High Resolution Mapping of LAI and other parameters with SPOT-4 Data for Spatially-explicit Ecohydrological Modeling in the Landes de Gascogne

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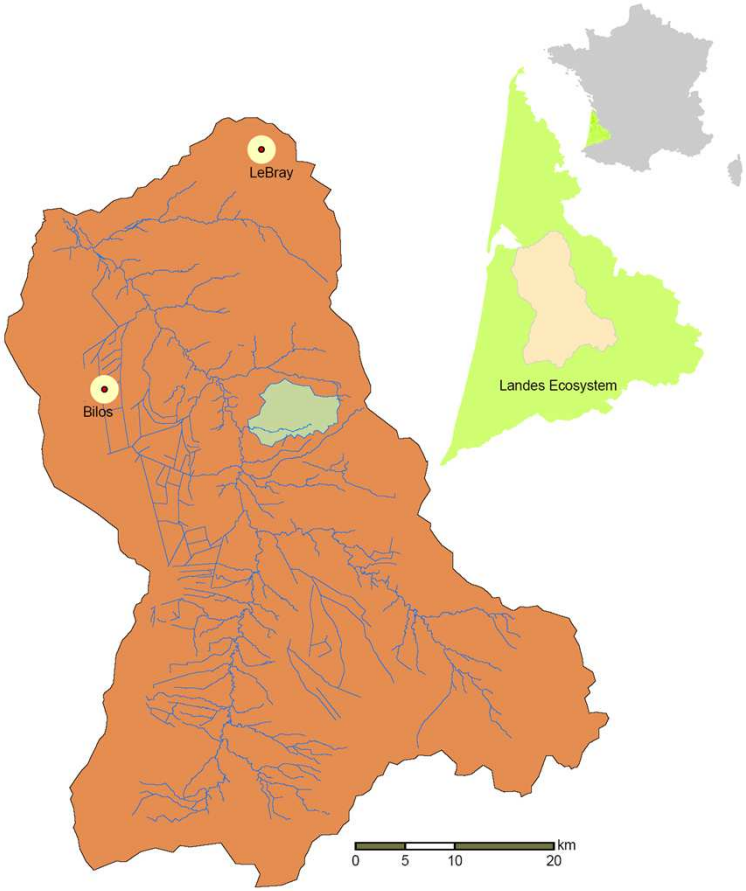
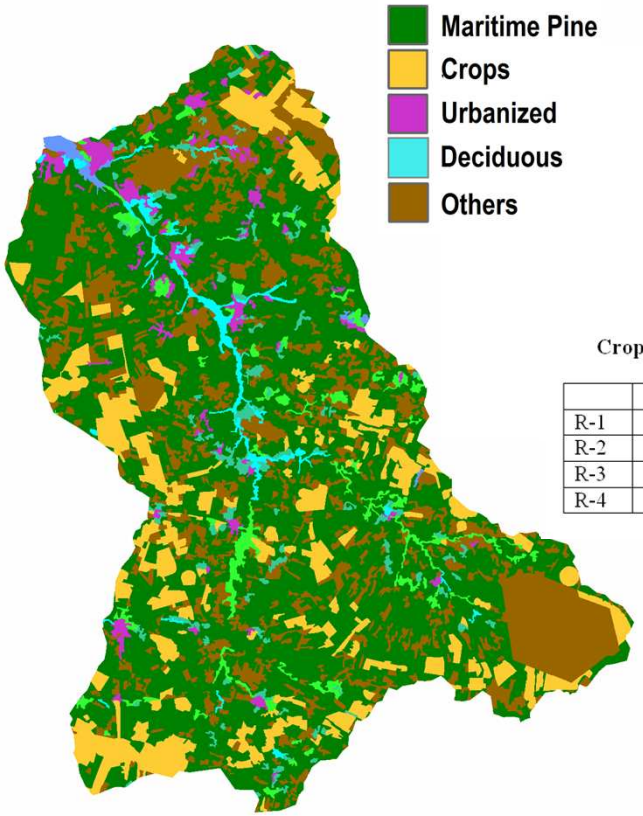
Modeling of Ecohydrological Processes in the Landes de Gascogne



Science Questions to be Answered

1. What determines interannual variability of C and water fluxes in this ecosystem?
2. What's is the role of hydrology?
3. How nutrients, water and C interact?
4. How landuse change affect C and W fluxes?
5. How disturbances affect C and W fluxes?
6. What are the governing mechanisms of terrestrial-benthic connectivity?

Characteristics of Vegetation in the Landes de Gascogne



- Small patches of managed forestry and croplands
- Forests stands at different ages have unique structures and hence creates complexity
- Croplands have different cropping rotation

Crop Rotation : Landes de Gascogne

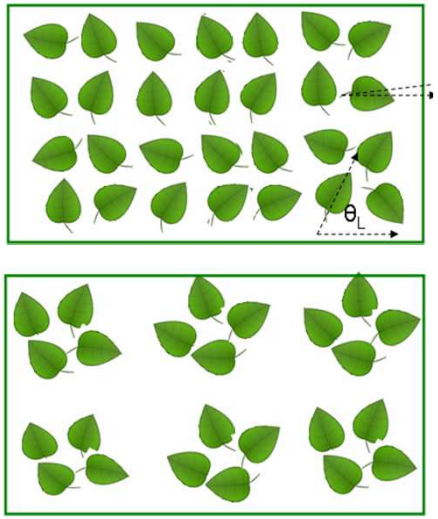
	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec
R-1								*Mais Grain*				
R-2							*Mais Consommation*			*Haricots*		
R-3				*Petit Pois*				*Haricots*				
R-4										*Mais Semences*		

