GOVERNMENT OF THE PORTUGUESE REPUBLIC

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Using SWAT to understand the eco-hydrological response to droughts of a dry Mediterranean agro-forested catchment, southern Portugal

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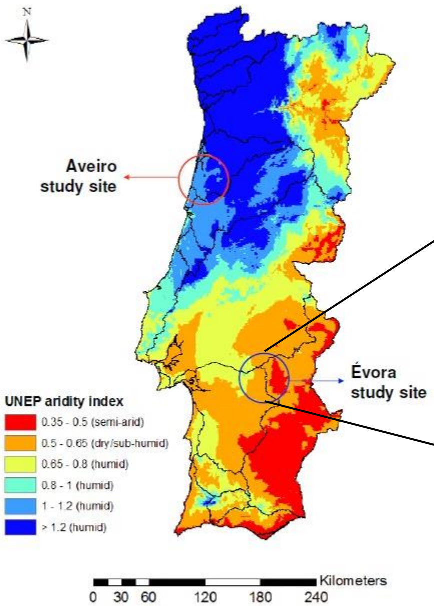
ERLAND Project

Introduction

Climate change is expected to increase aridity in the Mediterranean rim of Europe, leading to concerns on consequences for water resources availability in a region already under water stress

- Understanding how streamflow availability and vegetation growth have responded to past droughts

- How this might reflect future water availability conditions



Study Site: Guadalupe

GUADALUPE:

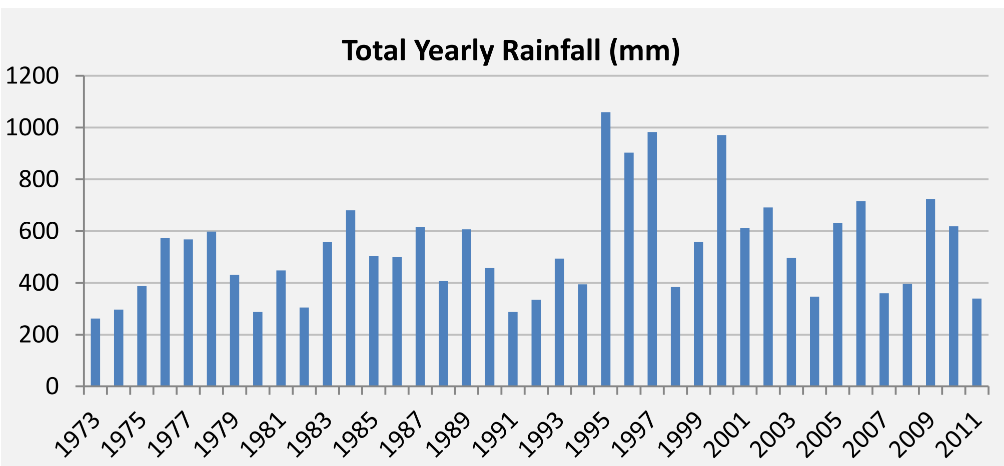
Agro-forested catchment

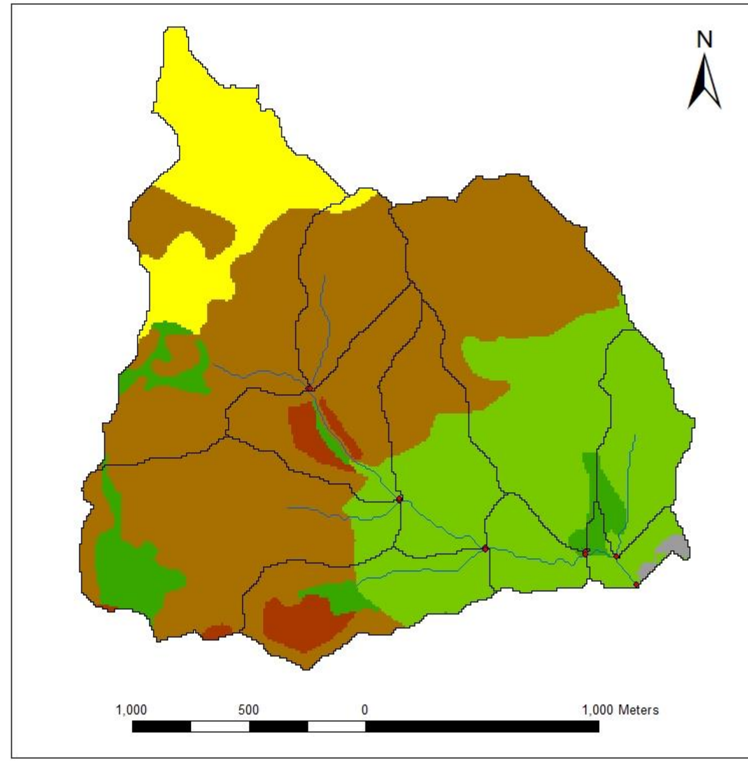
Area: 446 ha

Elevation: 260 to 380 meters

Mediterranean inland climate with hot and dry summers and mild winters:

- Mean annual precipitation (1973-2012): 533 mm
- Mean annual temperature: 15.5ºC



