« SAMIR 2013 »

A Life-Size and Real-time Test of Irrigation Driving with Satellite Imagery in Morocco

Preliminary Results

Michel LE PAGE
Saïd KHABBA,
Lionel JARLAN,
Adrien TAVERNIER,
Mohamed YOUSFI,
Olivier HAGOLLE,
Mireille HUC,
Hakim KHARROU,
Salah ERRAKI
Jihad TOUMI

TREMA
Laboratoire Mixte International

CESBIO

ORMVAH

IRD
Institut de recherche pour le développement

Université Cadi Ayyad de Marrakech Maroc

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Irrigation Driving

Plan

1. Objectives
2. Context
3. Method
4. Data
5. Results
6. Conclusion

Objectives

1° Try out the logistic

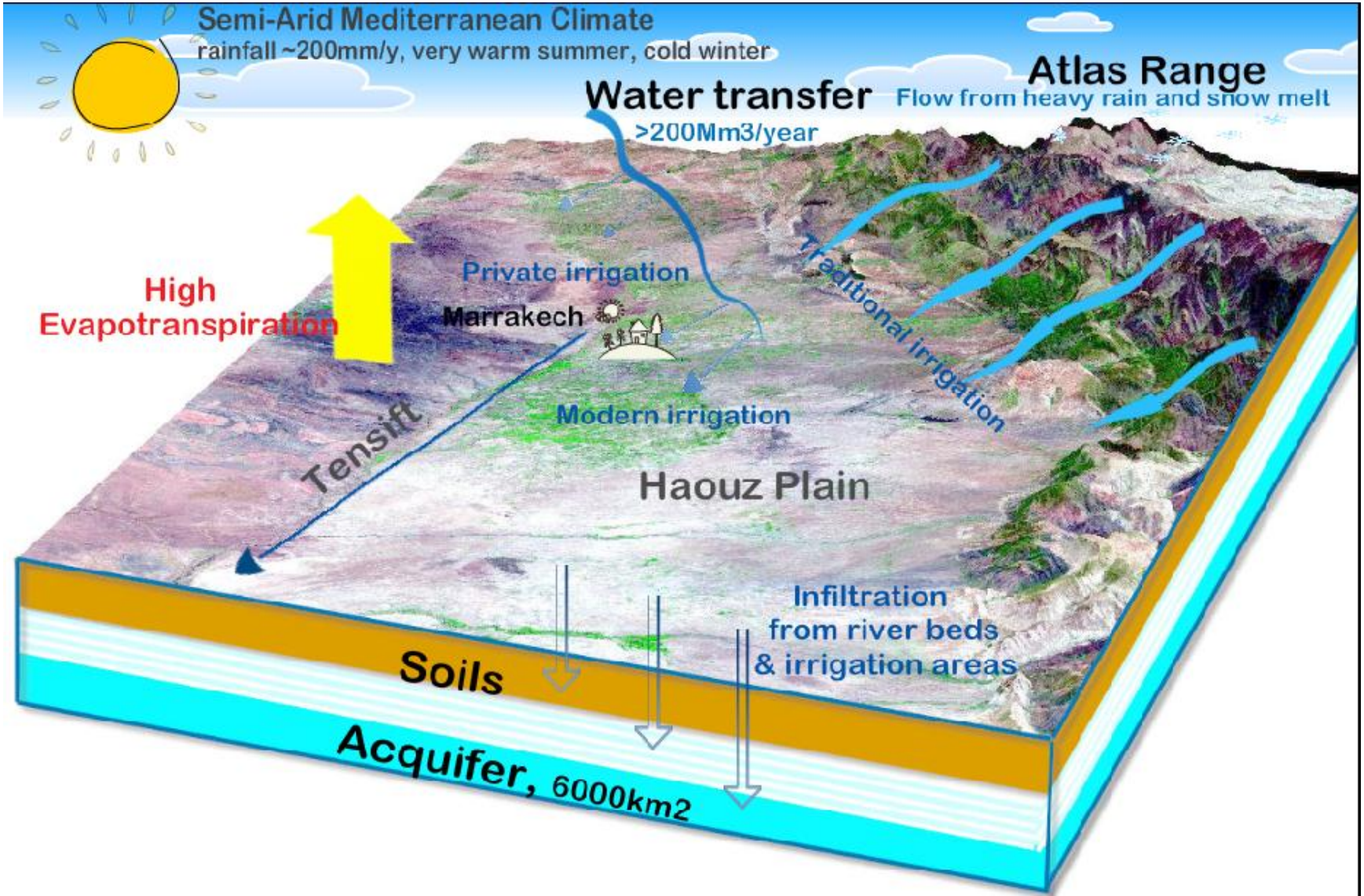
Imagery acquisition+corrections, In-situ meteo+telemetry, introduction into the model in real time conditions.