Canopy Attributes Controlling the Radiative Transfer Mechanism

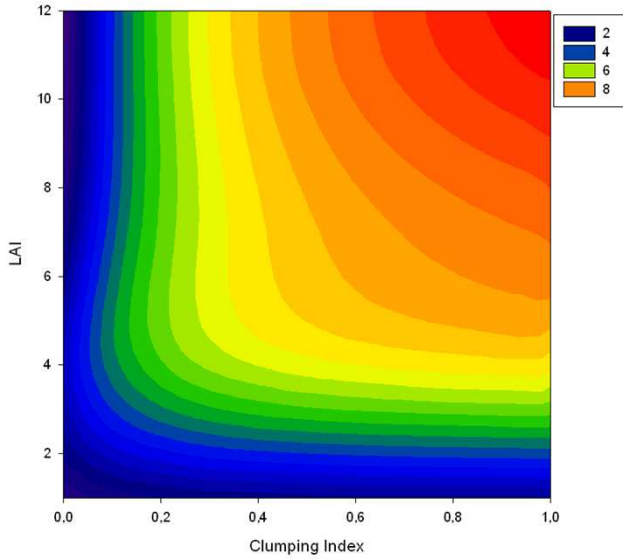
1. Leaf Abundance (**LAI**)

2. Element orientation affecting radiation transmission through the canopy (**G** factor)

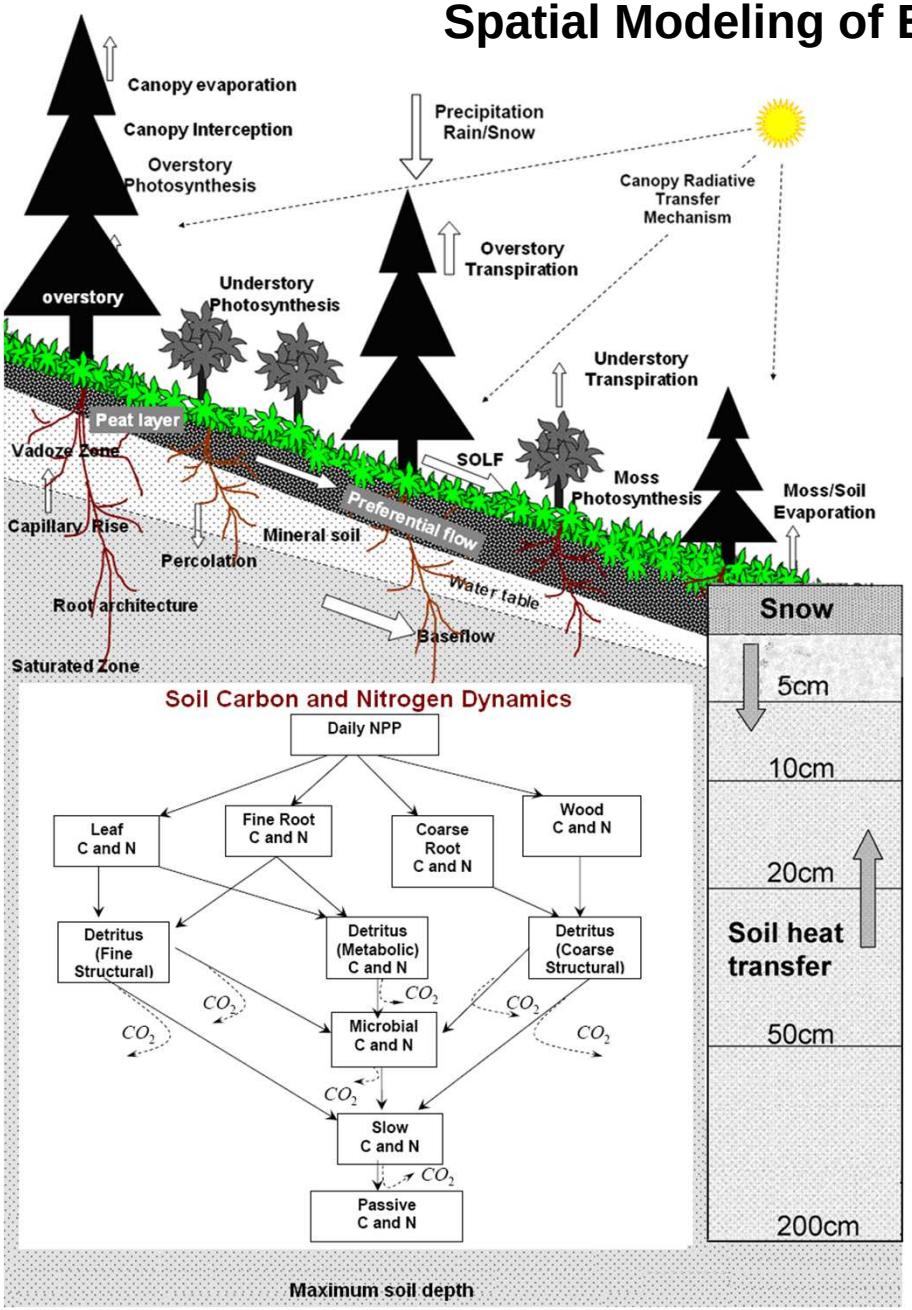
3. Elemental aggregation in space affecting radiation transmission (**Ω**)



Synergistic influence of LAI_{tot} and Clumping on Photosynthesis (color tones) gC/m2/day