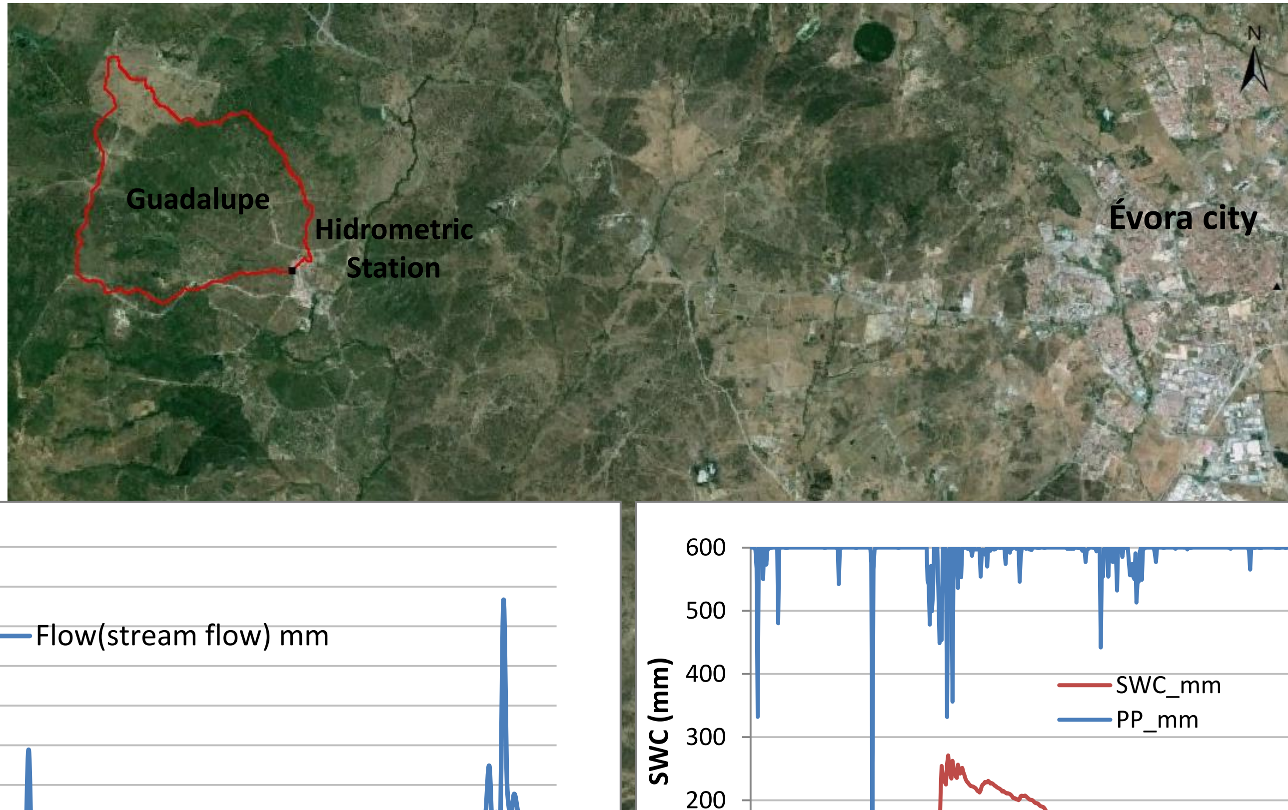


- Cork/holm oak (>50%) + pasture: 52.9 %
- Olive groves: 2.6 %
- Urban: 0.3 %
- Annual Crops: 10.7 %
- Cork/holm oak (30-50%) + pasture: 28.1 %
- Pasture: 5.4 %

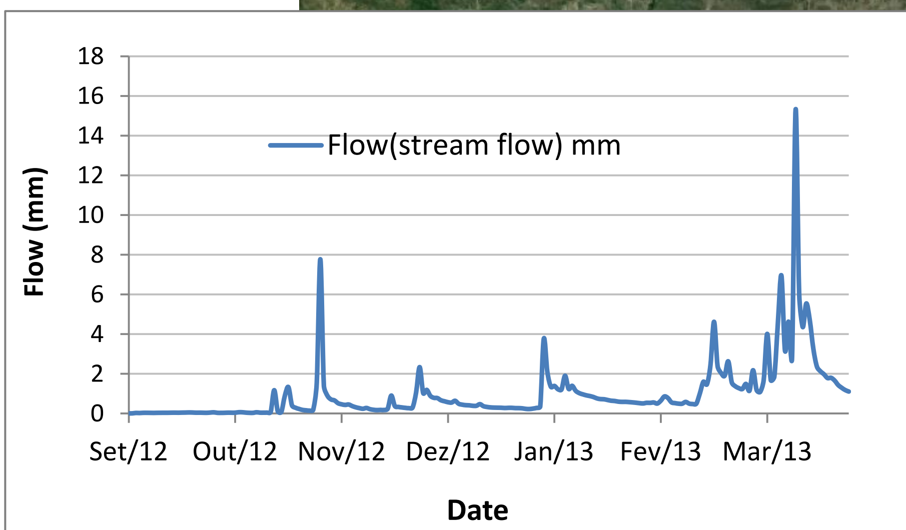
Representative of the dry regions of southern Portugal

Study Site: Guadalupe

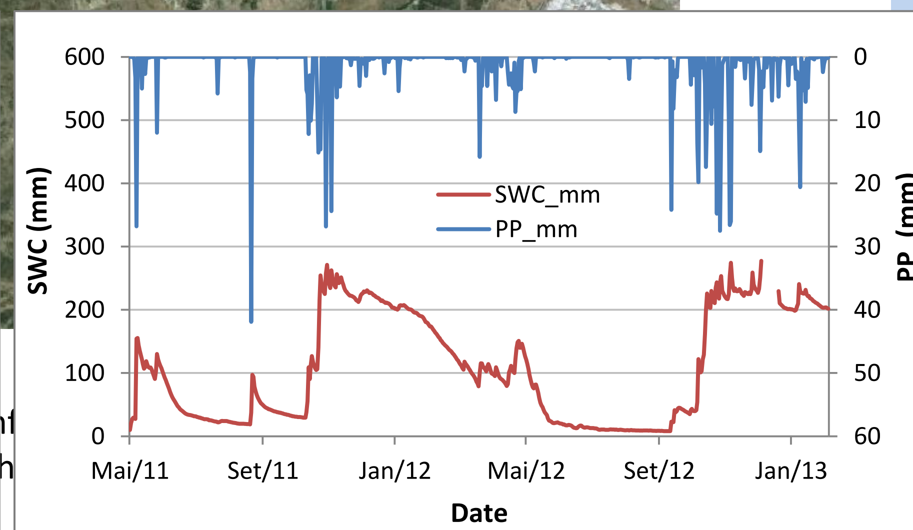
Data Collection:



Discharge:



Soil Moisture:

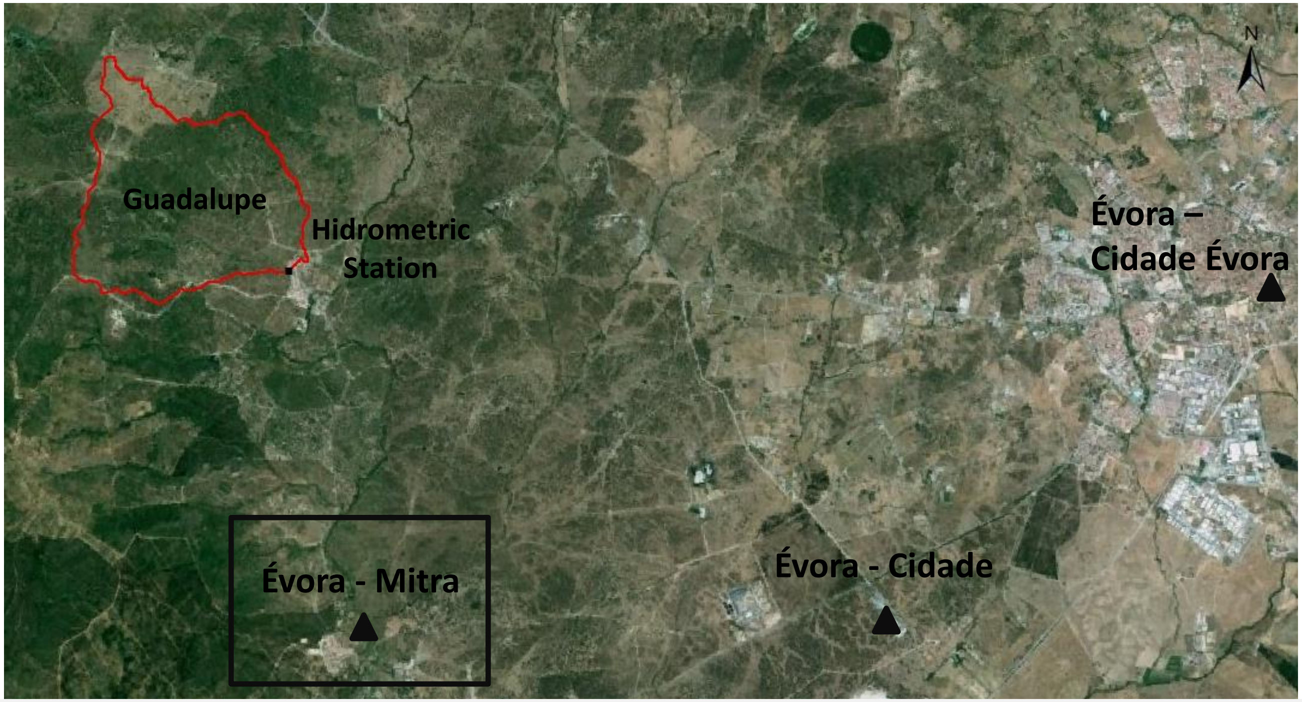


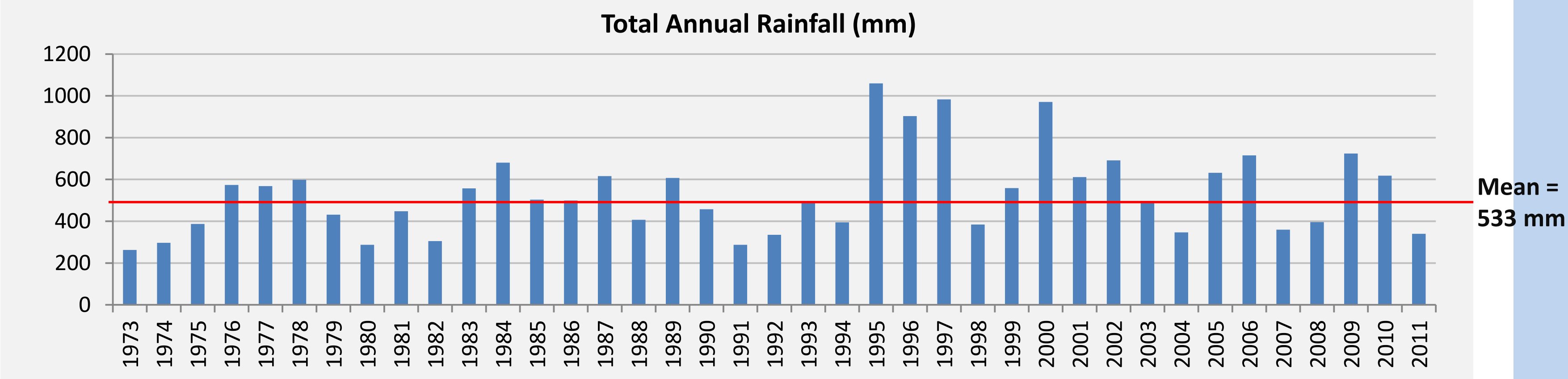
Study Site: Guadalupe

Data Collection:

Climate Data:

- Rainfall
- Wind Speed
- Solar Radiation
- Temperature
- Relative Humidity





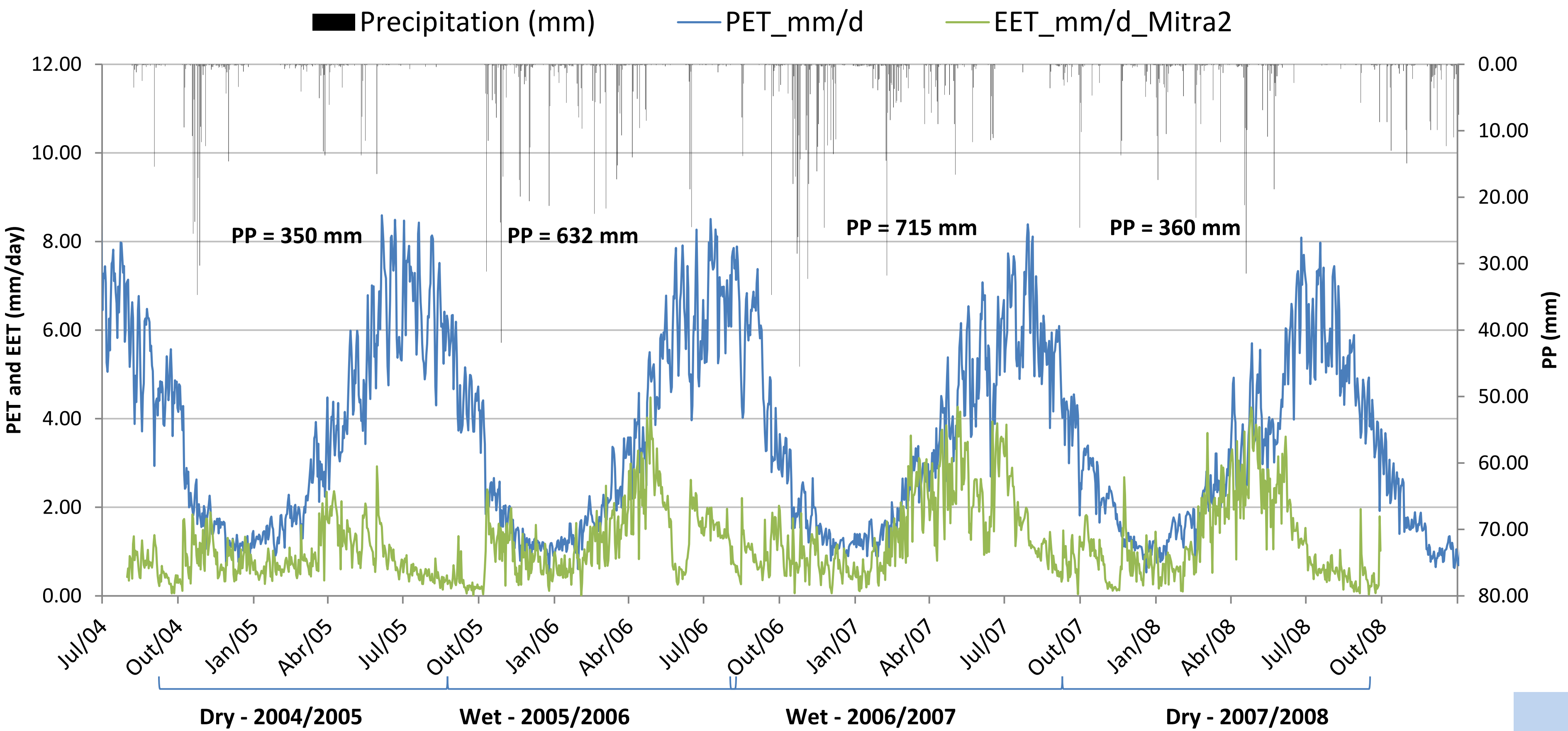
Study Site: Guadalupe

SWAT 2013
Toulouse France

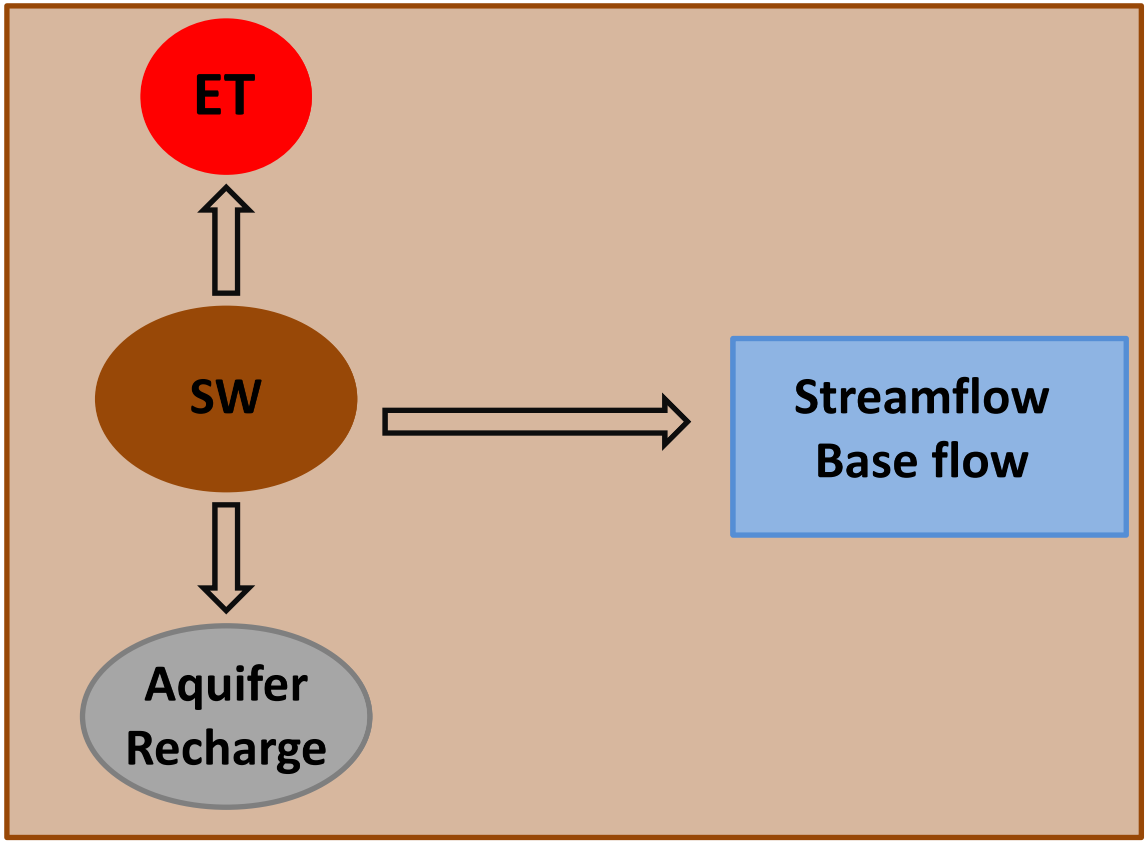
Data Collection:

2 Eddy covariance flux towers: Carbo Euro Flux

1999-2008



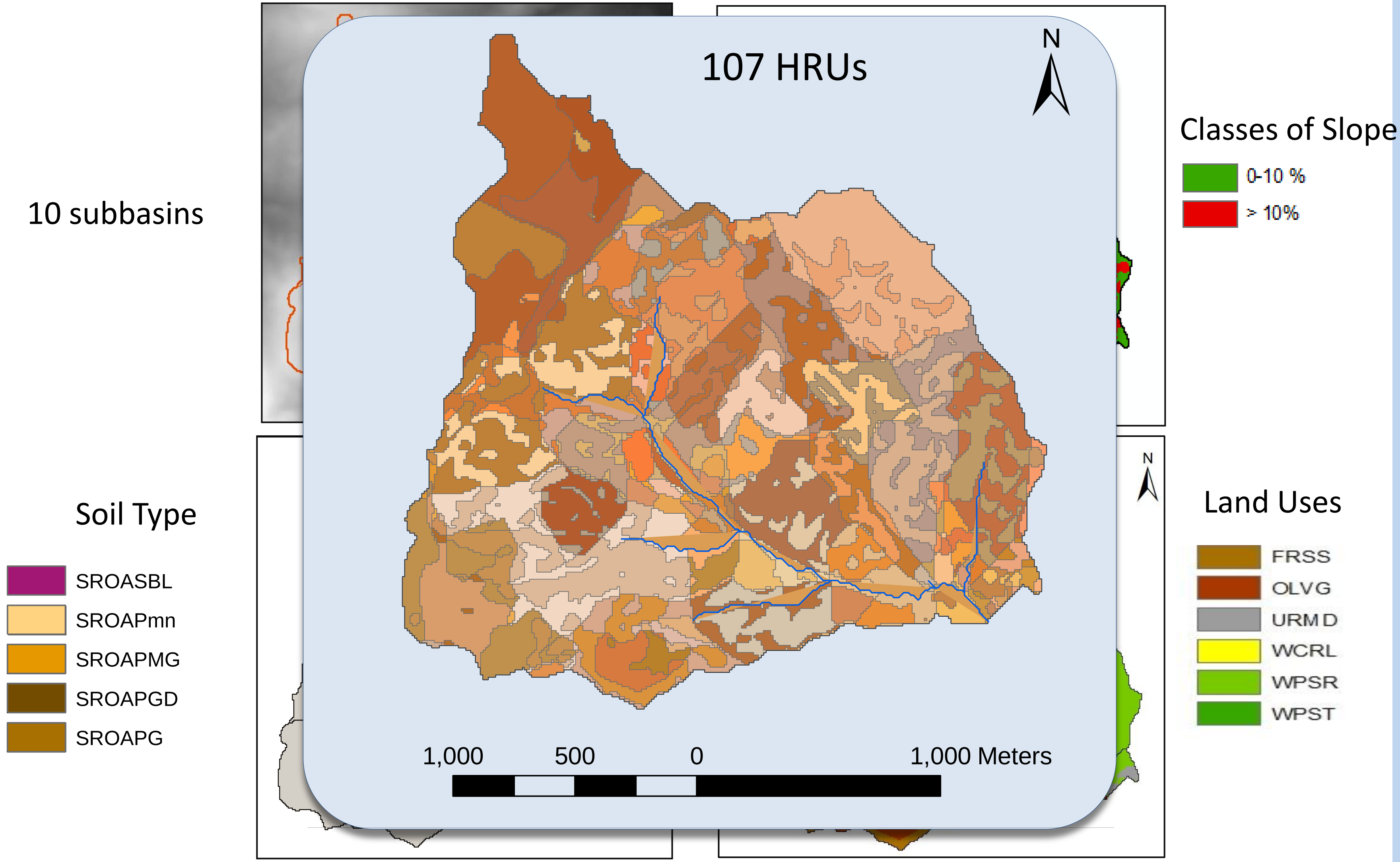
Evapotranspiration:



- Soil Moisture
- Plant Type
- Stage of the plant development
- Weather conditions

SWAT

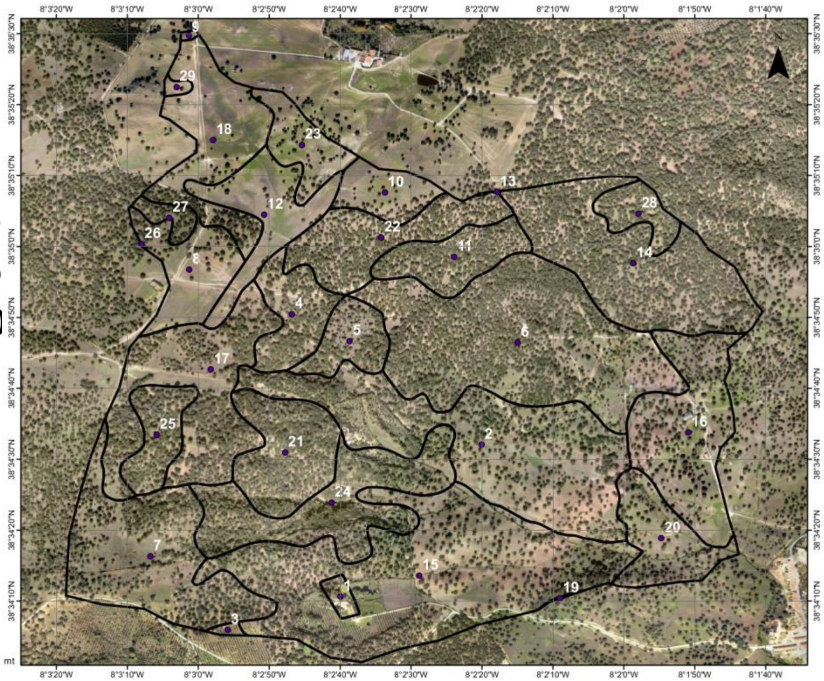
- HRU definition



SWAT

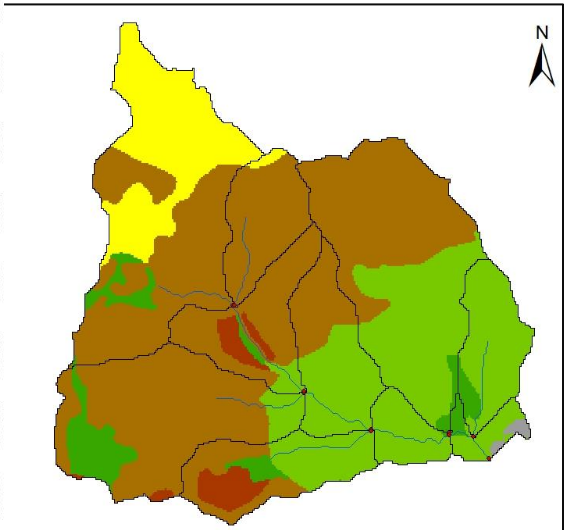
- Parameterization

Natio
Carto
1:250



SROASBL	Coluvisols
SROAPmn	Brown Mediterranean Soils - Schists
SROAPMG	Brown Mediterranean Soils - Plutonic Rocks
SROAPGD	Non-Humic Litholic Soils - Granite (shallow)
SROAPG	Non-Humic Litholic Soils - Granite