2° Test irrigation advices

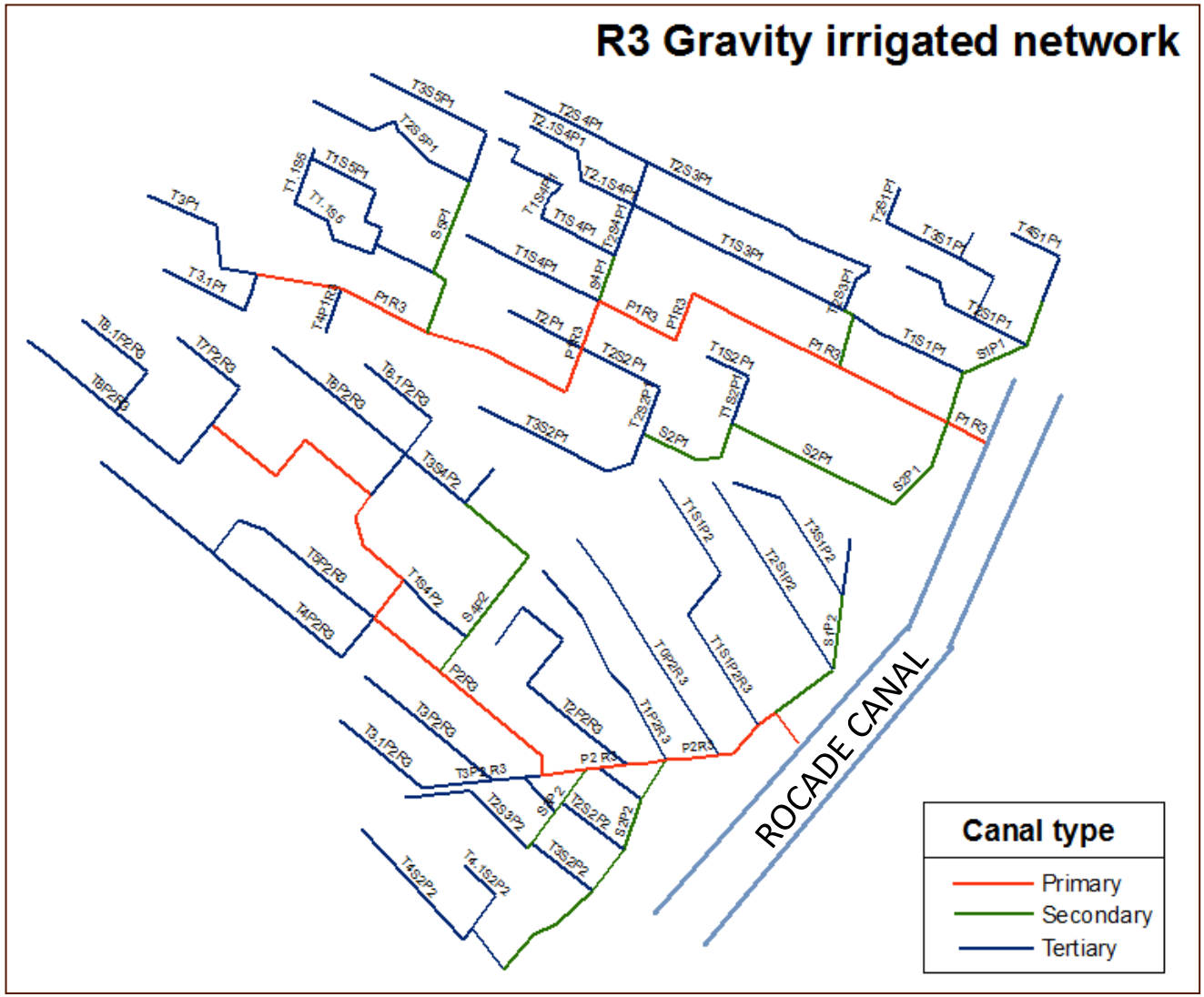
Advice and feasibility of irrigation turns all along the season with the SAMIR tool (Estimation of Evapotranspiration and Hydric Budget)

