





Principle of SM and SSS retrievals

For each SMOS grid location, a vector of TB_{SMOS} is provided for a list of incidence angles θ_m ;

Then the retrieval algorithm minimizes a **cost function** C:

$$C = \|\Delta TBM_m\|^t [COV]^{-1} \|\Delta TBM_m\| = \sum \frac{[p_i - p_{i0}]^2}{\sigma_i^2}$$

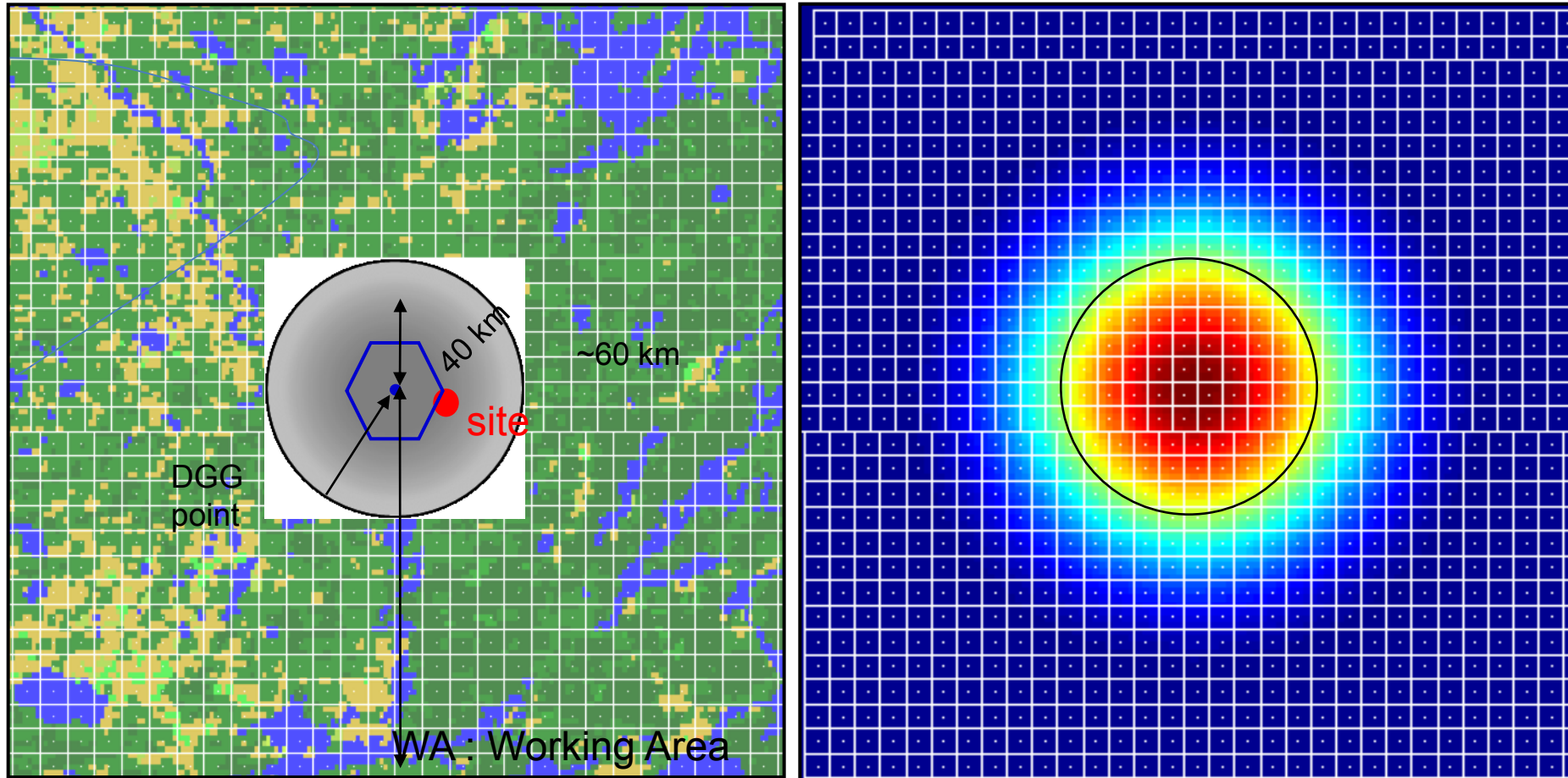
where

$$\Delta TBM_m = TB_{SMOS} - TM_{MODEL}(\theta_m, \dots, p_i, \dots)$$

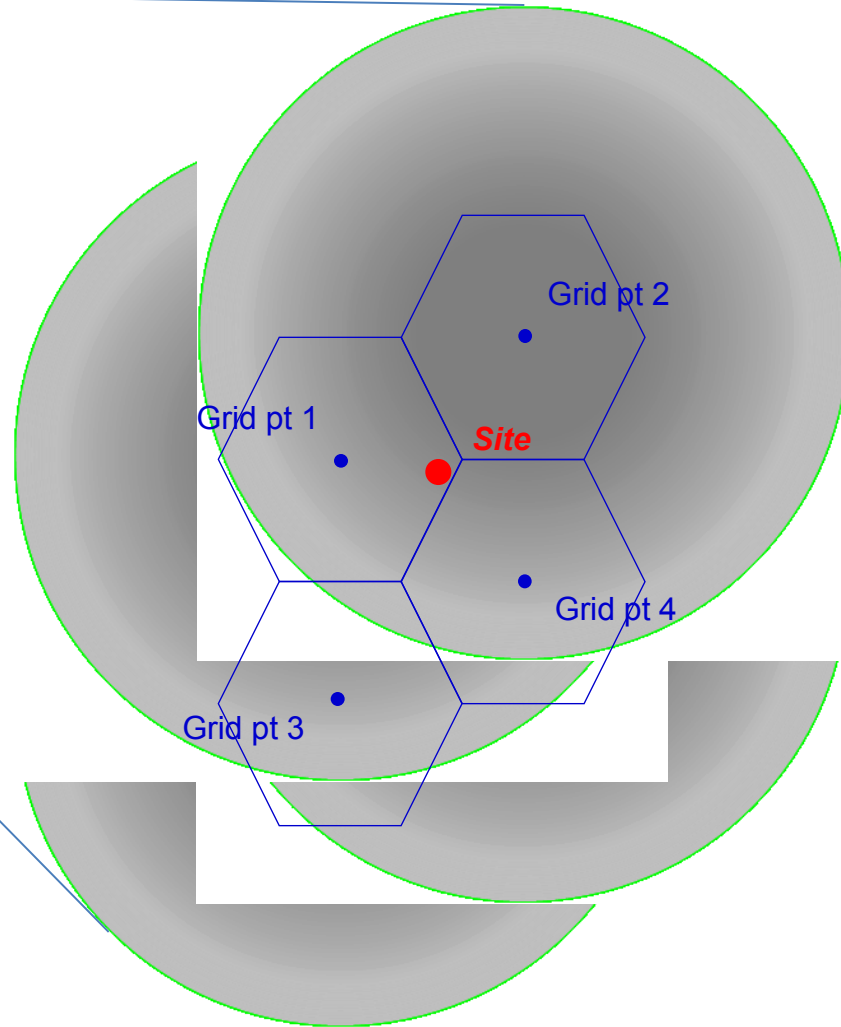
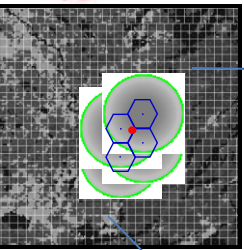
p_i are parameters of the model to be retrieved, with a priori values and standard deviations p_{i0} and σ_i .