Spatial Modeling of Ecohydroloical Processes

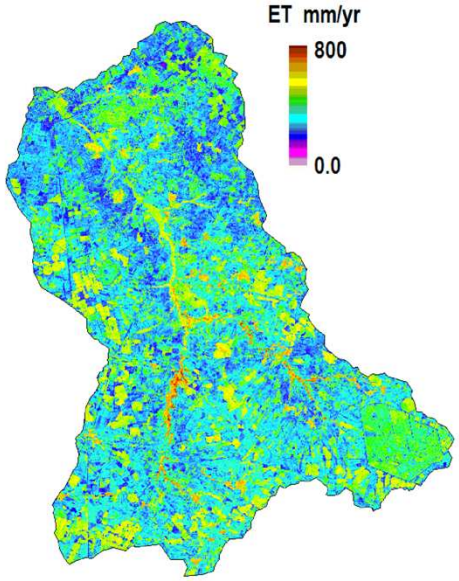


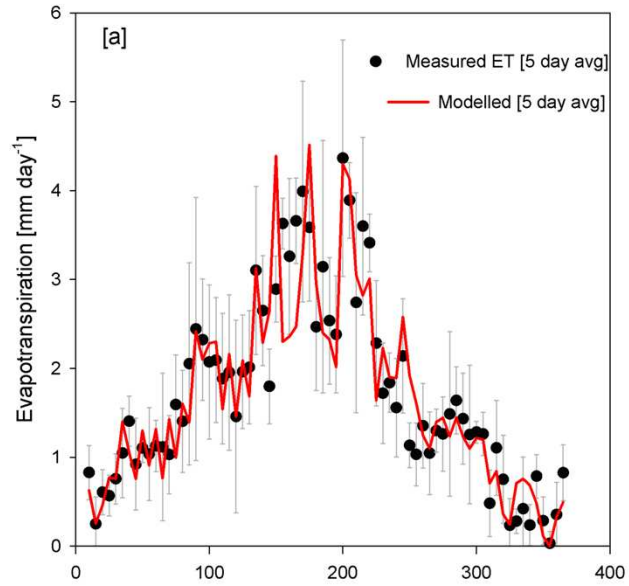
STEPS- **S**imulator of **T**errestrial **E**cohydrological **P**rocesses and **S**ystems

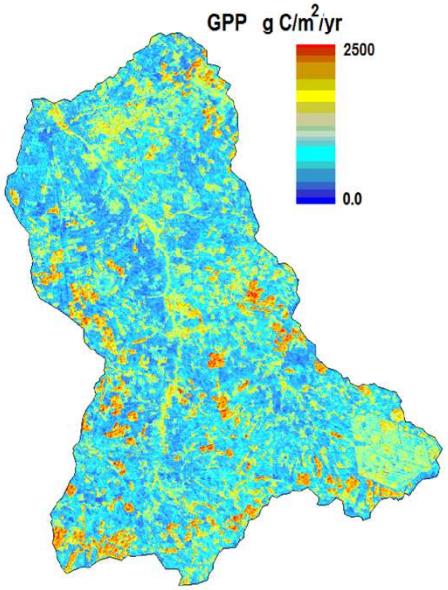
STEPS is being developed at EPHYSE incorporating:

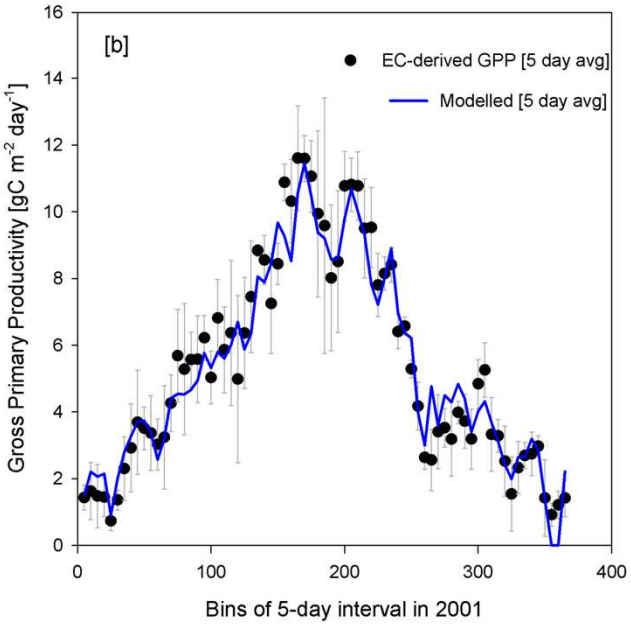
1. Agroecosystems (C3 and C4 plants)
2. Long-term simulations possible
3. Phosphorous-cycle
4. DOC, DON etc
5. Fate of N Fertilizer transformations
6. Forest / Agroecosystem Management
7. Biotic Stresses- Poplulation Dynamics of an endemic pest

Govind et al. [2013 b] , Ecological Modeling (revision)









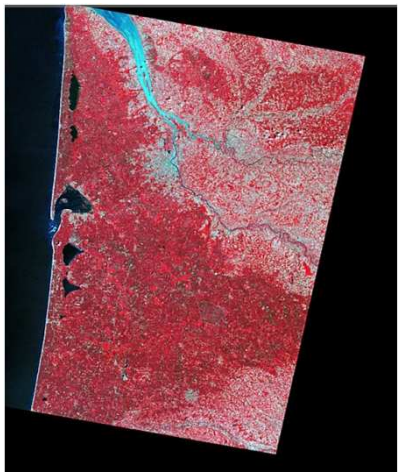
Our Limitations

Lack LAI information in recent years

Knowledge in crop rotation is limited

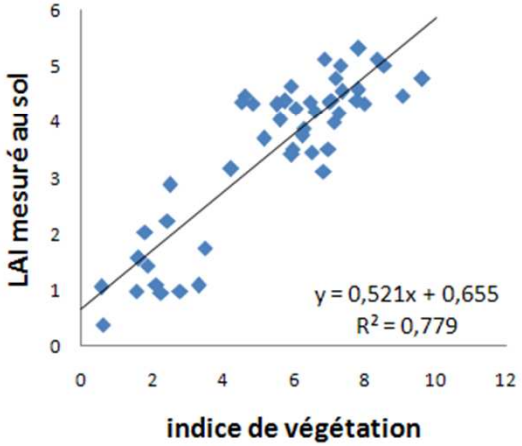
Govind et al. [2013 b] , Ecological Modeling (revision)

