H2020-MSCA-RISE-2018

Accounting for Climate Change in Water and Agriculture management

Water resources and agricultural management under global changes: CapBon site

First workshop INAT, 12 - 13 November

Context

- Water scarcity is continuously increasing and water resources face high competitions in these areas.
- Situation is exacerbated by the climate changes.
- Thus a proper water management and agricultural pratices are required for a compromise beween a sustainable and profitable agriculture

Cadre

Since 2004 OMERE a long term hydrological research observatory : anthropogenic and climate change impacts on water and matter flow in Mediterranean rural catchments

2010-2015 : SICMED/Mistrals (Mediterranean Integrated studies at regional and local scales (France): «Approche biophysique et socio-économique de la gestion de l'eau dans la région du Cap – Bon »

2013-2017: ANR Transmed: ALMIRA – "Adapting Landscape Mosaics of mediteranean Rainfed Agrosystems for a sustainable management of crop production, water and soil resources". https://www.almira-project.org/

LMI NAILA Mixte International « Laboratoire Mixte International « Gestion des ressources en eau dans les milieux ruraux tunisiens » **LMI NAÏLA** www.lmi-naila.com/

2019-2021 : PRIMA- ALTOS « Prise en compte des structures spatiales et connectivités pour la gestion des ressources en eau dans les agrosystèmes méditerranéens » coordinatrice nationale

2019-2021 : JPI-WATER – FLUXMED "STRATEGIES FOR INCREASING THE WATER USE EFFICIENCY OF SEMI-ARID MEDITERRANEAN AGROSILVOPASTORAL SYSTEMS UNDER CLIMATE CHANGE"

Goal

Determine efficient management strategies of the rainfed agricultural catchments and irrigated orchards that allow for compromises between economic development and natural resources preservation.

Transdisciplinary approach

Implementation of innovations by the exploitation of the local know-how local and the expertise of the recherche

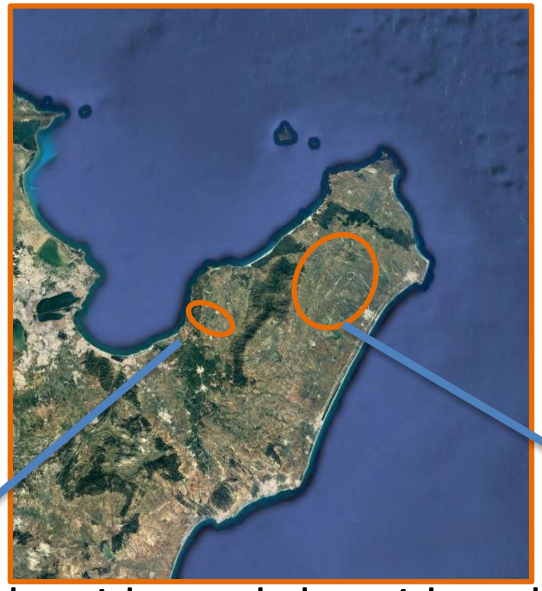
Participatory process and mutual learning