[COV] is the data covariance matrix

SMOS data



Contribution comes from many fractions but retrieval concerns only the dominant fraction



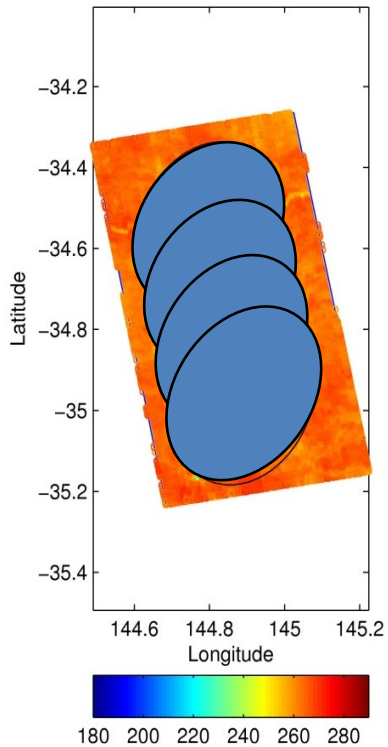
The closest DGG node is
not always the most
representative of the site

Australia

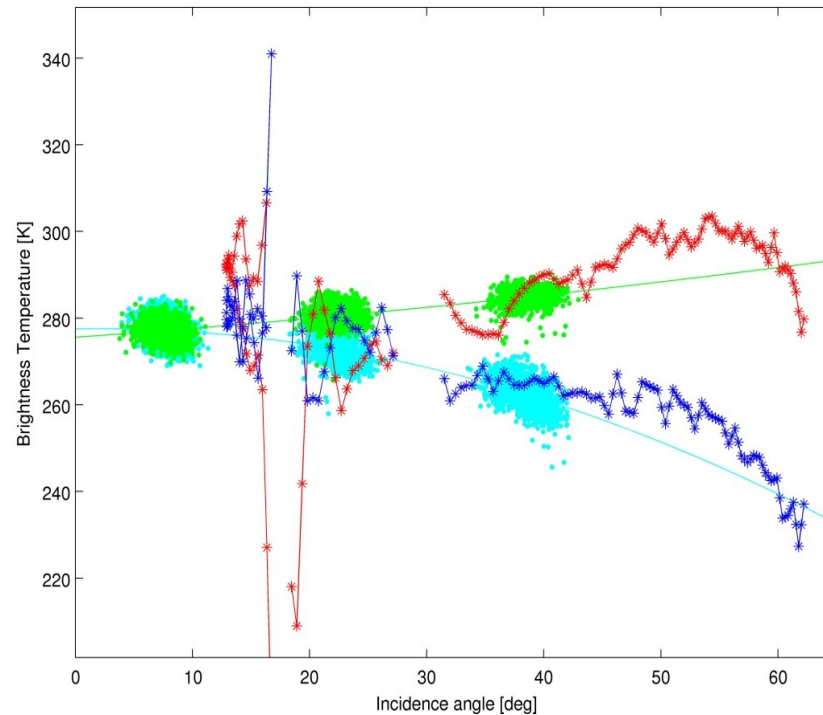
(summer campaign)

H Polarisation

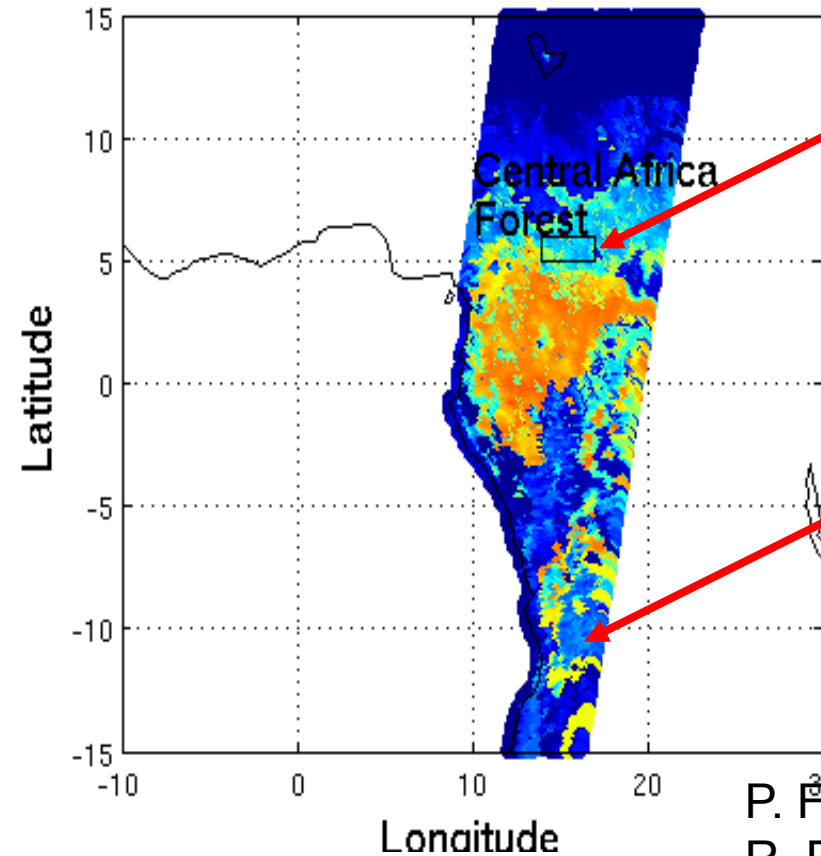
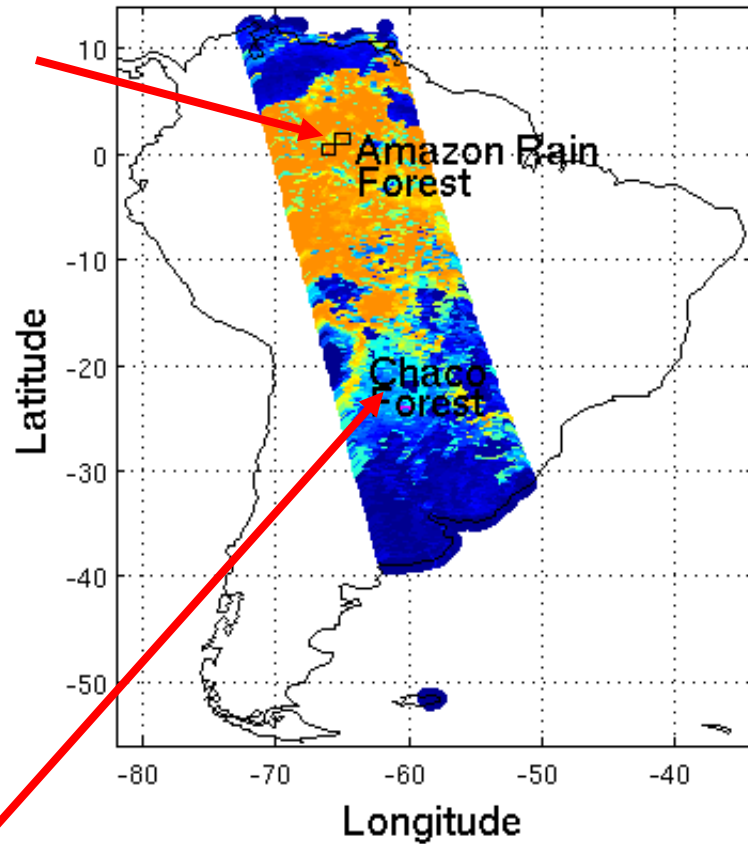
h-pol P03