LANDUSES



COS 2007
1:25 000

- Cork/holm oak (>50%) + pasture: 52.9 %
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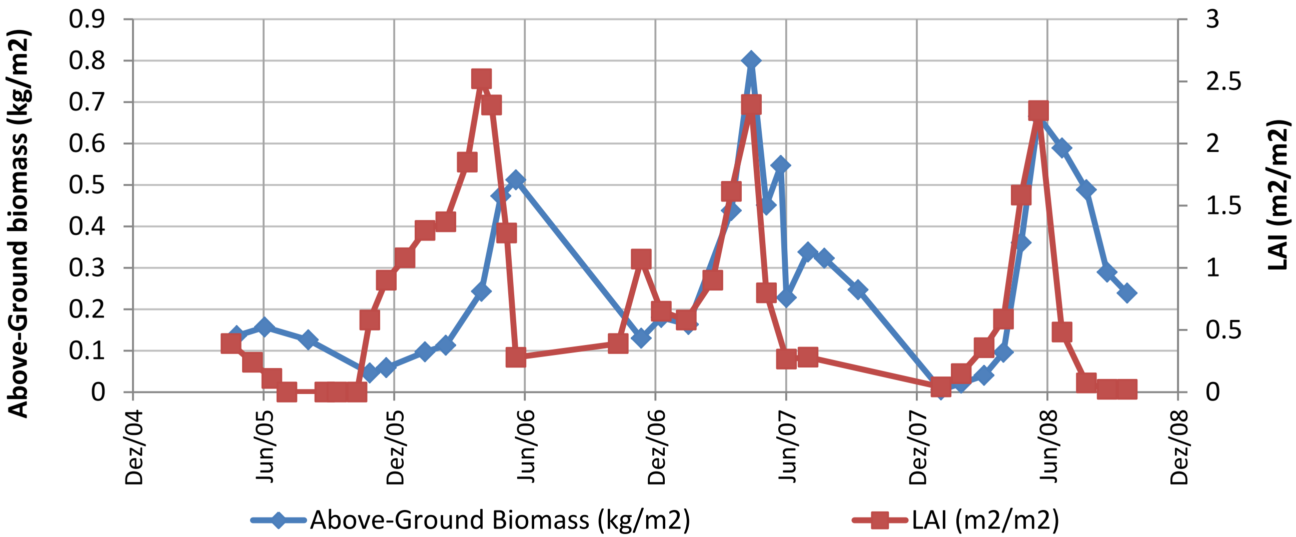
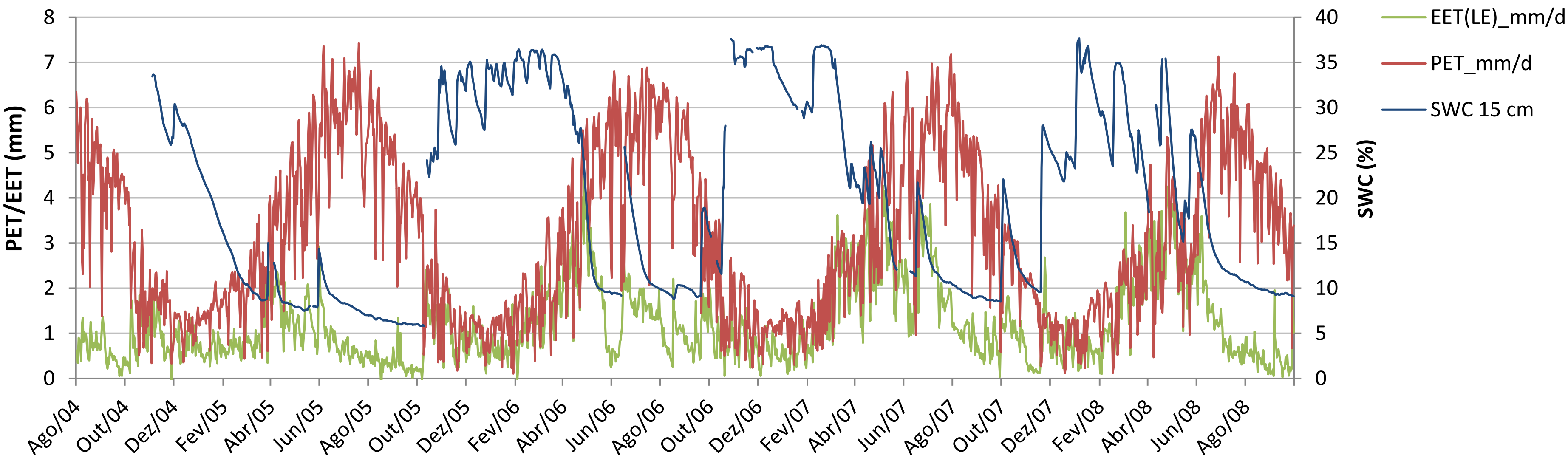
SWAT

Observed Data:

MITRA 2 - PASTURE





SWAT

Observed Data:

PASTURE

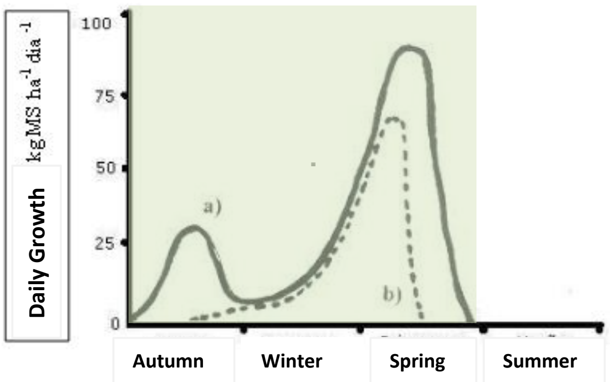
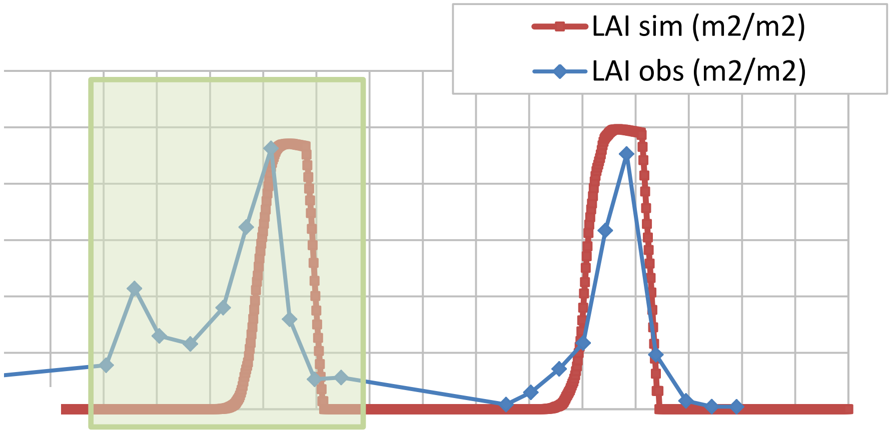