3° Analyze the results, improve our tool

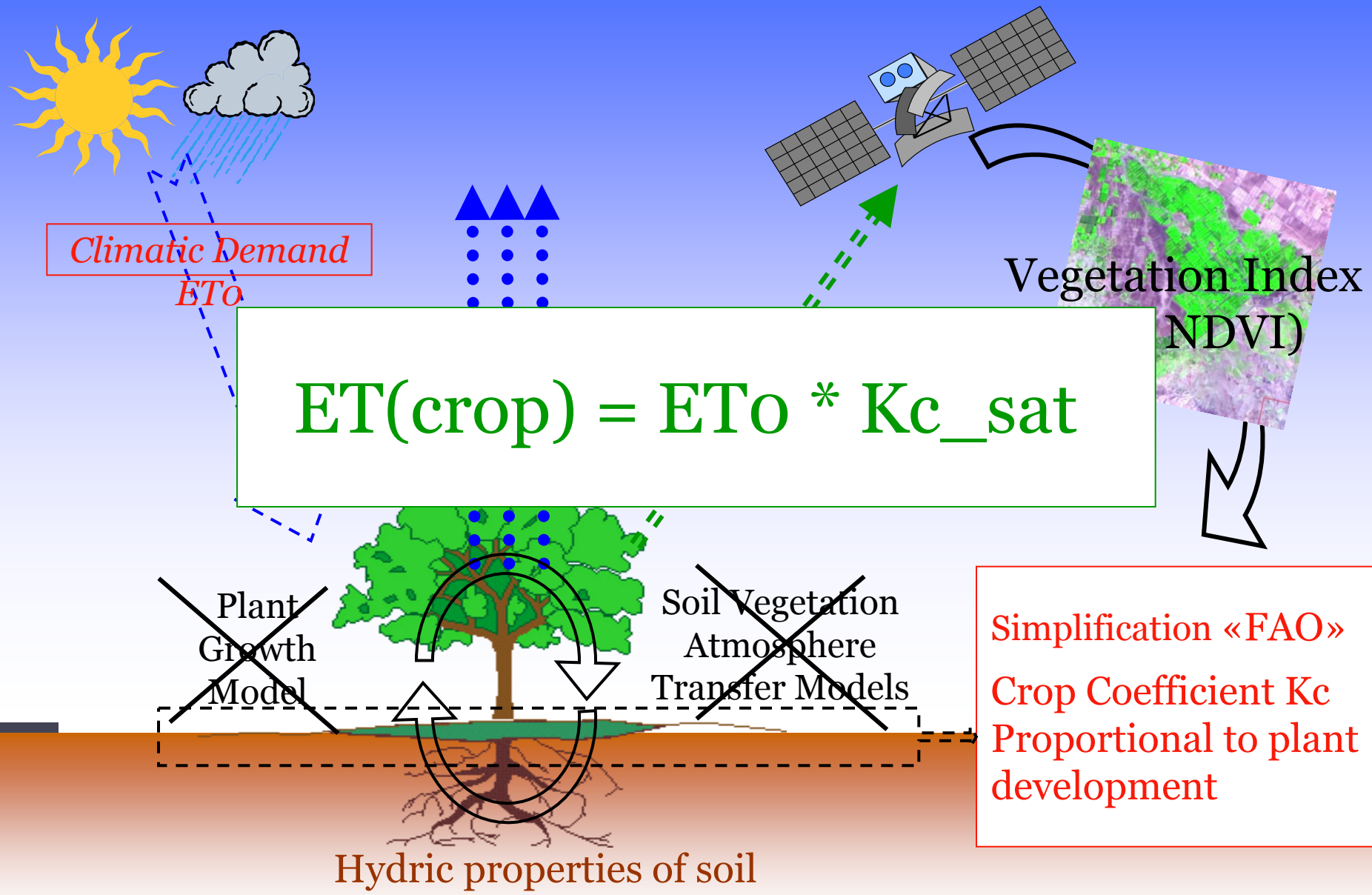
Morocco, A Semi Arid Context



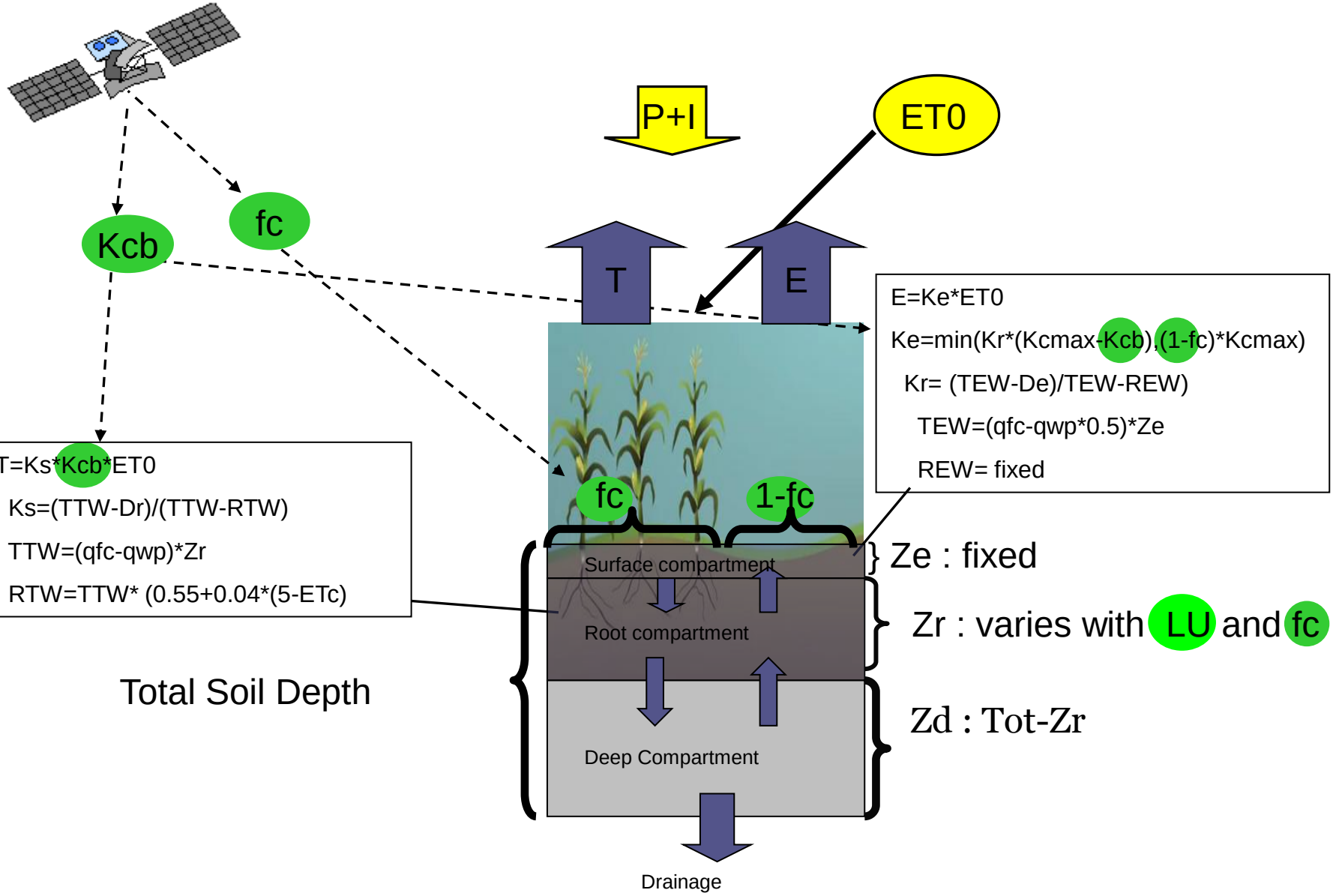
Wheat irrigation in an open canal network



Estimation of ET by satellite with the FAO method



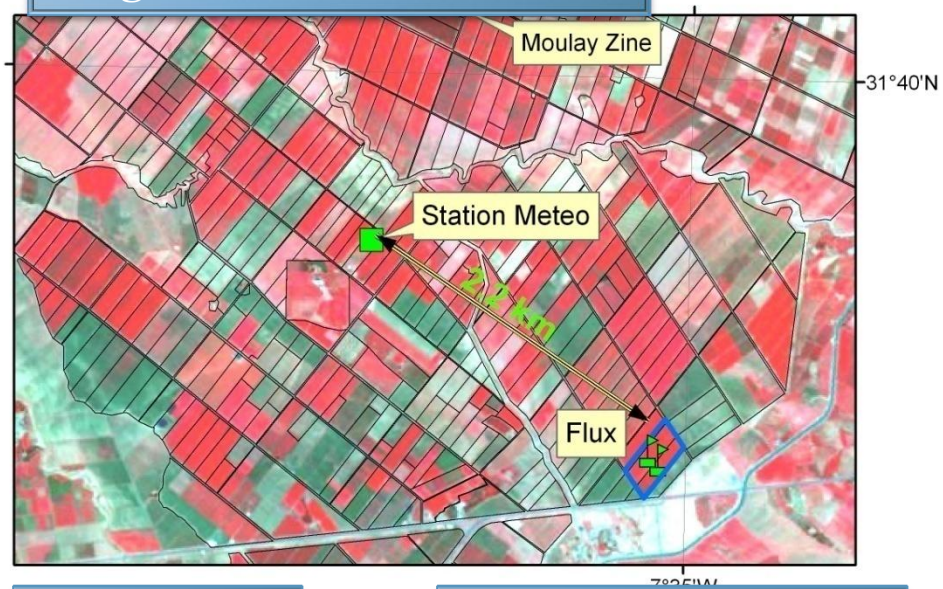
Hydric Budget in SAMIR



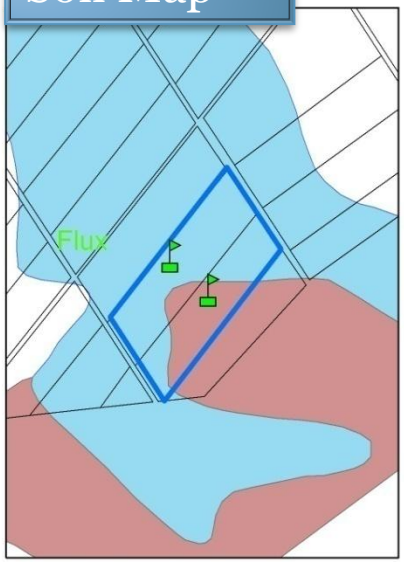
2 Plots of ~4ha

- Same Soil Texture (Clay: 36%, Sand 20%)
- Durum Wheat sowed 23/12
- Reference: Irrigation as usual
- Test: « Sat » Irrigation

