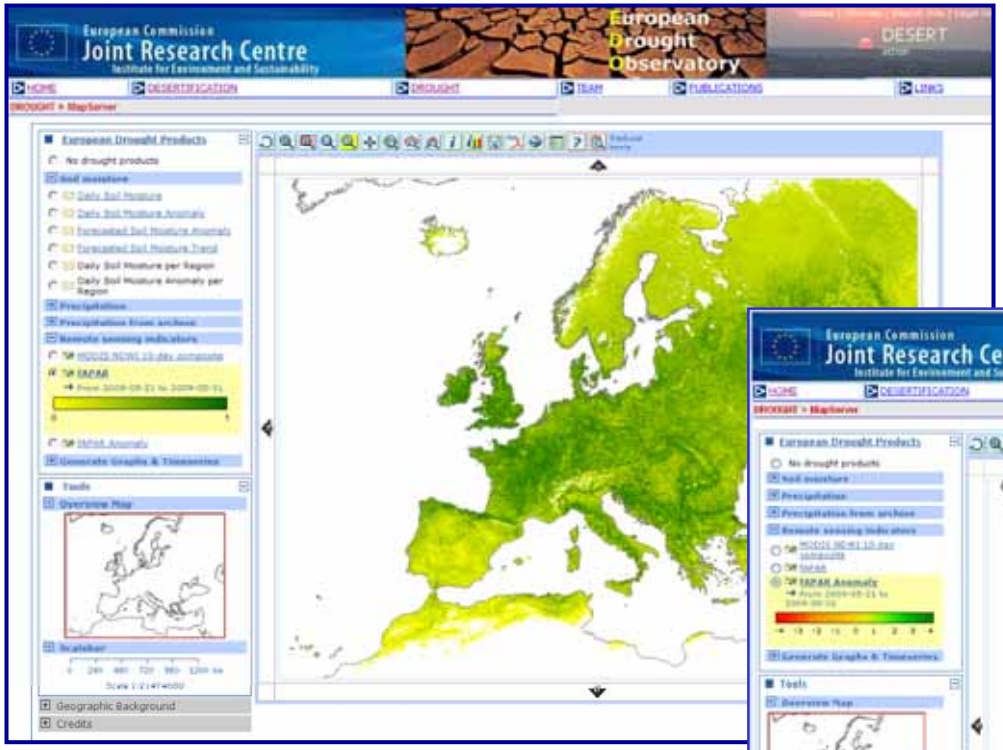
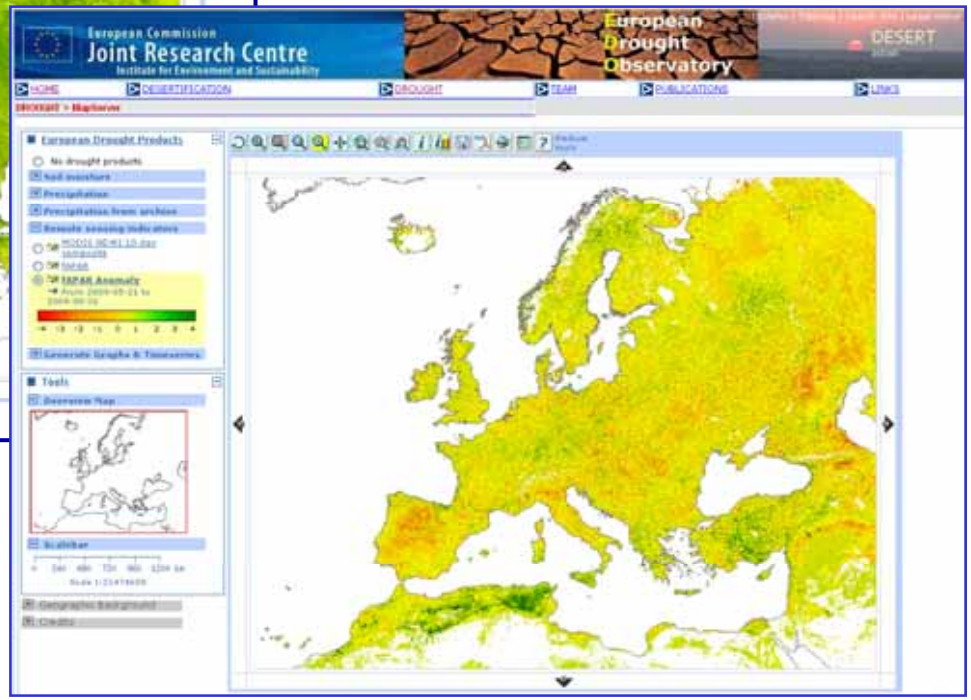
EDO: Photosynthetic Activity (fAPAR)



fAPAR, 21-31 May 2009
1km resolution

Remote Sensing Data - updated every 10 days



fAPAR Anomaly, 21-31 May 2009

- *Calculated from MERIS and SeaWIFS data (1997 →)*
- *http://fapar.jrc.ec.europa.eu*