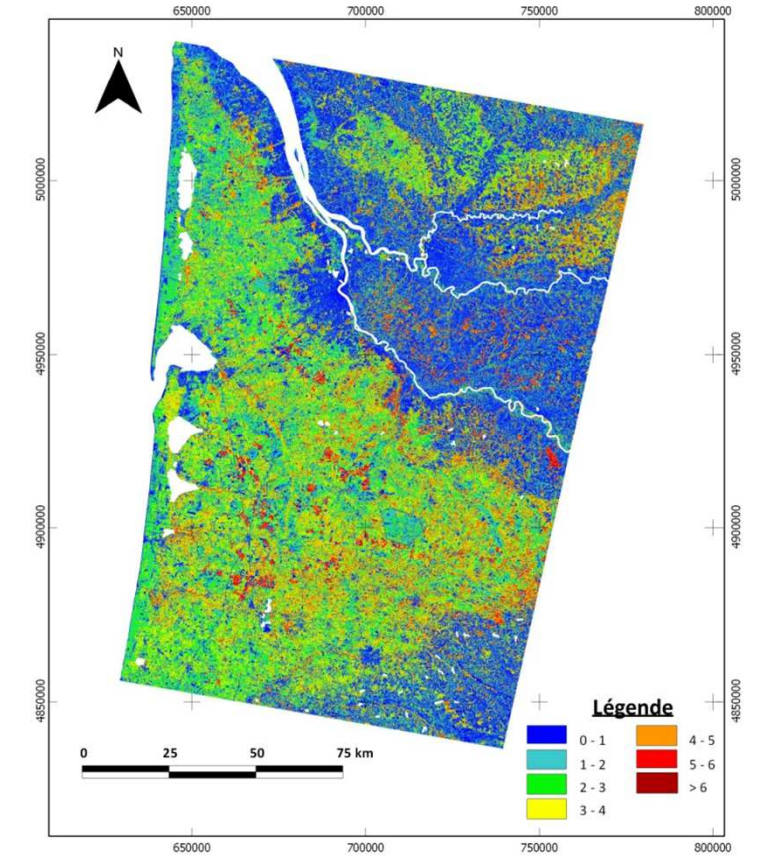
Developing a Landscape-specific Algorithm to map LAI



Landsat ETM
July 2001

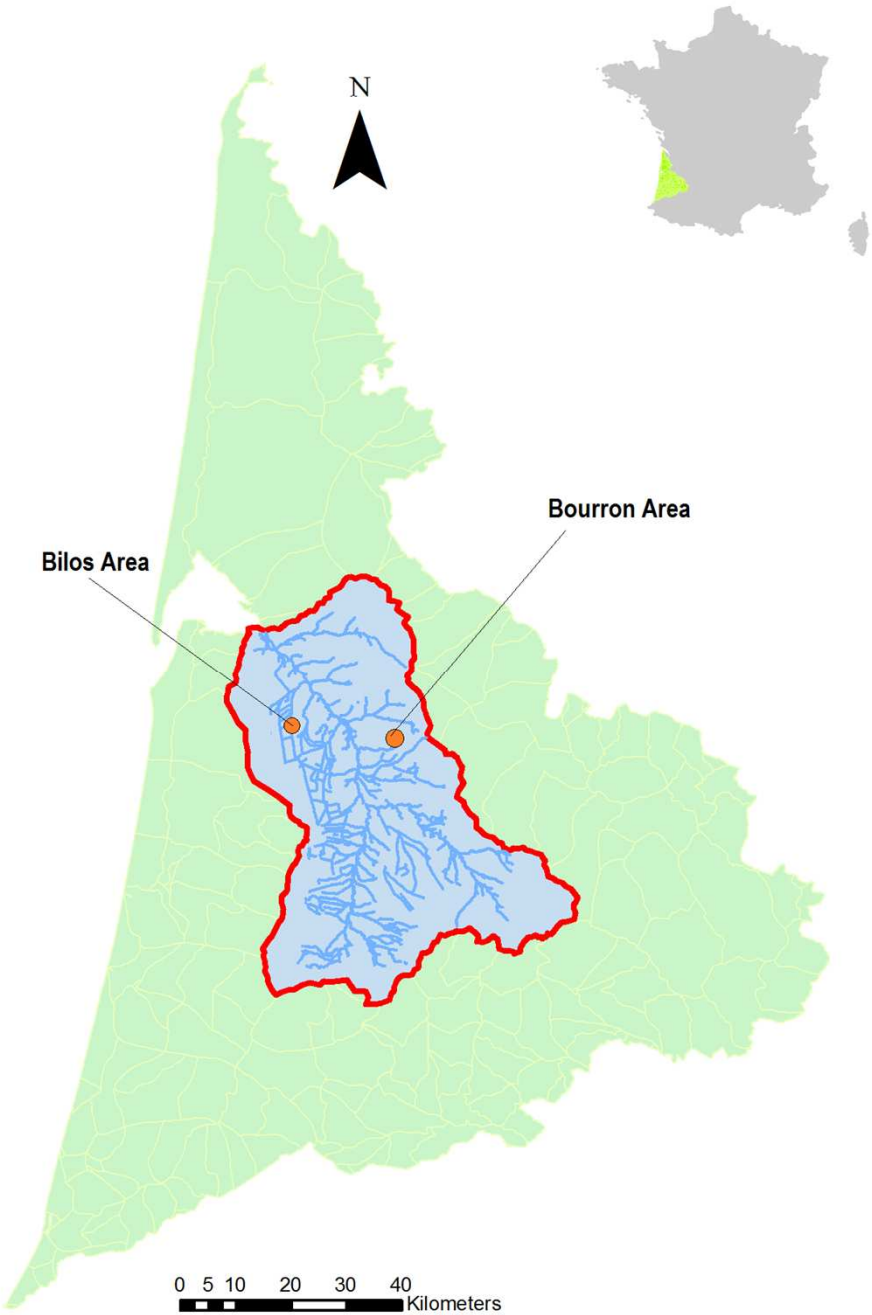
$$RSR = \frac{\rho_{PIR}}{\rho_R} * \frac{\rho_{MIR\max} - \rho_{MIR}}{\rho_{MIR\max} - \rho_{MIR\min}}$$





Field Measurements of LAI [VALERI Project]
July 2001

Reginiers et al. [2012], IEEE IGARSS
Masters thesis



Key Objectives with SPOT-4 data:

[1] Map LAI and associated CRTM parameters at high resolution (<50m)

[2] Map the cropping Rotation in LDG

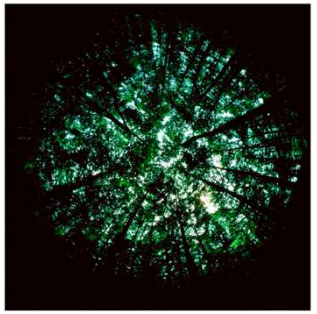
Measurements of various CRT Attributes in the Landes de Gascogne