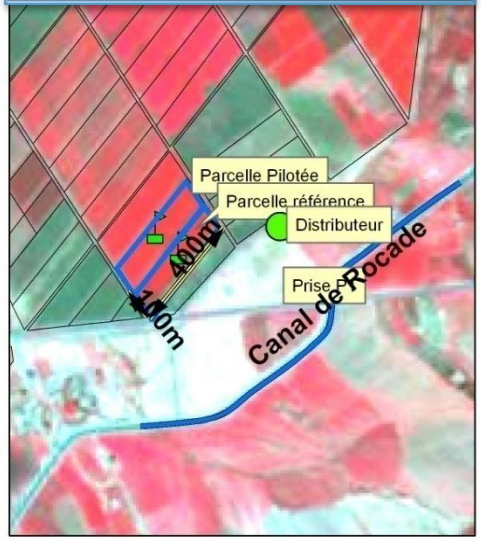
Irrigated Sector



Soil Map

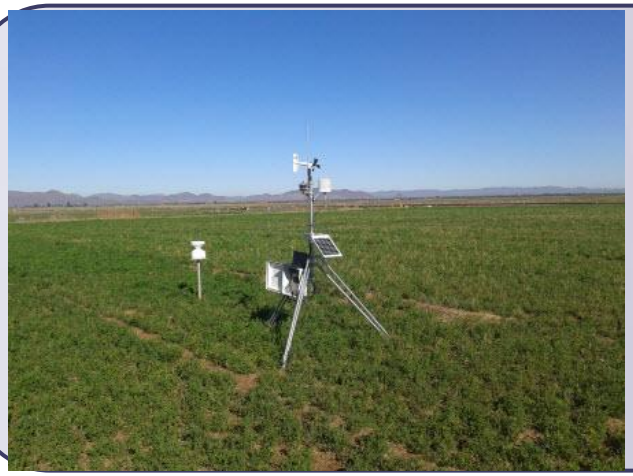


Experimental plots



Profondeur m	SOIL_TYPE	TEXTURE	FC_MIN	FC_MAX	WP_MIN	WP_MAX	REW_MIN	REW_MAX
0.300		Silty clay		0.30	0.42	0.17	0.29	8.00	12.00

On site measurements



METEO (forcing)

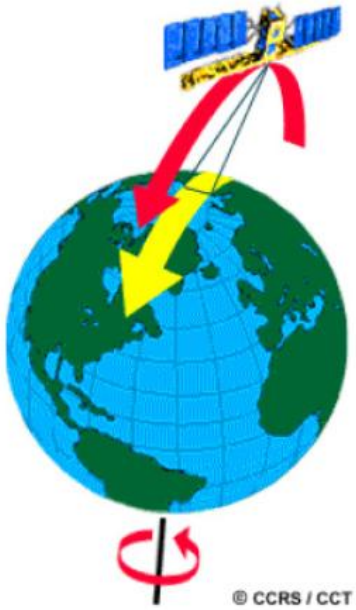
- Alfalfa maintained to 15cm
- Installed January 3rd, 2013
- ETo very comparable to the meteo station of Marrakech

FLUX (validation)

- South installed on Dec, 24th 2012
- Nord installed on Dec, 25th, 2012

- Soil Texture (Parametrization)
- Biomass (Yields estimates)
- Technical itinerary and irrigations inputs
- Cropscan Measurements and LAI (Validation)

Satellite Imagery Setup



Programmation of 2 satellites

Spot4 Take5, 20m, 5 days

Spot5 , 10m, 15 days

Geometric Corrections

Toulouse

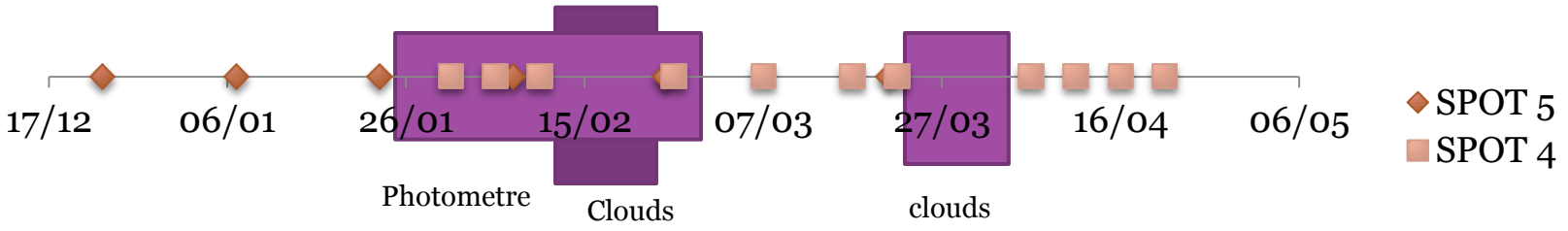
Photometer near Marrakech

Radiometric Corrections

SMAC, Marrakech

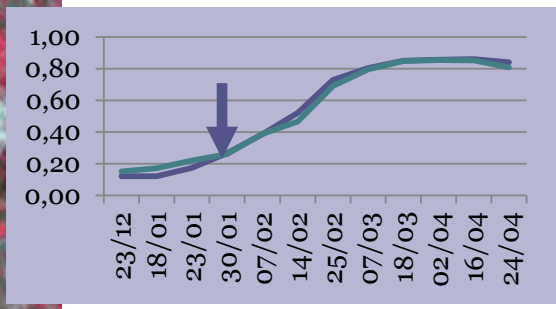
18 clear images from Dec 23rd to April 21st