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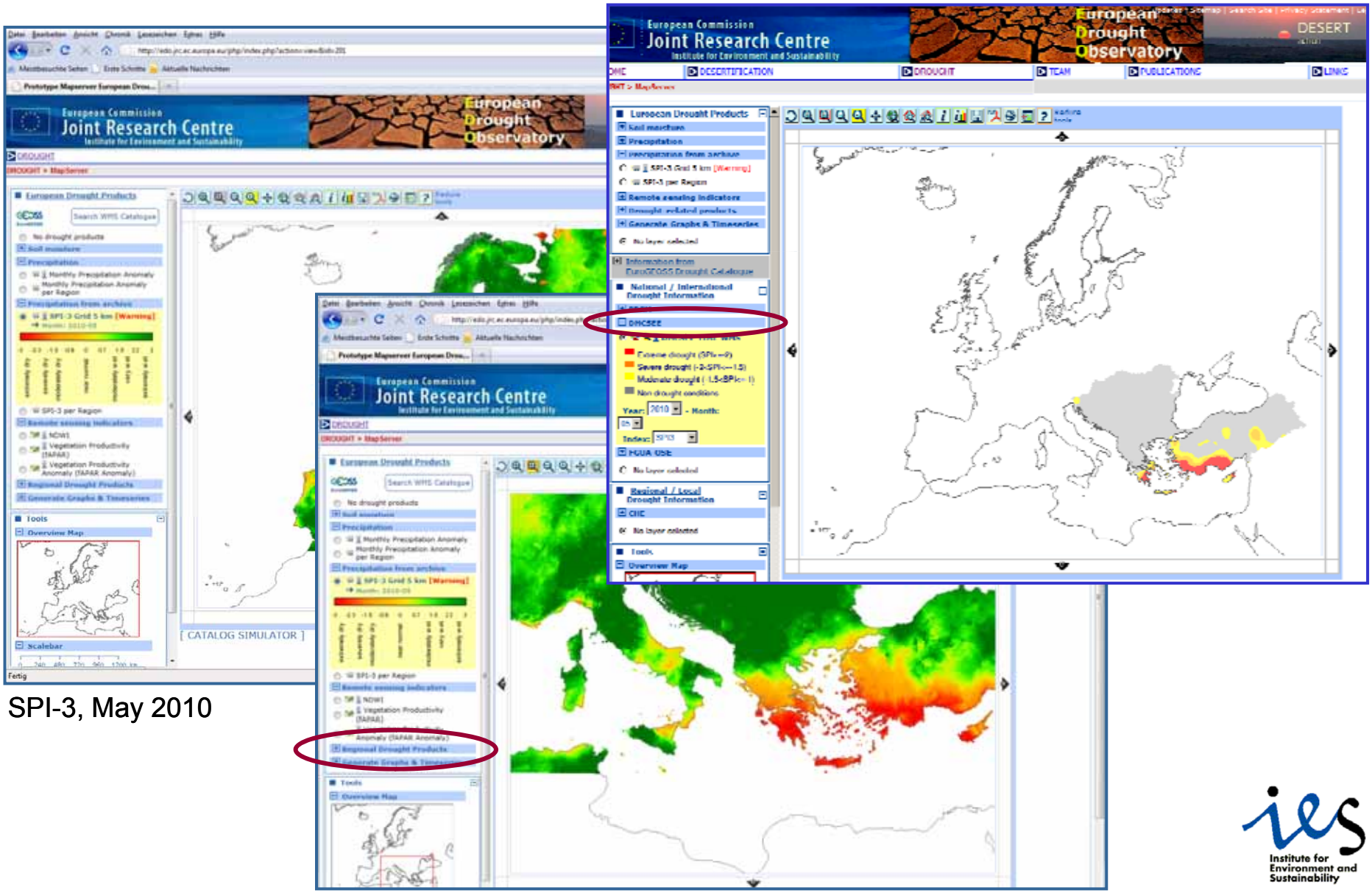
Link to Regional Observatories (DMCSEE)



SPI-3, May 2010

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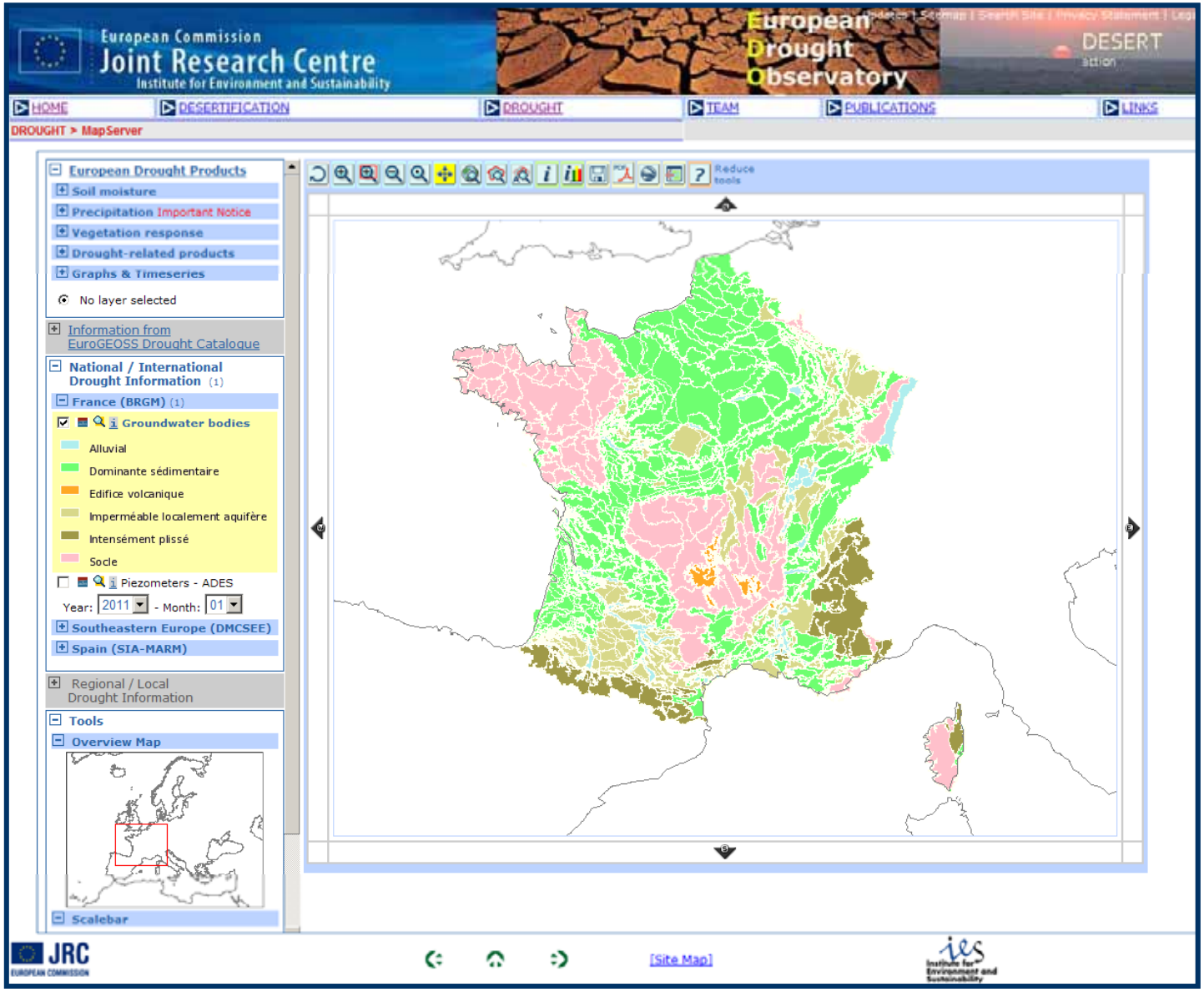
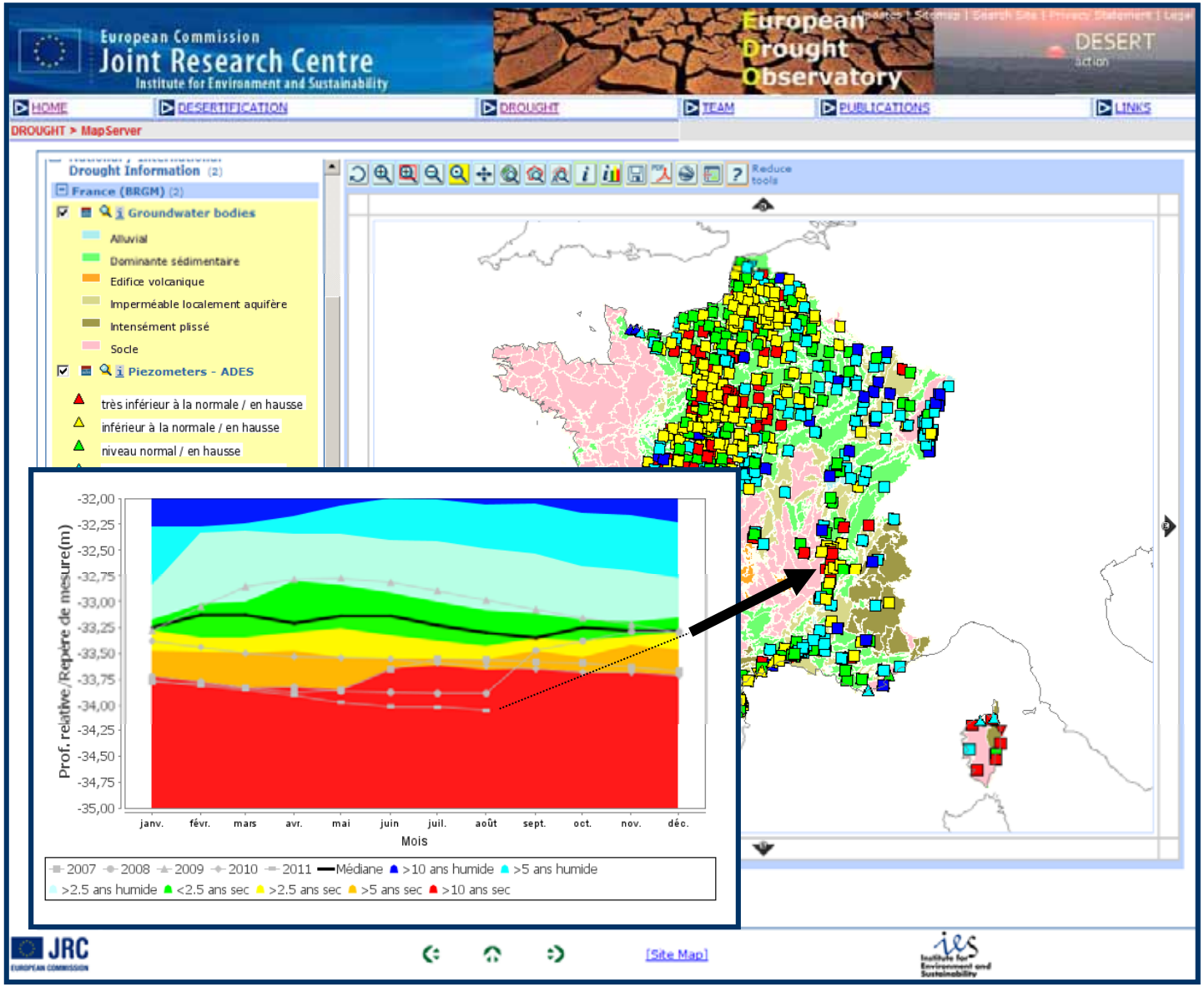
Link to National Observatories (BRGM -France)



