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Assessing soil moisture constraint on soil evaporation and plant transpiration fractioning

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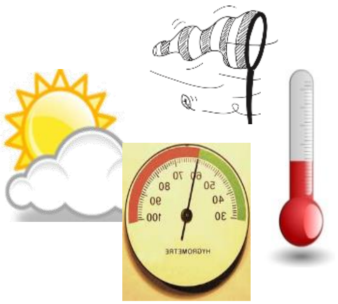
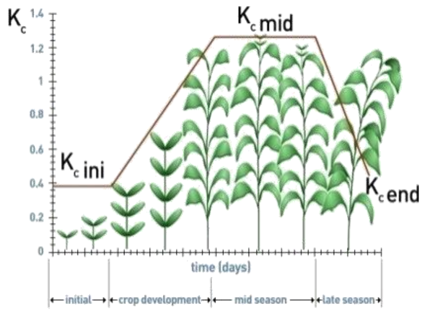
General context and objectives

Evapotranspiration (ET) is the key variable for monitoring the crop water consumption (dissipation of 60% of the rainfall contribution)

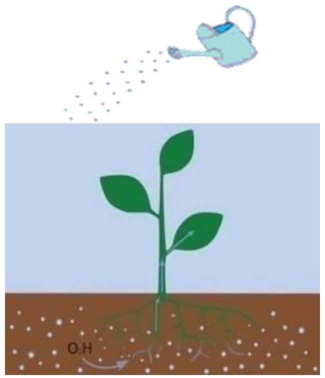
Actual Evapotranspiration



Climate demand