Scatter of PLMR P03 and corresponding SMOS data for DGGP: 8170154



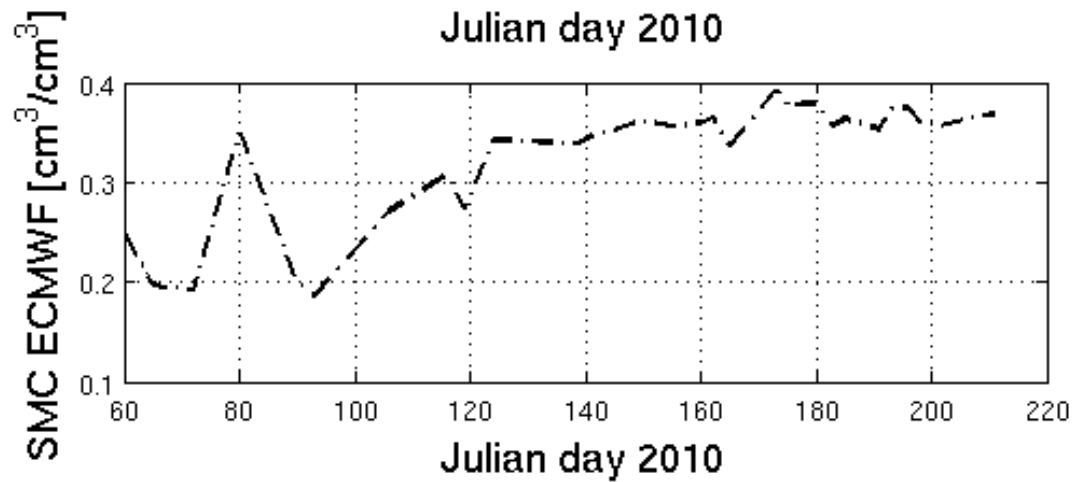
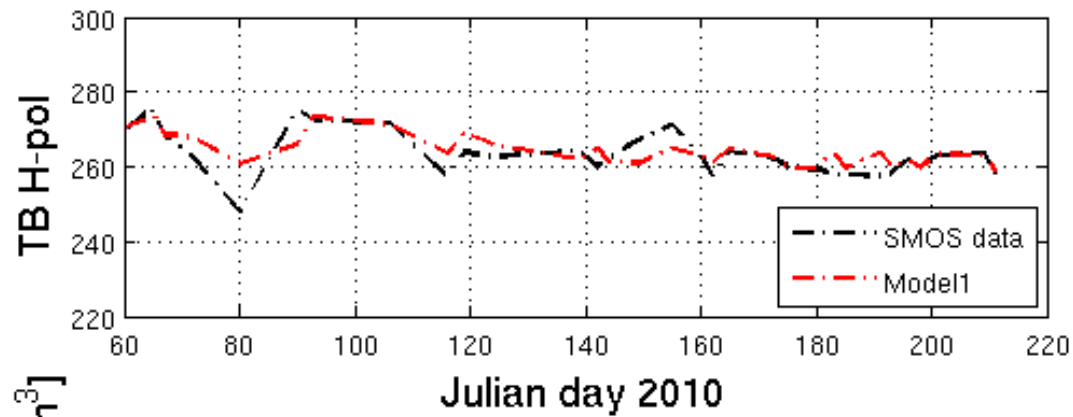
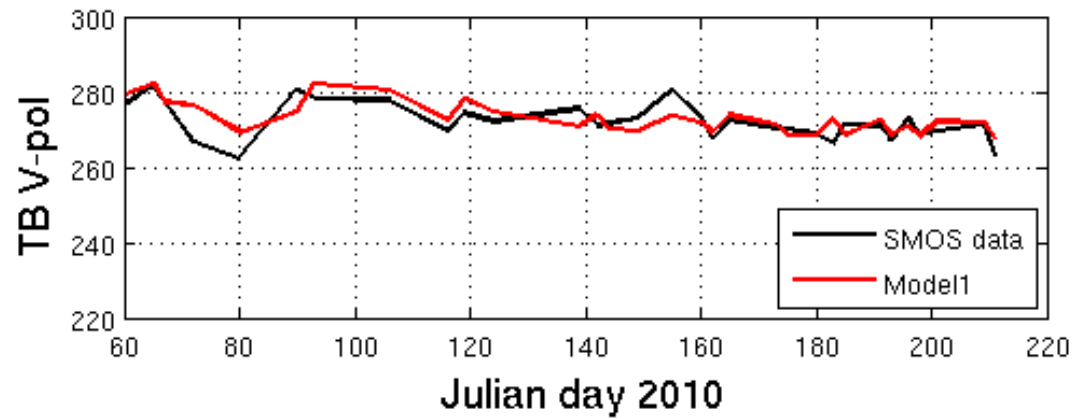
Tropical forest Sites



P. Ferrazzoli
R. Rahmoune

Area	Latitude	Longitude	LAI_MAX	τ
Amazonia	[1, 2]	[-65.5, -64.5]	6	1.6
Chaco	[-24.6, -24.0]	[-60.6, -60.0]	3	0.6
Africa 1	[5.5, 6]	[16.5, 17.0]	3.5	0.7
Africa 2	[-11.0, -10.5]	[16.5, 17.0]	2.4	0.42

Central Africa Forest



P. Ferrazzoli
R. Rahmoune



Match ups

- Goal
 - Simulate a pixel to be able to compare to SMOS
 - Has to be accurate
 - Possibility to monitor
 - And to validate products

Objective :

- *Use of ground and meteorological measurements from the VAS site to simulate the L-band surface emission **by coupling** 2 models :*
 - ✓ *SURFEX model (Météo France)*
– for the soil moisture
 - ✓ *L-MEB (L-band Microwave Emission of the Biosphere, Wigneron et al., 2006) model – for the brightness temperature*
- so as to derive a **Match-up** database for **SMOS L2** soil moisture validation and monitoring*
- *Validate/compare with SMOS data during Commissioning Phase*