Groundwater Bodies

Link to National Observatories (BRGM -France)



Groundwater Stations & Groundwater Levels

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Example of an analysis of the 2011 Spring Drought in Europe

EDO Drought News, May 2011

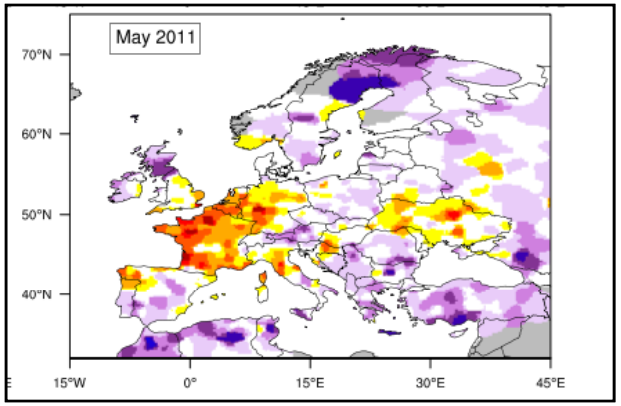
Based on SPI, cumulated rainfall and fAPAR

Precipitation Analysis

Standardized Precipitation Index (SPI):

- is a **statistical indicator** comparing the total precipitation received during a period of time with the long-term rainfall distribution for the same period of time
- is based on a transformation into a **standard normal variable** with zero mean and variance equal to one
- is given in units of **standard deviation** from the long-term mean of the standardized distribution
- Allows for the **statistical comparison** of wetter and drier climates
- reflects the statistically **expected frequency** (i.e. probability) of a given event
- is a **probabilistic measure of the severity** of a wet or dry event
- is calculated over **different rainfall accumulation periods**
- **Reference Period**: 1971 - 2010

SPI Values	Category	Probability [%]
SPI ≥ 2.00	Extremely wet	2.3%
1.50 < SPI ≤ 2.00	Severely wet	4.4%
1.00 < SPI ≤ 1.50	Moderately wet	9.2%
-1.00 < SPI ≤ 1.00	Near normal	68.2%
-1.50 < SPI ≤ -1.00	Moderately dry	9.2%
-2.00 < SPI ≤ -1.50	Severely dry	4.4%
SPI < -2.00	Extremely dry	2.3%



