

COPERNICUS FOR WATER MANAGEMENT WORKSHOP

29 May 2018, Brussels

Water scarcity and droughts: A European perspective

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Water scarcity:

- Water scarcity occurs where there are insufficient water resources to satisfy long-term average requirements. Water scarcity can be identified by water supply reliability criteria for each water use, taking into account water availability.
- In Spain, water scarcity is addressed in RBMPs, by identifying deficits in water supply in the process of water allocation according to water balances. All RBMPs account for reliability criteria in order to quantify deficits.

Drought:

- Drought is a natural dry period in the natural climate cycle caused by a lack of rainfall.
- Droughts are difficult to identify in time and to quantify in terms of intensity, magnitude, duration and surface extension.
- In Spain, droughts are addressed in Special Drought Plans, which identify climatological and hydrological droughts by indicators based on rainfall and surface and ground levels.

COPERNICUS and Water scarcity

Complex water balances
at each water resources system

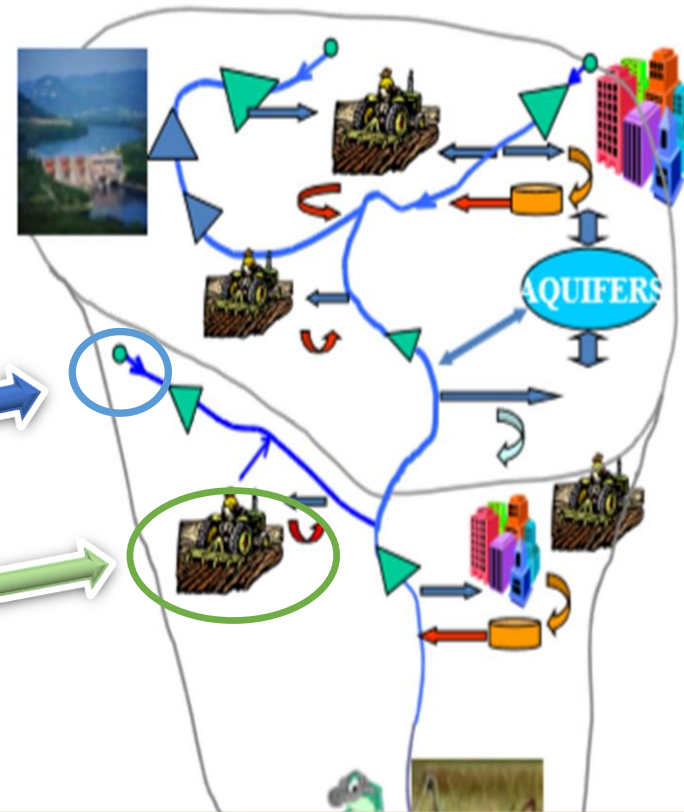


What does COPERNICUS do for us?:

Components of the natural freshwater runoff

Characterization of irrigation demands

WR Systems INTEGRATE at the BASIN SCALE:
WaterBodies, W.Uses (Demands), Infrastructures