Organisations of reflection days
Field days
Training days

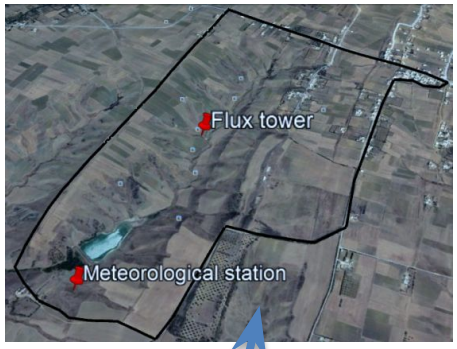
Experiments/ modelling

Document water requirement
Water flows
Land use
Plant water status

Study site



Kamech watershed



Lebna watershed

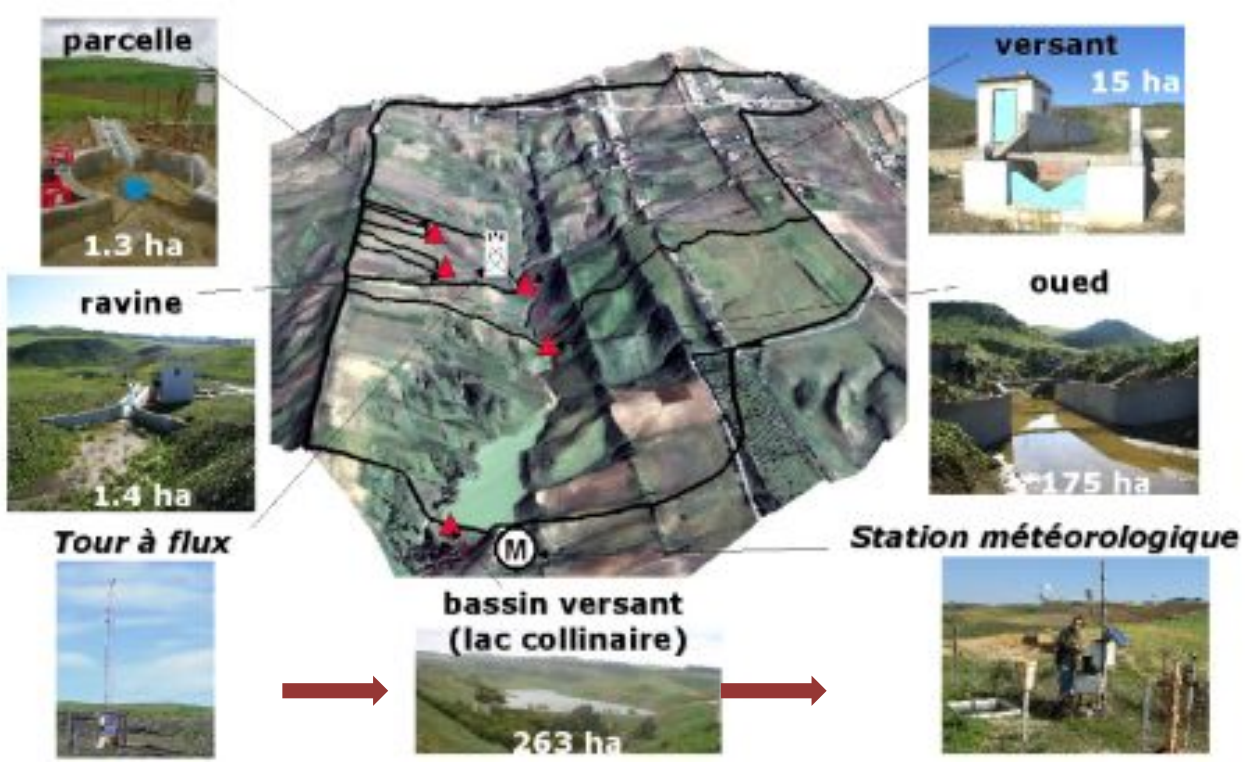
CTA orchard

- Sub-arid to sub-humid to climate
  - Rain = 450 to 700 mm/year
  - ETP = 1000 to 1400 mm/year
- Hilly topography
- Diversity of soil types (vertisols, cambisols, livisols, regosols,)
- Intermittent flow