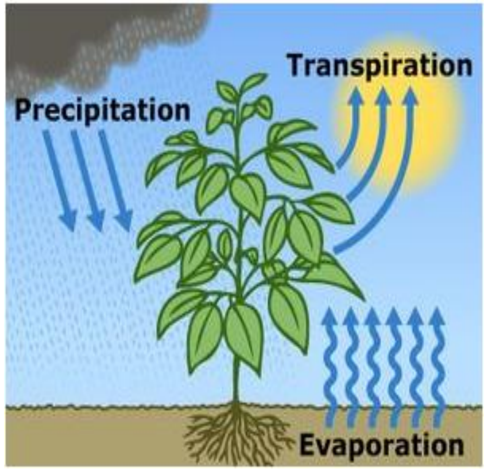


Vegetation



Ground water

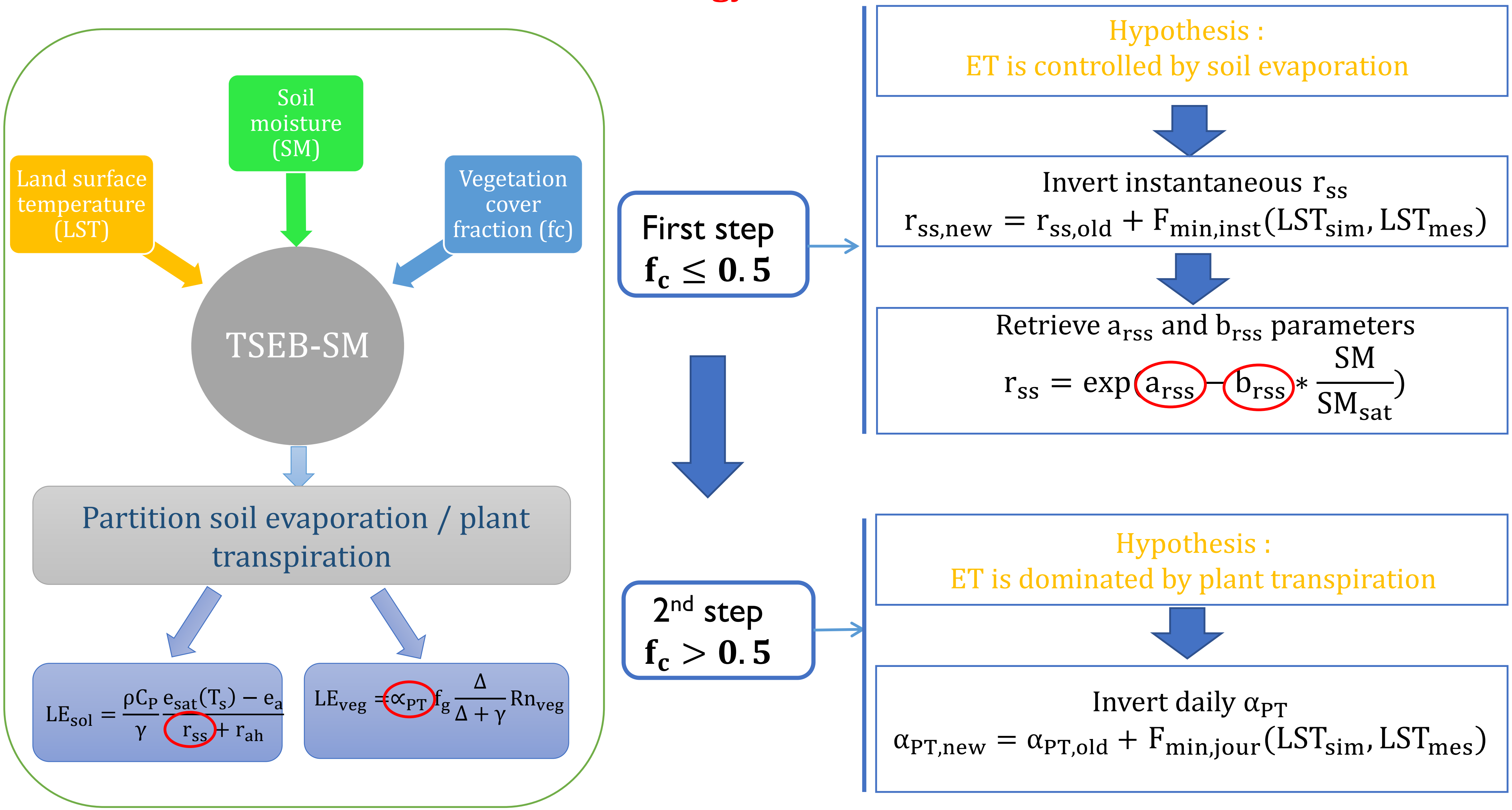
Evaporation + Transpiration



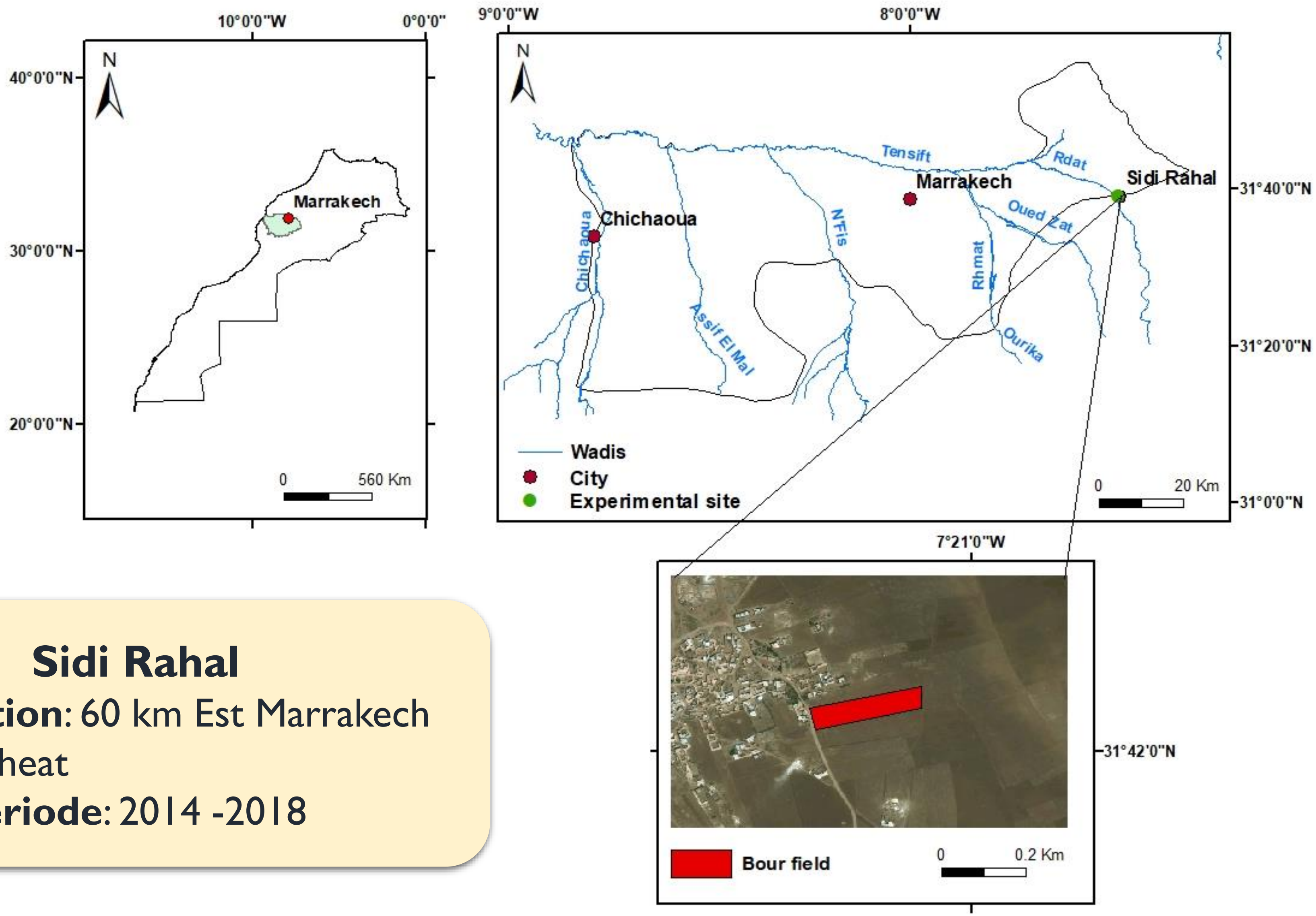
Partitioning the ET ➔ Optimizing water management practices and irrigation regimes

