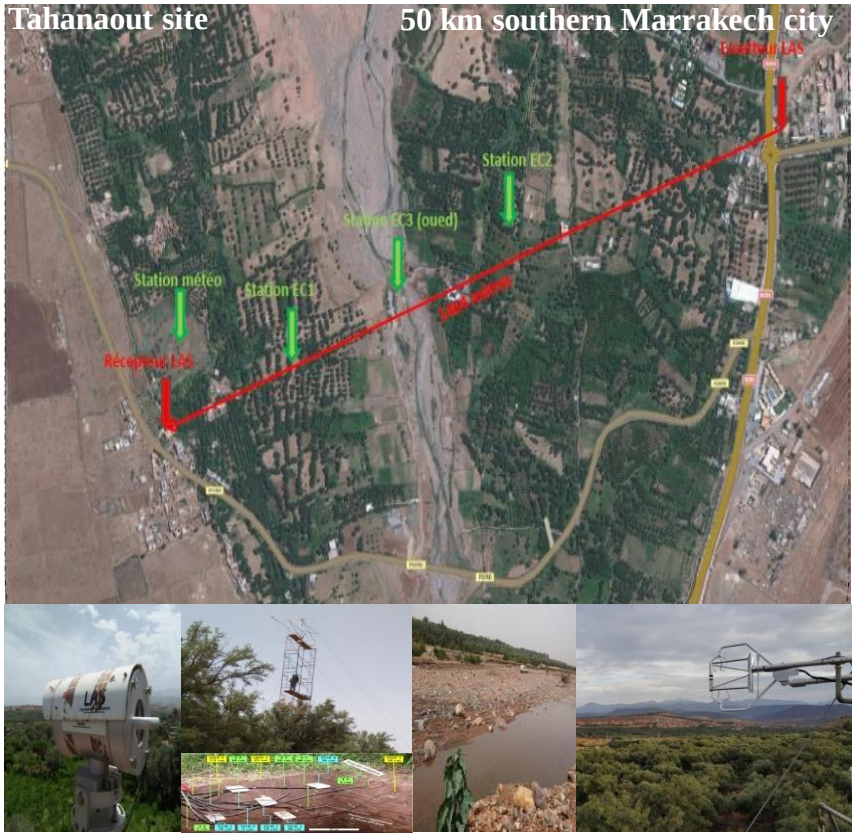
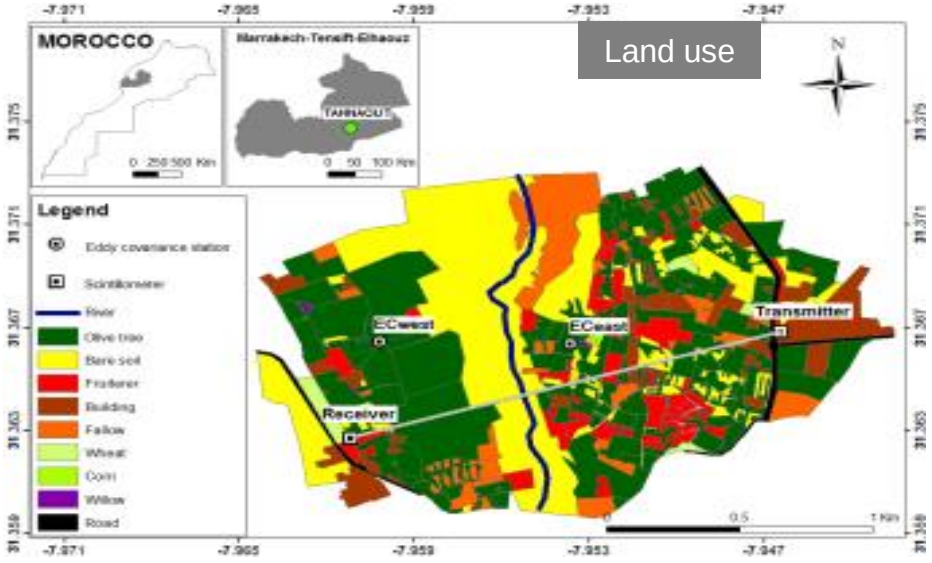

ALTOS KoF meeting
- Cadi Ayyad University UCA -
Tensift Site
WP3.2.
October 26, 2020

Hydrological functioning of the foot-mountain zone

Main objectives:

- Evaluation of the ETR over the practiced heterogeneous covers,
- Extension of SAMIR Software to this zone,
- SAMIR vs (SPARSE and Shuttleworth-Wallace models)
- Estimation of deep percolation with water balance (groundwater recharge).





