



Bringing together hydrologic models and Earth Observation data with water users through the WebGIS tool SPIDER in the context of the SIRIUS project



Jesús Garrido Rubio¹ (Jesus.Garrido@uclm.es)

J.M. Moreno-Rivera¹, A. Momblanch², J. Andreu², A. Solera², M.F. Mejuto³, A. Calera¹, A. Osann¹



1. Remote Sensing and GIS department – Institute for Regional Development (IDR),
Castilla-La Mancha University (UCLM)



2. Institute of Water Environmental Engineering,
Technical University of Valencia (UPVLC)



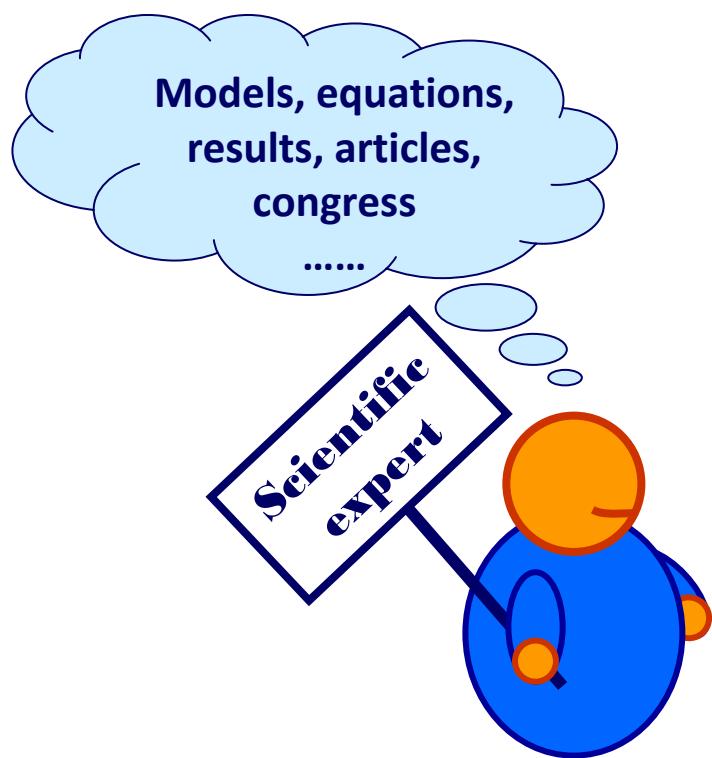
3. Hydrological Cycle Department,
Alicante Council (DPA-DCH)



► 1. Introduction & Context

Scientific expertise on irrigated agriculture or hydrological modelling has achieved advanced models with tested results. However, real connections between this knowledge and its applications to the water end-users need a meeting point.

(Bastiaanssen et al., 2007)



► 1. Introduction & Context

SIRIUS PROPOSES A PARTICIPATORY PROCESS



► 1. Introduction & Context



SIRIUS: Sustainable Irrigation water management and River-basin governance: Implementing User-driven Services

*Efficient & effective
water resources governance
in water-scarce environments*

SIRIUS project aims to optimize water use in agriculture by developing satellite assisted monitoring technologies and sustainable irrigation practices



www.sirius-gmes.es



► 1. Introduction & Context



SIRIUS Water Users.....