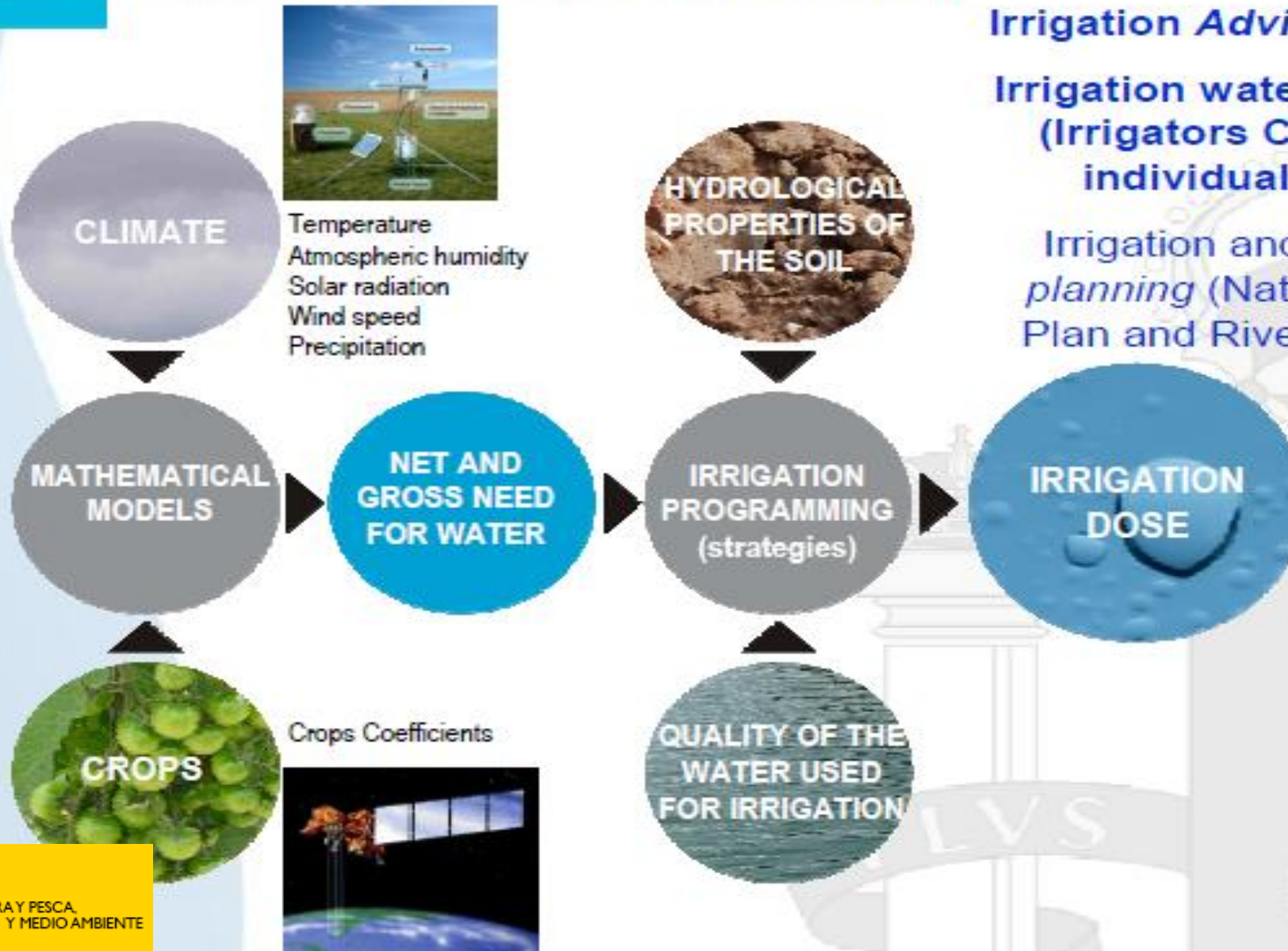
Complex relationships
that affect water
availability both in
SPACE & TIME

Implications on all
aspects (w. quality,
environment,
economy, ...) **can
only be captured by
means of adequate
integrated modeling**

ET: Land Use → Vegetation Indexes → Water needed by crops

SIAR project: FUNCTIONALITIES

Agroclimatic Information Service for Irrigation



Provide useful and rigorous information of quality for:

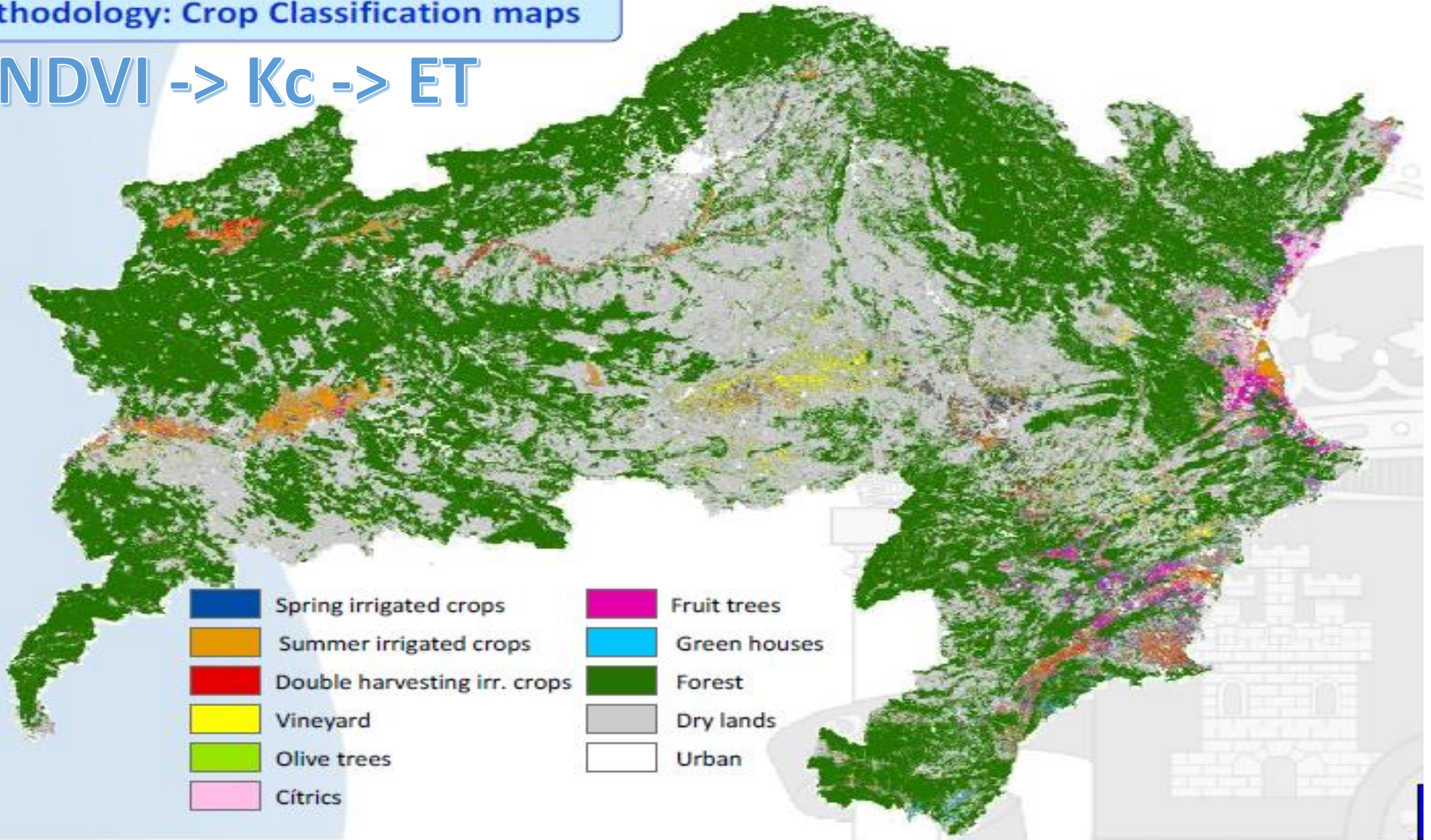
Irrigation Advdsory Services

Irrigation water management (Irrigators Communities, individual irrigators)

Irrigation and hydrological planning (National Irrigation Plan and River Basin Plans)



NDVI -> Kc -> ET



SPIDERWeb project: Landsat + Sentinel (2009 - 2017) + SIAR



EXAMPLE: APPLICATION IN AN IRRIGATION COMMUNITY

Annual Resolution of the RBD + Annual Crop Plan of JCRMO

Authorised volume irrigation campaign

Volume determined by Resolution of the Júcar River Basin Authority in an individualised manner according to the RBMP and related legal dispositions (over exploited groundwater body)

Indirect monitoring

By theoretical crop consumption

Total consumption of the farm is computed as the theoretical average consumptions per crop hectare foreseen for each crop surface in the irrigation campaign

Direct monitoring

By installing and controlling flowmeters

Total consumption will be calculated as the difference between the measuring devices readings before and after the irrigation campaign

Holders'
declarations

Field
confrontation
visits

Irrigation crops
classification
through **remote
sensing**

← **CONTROLS**



COPERNICUS and Droughts

Complex phenomenon, hard to detect
In the first stages, unknown duration and spatial extent



What does COPERNICUS do for us?:

Vegetation Indexes correlated to Drought Indexes

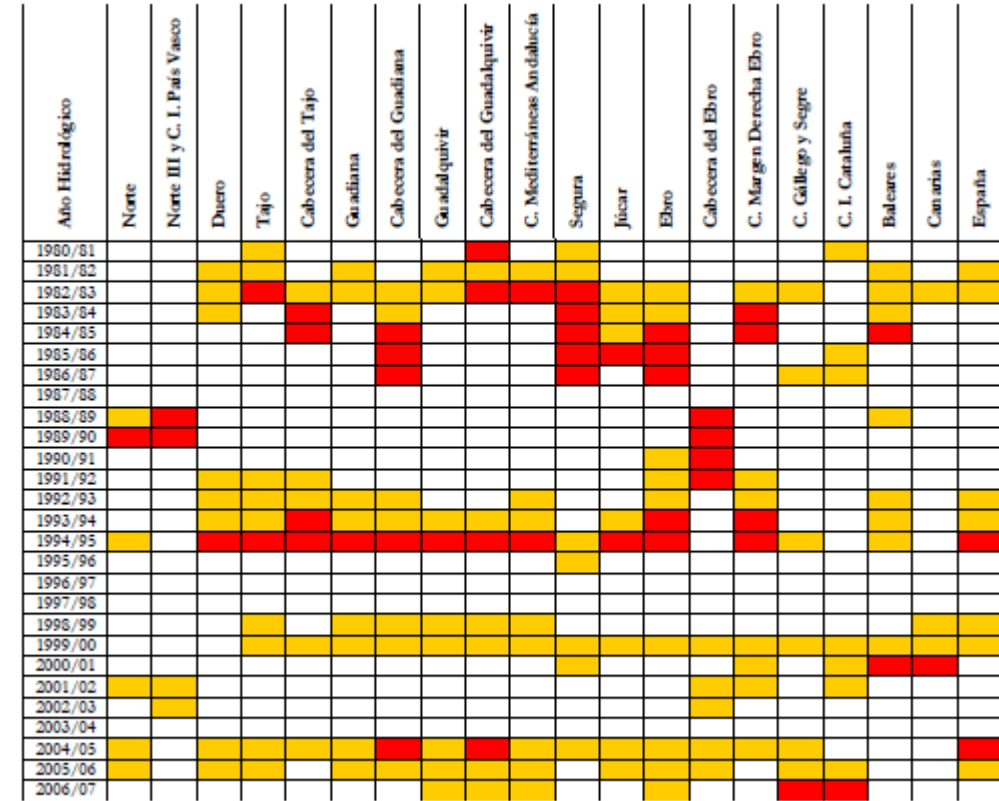


Figura 72. Identificación de sequías anuales por regiones en España³⁴

Table 1 Drought period identification (12-month scale) using SPEI and SPI threshold (< -1.84)