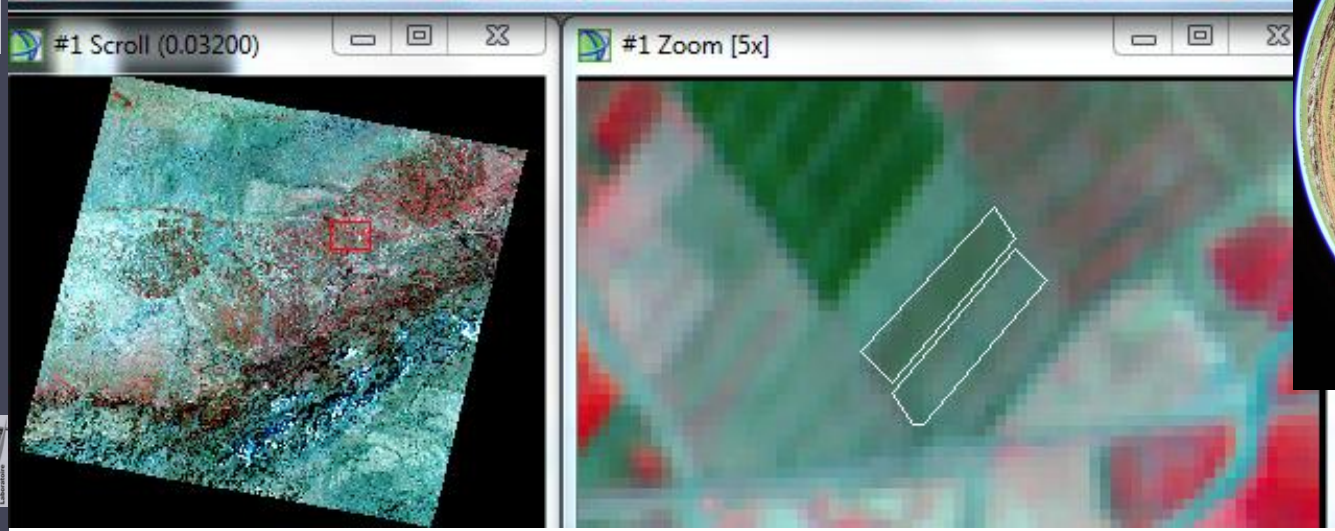
- SPOT5 (ISIS 691)
  - 6 imgs
  - Orthorectified
- SPOT4 (Project Take5)
  - 12 imgs (until 21/04)
  - Orthorectified
- PHOTOMETER SAADA
  - Down from Jan, 27th to Feb, 26th, grrrrr



Irrigation Driving

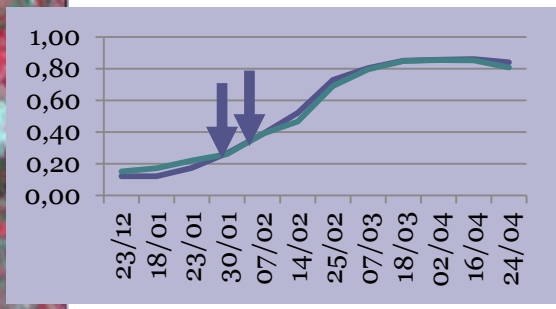
Jan, 31





Irrigation Driving

Feb, 05

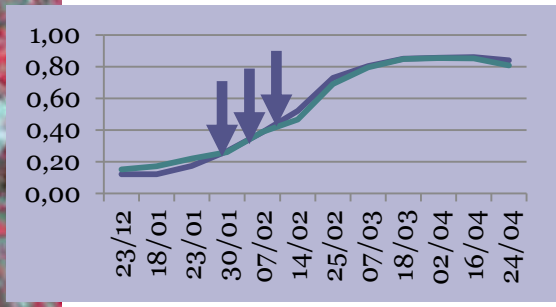


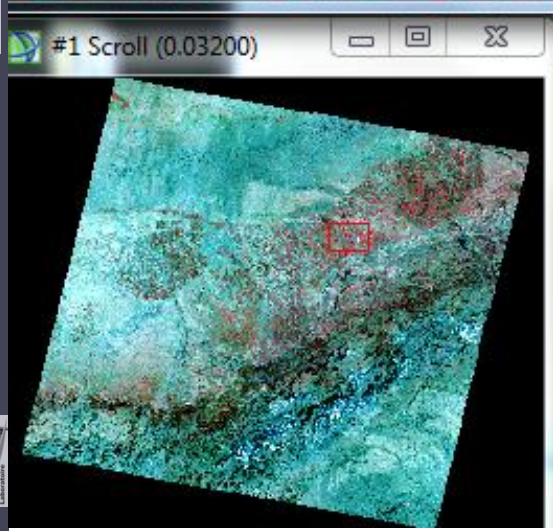
#1 Scroll (0.03200)

#1 Zoom [5x]