Observations : Kamech observatory

Nested system

Since 2004



Flux measurements

Anthropogenic activities

1. Data acquisition and processing

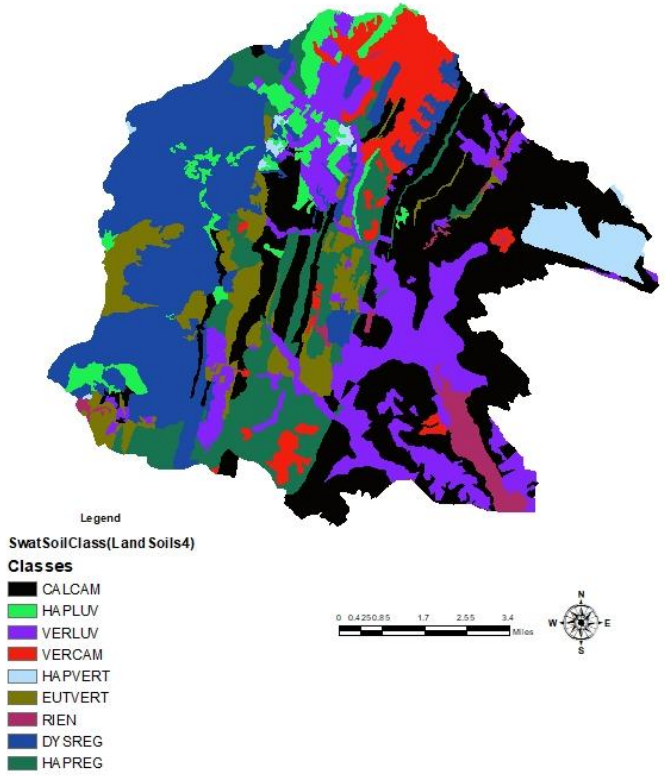
2. Data and metadata base management

3. **Making data available**

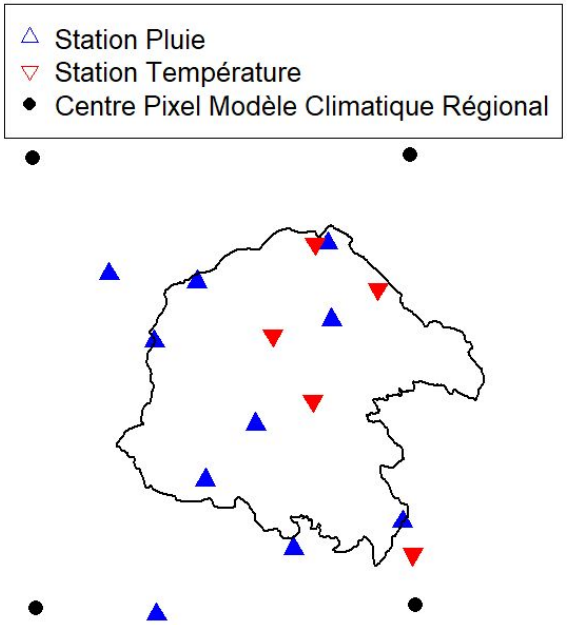
http://www.umr-lisah.fr/omere

Data visualization and extraction

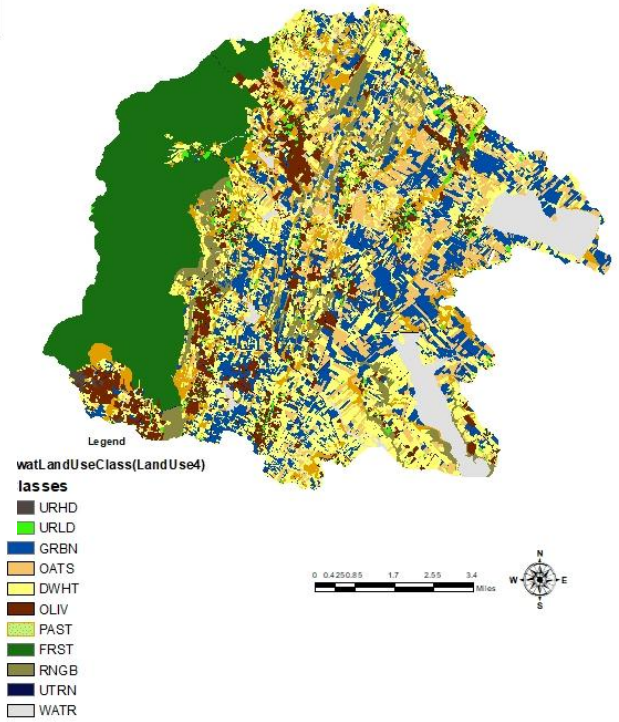
Observations : Lebna watershed



Soils



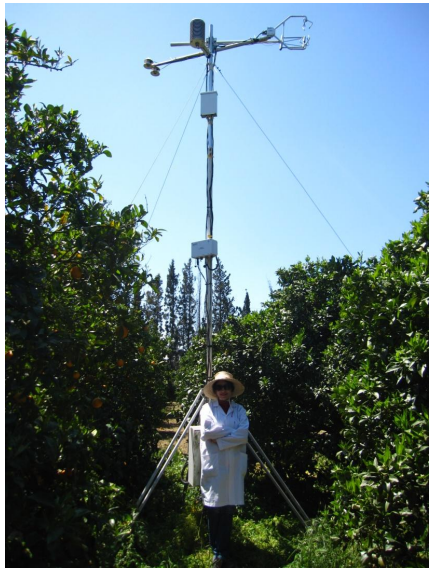
Climat



Land use- vegetation

+ Agricultural practices

Observations : CTA site



footprint de 4000 m²

Since 2014

Insturments rapides: 20Hz

Anemometer sonic (u, v, w, T)

Hygromètre optique (q)

Instrument lent: 1s

Pyrranometer

3 plaquettes de flux de chaleurs dans le sol

Centrale d'acquisition

ET0 (Ta,Hr,U,Rg)

Rn, H, G, LE=ETa

Stem water potentiel
Soil humidity
Production
Vegetation growth

Modelling

Hydrological models

Soil and Water Assessment Tool

SWAT Long-term, continuous watershed simulation model (Arnold et al,1998)