Methodology

❑ The model and the calibration strategy



Study area



Sidi Rahal

- **Localisation**: 60 km Est Marrakech
- Rainfed wheat
- **Study periode**: 2014 -2018

Results and discussions

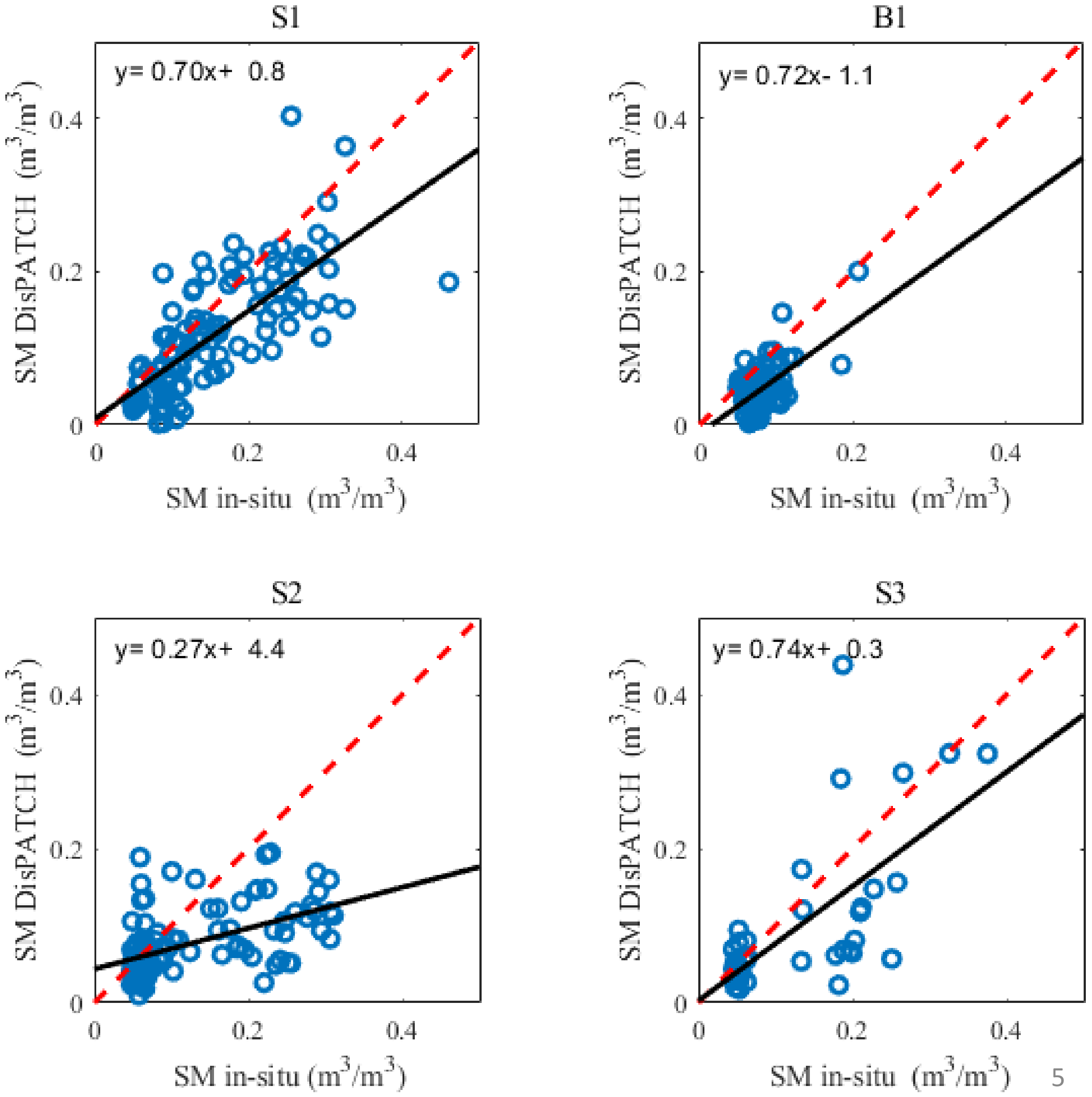
❑ DisPATCh data analysis

	Période	R^2	RMSE (m^3/m^3)	MBE (m^3/m^3)
SM	S1	0.55	0.07	-0.04
	B1	0.36	0.04	-0.03
	S2	0.27	0.09	-0.05
	S3	0.47	0.08	-0.03

- The Efficiency of DisPATCh algorithm:

➔higher for low SM values

➔lower for high SM values (after rain events)