Irrigation Driving

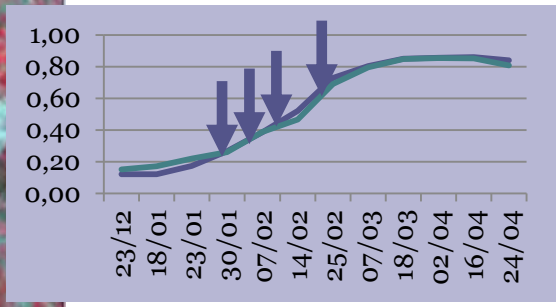
Feb, 10

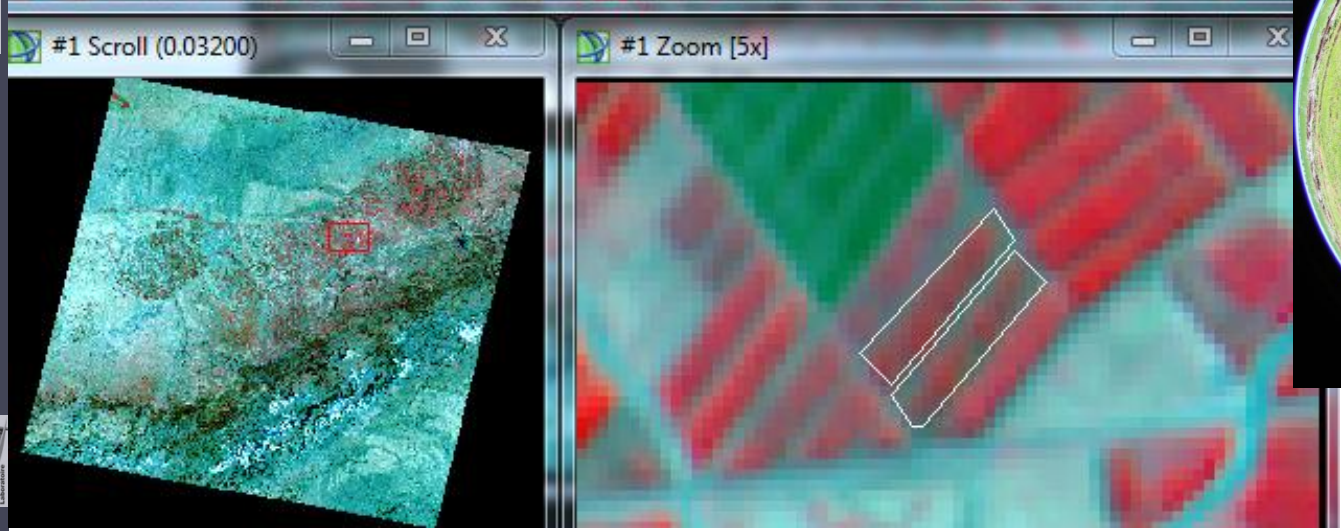




Irrigation Driving

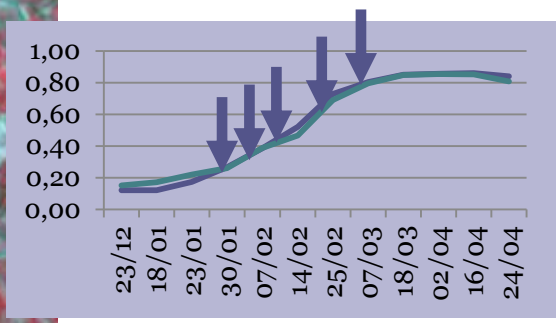
Feb, 25

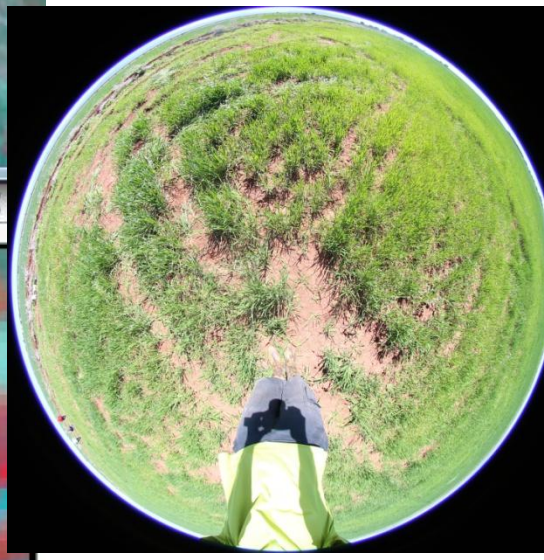


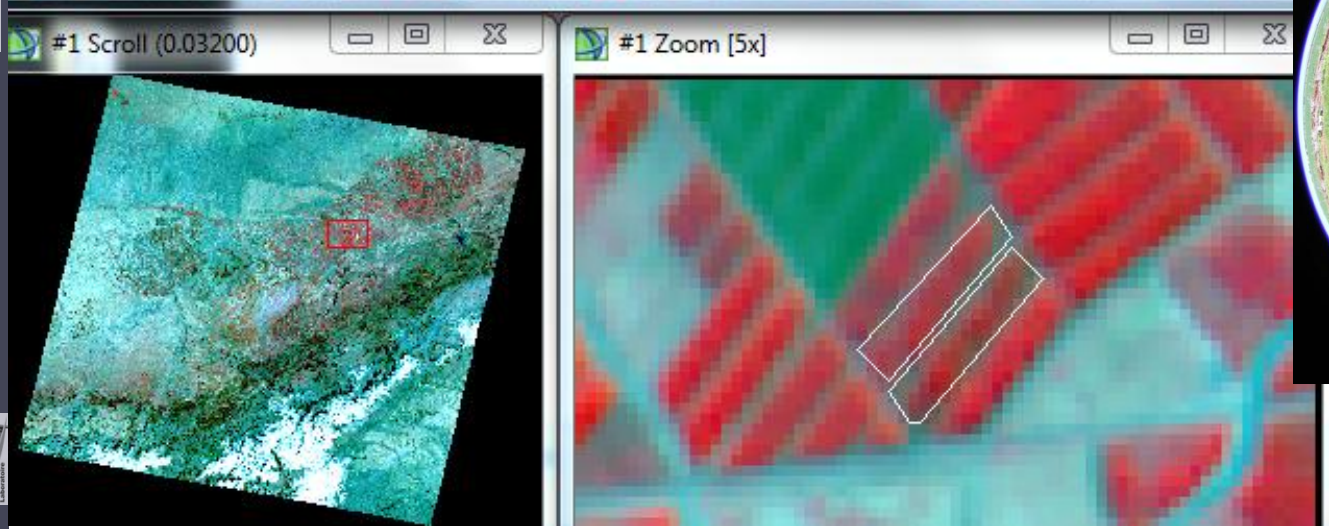


Irrigation Driving

Mar, 07

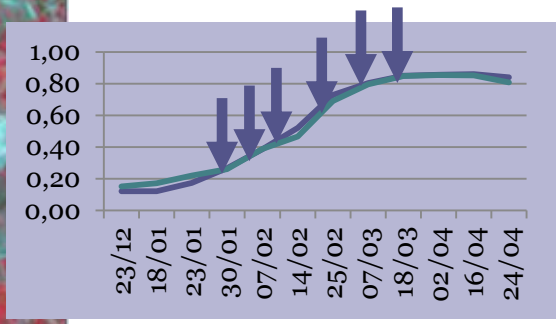