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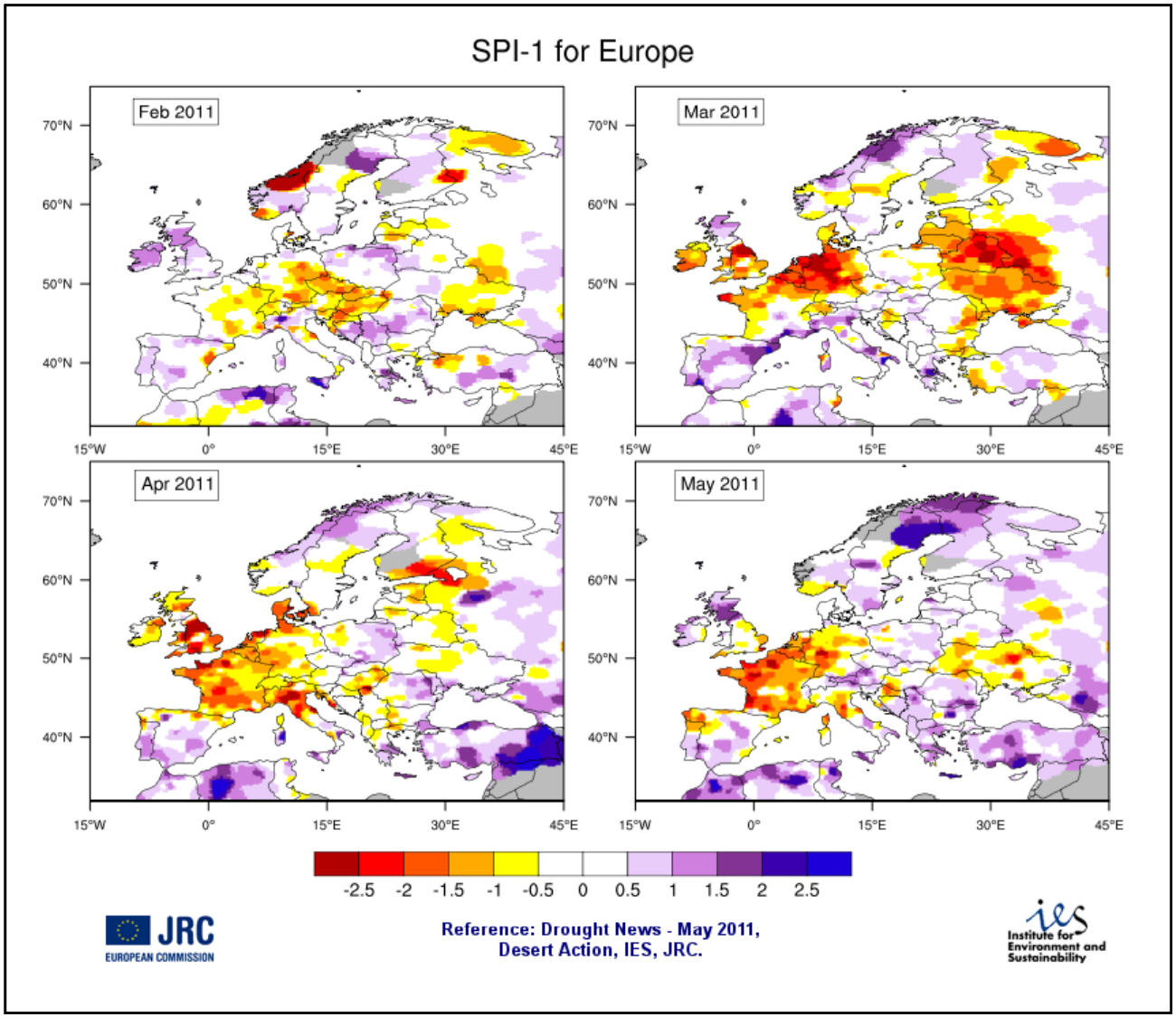
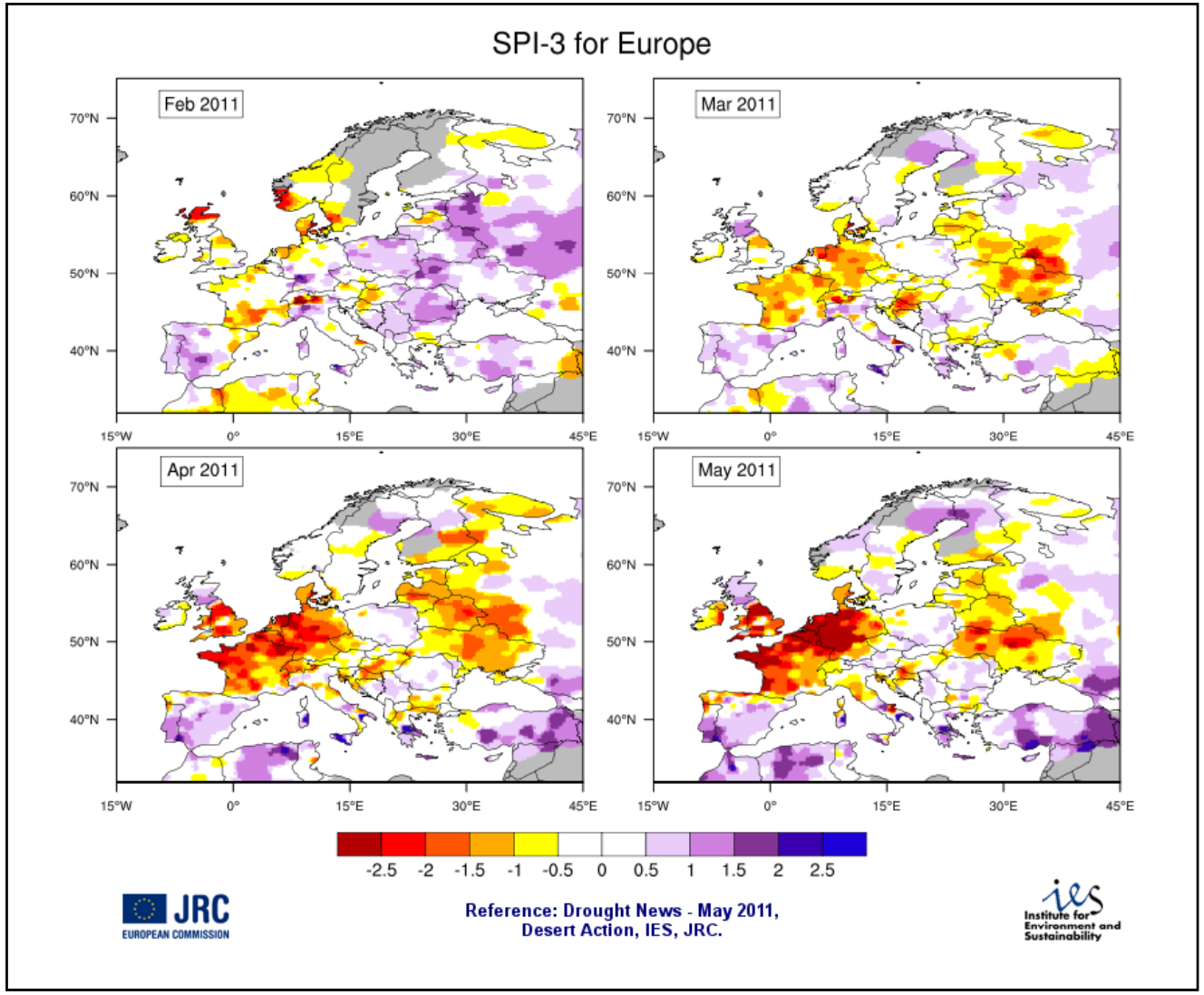
Precipitation Analysis: SPI-1