1 LAS, 2 completes EC, 1 meteo station

+ OS, LAI (from 2016-date)

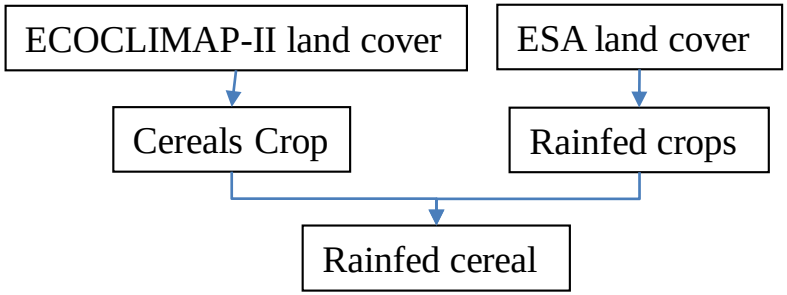
PhD : J. Elfarekh

Assessing the linkages between agricultural drought indices and rainfed cereal production in Morocco

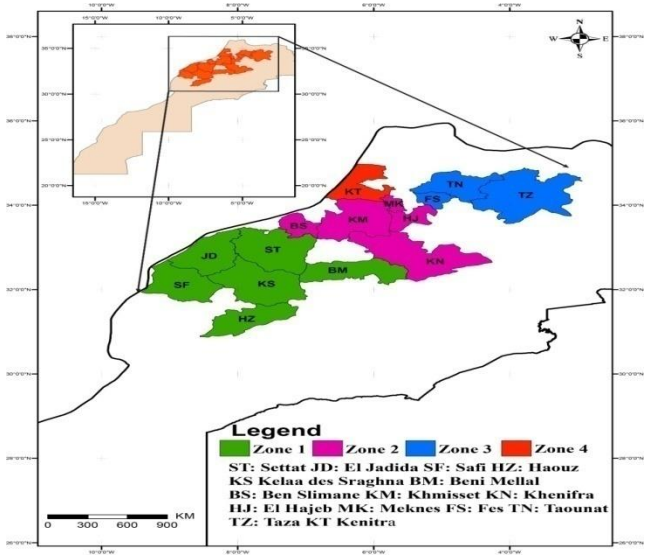
Objectives:

- Asses the linkages between agricultural drought and variables and cereal crop production.
- Identification of the key phenological stages for each drought index.
- Determination of the more relevant combinations of indices.
- Evaluation of the added value of a Land Data Assimilation System regards to Remote sensing products.

Identification of rainfed cereal zones



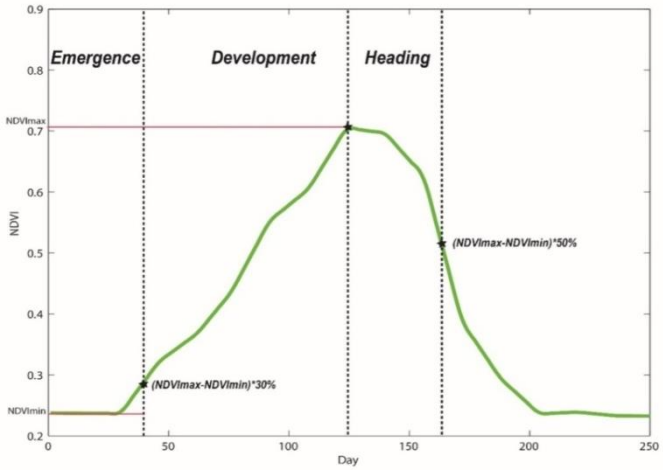
Hierarchical cluster analysis based on yield using K means ➔ 4 groups



Crop production

Statistics from the Moroccan ministry of agriculture at province level (2000-2017)

Identification of major phenological stage



PhD: Elhoussaine Bouras

Assessing the linkages between agricultural drought indices and rainfed cereal production in Morocco