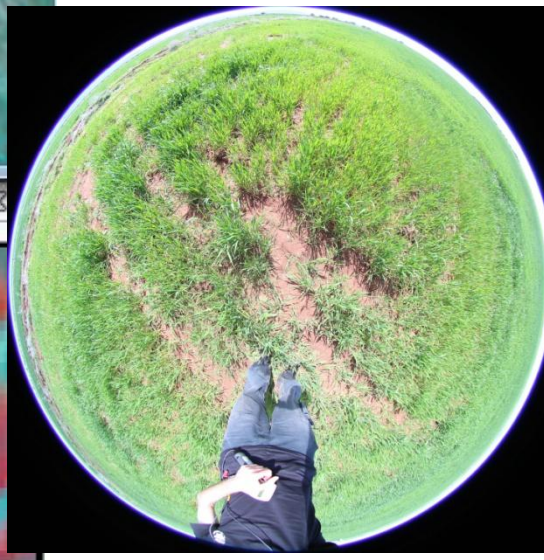


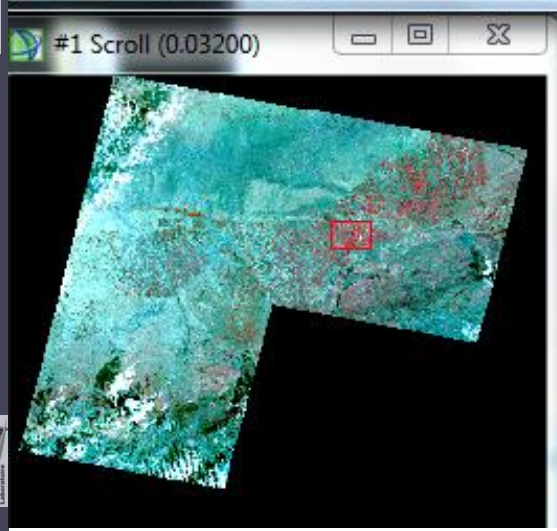


Irrigation Driving

Mar, 17







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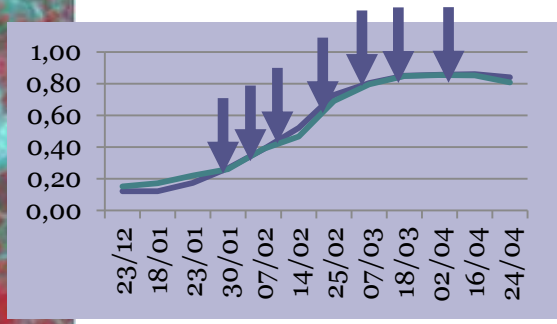
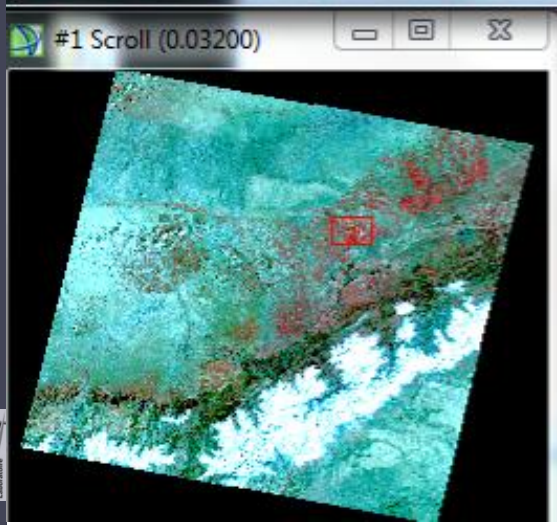
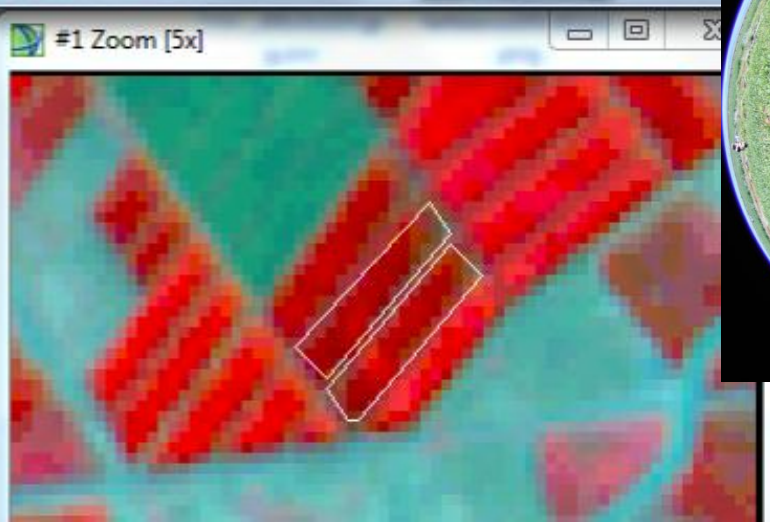
Apr, 06