Farm Holding

Fine-tune irrigation applications

Water Users Associations

Monitor irrigation water consumption

River Basin Authorities

Hydrologic planning & Drought management

..... of SIRIUS Services

Farm Advisory

Irrigation scheduling, efficiency monitoring

Water Management

Water exploitation planning, monitoring and control

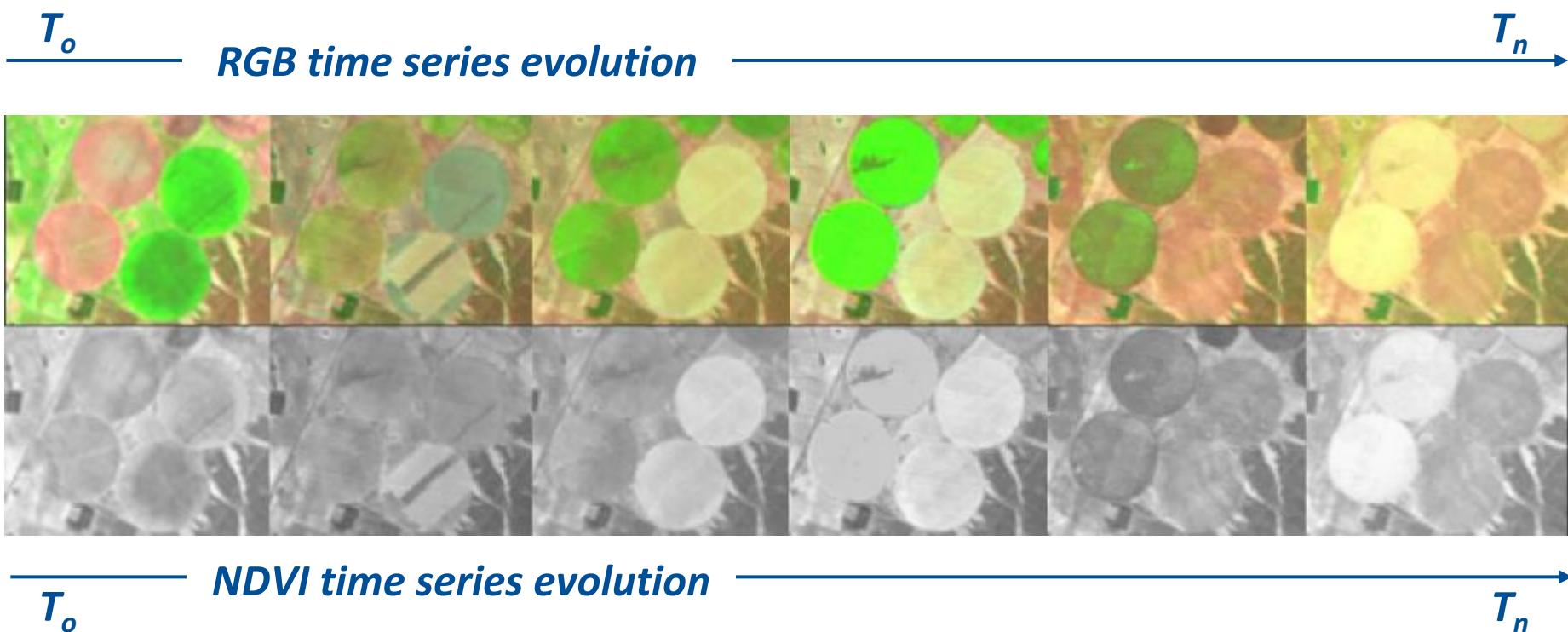
Drought Management

Drought management & decision-support



► 2. SIRIUS Services: EO data

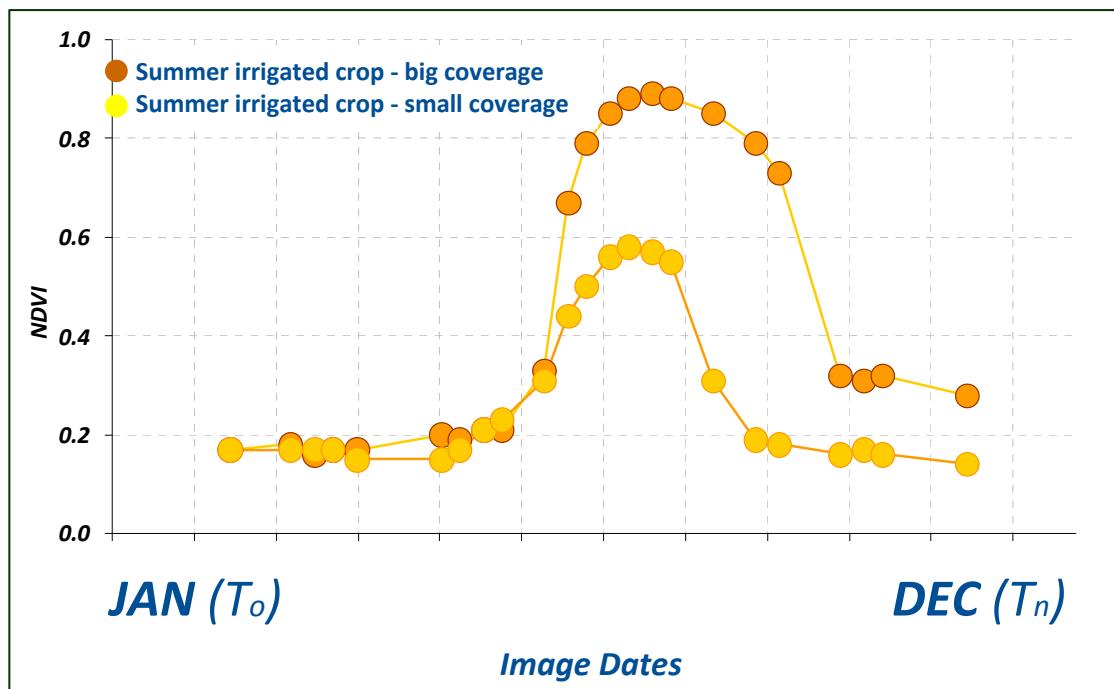
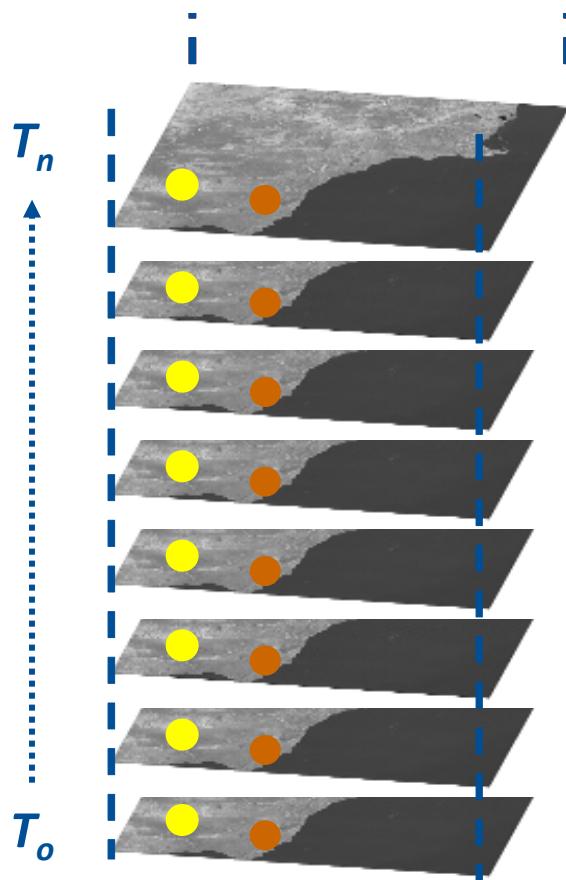
Couple NDVI & RGB time series as basic EO products



► 2. SIRIUS Services: EO data

Couple NDVI & RGB time series as basic EO products

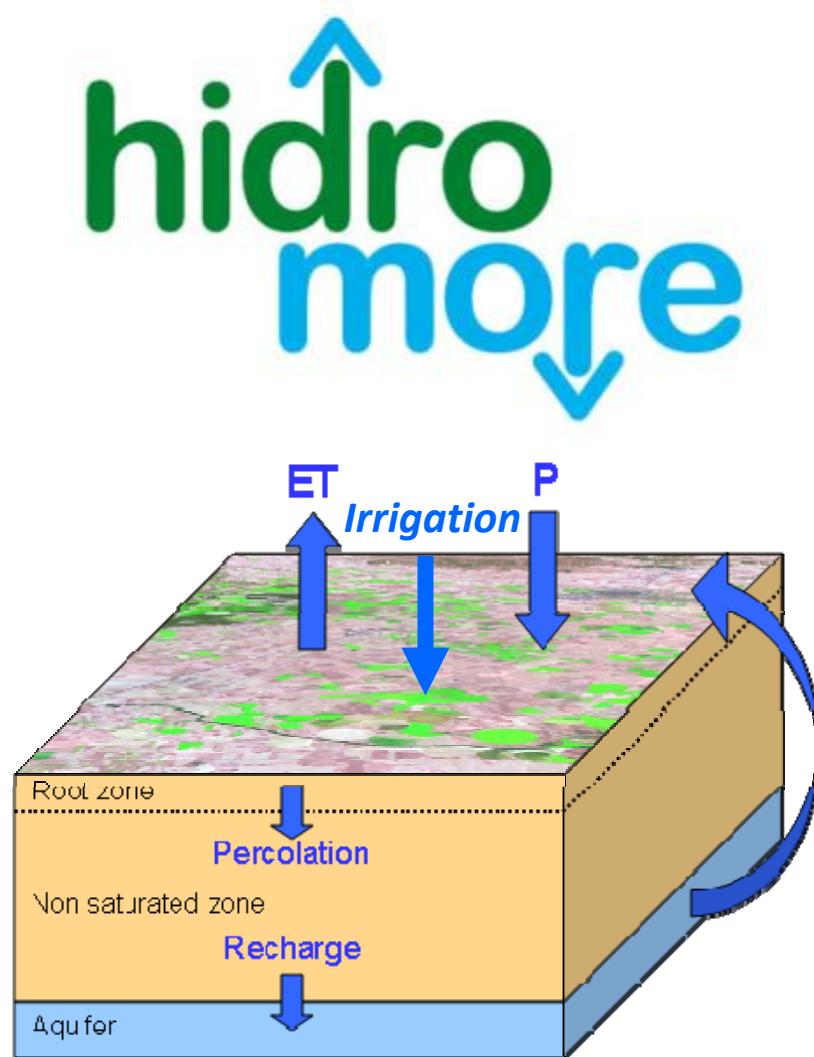
→ Monitor crop development in time



Published relations → $K_{cb} - NDVI$

► 2. SIRIUS Services: hydrologic models – HidroMORE

www.hidromore.es



Computes spatially distributed the components of a soil water balance (SWB) remote sensing driven in large areas at high spatial and temporal resolution

Used to estimate crop evapotranspiration and irrigation (among others components of the SWB), by implementing the FAO56 dual crop coefficient methodology (Allen et al, 1998) assisted by satellite images (Torres 2010; Sánchez et al, 2012)