Remote sensing variables and index

Vegetation Condition Index

$$VCI = \frac{NDVI_{(i)} - NDVI_{min}}{NDVI_{max} - NDVI_{min}} * 100$$

MODIS MOD13A2 (16-days, 1 km, 2000-2017)

Cell alteration

Visible

Microwave

Thermal Infrared

Soil moisture

Water stress

VHI=0.5 TCI + 0.5 VCI

Soil Moister Condition Index

$$SMCI = \frac{SM_i - SM_{min}}{SM_{max} - SM_{min}} * 100$$

SSM CCI, daily, 0.25°

Soil water index

$$SWI(t_n) = \frac{\sum_i^n SSM(t_i) e^{-\frac{t_n - t_i}{T}}}{\sum_i^n e^{-\frac{t_n - t_i}{T}}}$$

ASCAT SWI 10 day,0.25

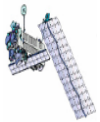
Temperature Condition Index

$$TCI = \frac{LST_{max} - LST_i}{LST_{max} - LST_{min}} * 100$$

MODIS MOD11A1 (daily, 1 km, 2000-2017)

Land Data Assimilation System

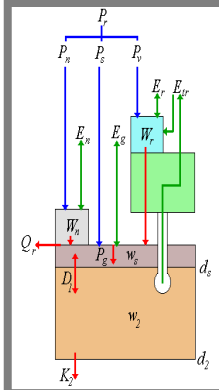
- Surface soil moisture (CCI, daily, 0.25°)
- LAI (Copernicus, 10-days, 0.25°)



Satellite products

Obs. errors

SURFEX platform (Meteo-France)



ISBA-A-gs model for natural and crop surface

Model errors

Assimilation

Normalized anomalies of LAI, RZSM, ETR, E/Tr 0.25°, daily, 2001-2017

PHD: Elhoussaine Bouras

Test of SAT-IRR admissibility (2020-2021)

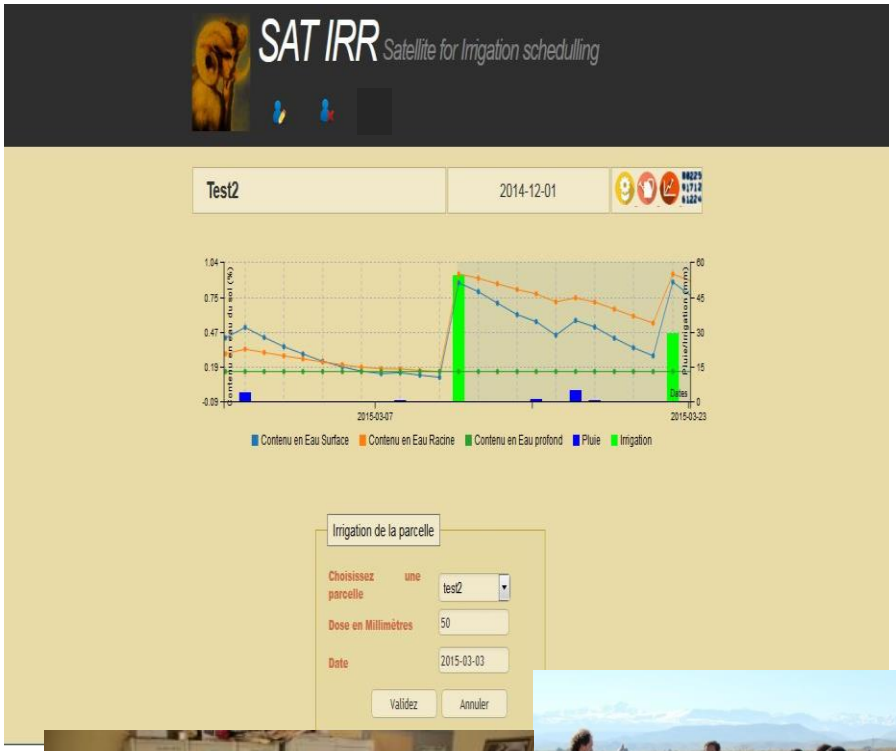
The SAT-IRR software is available at http://osr-cesbio.ups-tlse.fr/Satirr/

Comparison with actual practices (dates and irrigation amounts):

- Assessment of the software admissibility,
- Evaluation of the irrigation conversion (from flood to drip) driven by the ORMVAH, in the frame work of “Green Moroccan plan”.