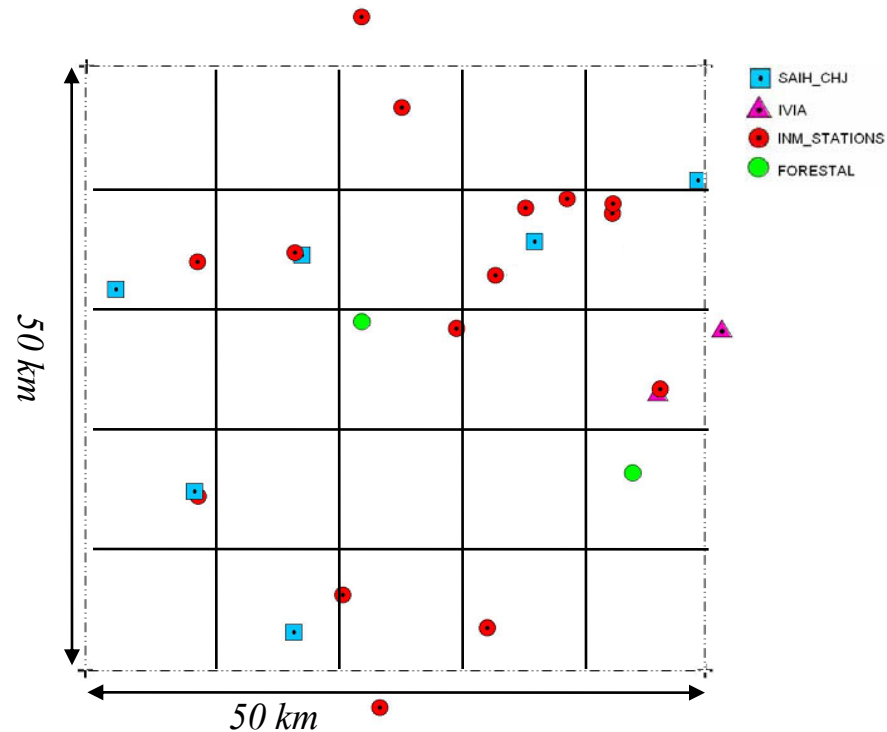
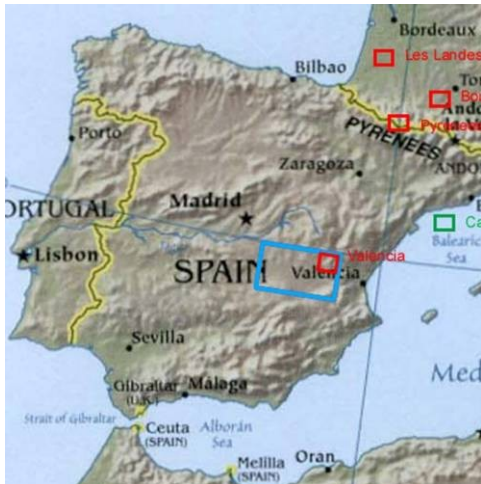
Valencia Anchor Station