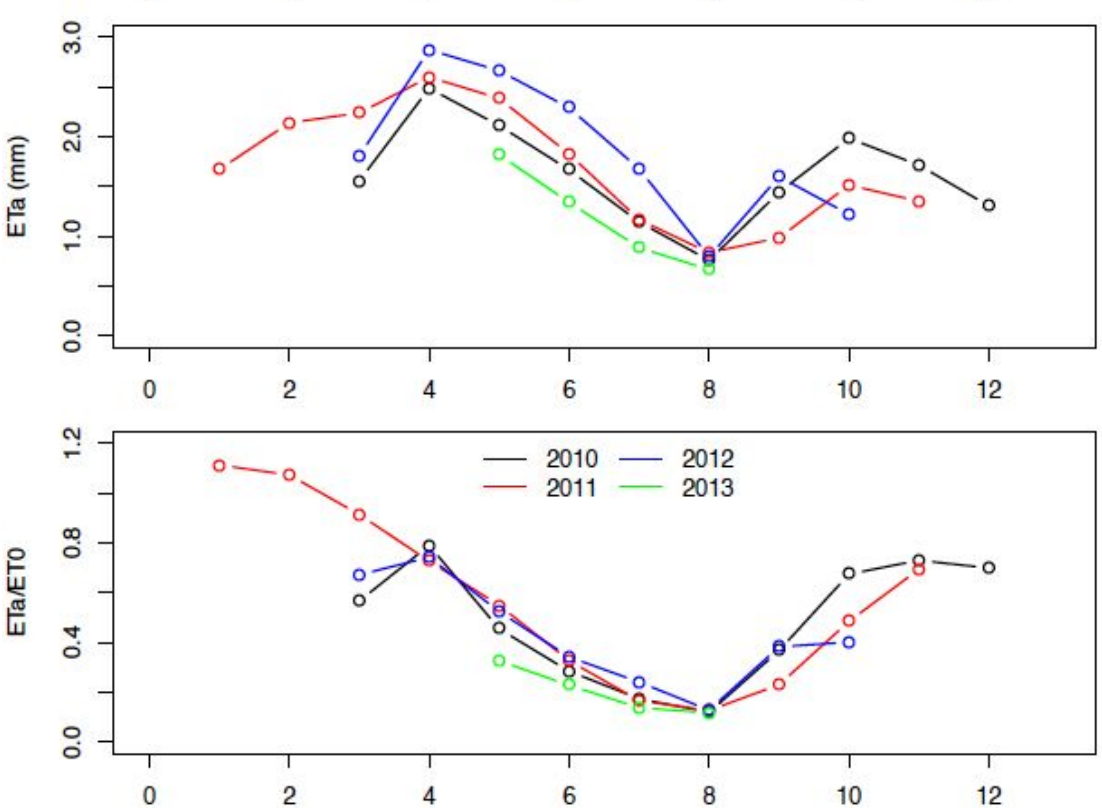
Crop models

FAO56 modified by taking into account CO2

$$r_s = \frac{1}{g\left[1.4 - 0.4\left(\frac{CO_2}{330}\right)\right]} \times \frac{1}{12h\left[1 + \frac{7}{100}\left(\frac{CO_2 - 330}{330}\right)\right]}$$

Agro-hydrological modeling

OMERE Observatory



Hydrological distributed model implemented in a modeling platform openFluid

Impacts of land use and climate on the agronomic efficiency of water under a rainfed mediterranean watershed: modellng and scenarios analysis

PHD Mariem Dhouib.

ALTOS –prima project