SAT-IRR improvement:

- Introduction of crop yield (GY, DM),
- development of a better rain product (combination IMERG + obs in Tunisia and Morocco),
- Assimilation of high resolution satellite products (eg SSM and LST) and possibly improve the estimation of irrigations.



PhD: M. Khlif, Co-suprvised by INAT/UCA/CESBIO???

A Simple Light-Use-Efficiency model for cereal yield estimation

Aboveground biomass variation:

$$\Delta MS = \varepsilon_i * \varepsilon_s * \varepsilon_{conv} * R_g * \Delta t$$

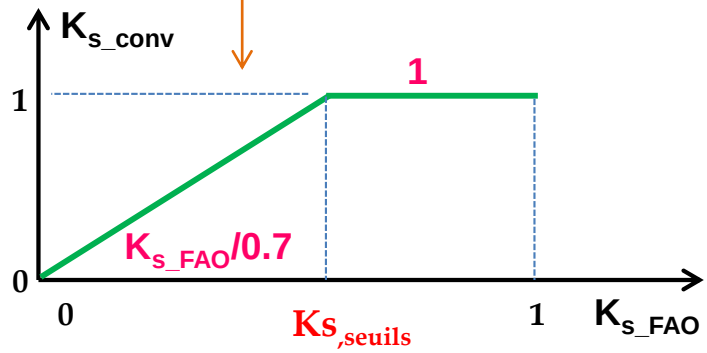
Monteith (1972)

$$\varepsilon_i = \varepsilon_{imax} * (1 - \exp^{-k*LAI})$$

$$0.48$$

$$\varepsilon_{conv\_max}(t) * K_{s\_conv} * K_t$$

- k=0.55
- LAI= f(NDVI)



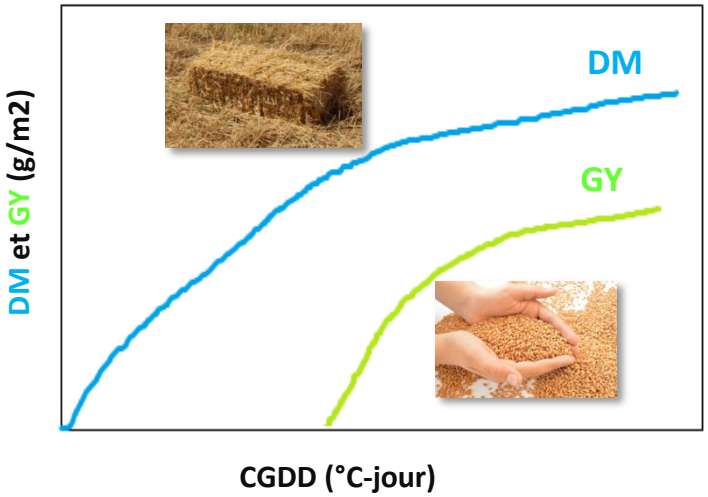
$$\Delta MS(t) = 0.48 * (\varepsilon_{imax} * \varepsilon_{conv\_max}(t)) * K_{s\_conv} * K_t * (1 - \exp^{-k*LAI}) * R_g * \Delta t$$