E.Lopez-Baeza, M.C. Antolin, A. Cano, C. Millan-Scheiding

✓ *Location : Utiel-Requena Plateau (Valencia, Spain)*

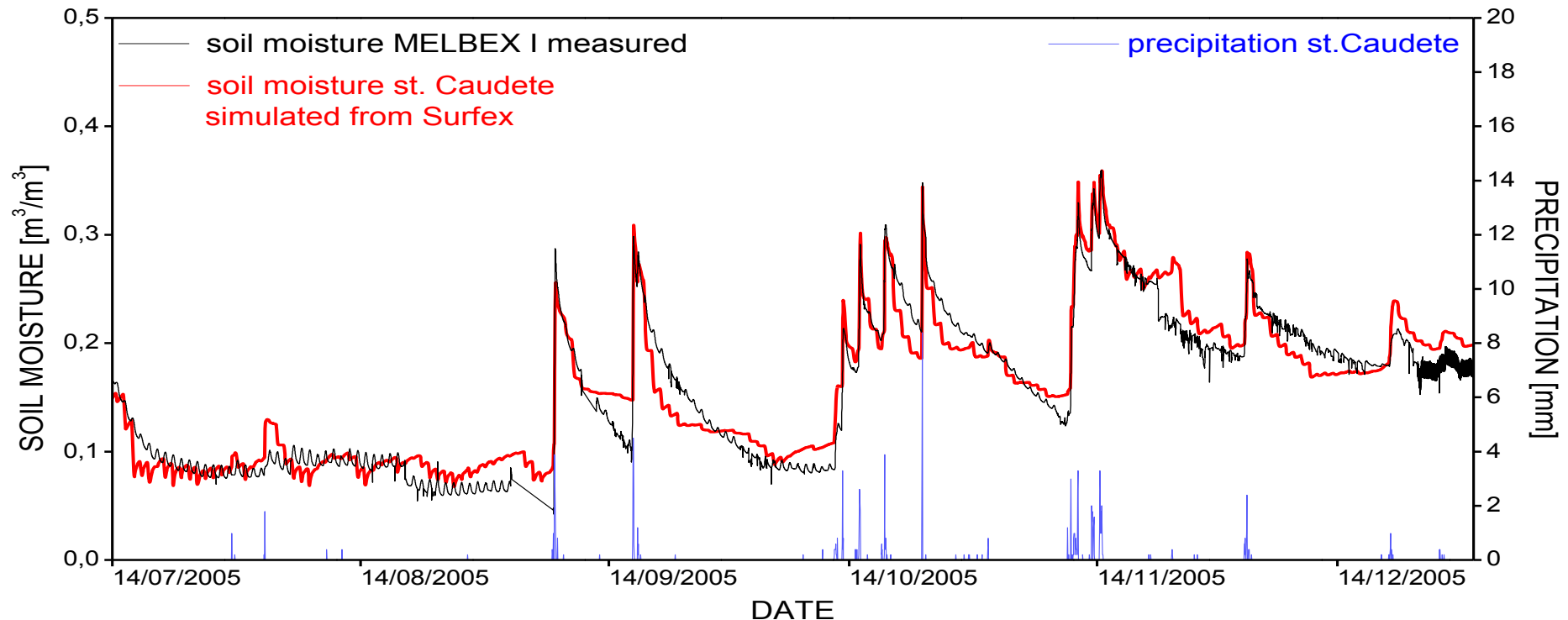
✓ *Coordinates : 39°34'15"N, 1°17'18"W*

✓ *Height : 813 m over sea level*



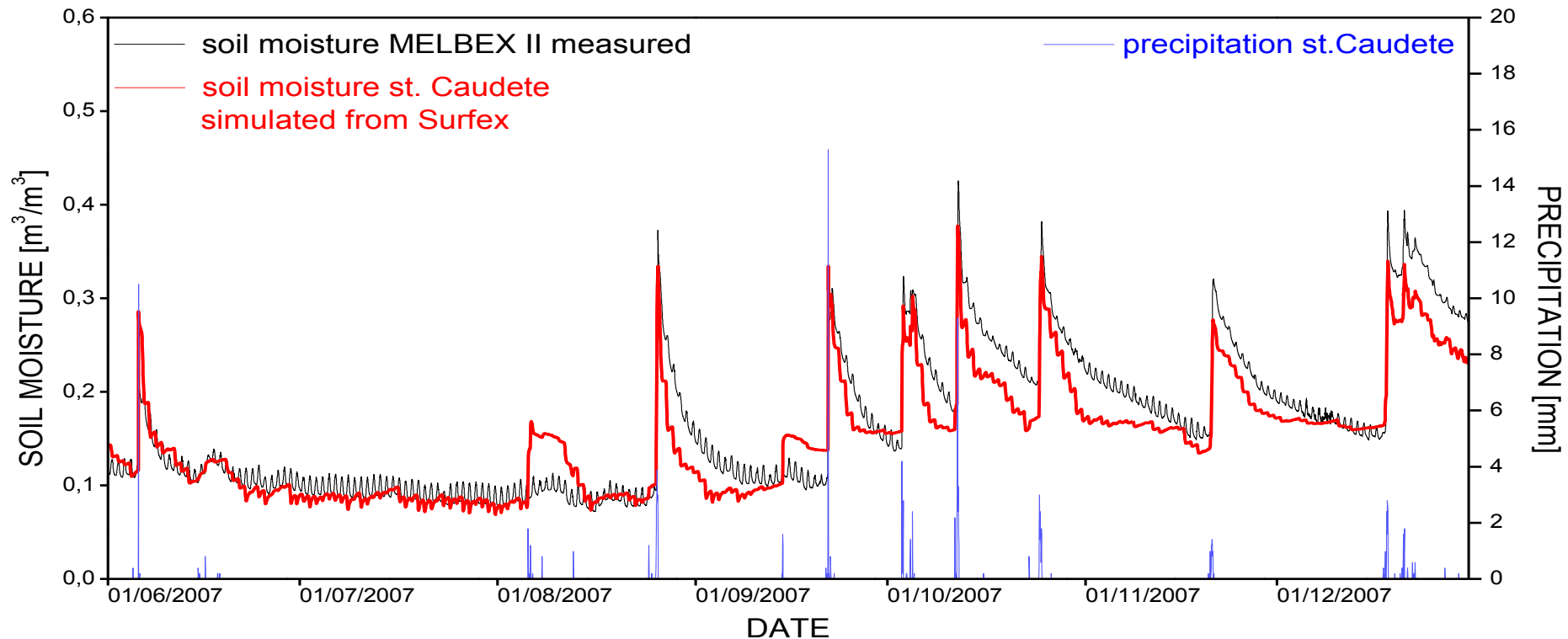
SURFEX validation – comparison with ground measurements

- ✓ **MELBEX I** campaign - Mediterranean Ecosystem L-Band characterization Experiment
 - shrubs, matorral
 - from July to December 2005



SURFEX validation – comparison with ground measurements

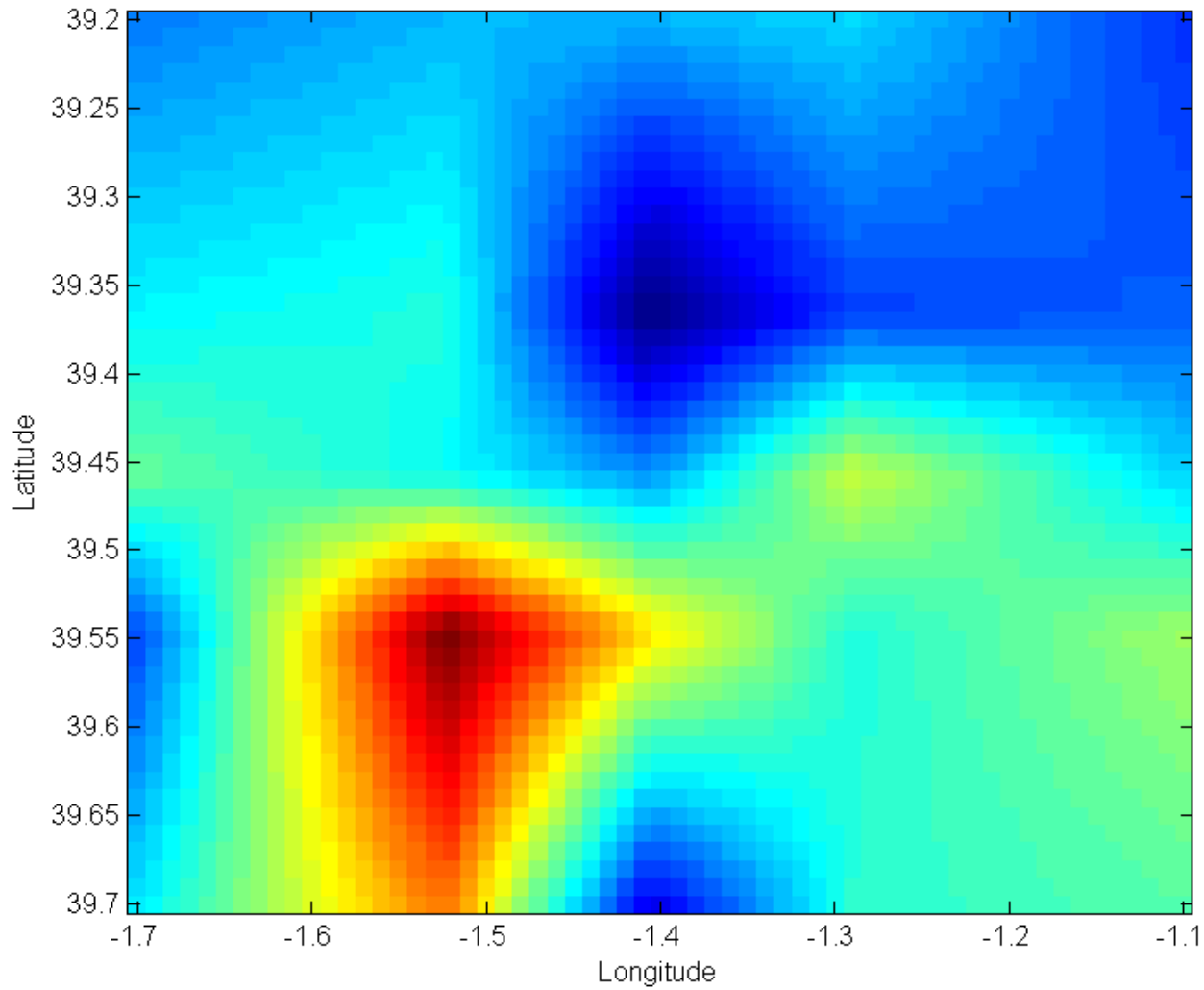
✓ *MELBEX II* campaign - *Mediterranean
Ecosystem L-Band characterization Experiment*
- vineyard
- from April to December 2007



Surface soil moisture 26.01.2007 6h

[m³/m³]

re:

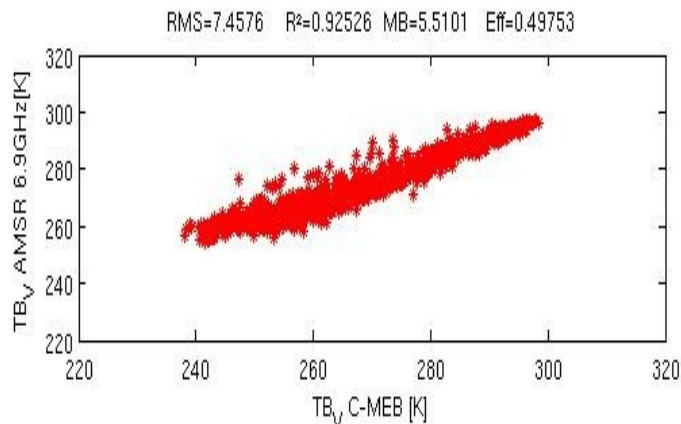


-1.04 -1.02 -1.0 -1.02 -1.04 -1.06 -1.08 -1.1 Longitude

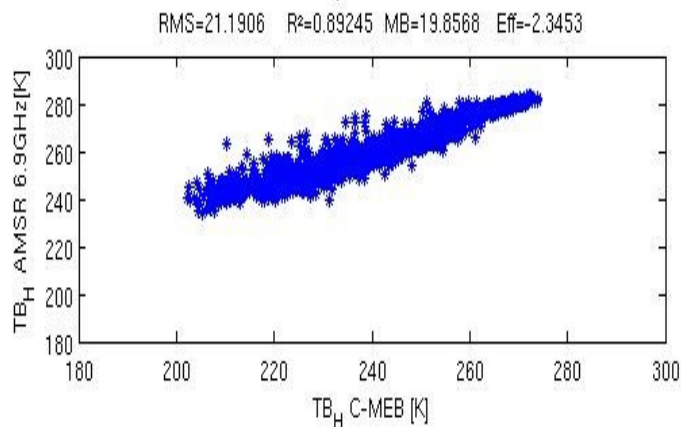
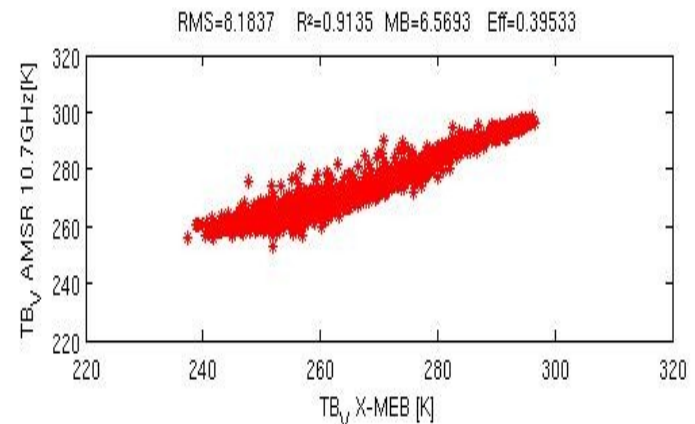


Brightness temperature simulated at C (6.9 GHz) and X (10.7 GHz) band)

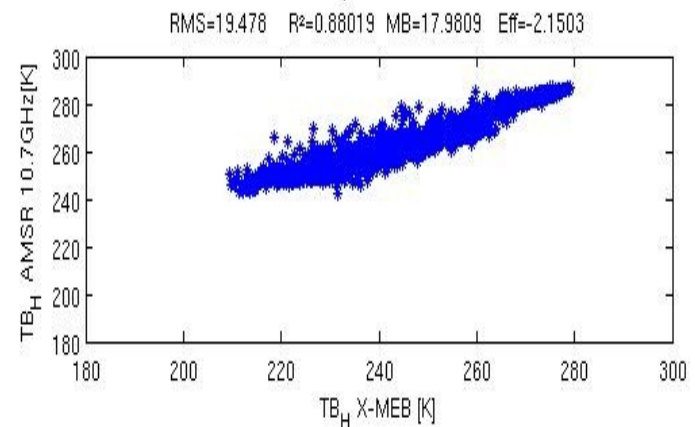
- L-MEB adapted in C-band (C-MEB) and X- band (X-MEB)
- Comparison with remotely sensed data - AMSR-E (Advanced Microwave Scanning Radiometer of the Earth Observing System)
- Parametrisation needs to be fine tuned