Precipitation Analysis: SPI-3



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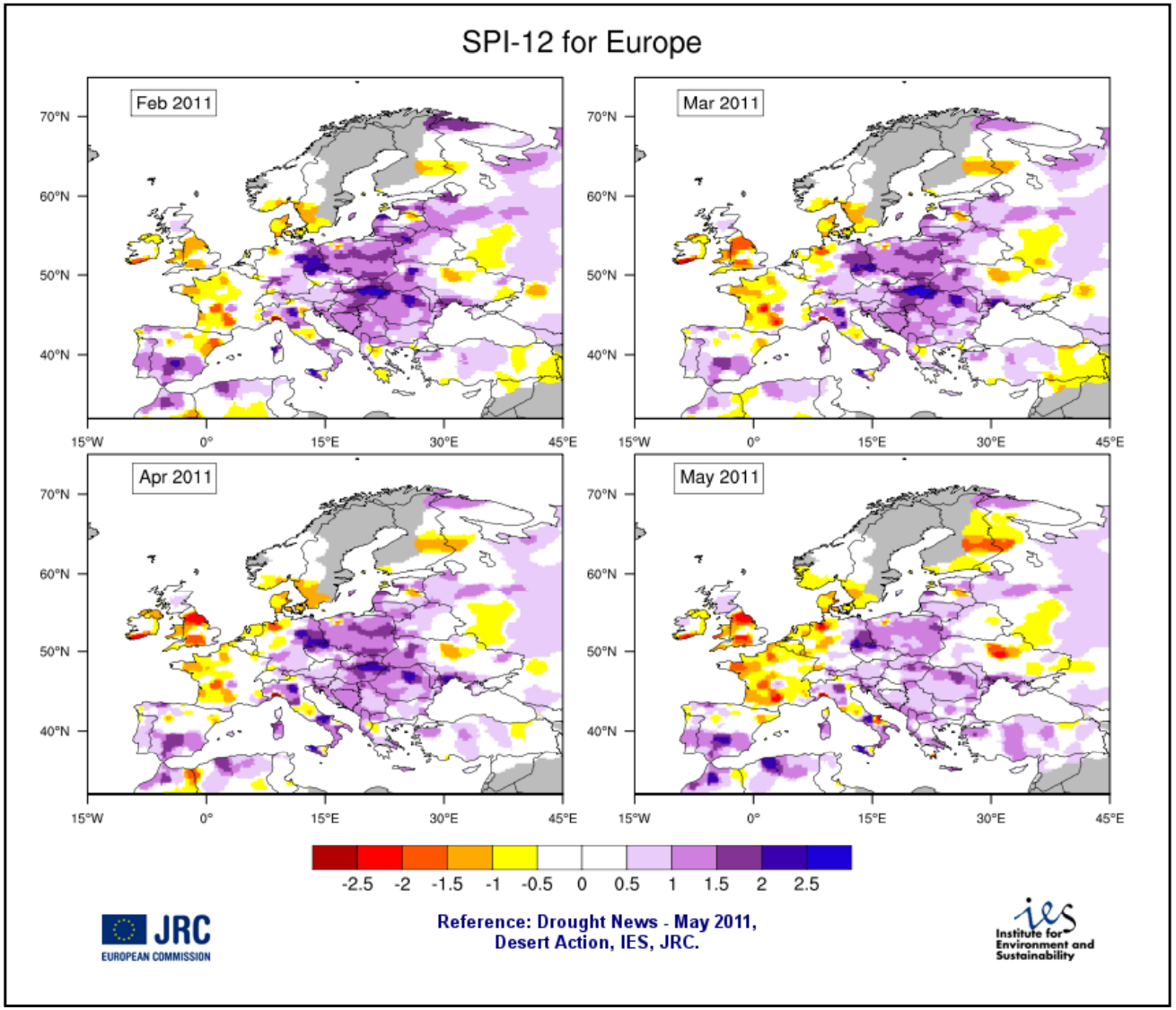
Precipitation Analysis: SPI-12



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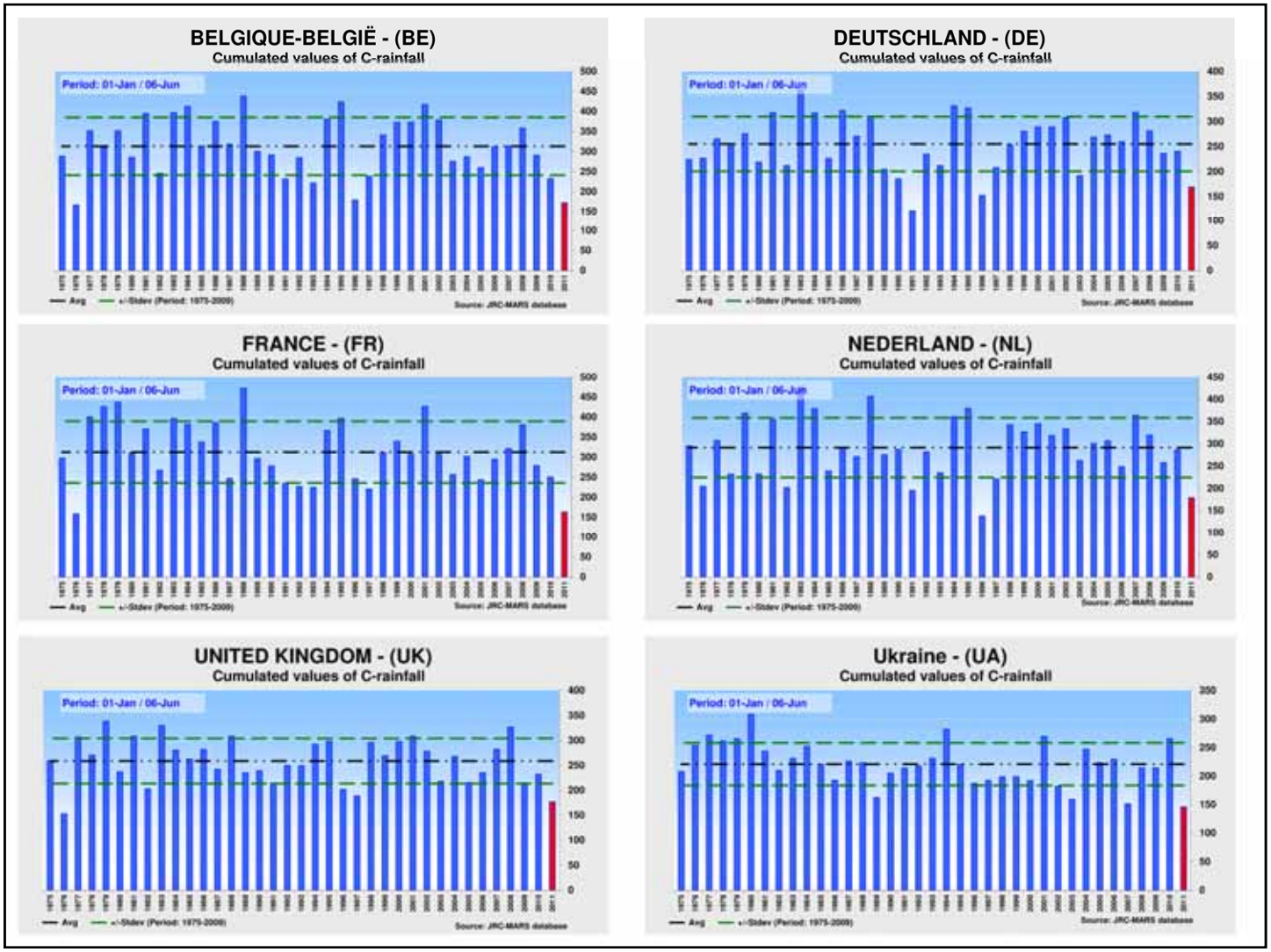
Cumulated Rainfall 1 January to 6 June 2011