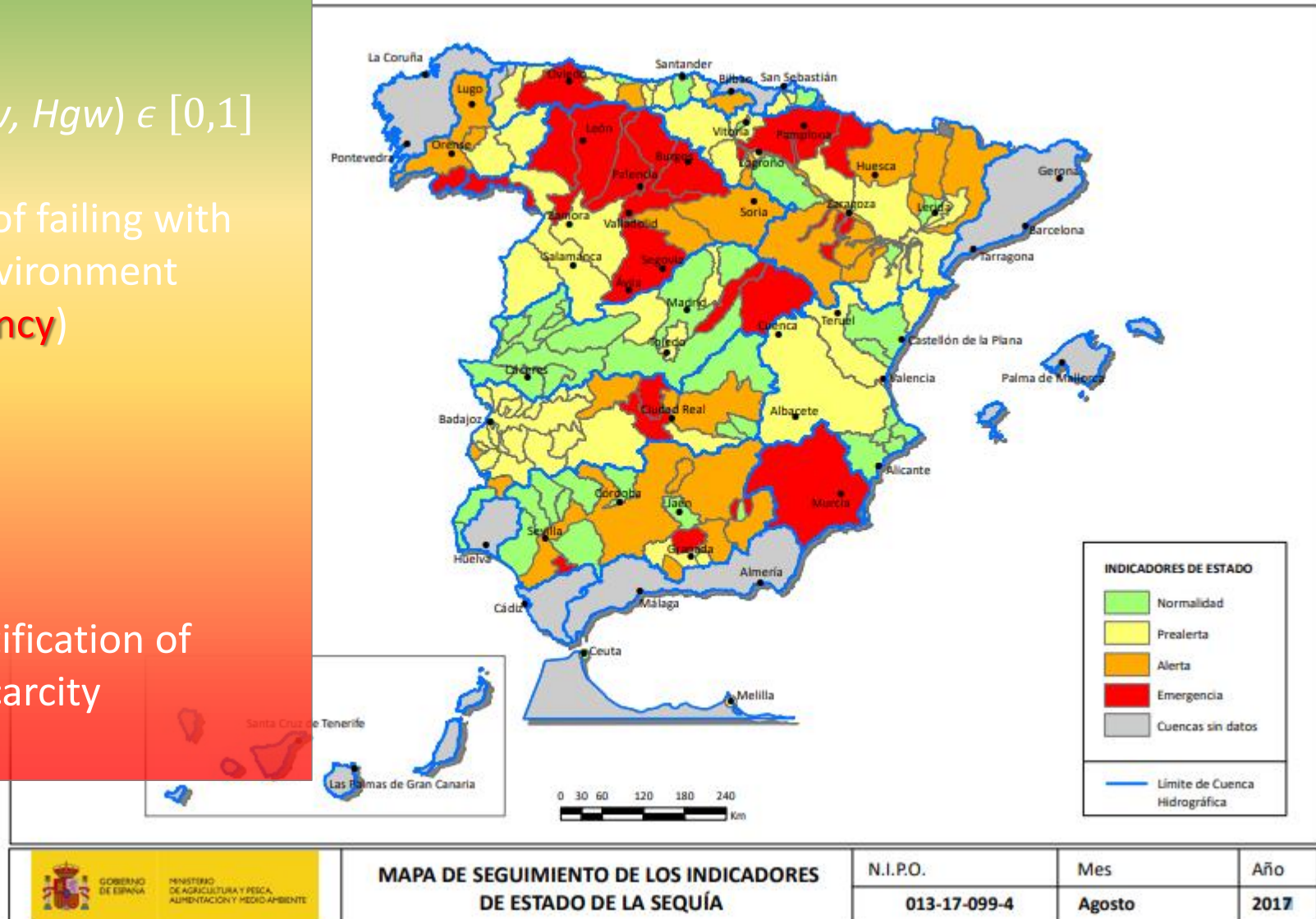
Event	Spatial gradient propagation	SPEI	Duration	SPI	Duration
1	W/E	1965-Jun-3/1965-Sep-4	14	1965-Jul-2/1965-Sep-3	10
2	E/W	1970-Dec-4/1971-Apr-2	15	1971-Jan-1/1971-Apr-1	13
3	W/E	1981-Feb-3/1981-March-4	6	1981-Feb-3/1981-Dec-3	8 + 8+6 + 10
4	W/E	1981-Nov-1/1981-Dec-3	7		
5	E/W	1983-Oct-3/1983-Dec-3	4 + 3	1983-Sep-4/1983-Dec-2	11
6	E/W	1986-May-2/1986-Sep-2	16	1986-Jan-2/1986-Sep-1	15

Drought Special Plans (PES) – 2007:

- System of drought indicators
 $f(P, V_{res}, Q_{sw}, H_{gw}) \in [0,1]$
- Scenarios according to risk level of failing with water supply for uses and the environment
(**normal**, **pre-alert**, **alert**, **emergency**)
- Measures taken according to PES

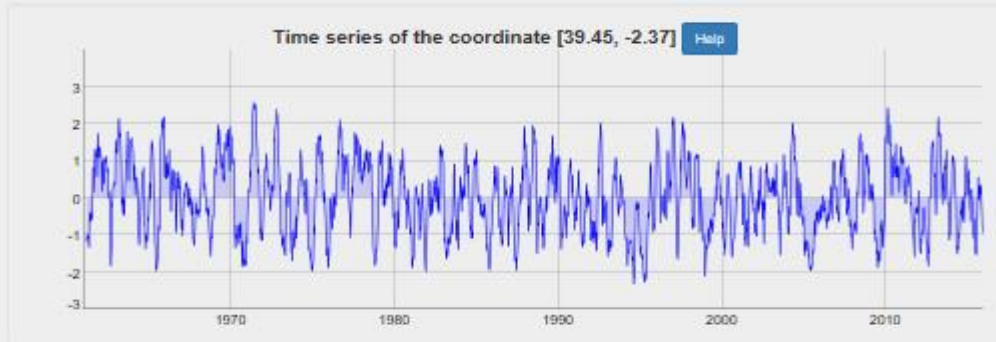
Reviewed PES – 2018:

- Indicators review for better identification of prolonged drought from water scarcity



FURTHER RESEARCH NEEDED – EXAMPLE: H2020 DESEMON PROJECT

Drought indices dataset for Spain <http://monitordesequia.csic.es/>



Time series of the coordinate:

Coordinate:

39.45

-2.37

Download

Download the entire dataset in NetCDF format

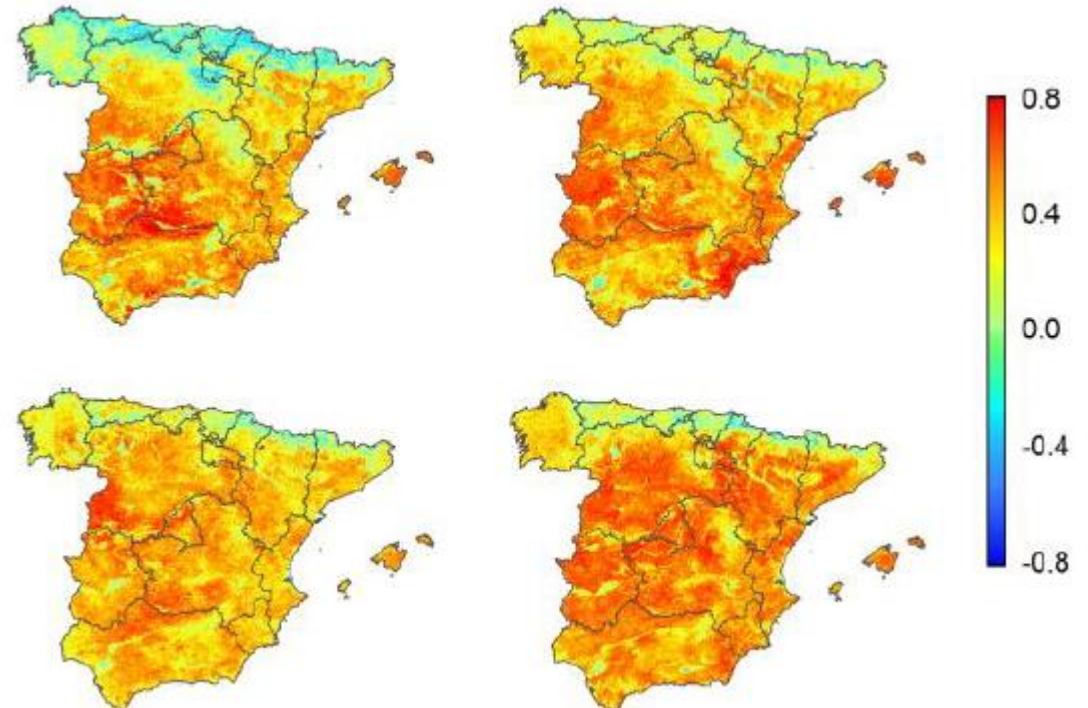
Improving drought characterization Segmentation of the droughtSpain dataset

Application of the 'spaR' package

Santiago Begueria

18 abril, 2018

Impacts: Correlation between EO-based and Drought Indexes



CONCLUSIONS

COPERNICUS services provide high-valued input to water scarcity management and planning

However, there is a need for making products and services more accessible to policy making, in particular for water management and planning.

Evapotranspiration is an essential component in the water balance. Accurate estimation can be made through EO-based Sentinel products for land use and crop classification and services based on vegetation indexes and others

At national level, COPERNICUS is perceived as a “too much centralized structure”. Sectoral implication is difficult. This challenges a wide implementation of products and services for policy making.

Further research is needed in order to a better uptake of EO-based indexes for characterization, impact assessment and Prediction of droughts.

Cooperation is essential for dissemination of COPERNICUS products and services:

- Through dissemination of **HORIZON 2020** projects' results
- Exchange of practices and knowledge through the **WFD Common Implementation Strategy**
- Knowledge transfer and institutional strengthening in **Iberoamerican region** through the **Conference of Iberoamerican Water Directors (CODIA)**.

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Thank you!

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