C-MEB



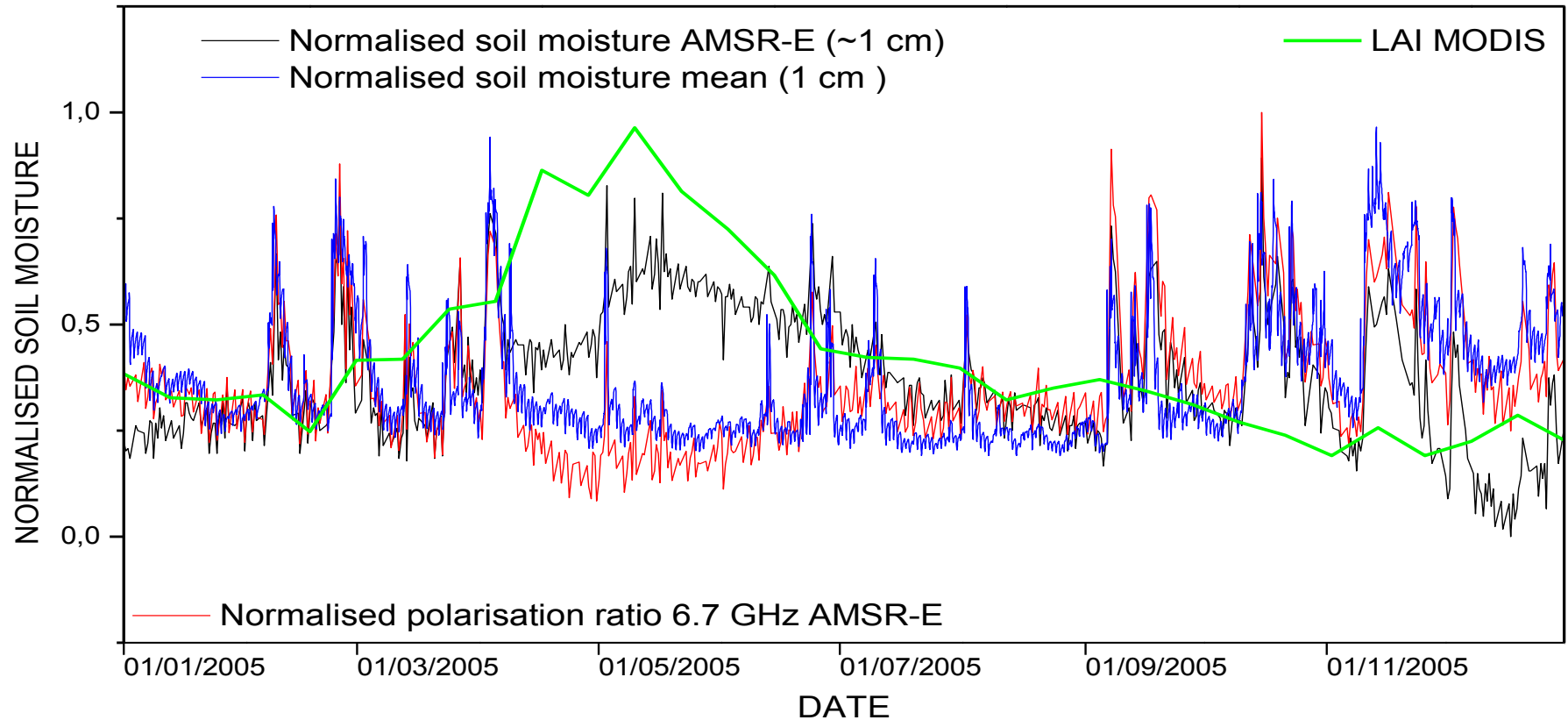
X-MEB



Parametrisation used : T.Pellarin, Y.Kerr - September 2006

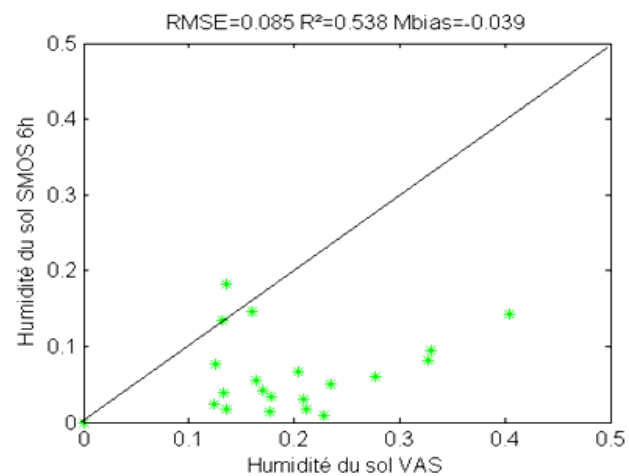
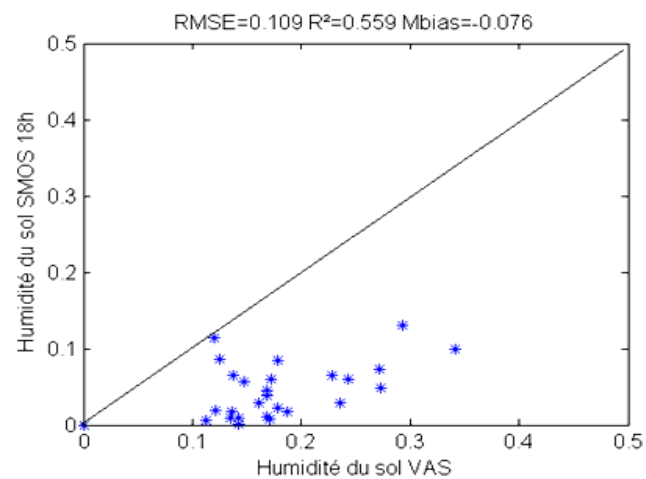
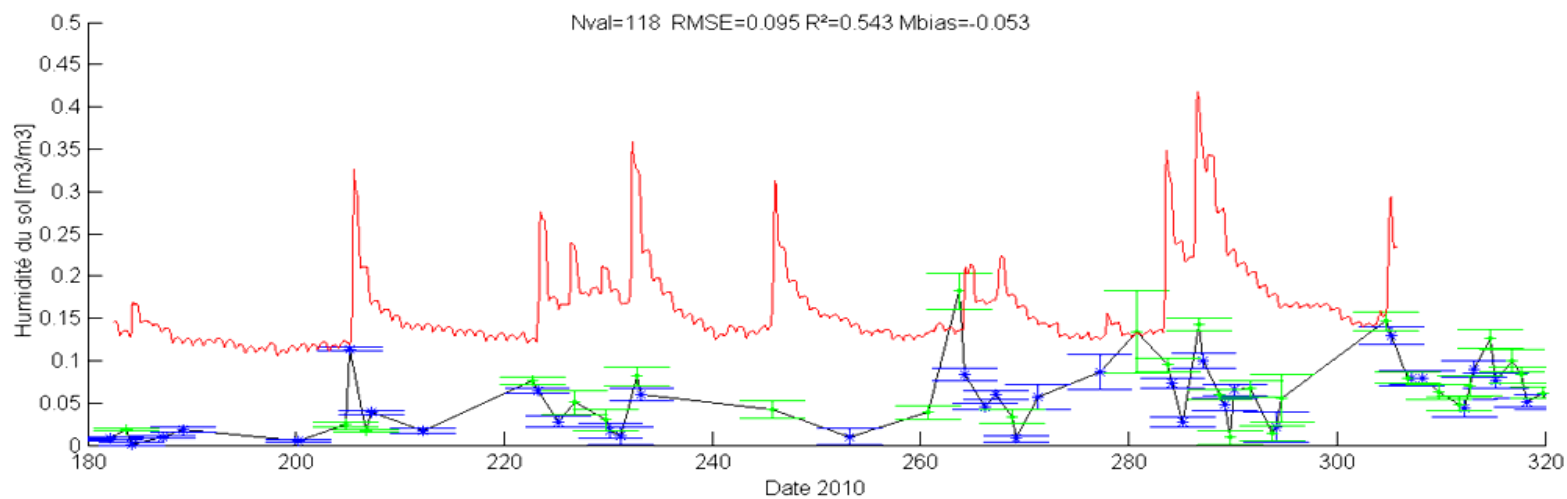