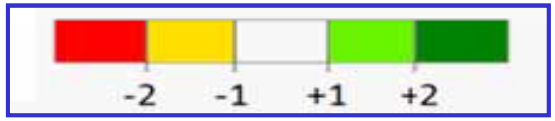


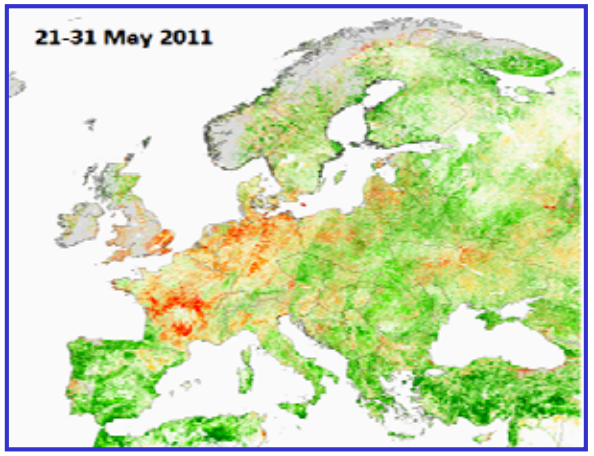
Analysis of Vegetation Vigour

Fraction of Absorbed Photosynthetically Active Radiation (fAPAR):

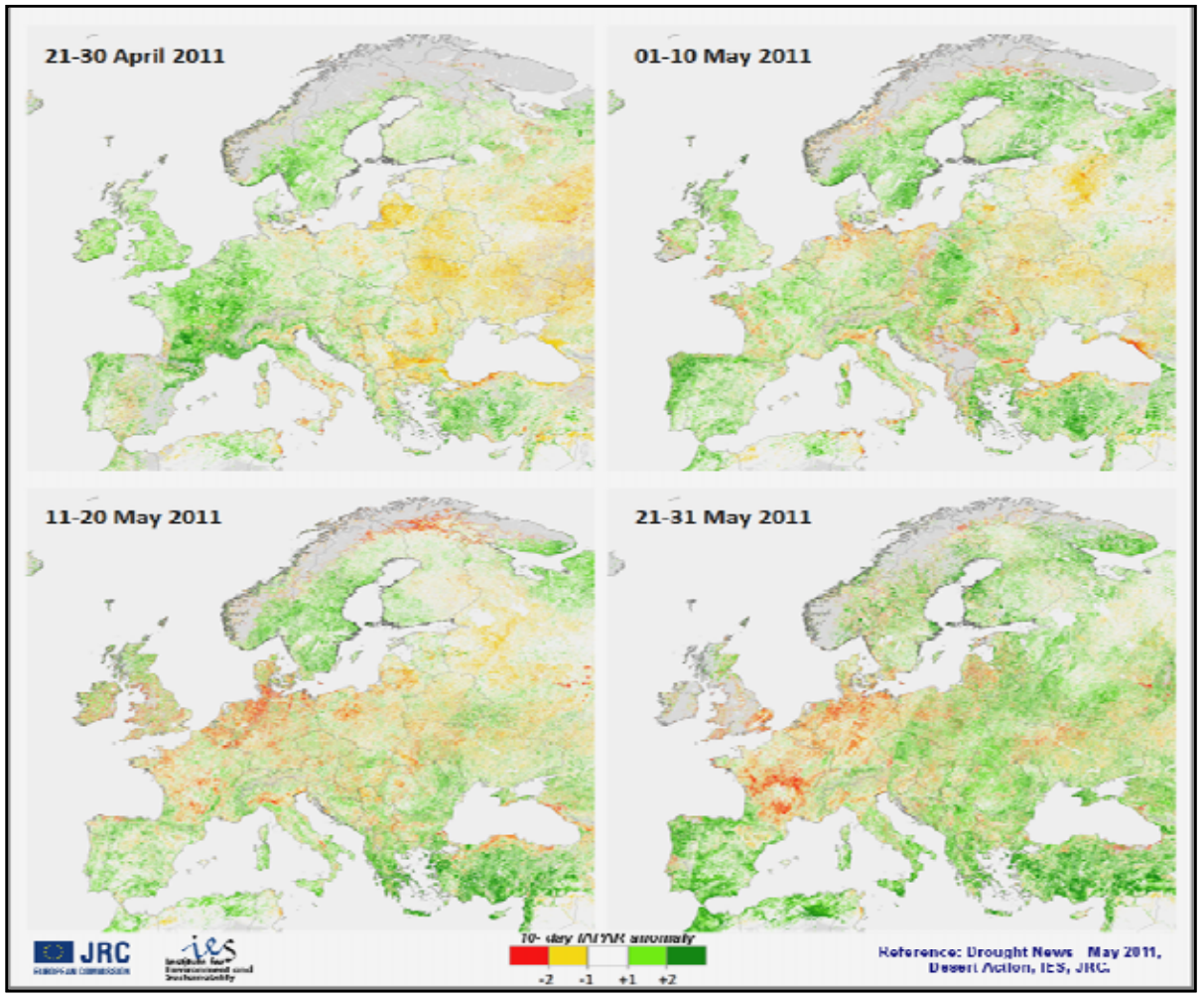
- represents the **fraction of the solar energy which is absorbed** by the vegetation canopy
- is a **biophysical variable** directly correlated with the primary productivity of the vegetation
- is **sensitive to vegetation stress** that causes changes in the solar interception of the plant or its light use efficiency
- is **remote sensing derived** indicator available every 10 days (MERIS and SeaWIFS data)
- Is presented as **anomalies** (statistical deviation from the long-term mean)
- the available **time-series** is still short (from 1997)