Figure: Pasture production curve in rainfed Mediterranean conditions



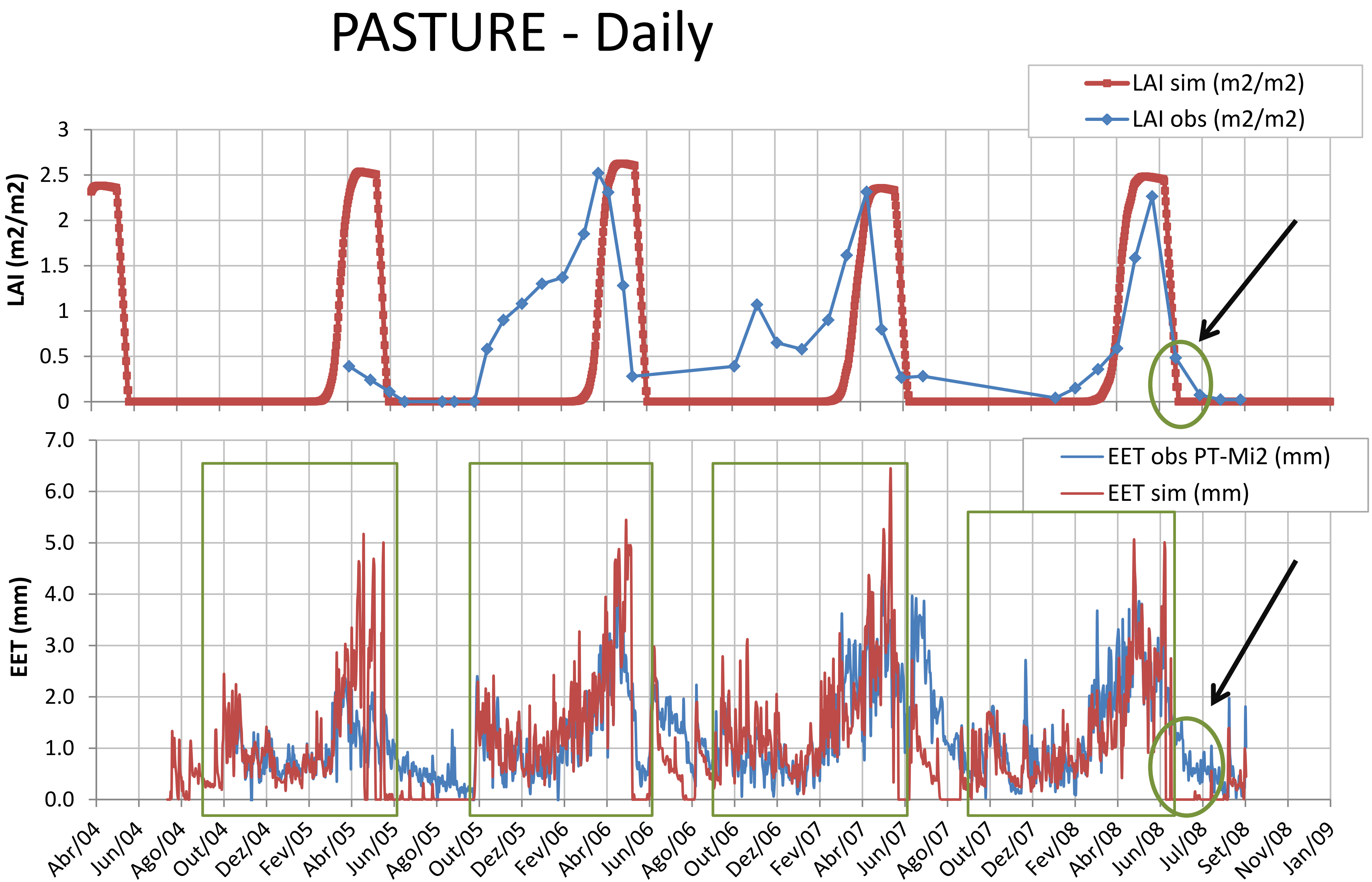
Management Operations - PASTURE

Current Management Operations

	Year	OP_NUM	Operation	Crop	Heat Units
▶	1	1	Plant/begin. growing se	WPST	0.07
	1	2	Auto fertilization initializ		0.1
	1	3	Grazing operation		0.4
	1	4	Harvest and kill operati		1
*					

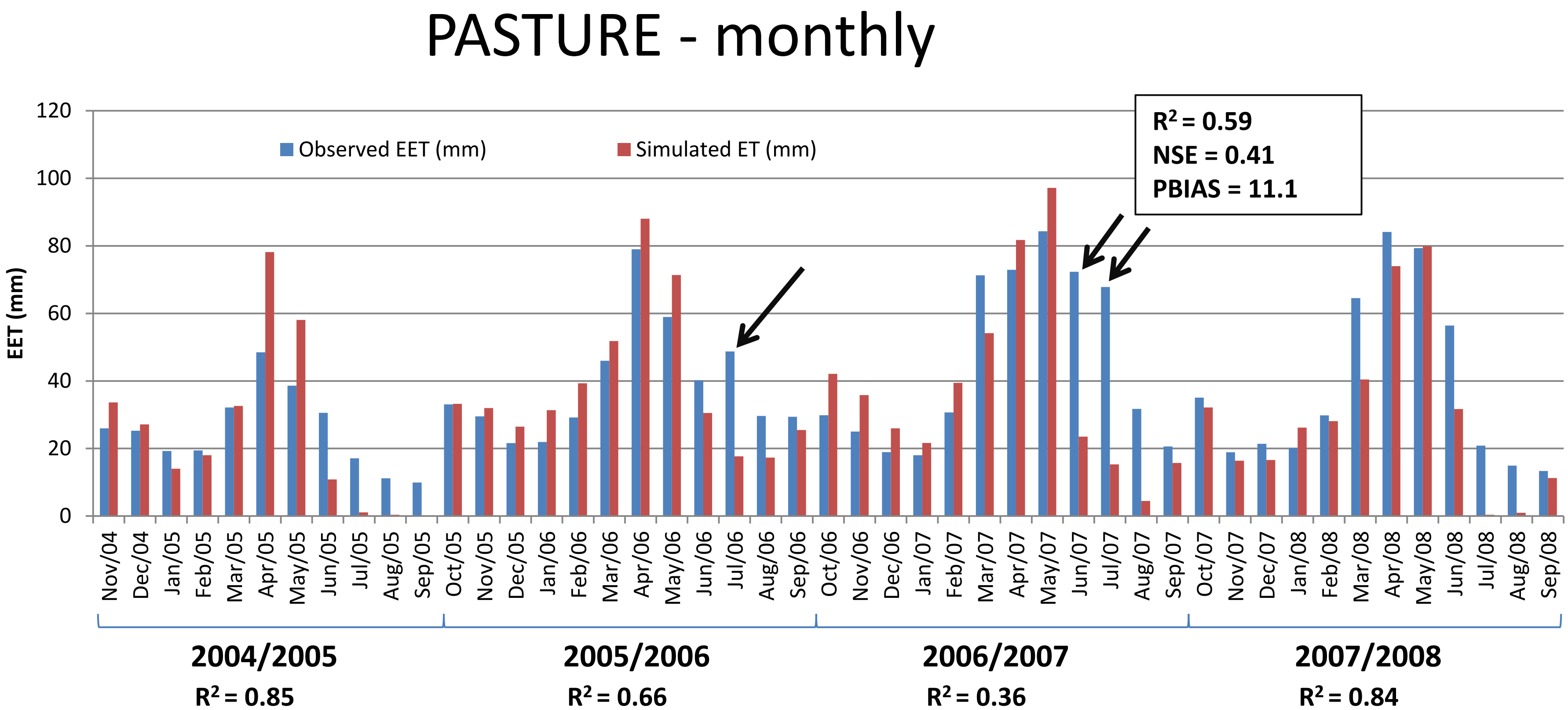
SWAT

Preliminary Results:



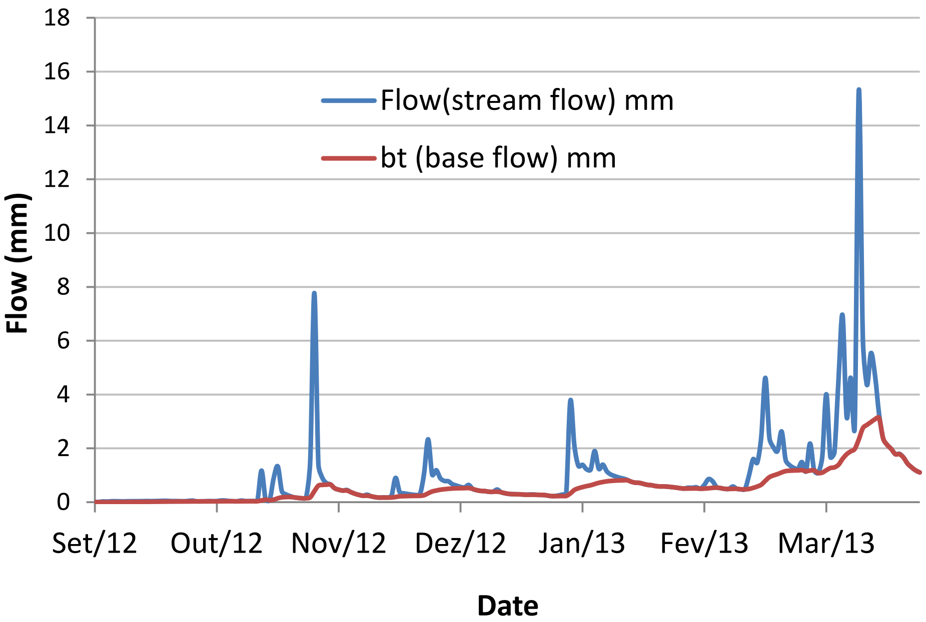
SWAT

Preliminary Results:



Baseflow Separation

- Baseflow separation with filter
- Recession curve analysis (Arnold et al, 1995)



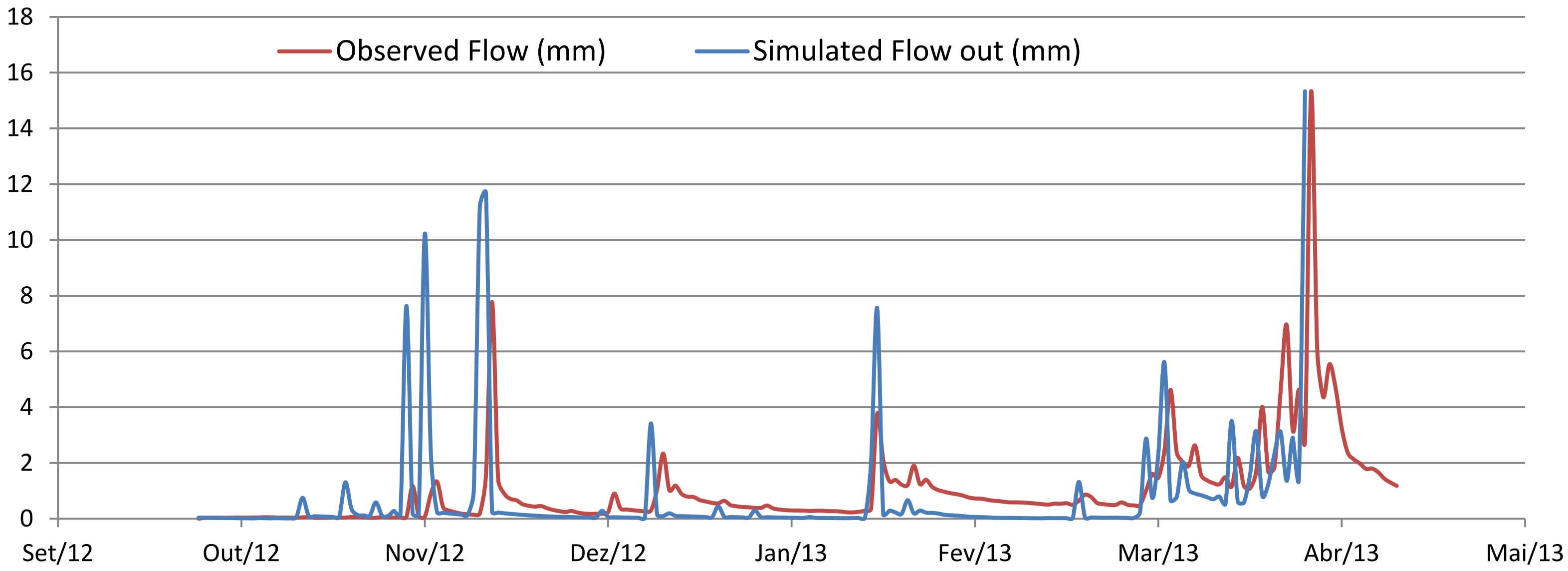
AlphaBf= (-1/N) ln(Qn/Qo)

N=Number of day
Qo=Q at the beginning of the recession
Qn=Q at the end of the recession

Parameter Range	mean	min	max
Alha_Bf (day)	0.09	0.02	0.58

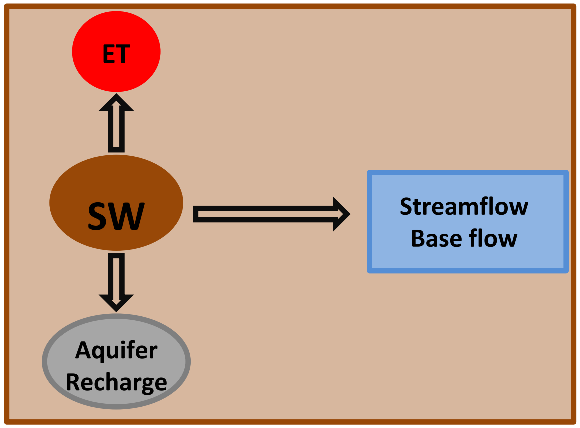
SWAT

Preliminary Results:



Conclusions

- The Evapotranspiration is a very important parameter to understand the water balance and can be simulated in SWAT



- The most sensitive parameter to calibrate LAI and evapotranspiration was heat unit

Ongoing:

- Compare the data with satellite data
- Future work will include the upscaling of the model for regional catchments, and its application to evaluate the impacts of climate change scenarios

Thank you for your attention