LAI-2000

- Effective PAI
- Mean Tilt Angle for the deriving

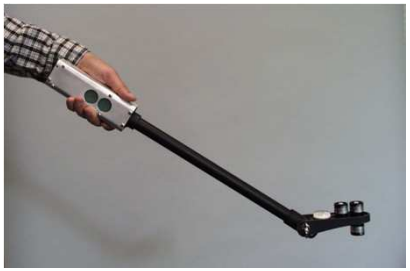
Digital Hemispherical Photography

- Effective PAI
- Clumping Index using Leblanc (2005) approach at various VZAs



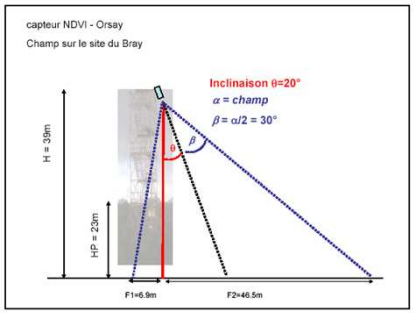
Tracing Radiation and Architecture in Canopies (TRAC)

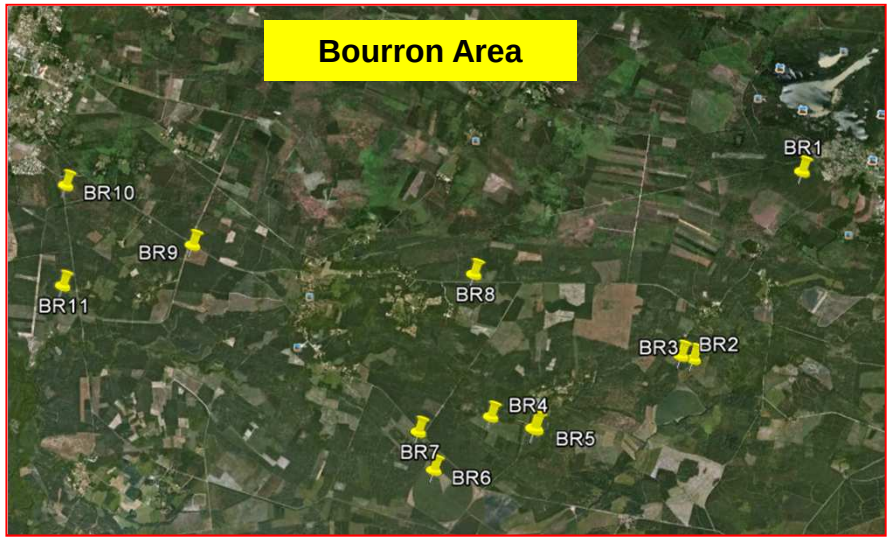
Clumping Index



Field-based NDVI observation

- At 8m above canopy at Bilos site
- Zenith angle 30degrees
- Azimuth towards West