Anomaly in StDV





FAPAR Anomalies April to May 2011



FAPAR: Fraction of Absorbed Photosynthetically Active Radiation

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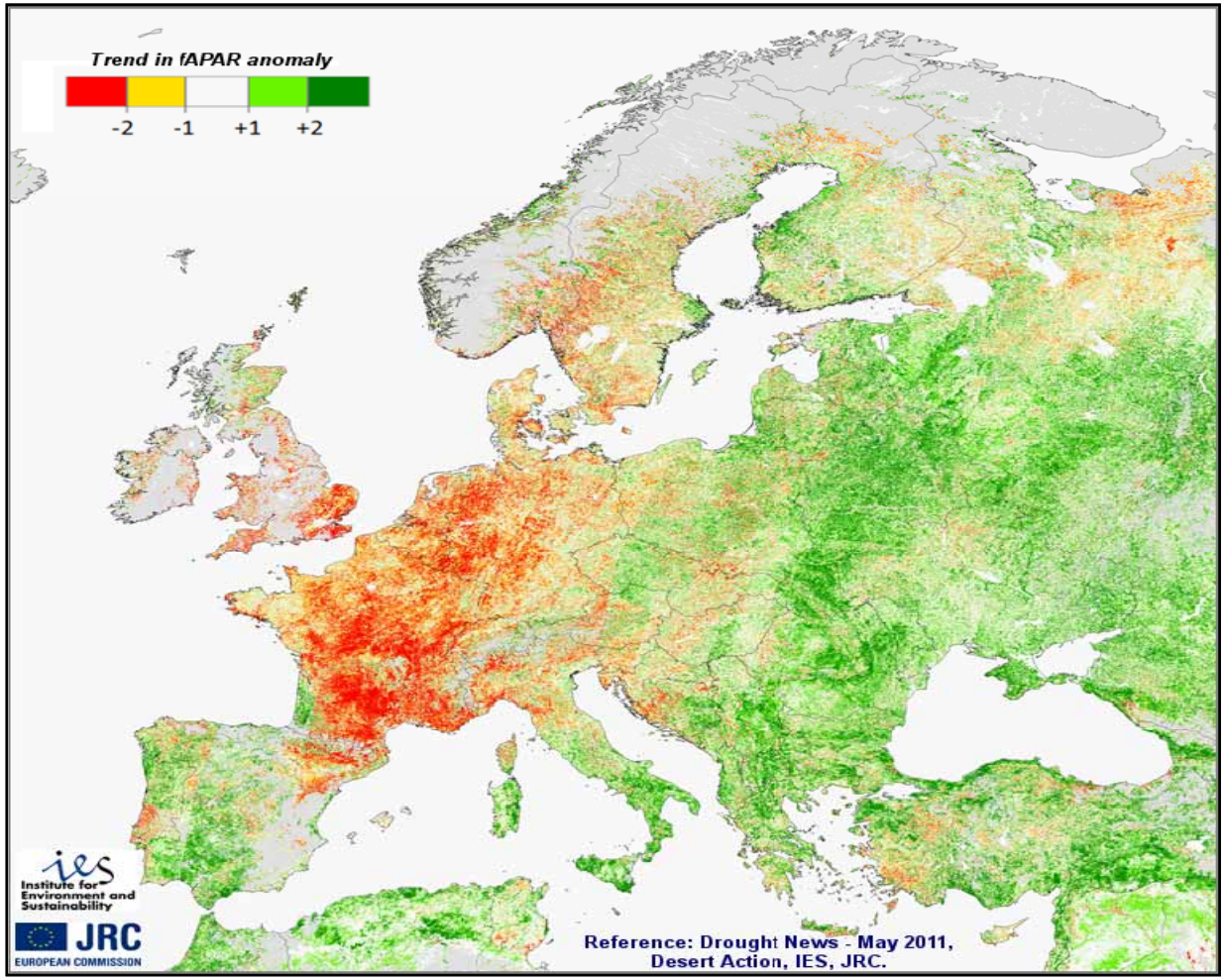
Vegetation Vigour: Trend

FAPAR Anomaly Trend

Difference between the 3rd decade in April and the 3rd decade in May 2011



FAPAR: Fraction of Absorbed Photosynthetically Active Radiation

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Next Steps

1. Agree on and implement a **core set of Water Scarcity and Drought Indicators**, including precipitation, soil moisture, snow pack, river flows, groundwater, reservoirs, and vegetation response

2. Regionally used a**dditional indicators** can be added

3. Establish general **interoperability** to EDO

4. Combine the core indicators to an **alert level**.

Next Steps

4. Develop and implement drought forecasting over short to medium ranges (1 week to 1 month).

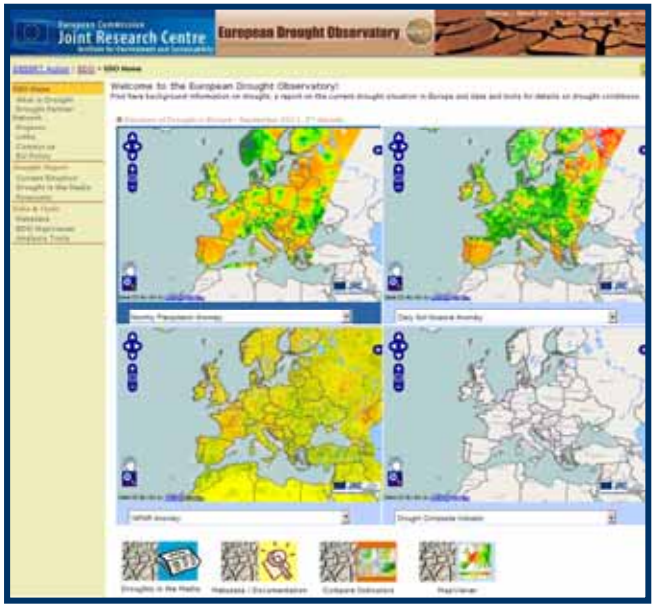
5. Migrate to an improved EDO Portal, incl. information on