$$Dr_i = Dr_{i-1} - (P - RO)_i - I_i - CR_i + ETc_i + DP_i$$

$$ETc_i = Kc_i \cdot ETo_i = (Ksi \cdot Kcb_i + Ke_i) \cdot ETo_i$$



► 2. SIRIUS Services: hydrologic models – HidroMORE



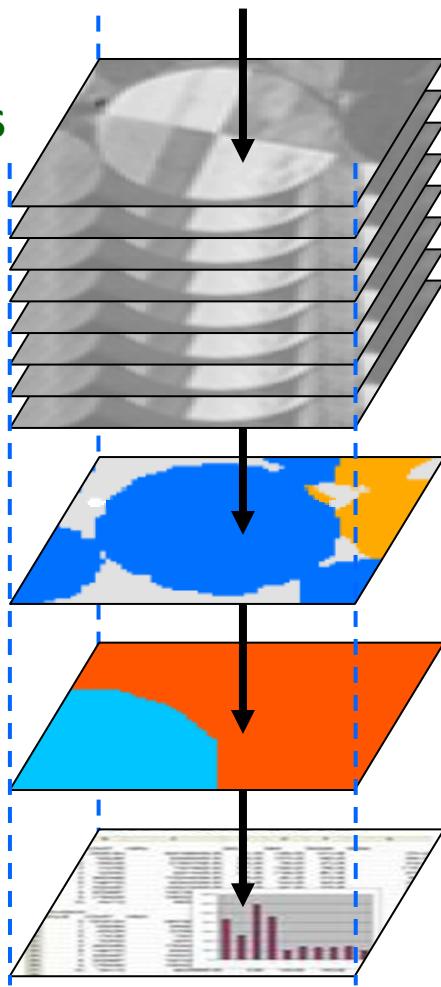
INPUTS

NDVI
time series

Land Use
Map

Soil
Map

Climatic
Data

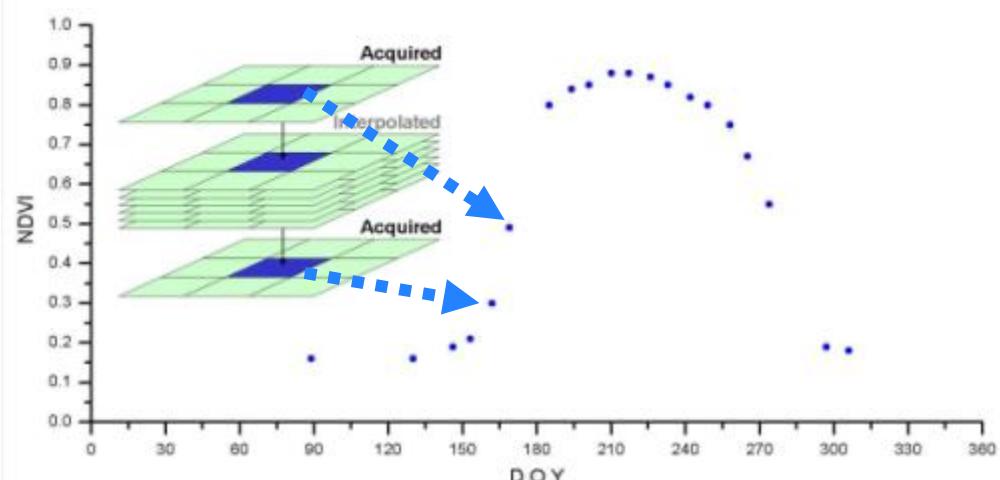


- Pixel as work unit

- Daily calculations:

- Spatial interpolation for climatic data

- Temporal interpolation for NDVI data



► 2. SIRIUS Services: hydrologic models – HidroMORE



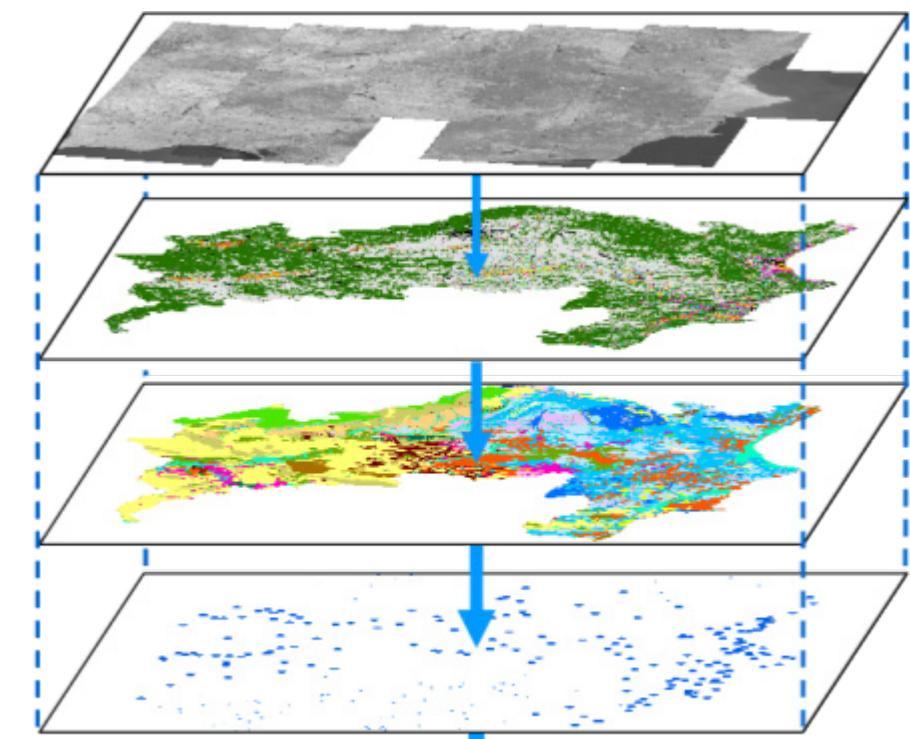
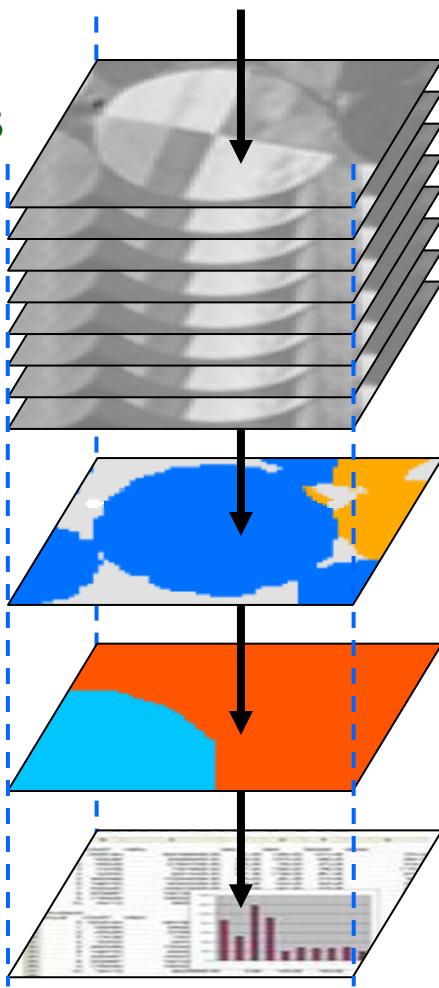
INPUTS

NDVI
time series

Land Use
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Climatic
Data



OUTPUTS



► 2. SIRIUS Services: hydrologic models – HidroMORE

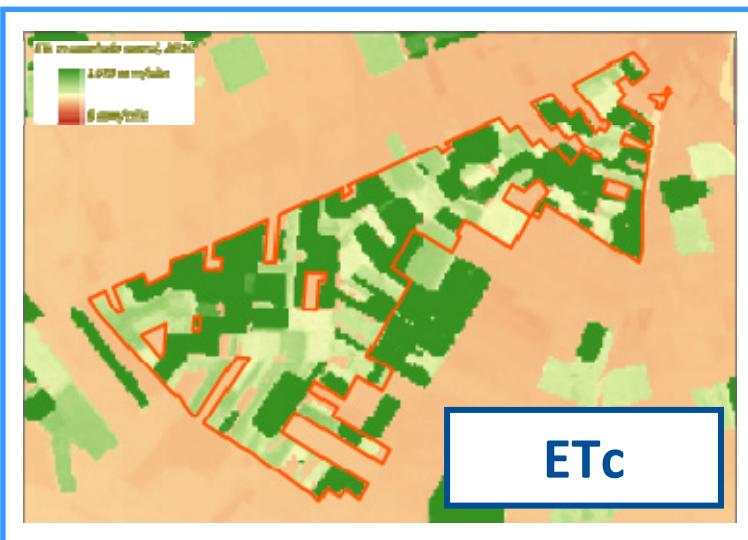


OUTPUTS

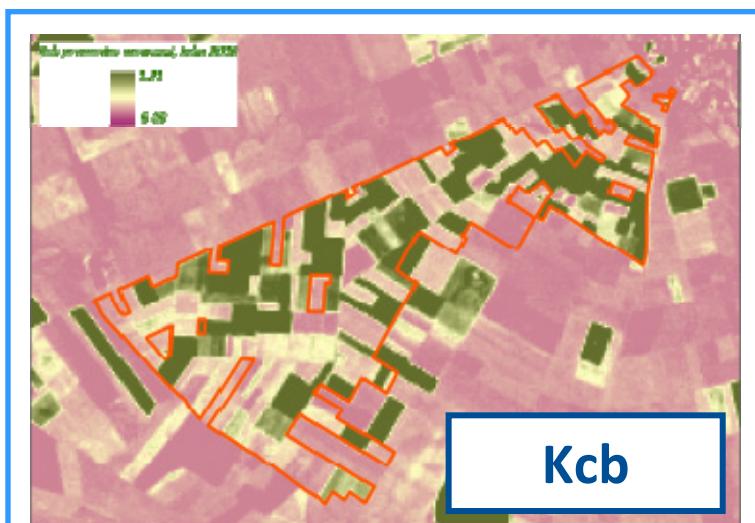
MAPS of Soil Water Balance components

Temporally aggregated to desired frequency:

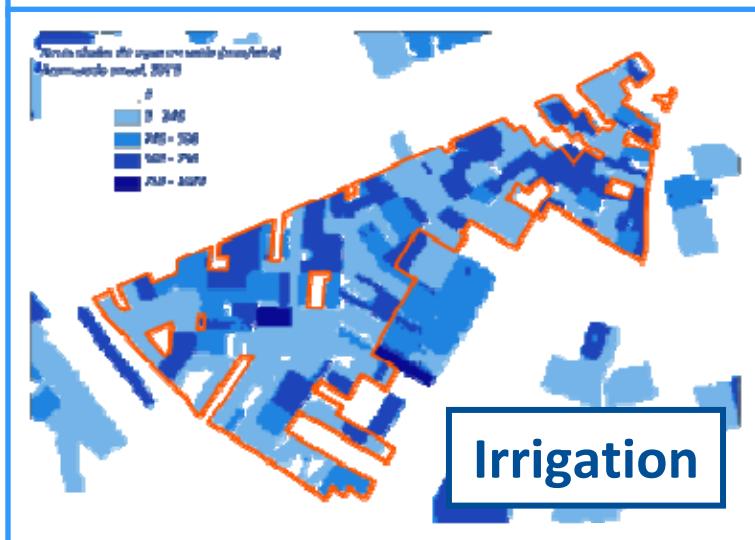
Day – Week – Month – Year



Kcb



ETc



Irrigation



► 2. SIRIUS Services: hydrologic models – AQUATOOL www.upv.es/aquatool



**DSS SHELL FOR WATER
RESOURCES PLANNING
AND MANAGEMENT**



Is a Decision Support System (DSS) for the management of the water resources in a river basin which integrates in a comprehensive way all relevant water elements and its interactions, in order to provide different scenarios that incorporate water offers and demands.

AQUATOOL model includes several modules : water management, quality modelling, environmental flows, etc.
The modules can be used all together or separately, what provides big flexibility to its users.

SIMRISK module is used in SIRIUS.

► 2. SIRIUS Services: hydrologic models – AQUATOOL

1. General Description

- Topology (management scheme)

2. Calibration process

- River stretches
 - Conductions
 - Reservoirs, aqu

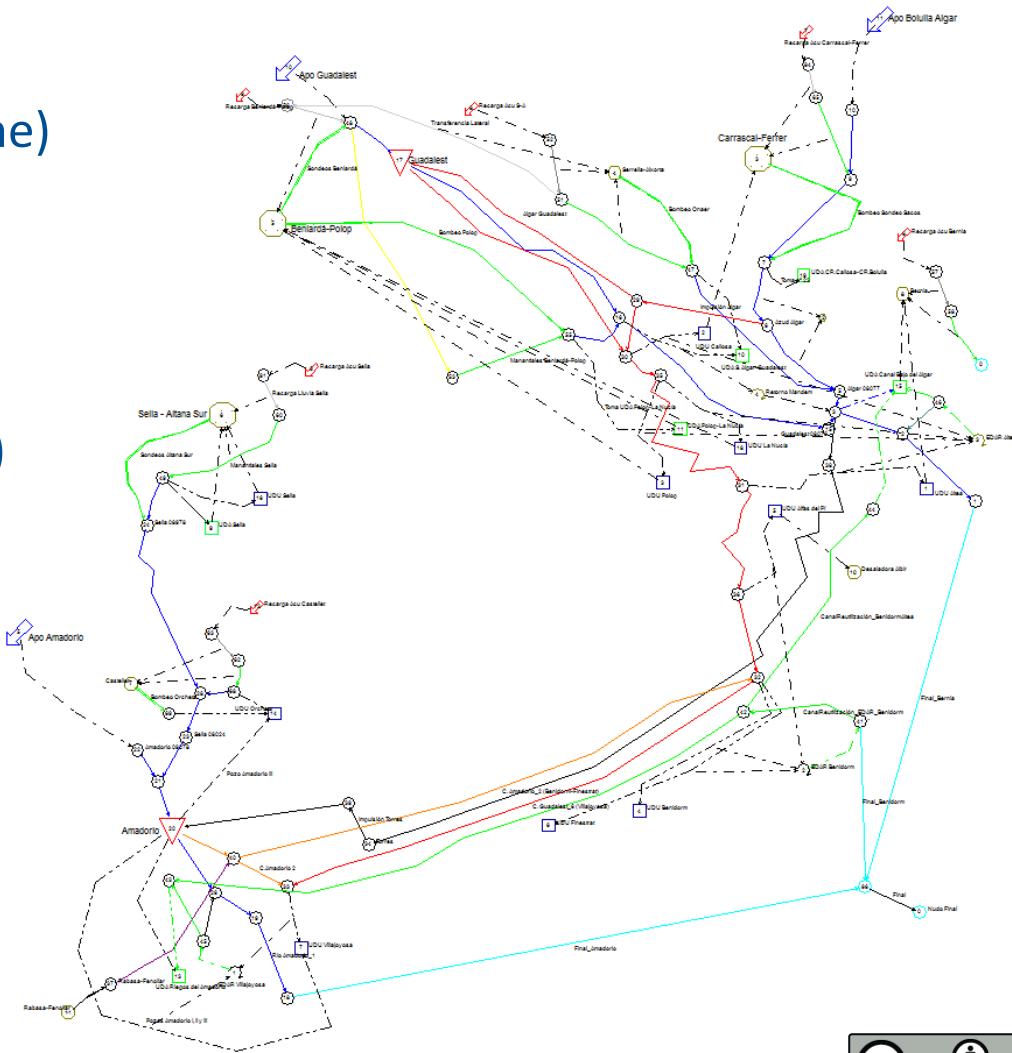
3. Water Balances (each subsystem)

- Water demands
 - River flows
 - Pumps, springs

4. Management priorities in

- Demands
 - Intakes
 - Adjusted in comparison with historical management data.