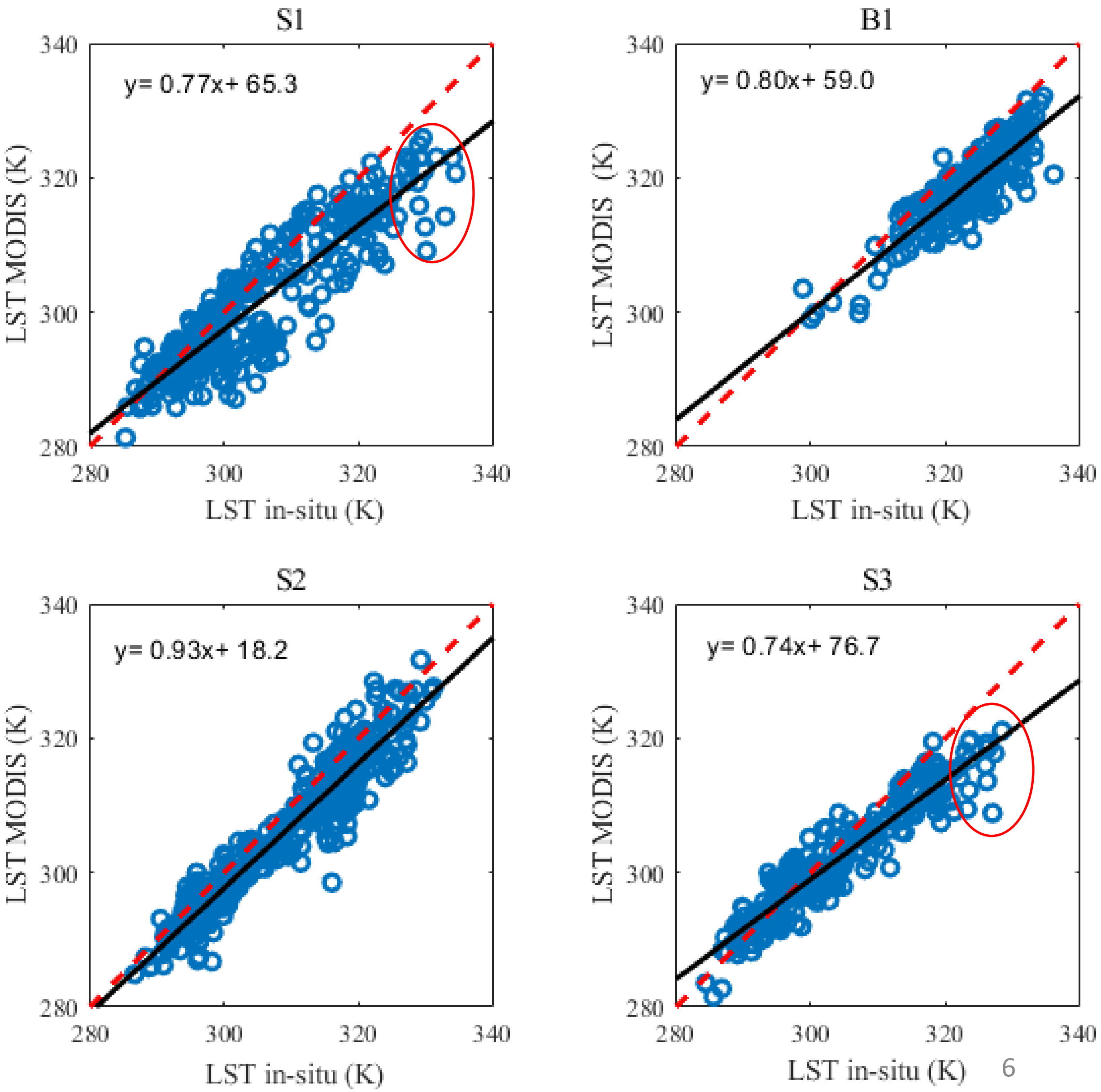


❑ MODIS data analysis

	Periode	R^2	RMSE (K)	MBE (K)
LST	S1	0.8	6.4	-3.7
	B1	0.76	5.6	-4.6
	S2	0.91	4.3	-2.9
	S3	0.89	4	-2

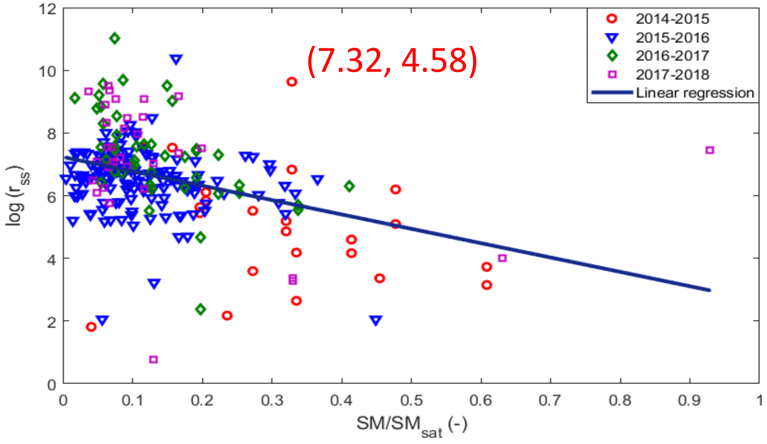
○ Biais

➔ Scale difference between in-situ LST and MODIS observations.