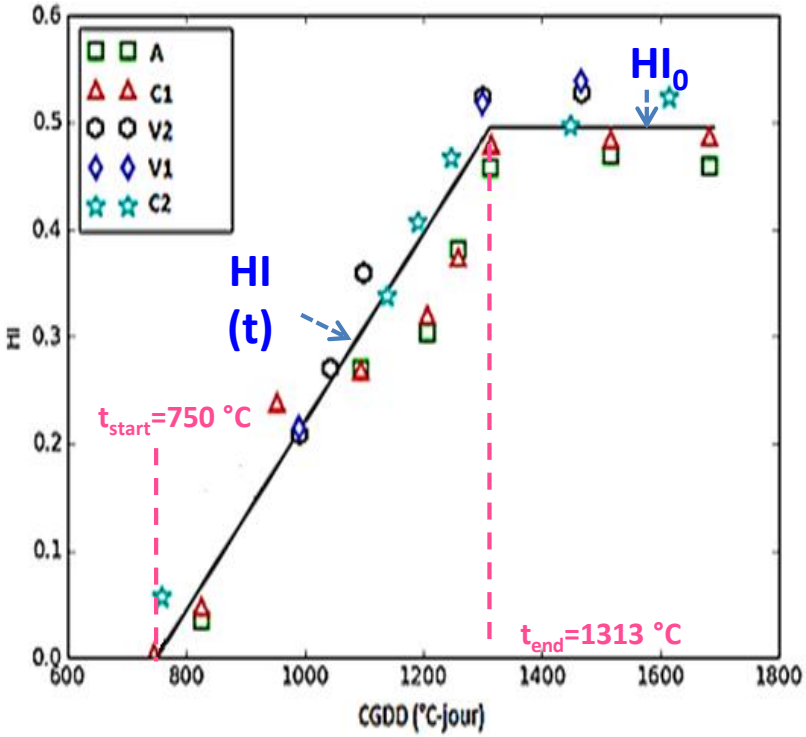
$$\varepsilon_{max}(t)$$

A Simple Light-Use-Efficiency model for cereal yield estimation

Partition of aboveground biomass (DM) in straw and grains (GY)

Harvest Index HI = GY / DM





$$HI_0 = HI_{0max} - \Delta HI_0 * \left(\frac{NDVI_{max_{max}} - NDVI_{max}}{NDVI_{max_{max}} - NDVI_{max_{min}}} \right)$$

$$HI(t) = \frac{HI_0}{(t_{end} - t_{start})} * (t - t_{start})$$

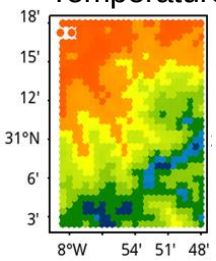
INTEGRATED MODELLING

SIM: SAFRAN-ISBA-MODCOU

The main goals:

- Set up the SAFRAN re-analysis system on the Tensift catchment, by using all the meteorological measurements acquired on the site from 2004 to 2019,
- Representation of irrigation zone in ISBA.

Température

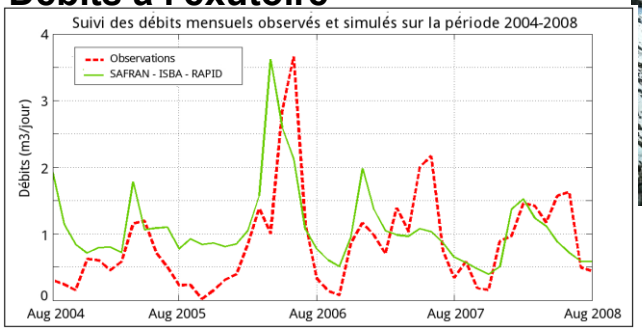


Forçage météo
(ré-analyse SAFRAN)
Quintana-Segui et al., 2008

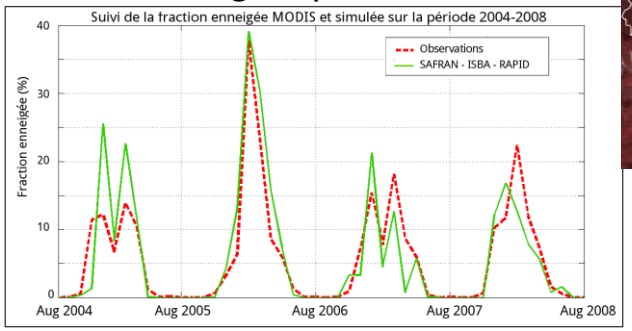
Modèle SVAT et neige
(ISBA et ISBA-ES)
Noilhan et Mahfouf, 1996

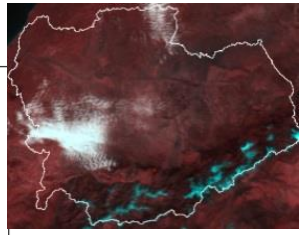
MODCOU
(routage)
David et al., 2011

Débits à l'exutoire



Surface enneigée: produits MODIS





PhD: Ahmed Moucha