Bourron Area
BR1
BR10
BR9
BR11
BR8
BR3
BR2
BR4
BR5
BR7
BR6


BR-1


BR-11


BR-2


BR-8


BR-9


BR-10

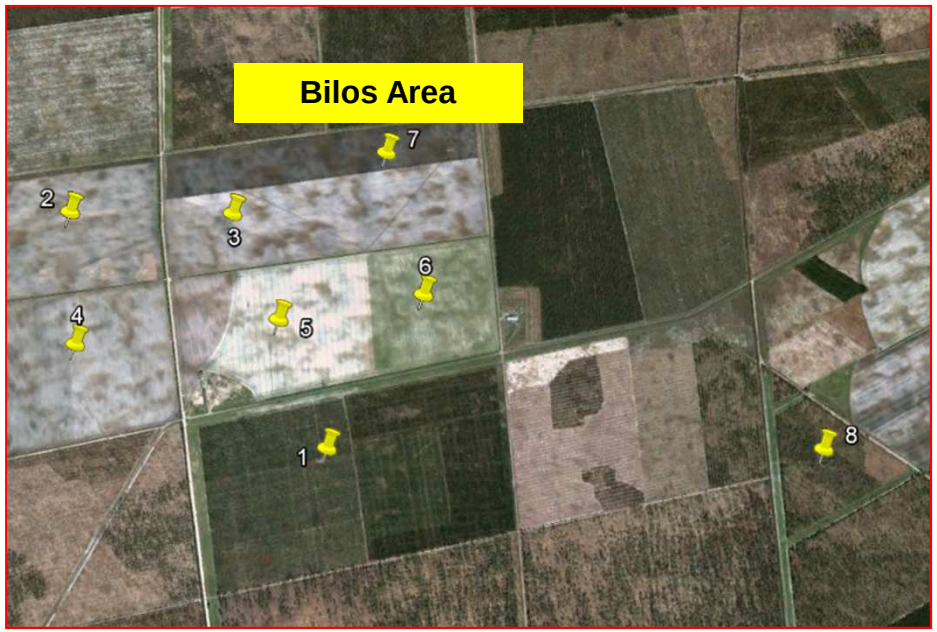

BR-3


BR-7


BR-6


BR-5


BR-4


Bilos Area
1
2
3
4
5
6
7
8


BR-1


BR-2,4


BR-9


BR-3


BR-8

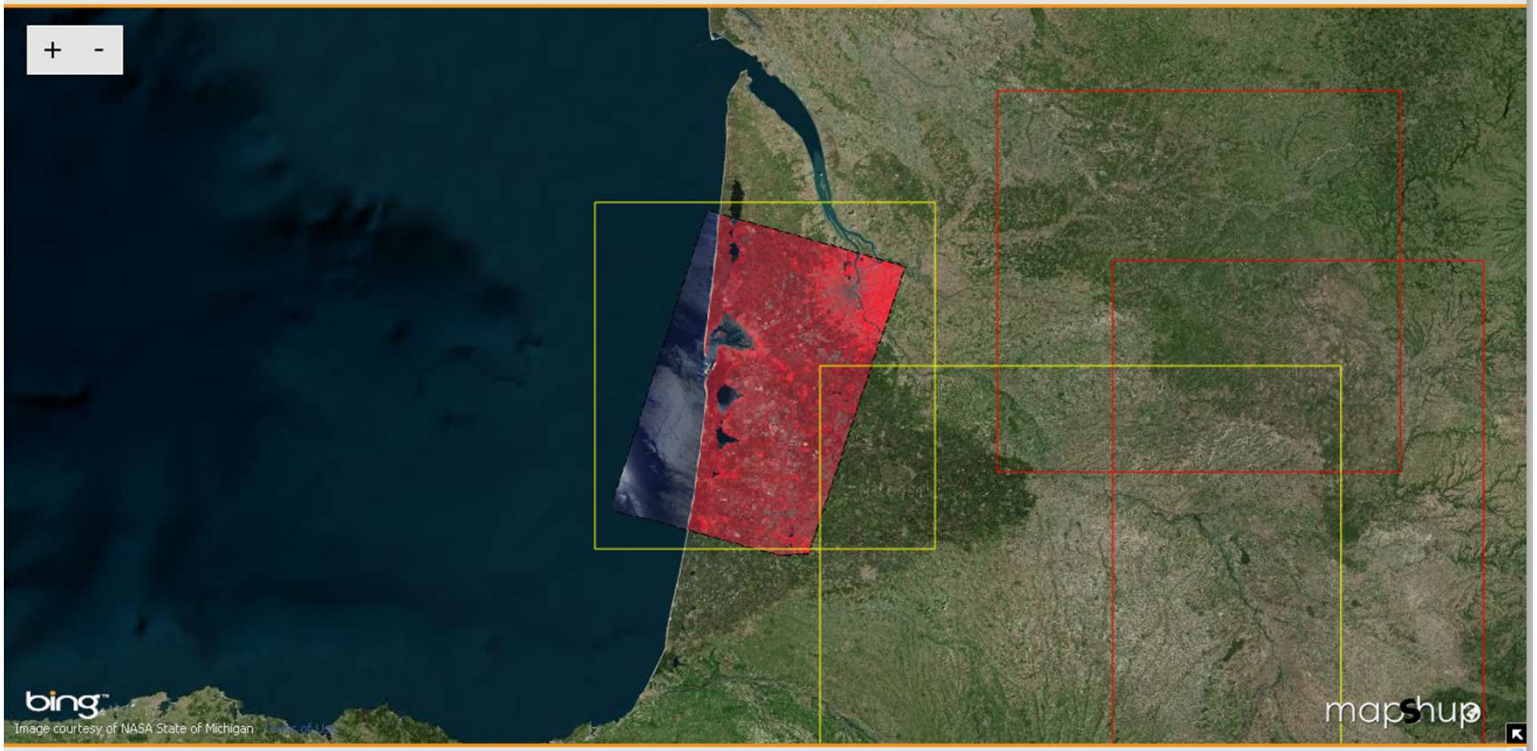

BR-7


BR-6


BR-5

SPOT4 (TAKE 5)

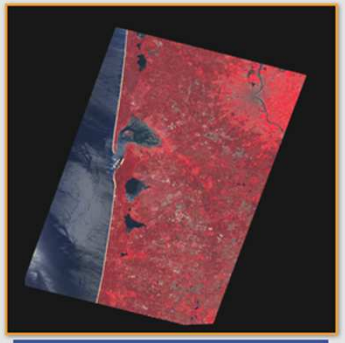
A PROPOS



Sélectionner un site

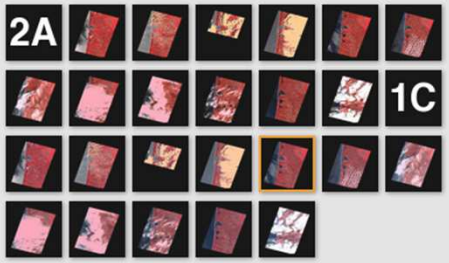
France : Aquitaine

Porteur
Laboratoire EPOC (Université de Bordeaux)
Utilisateurs
EPOC, Geo Transfert, EPHYSE (INRA Bordeaux)
Objectifs scientifiques
Trait de côte et couvert côtier, Qualité de l'eau, Suivi de la végétation sur le bassin de la Leyre



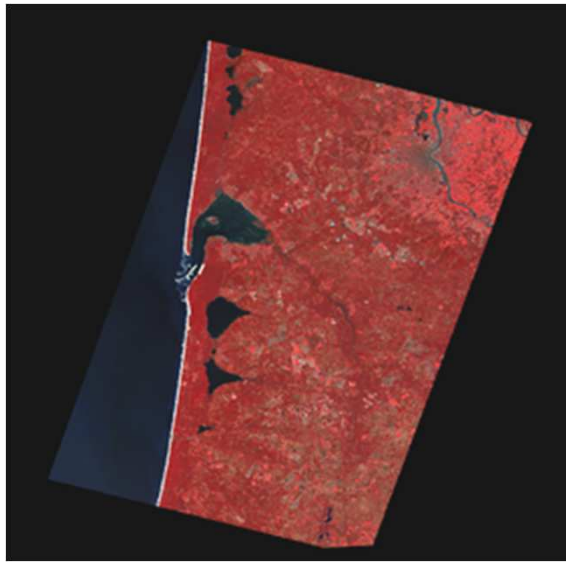
Télécharger : 2013-05-06 [1C]