Implementation of a crop model to the plateform OpenFLUID (MHYDAS)

Calibration and validation with the existing observations

Simulationsof the agronomic efficiency of water for

Climatic change scenarios (available)
and
Land use scenarios (available)

Explore the use of SWAT in order to predict the hydrologic response in agricultural catchment context

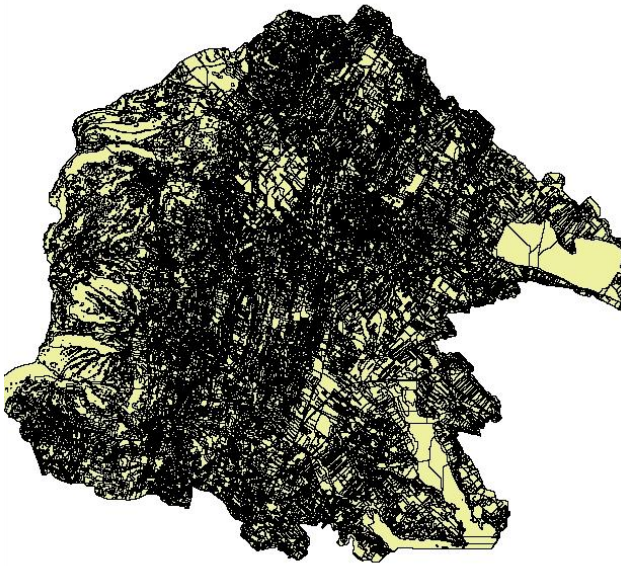
Implementation SWAT: 30 years (1986-2016), discharge at the outlet of Lebna catchment and Kamech sub-basins

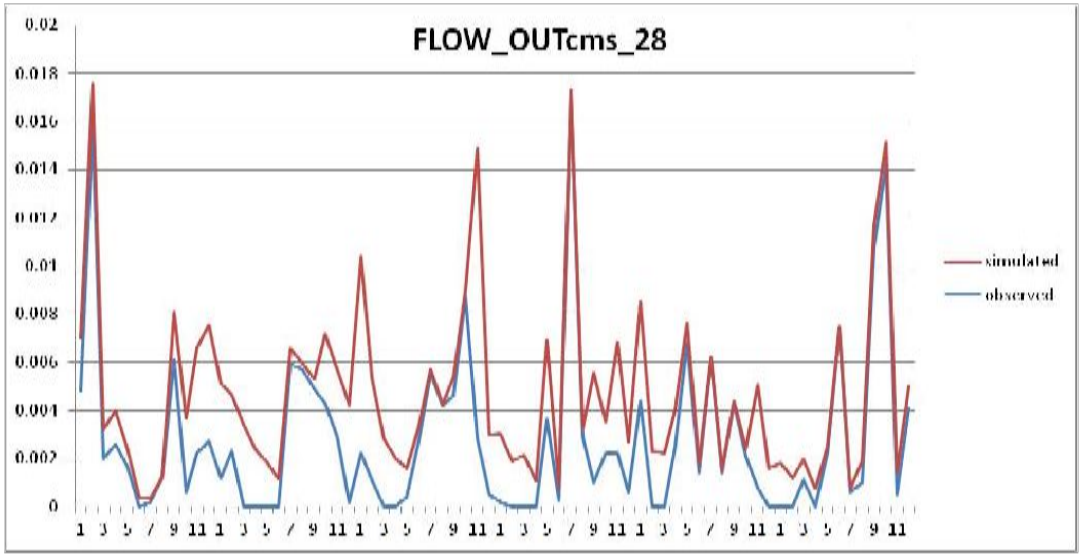
4 years warm up (1986-1989)