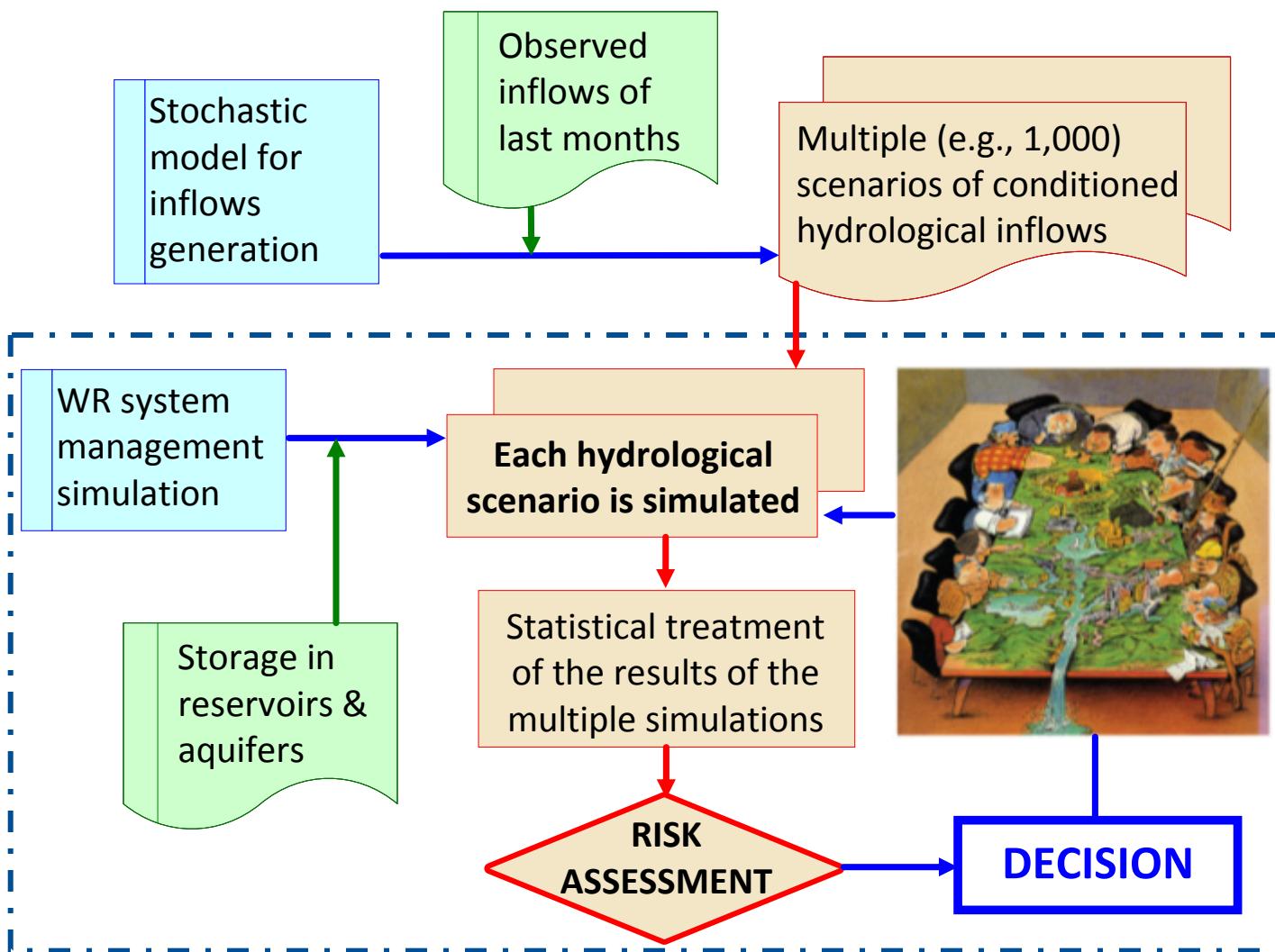
5. Simulation



► 2. SIRIUS Services: hydrologic models – AQUATOOL

SIMRISK

- Assess the risk of drought
- Anticipate (risk perception)
- Test the effectiveness of proposed measures for risk reduction (proactive approach).

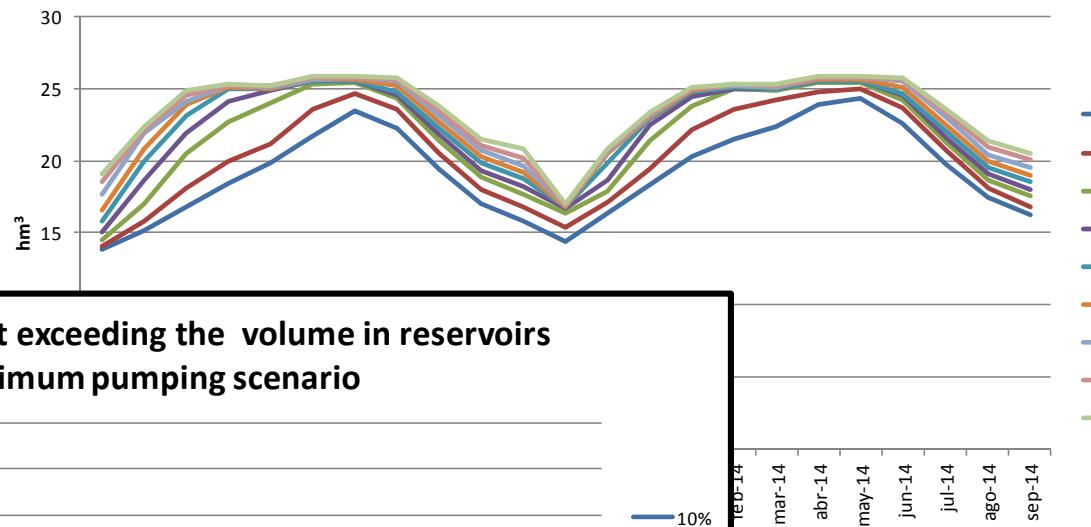


► 2. SIRIUS Services: hydrologic models – AQUATOOL

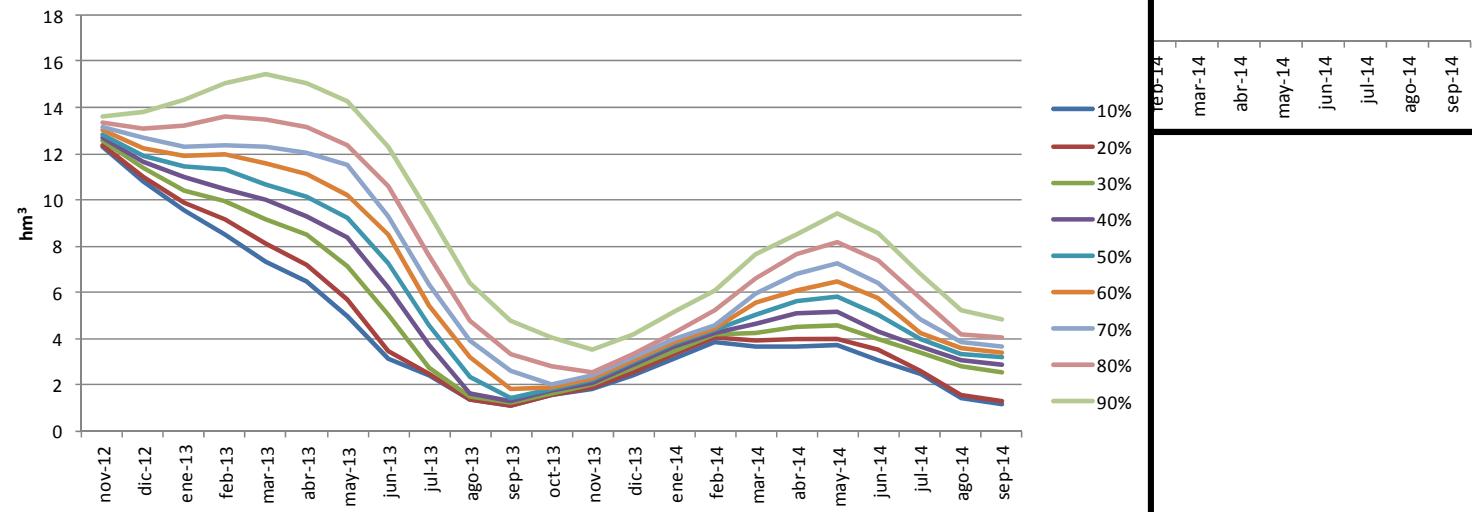
SIMRISK

Provides
different scenarios to
manage water resources

Probability of not exceeding the volume in reservoirs
Medium pumping scenario



Probability of not exceeding the volume in reservoirs
Minimum pumping scenario



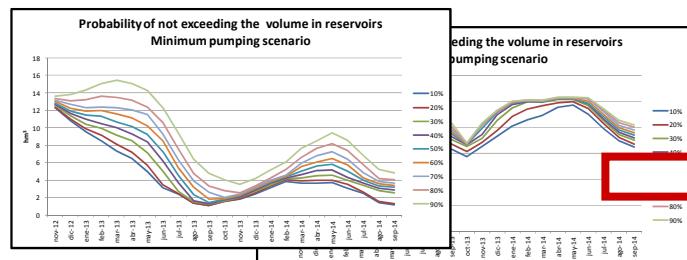
► 3. SPIDER WebGIS Tool – EO data & Models to water end users