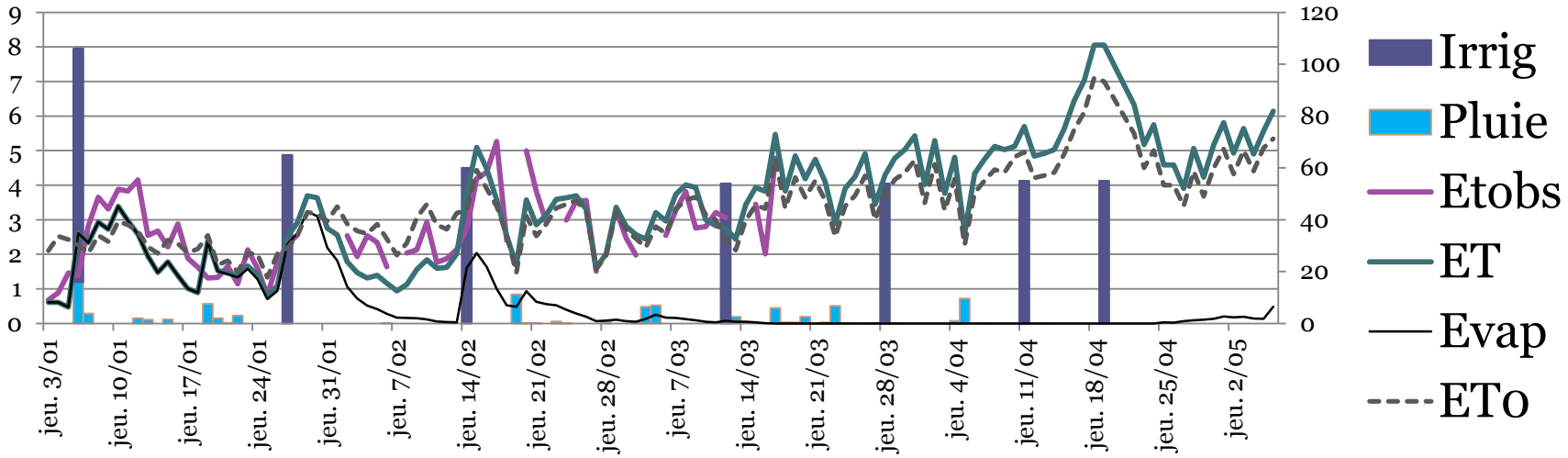






RESULTS On E-T

NB	62
RMSE	0.75 mm/d
Sum_diffs	11 mm



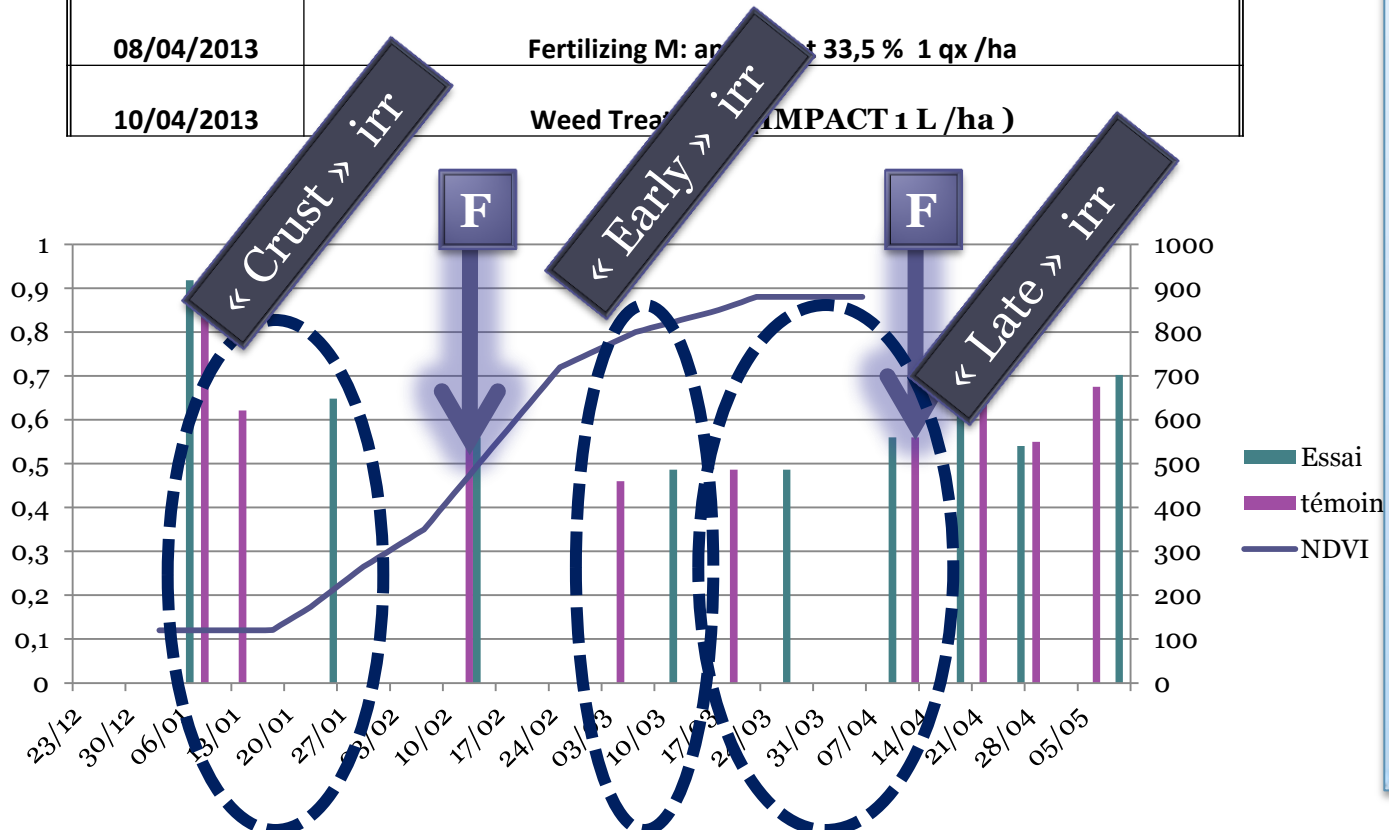
On the 62 dates, RMSE is 0.75 mm/day compared to Eddycov Measurements.

- This is the usual error range of our previous FAO modelling of ET

- A small delay is visible at irrigation time. It is mainly due to the duration of the water turn (20 to 30h).

Technical Itineraries

23/12/2012	Soil preparation (Schezell)
24/12/2012	Soil preparation (Cover croup 2 ftimes)
	Sowing: Durum Wheat (V /SARAGOLA 200 Kg /ha)
	Fertilizing (DAP) 200kG /Ha
12/02/2013	Weed treatment (TRAXOS 75cl /ha ; lintur 150 g/ha)
08/04/2013	Fertilizing M: ar t 33,5 % 1 qx /ha
10/04/2013	Weed Trea MPACT 1 L /ha)



-> 9 irrigations on each side.

-> At the end, the same quantity of water was used (562mm)

-> Three big differences on Irrigation

-
>Fertilizatio n realized according to Ref Plot

Balance sheet (03/01 – 18/04)

- ETo: 333 mm
- Rain: 96mm

- Irrigation: 365mm (plus three water turns after 18/04=562mm au total)

- Fair results on Yields (June 10) in spite of the crust problem:
  - Equal grain yield
  - Minus 20% on straw

Conclusions

- In general, the logistic was efficient (Meteo+images+model+water delivery) but some things can be improved: replace the radio correction technique (*Hagolle et al*), improve image delivery …
- The misunderstanding with the farmer (at the beginning and end of the season) was a real handicap! : Yield can be improved
- Better to advice an Irrigation Window in place of 1 Irrigation Date. Irrigation schedulling of a whole sector is feasible (*Belaqziz et al*).
- We are working on the development of a Web version os SAMIR (expected by early 2014)
- Our colleagues of the Agricultual Office found this experiment very promising and are willing to renew it this year.
- We are working on two other studies with this dataset, not presented here : Land Use Classification based on Dynamic Phase Portraits and Snow Cover Monitoring

Thanks everybody
Very special thanks to Mr. Tarbaoui and the Agricultural Office who agreed to play the game