16 years calibration (1990-2005)

10 years validation (2006-2016)

2499 HRU

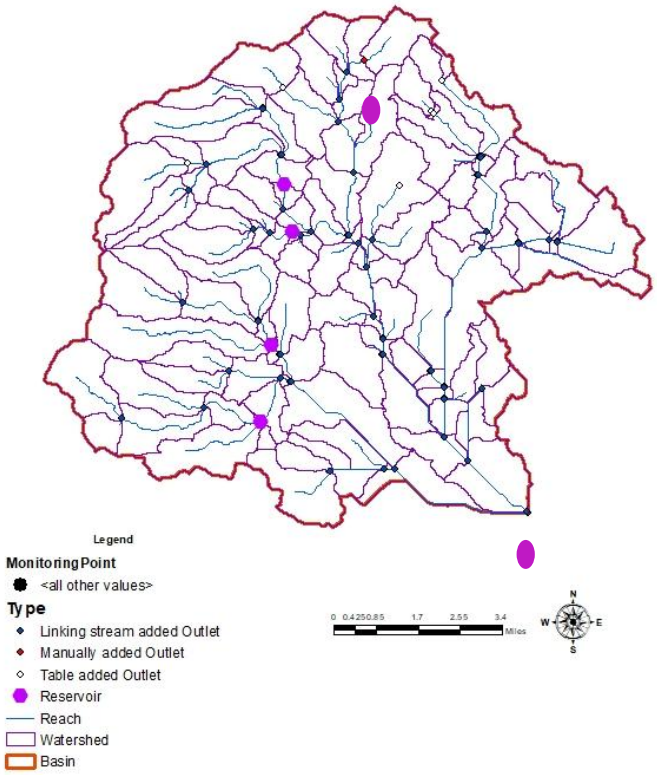




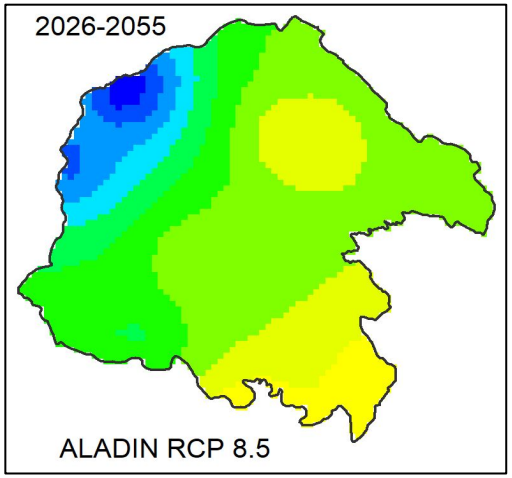
Impacts of reservoirs cracks

Modeling the hydrological processes and the ecosystem services in the Lebna catchment (Cap Bon, Tunisia)