EO data

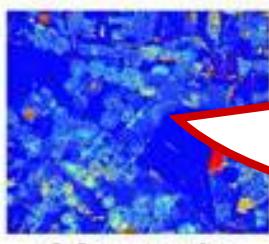
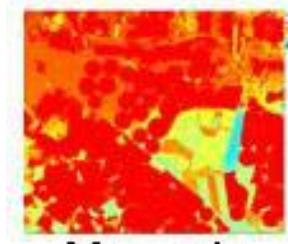


SPIDER WebGIS Tool

AQUATOOL scenarios on water management

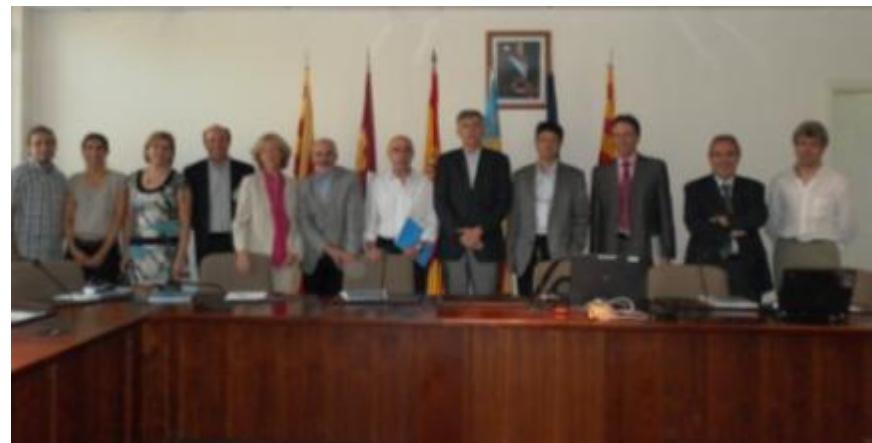


HidroMORE maps on SWB components



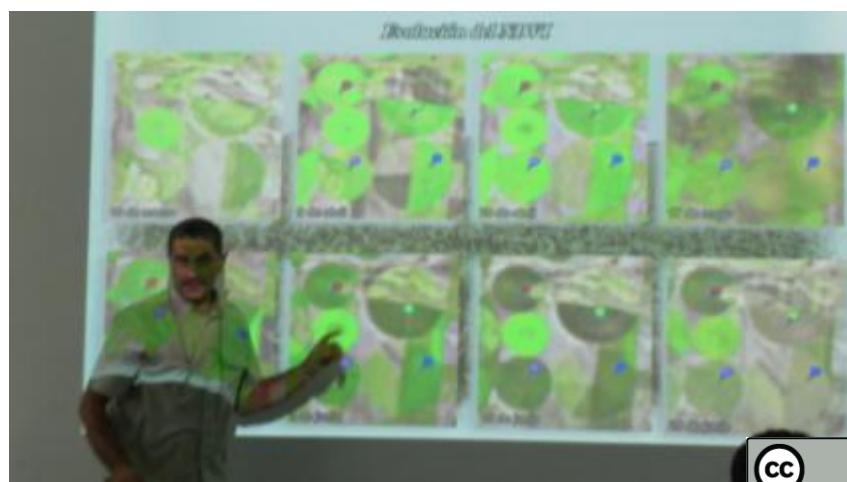
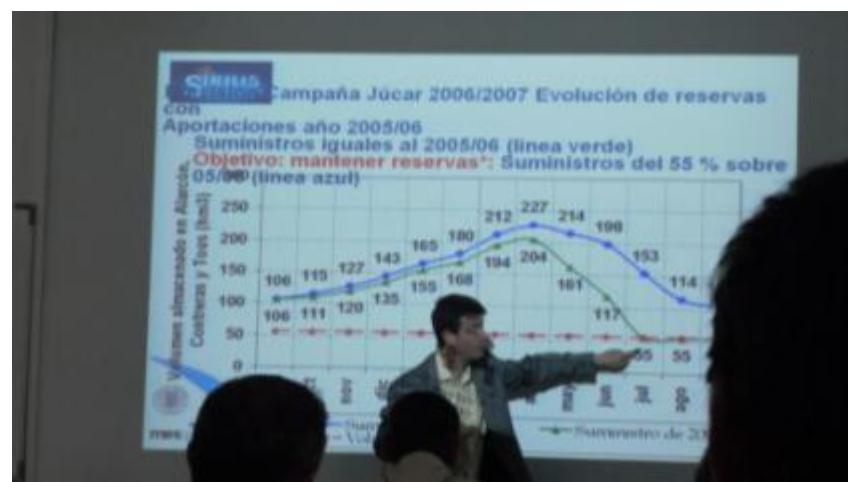
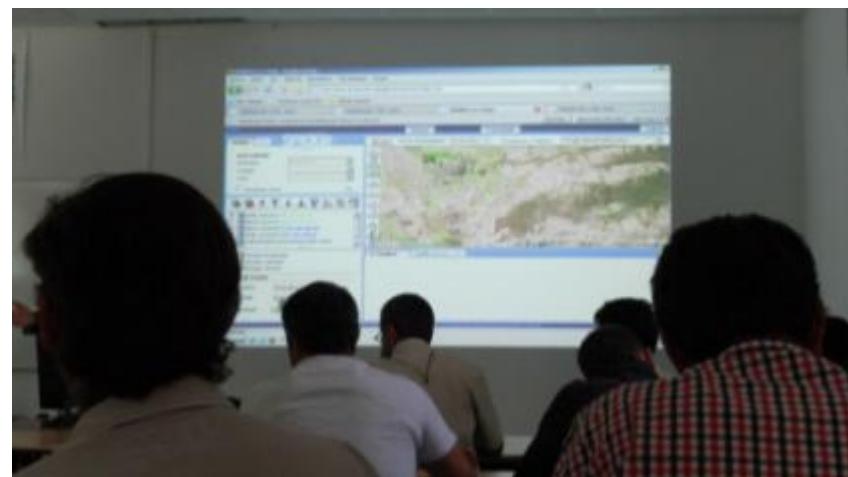
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Regional Meetings & Workshops with water users – Spanish Case.