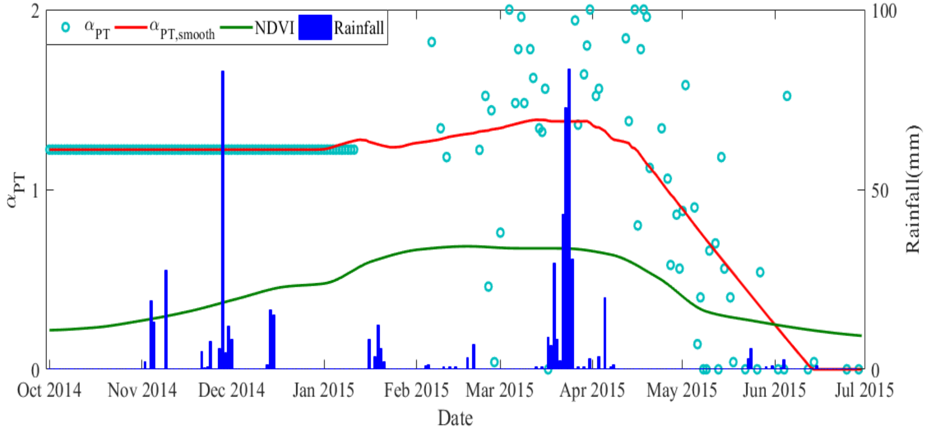


Results and discussions

- Retrieved a_{rss} and b_{rss} parameters

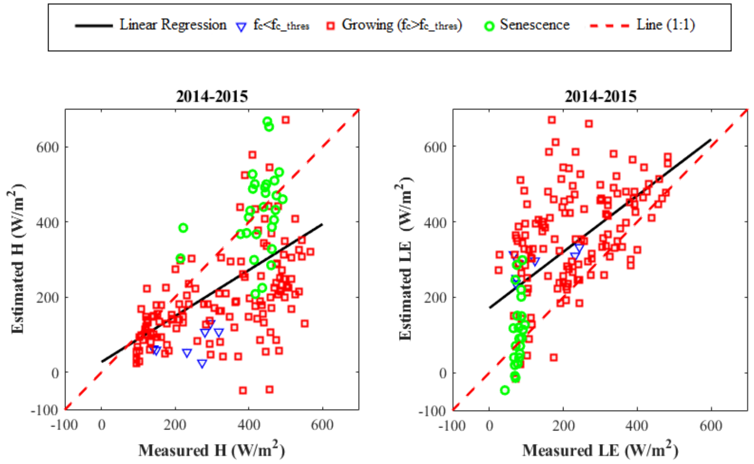


- Daily calibrated α_{PT}



- Surface fluxes

Classic-TSEB

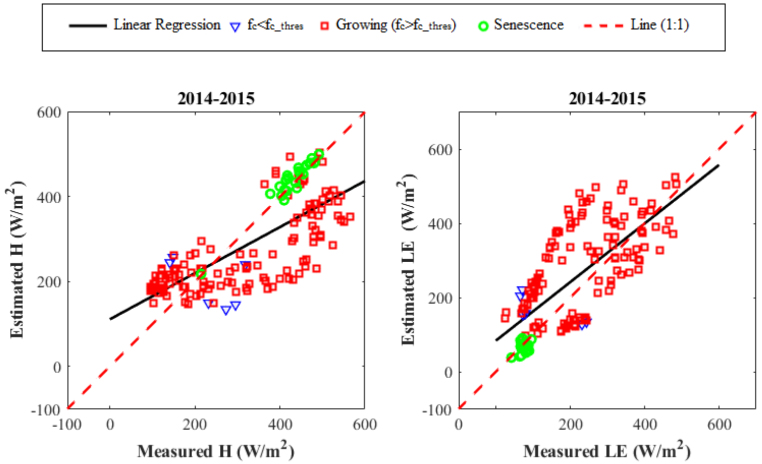


RMSE ↓ 43%

MBE ↓ 66%

R^2 ↑ 24%

TSEB-SM



Conclusions

- **Improvement and Validation of the TSEB-SM model (LST, f_c et SM)**
  - **SM** : Additional constraint on soil evaporation($f_c \leq 0.5$)

  ➔Coupling r_{ss} with **SM** and **LST** ➔ Improved soil evaporation

  - α_{PT} : Constraint on plant transpiration ($f_c > 0.5$)

  ➔ Variation (**SM** and **vegetation water content**)

  ➔Good estimation of LE (Growing / Senescence)

  - **SM/ SMOS** ➔ Encouraging results in term of LE

Limitations

- **Resistances** used in the LE estimation

  r_{ss} ➔ Influenced by soil texture and structure

  r_s ➔ Difficult to characterize (wind speed, roughness and type of cover)

- **SM DisPATCh** ➔ Differences Spatial/ Temporal scales

Thank you