PRIMA-ALTOS + H2020-MSCA-RISE ACCWA



Climat change scenarios

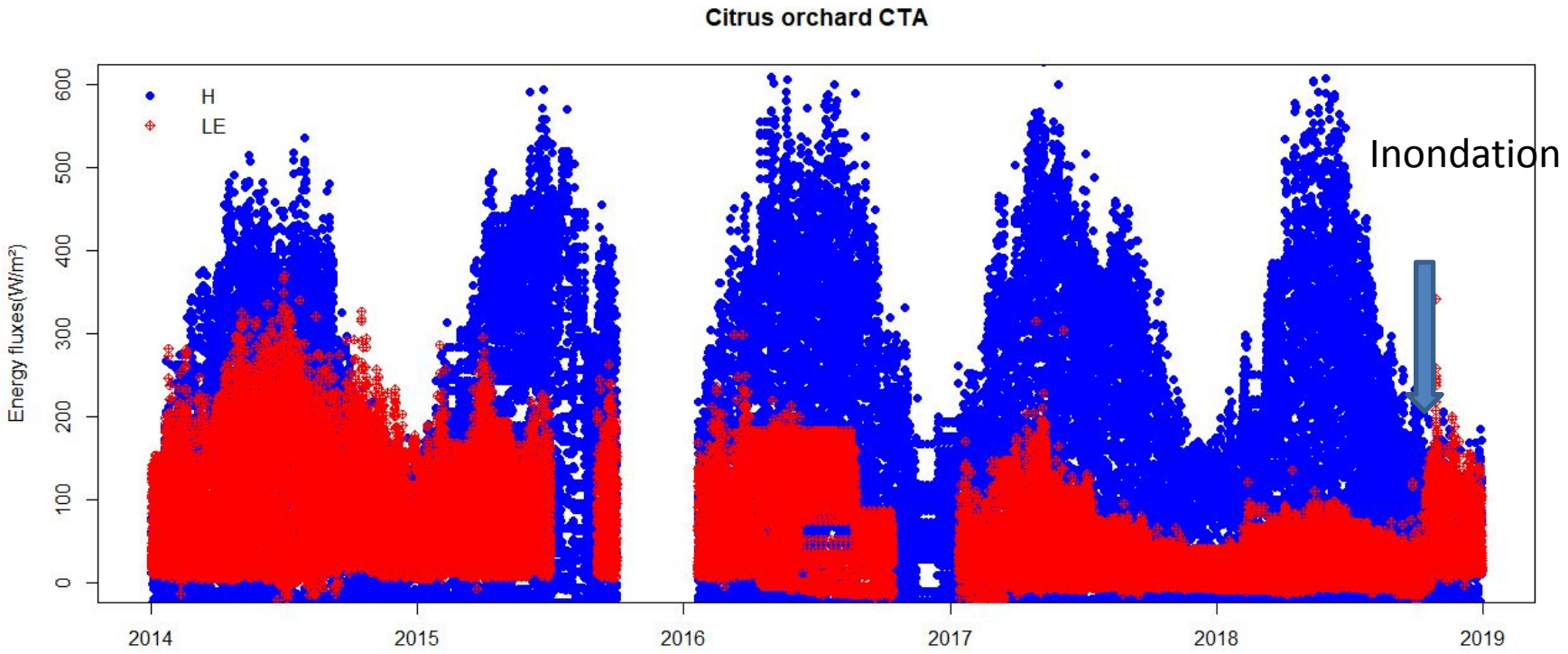


Land soil scenarios

Simulation of provisioning and regulating services; yields of water, sediments, and agricultural production using SWAT

These 3

Time series of hourly Energy fluxes observation: irrigated orchard



Interannuel variability is clearly observed

The data set represent various conditions of water availibility

Modeling the impacts of climate change on water and energy exchange in the citrus agricultural systems – CapBon Tunsisia

JPI WATER FLUXMED

Methodolgy

- Sap flow measurement
- Modeling the surface enrergy exchange
- Simulations include
  - Climatic change scenarios (available)
  - Elaboratie pratices scenarios (mulching + deficit irrigation déficitaire)

accwa

ACCWA will offer mobility and collaboations with mediterranean parteners

thanks