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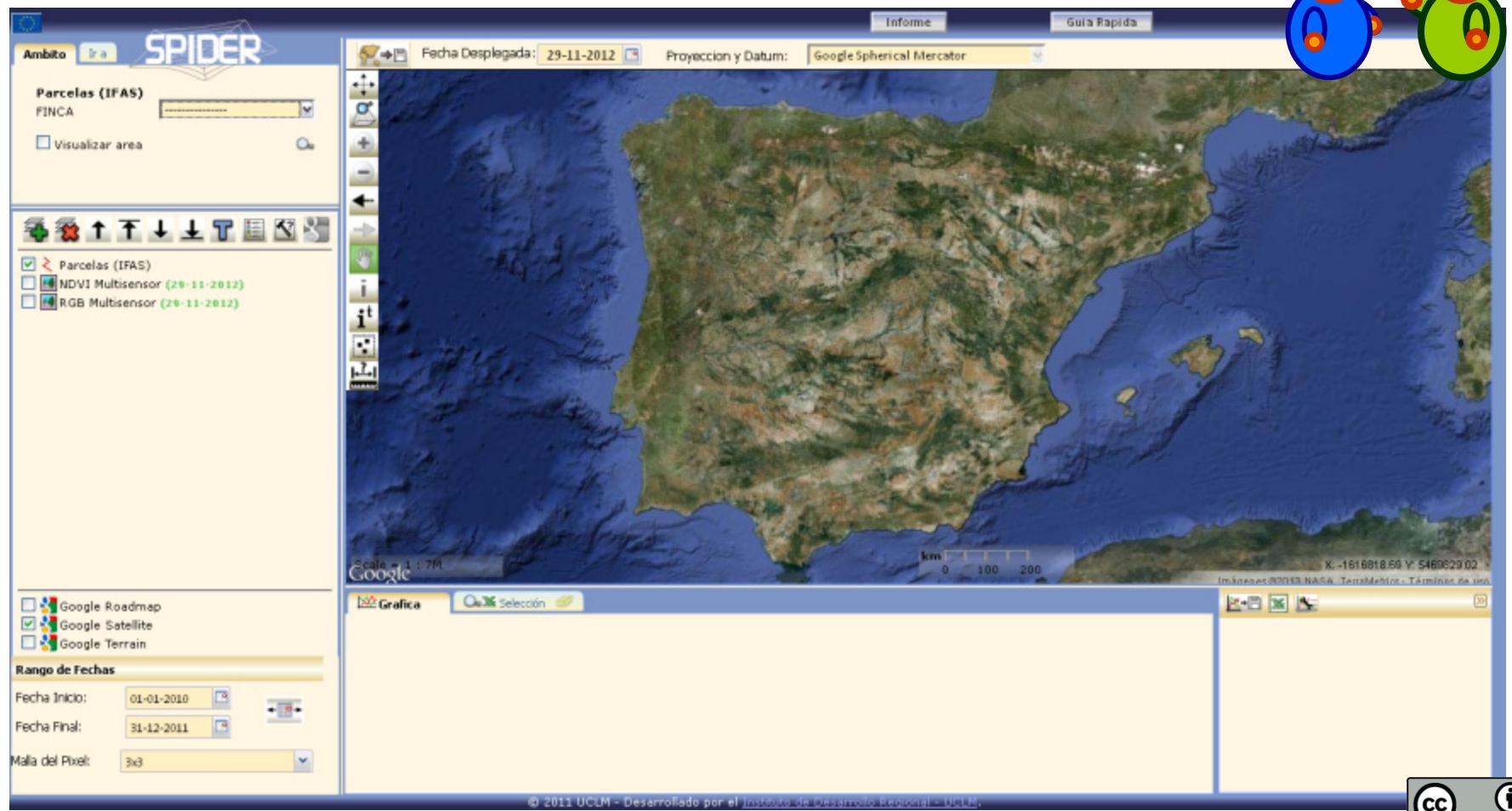
Regional Meetings & Workshops with water users – Spanish Case.



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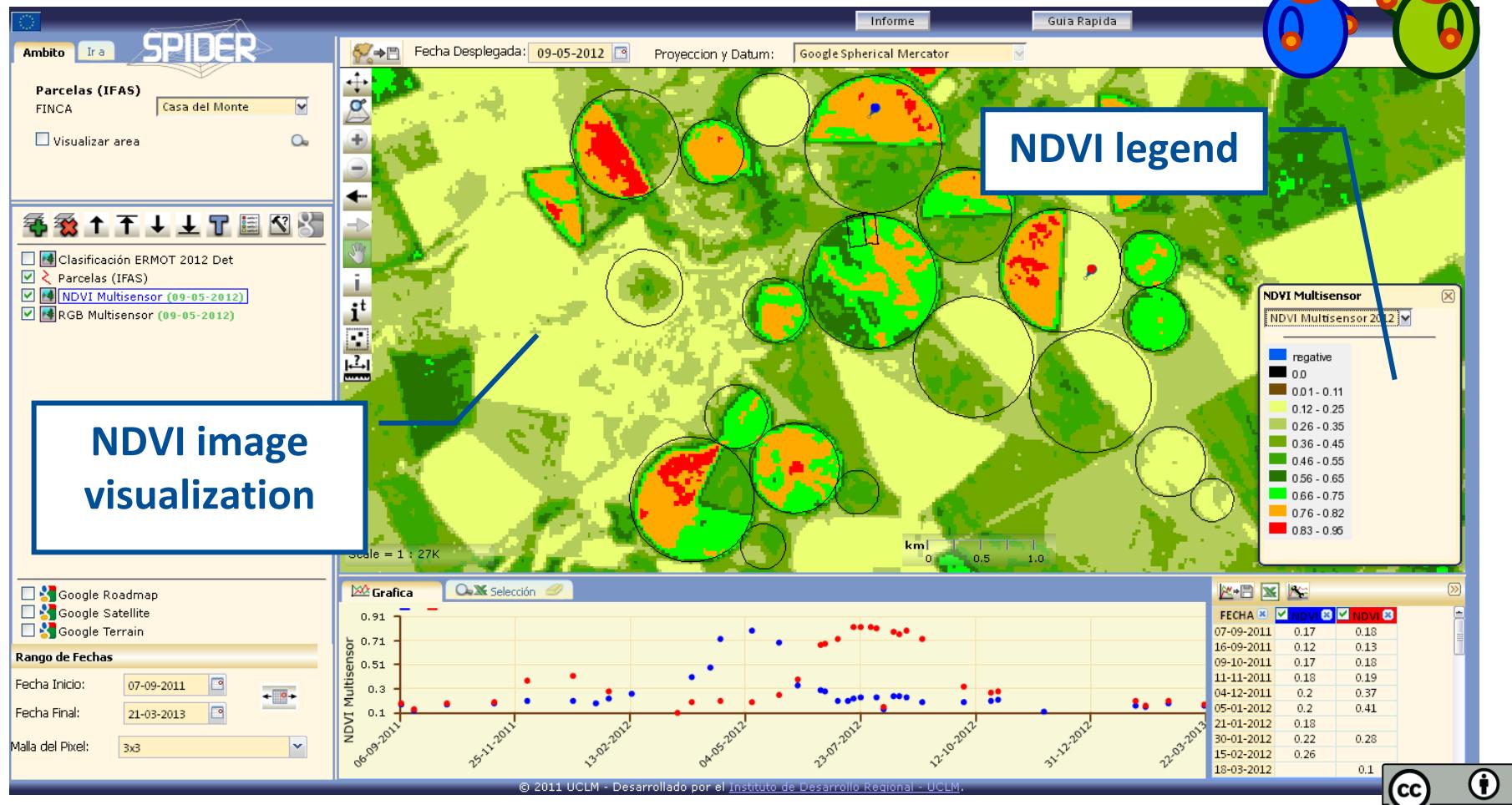
SPIDER WebGIS Tool – Viewer