Cliquez sur les icones 2A et 1C pour télécharger tous les produits

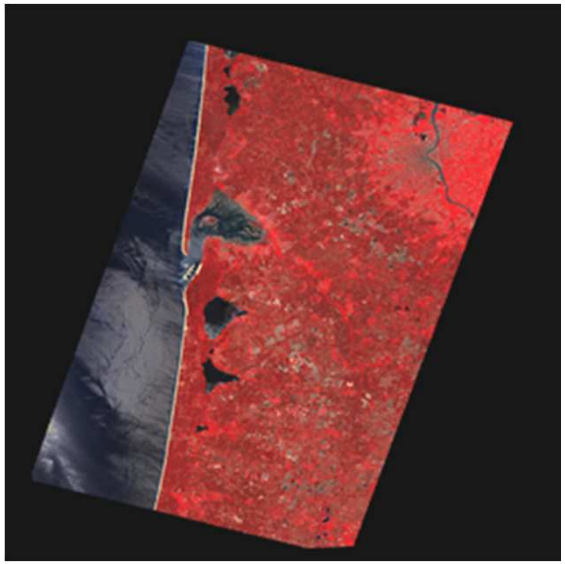


Some Usable Satellite Data Available via SPOT-4 (Take-5) Project

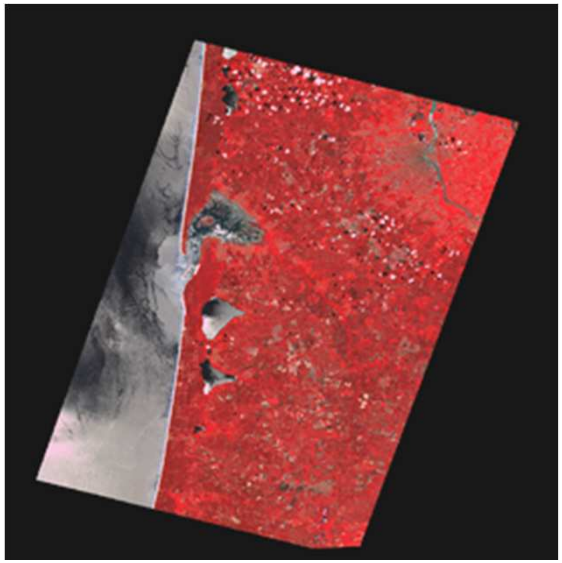
SPOT-4



20 Feb 2013 [2A, 1C]

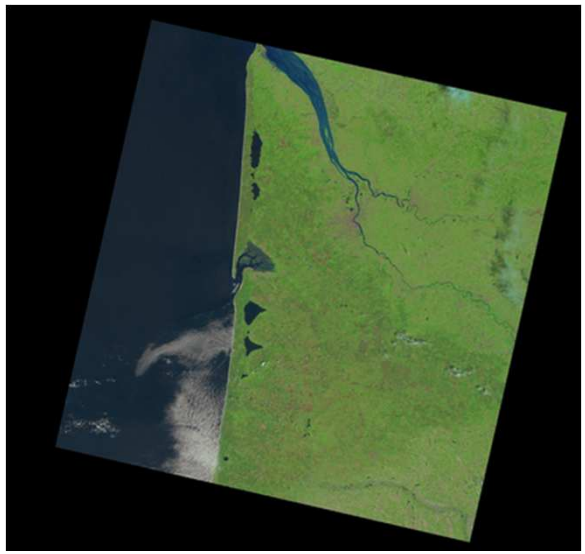


6 May 2013 [2A, 1C]

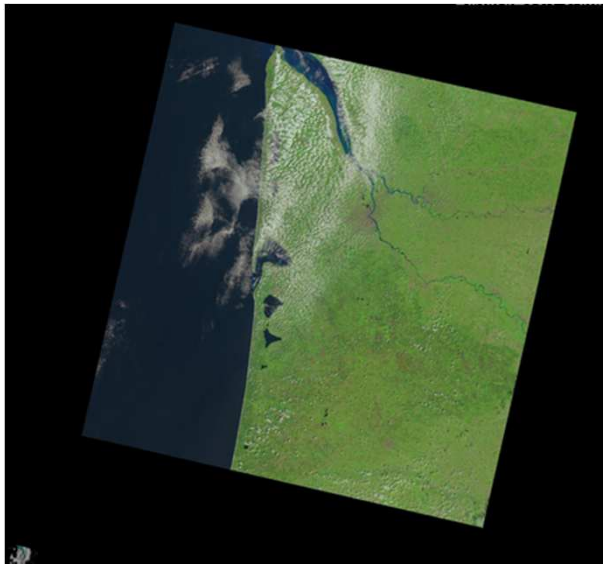


5 June 2013 [2A, 1C]

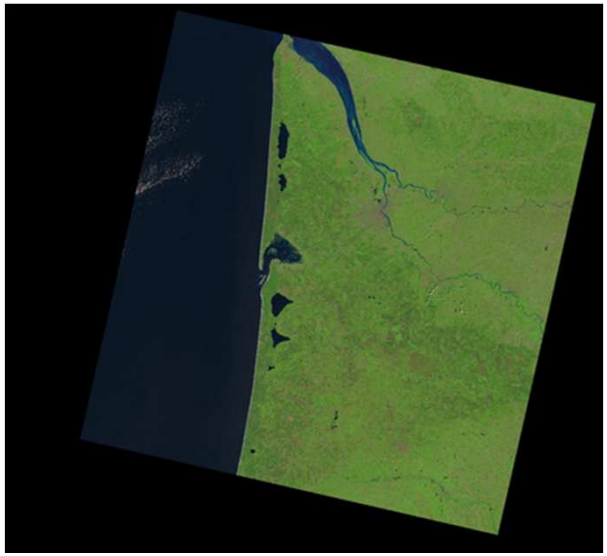
Landsat-8



10 July 2013

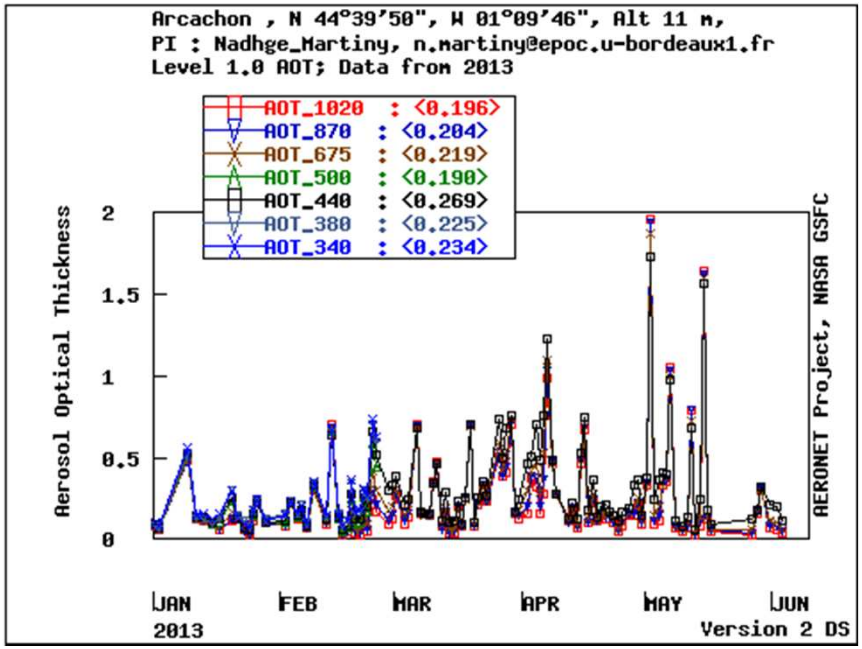


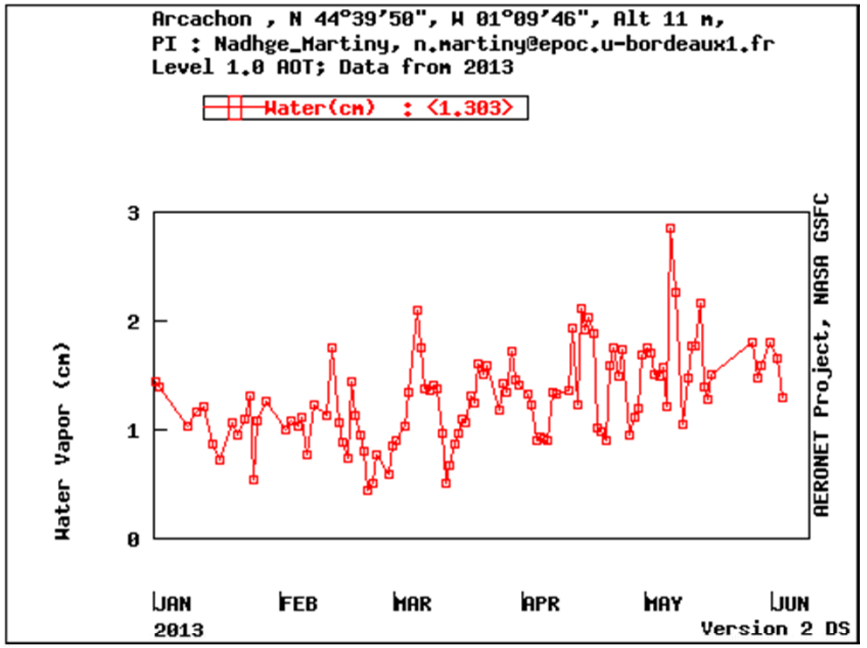
26July 2013

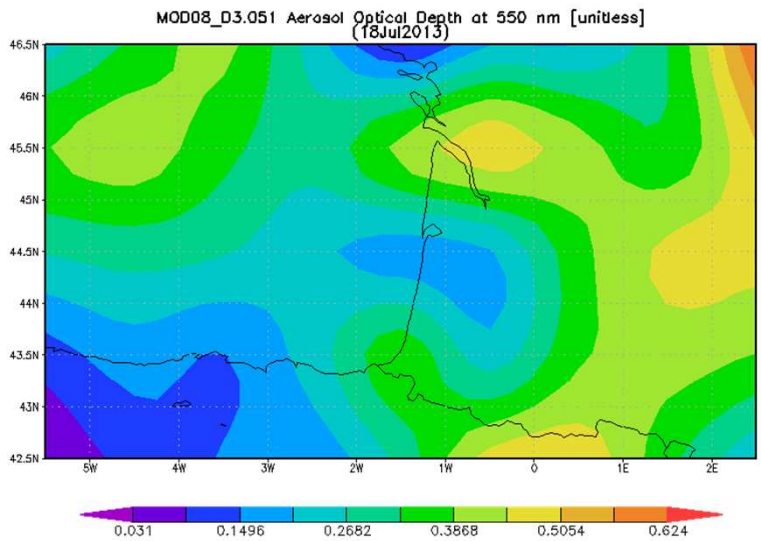


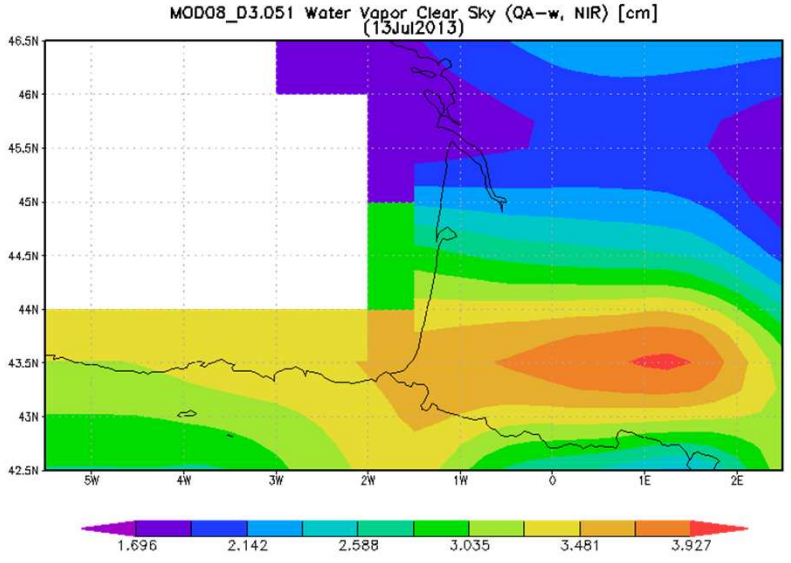
11 Aug 2013

Input Data Source for Atmospheric Correction









Future Activities

- Process the ground-based observations of LAI and related parameters.
- Atmospheric Correction of datasets with SMAC model and calculate spectral indices (NDVI and RSR) based on TOC reflectances.
- Invert our algorithm developed in June 2001 over the June 2013 imageries
- Validate the retrievals with LAI measurements and NDVI observations
- Map cropping Rotation with multi-temporal data (SPOT-4, Landsat 8)
- Make end-member spectral reflectance measurements for sub-pixel decomposition and characterization (STEPS-TOSCA project)
- Simulate C and W fluxes over Landes de Gascogne

Merci

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Jan Pisek (CR, Tartu Observatory)

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