   a. Drought hazard, vulnerability and risk

   b. Environmental and economic impacts

   c. EU Drought Policies

   d. …



7. Establish EDO as a building block of a Global Drought Information System

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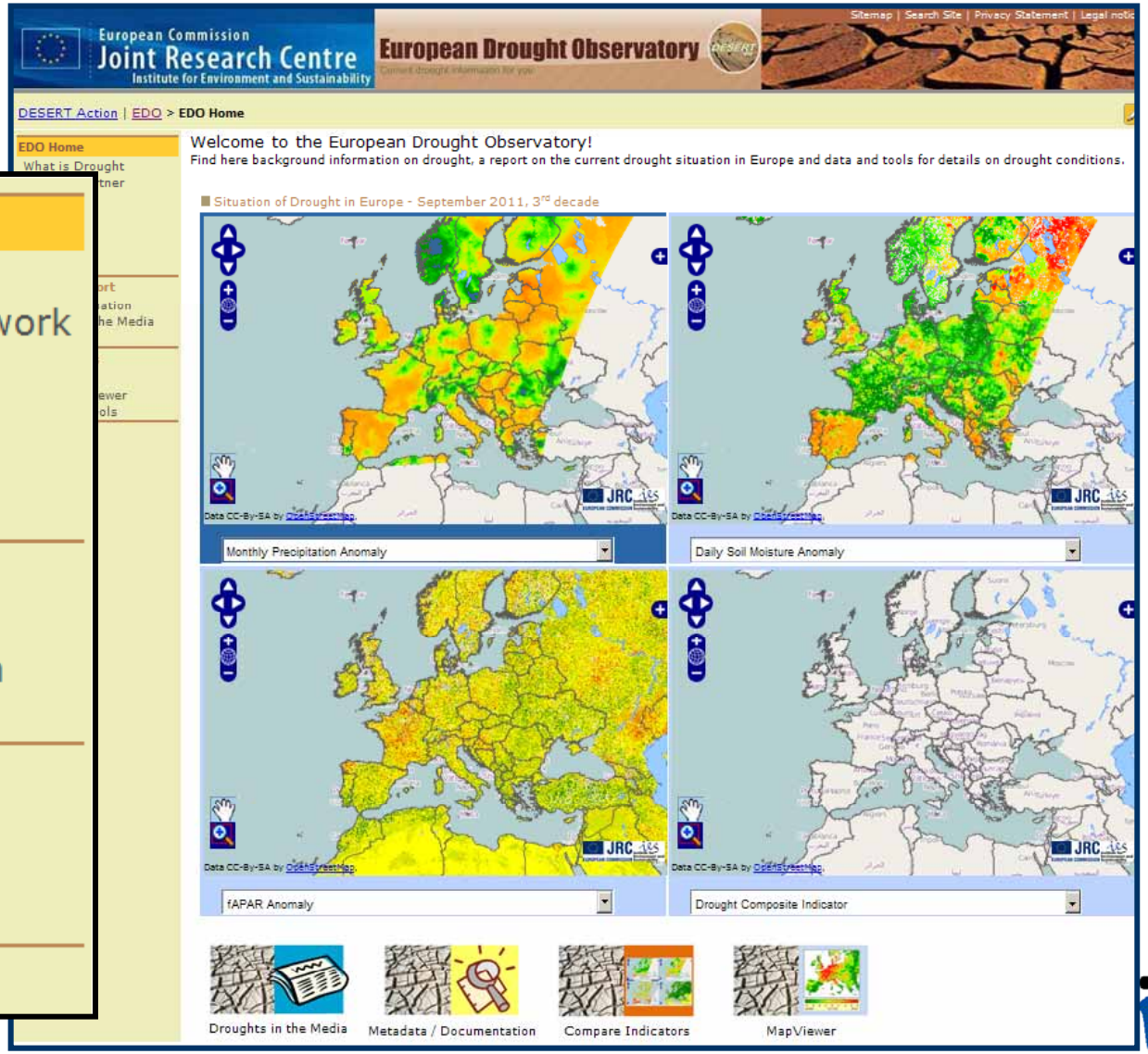
EDO Portal

WS&D EG Meeting – 13-10-2011 – Venice

EDO Home
- What is Drought
- Drought Partner Network
- Projects
- Links
- Contact us
- EU Policy

Drought Report
- Current Situation
- Drought in the Media
- Forecasts

Data & Tools
- Metadata
- EDO MapViewer
- Analysis Tools



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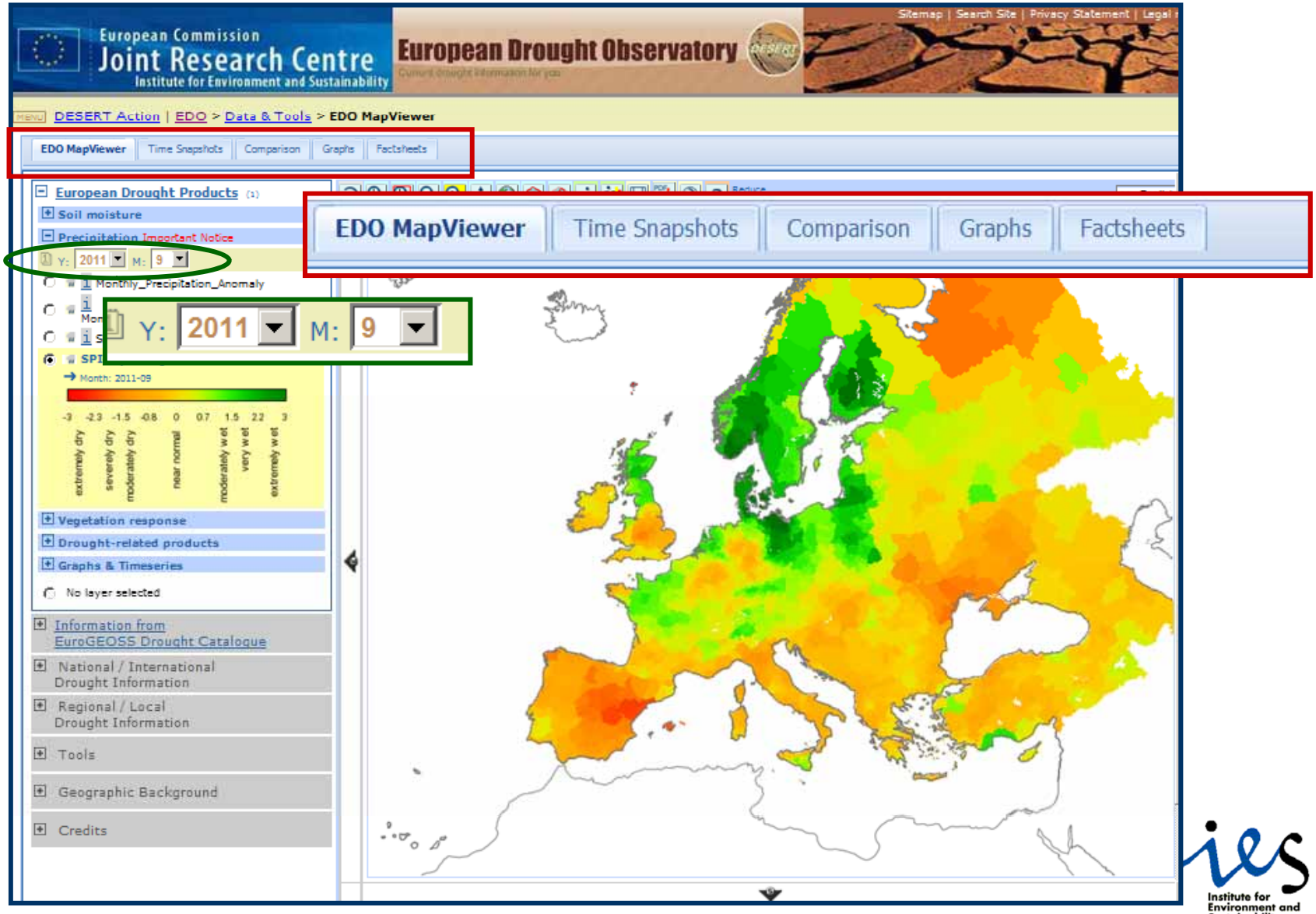
New EDO Map Viewer



Thank you!

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juergen.vogt@jrc.ec.europa.eu

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