www.sirius-gmes.es



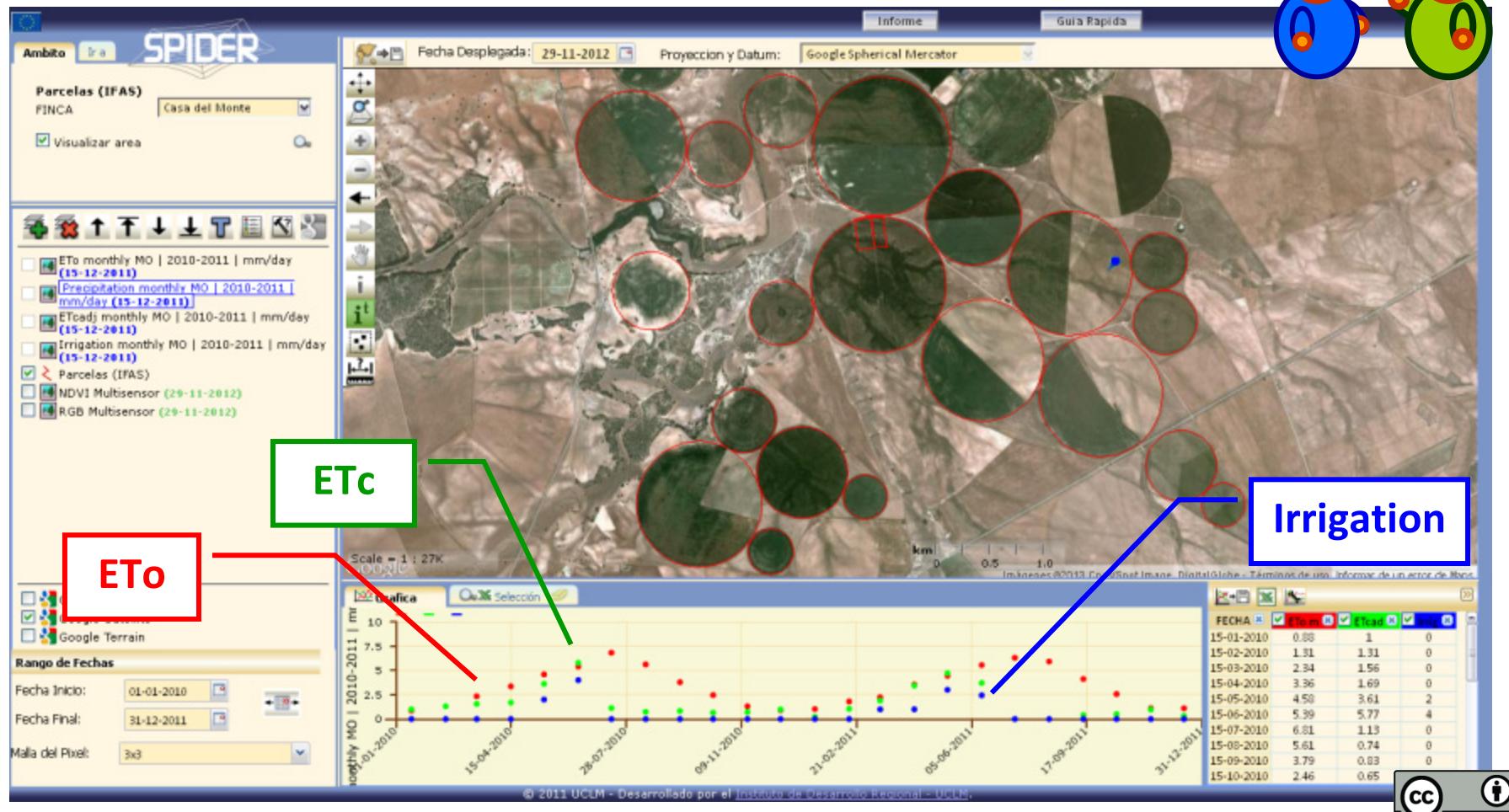
► 3. SPIDER WebGIS Tool – EO data & Models to water end users

EO data –NDVI time series for crop monitoring



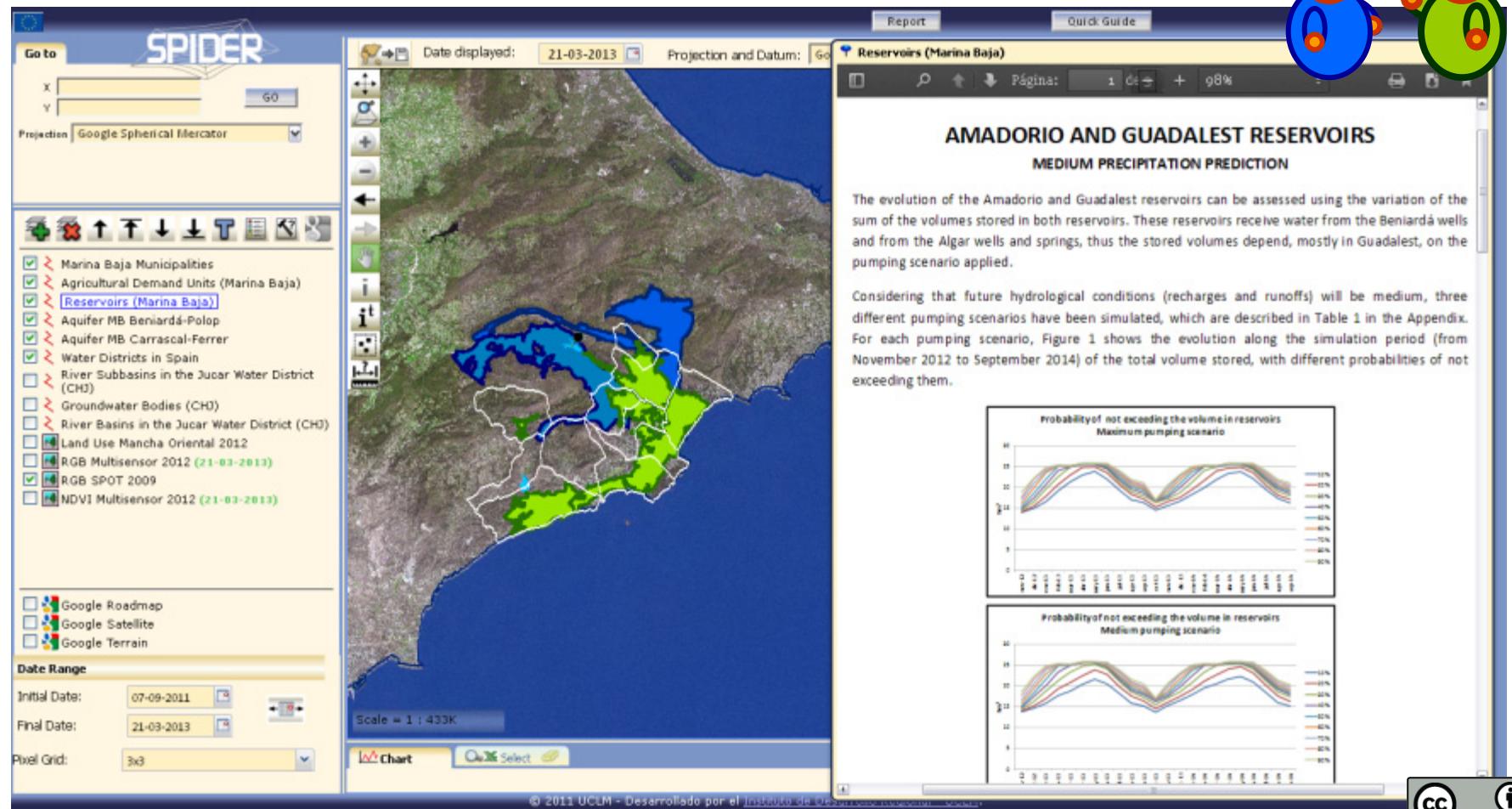
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HidroMORE – SWB components: ETo / ETc / Irrigation



► 3. SPIDER WebGIS Tool – EO data & Models to water end users

AQUATOOL – Reports : scenarios to manage water resources



The screenshot displays the SPIDER WebGIS Tool interface. On the left, the 'Go to' panel shows coordinates X: 0 Y: 0 and a projection set to Google Spherical Mercator. Below it is a legend with various layers checked, including 'Reservoirs (Marina Baja)'. The main map view shows the coastal area of the Jucar Water District with several reservoirs highlighted in blue. A scale bar indicates 1:433K. To the right, a report titled 'Reservoirs (Marina Baja)' is open, showing 'AMADORIO AND GUADELEST RESERVOIRS MEDIUM PRECIPITATION PREDICTION'. It includes a text summary about reservoir evolution and two line graphs showing the probability of not exceeding reservoir volume over time under maximum and medium pumping scenarios. The graphs plot probability (%) from 0 to 100 against months from November 2012 to September 2014, with multiple colored lines representing different confidence levels (e.g., 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%).



► 4. Conclusions

EO data & Hydrologic Models – SPIDER WebGIS Tool – Participatory Process

- ✓ There is a gap between scientific knowledge & water users
- ✓ EO data & products from Hydrological models provide valuable information on irrigated agriculture & drought management.
- ✓ SPIDER WebGIS tool puts in hands of water user scientific knowledge
- ✓ Meetings with water users provide realistic feed-backs on their necessities
- ✓ Without a Participatory Process on Decision Support Systems can not be expected that water resources management and its tools will be accepted by water users.