Comparison with AMSR-E





"Validation comparison

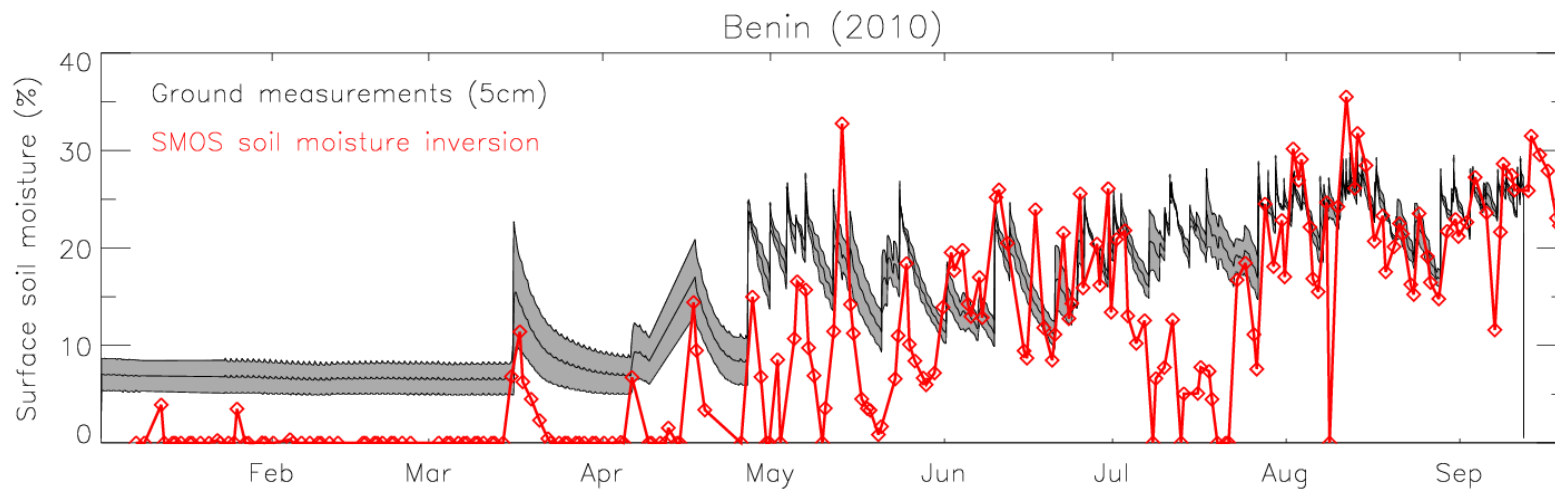
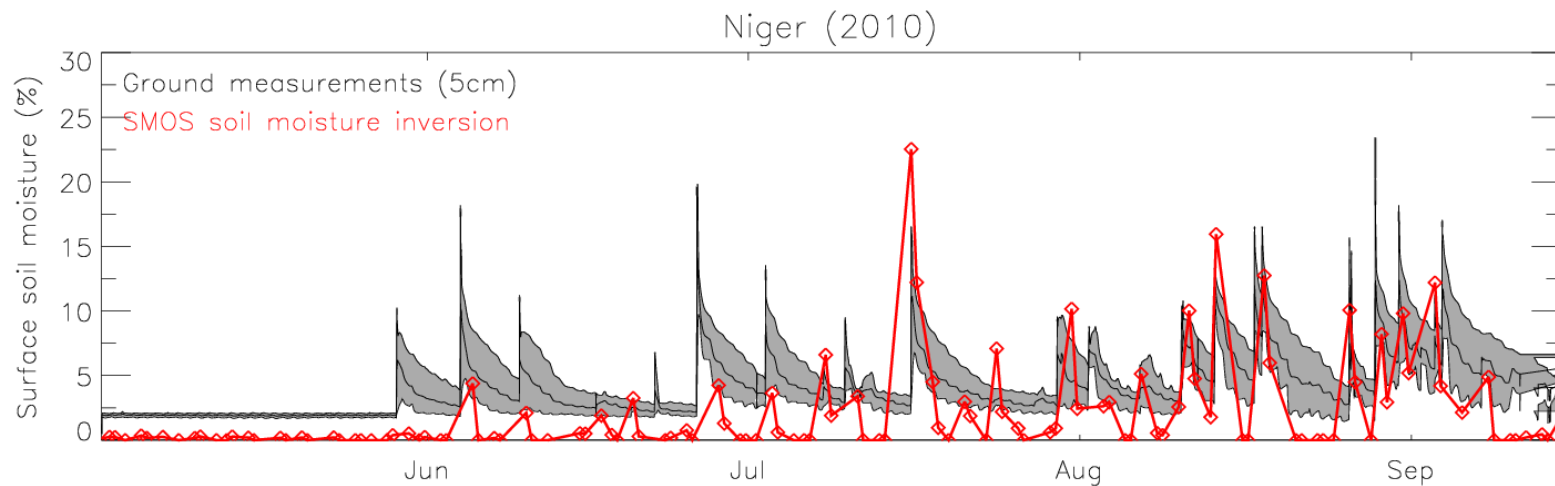




SoilMoisture retrieval AMMA sites



12 SM probes (@-5 cm) in Niger and Benin



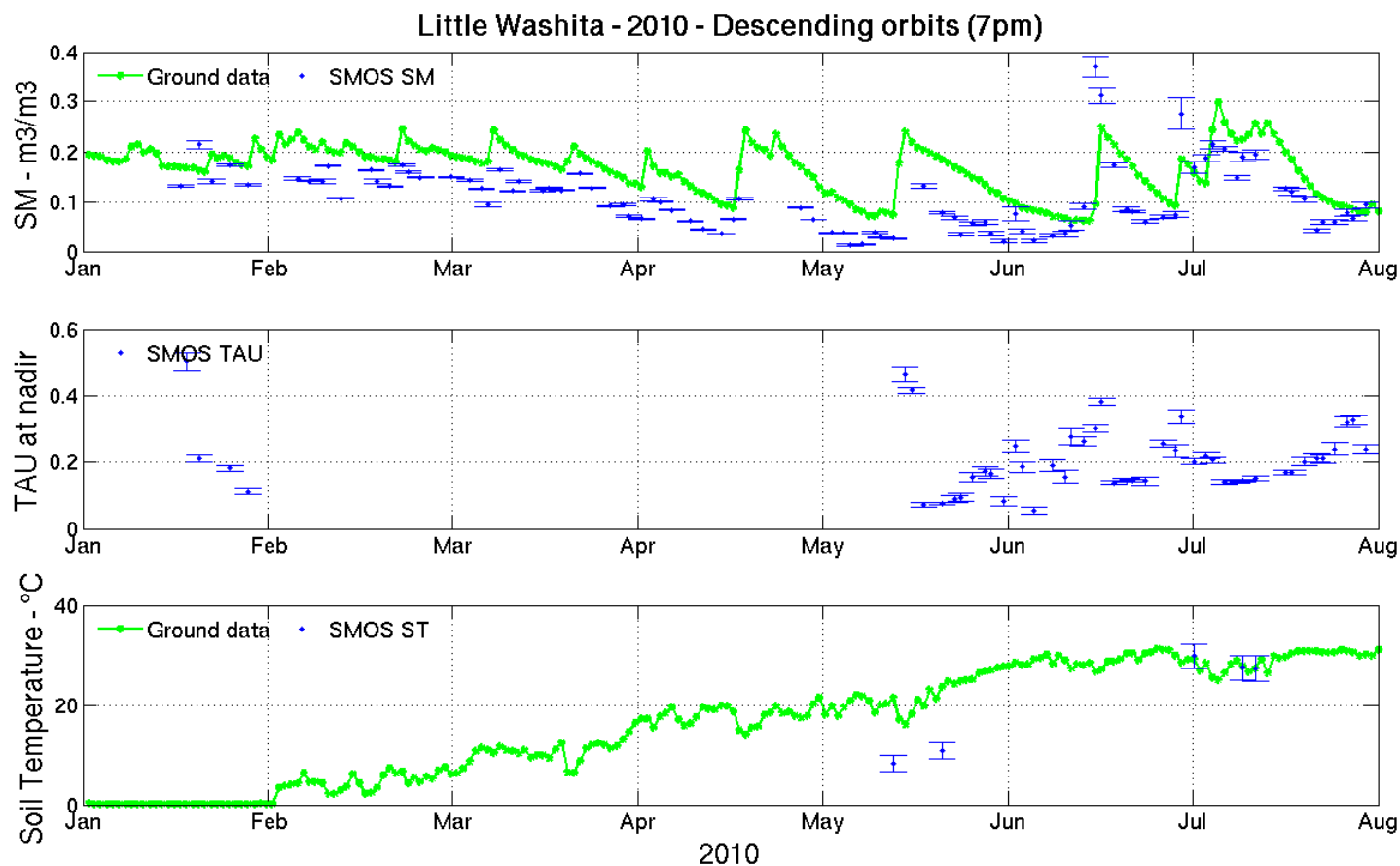
T. Pellarin



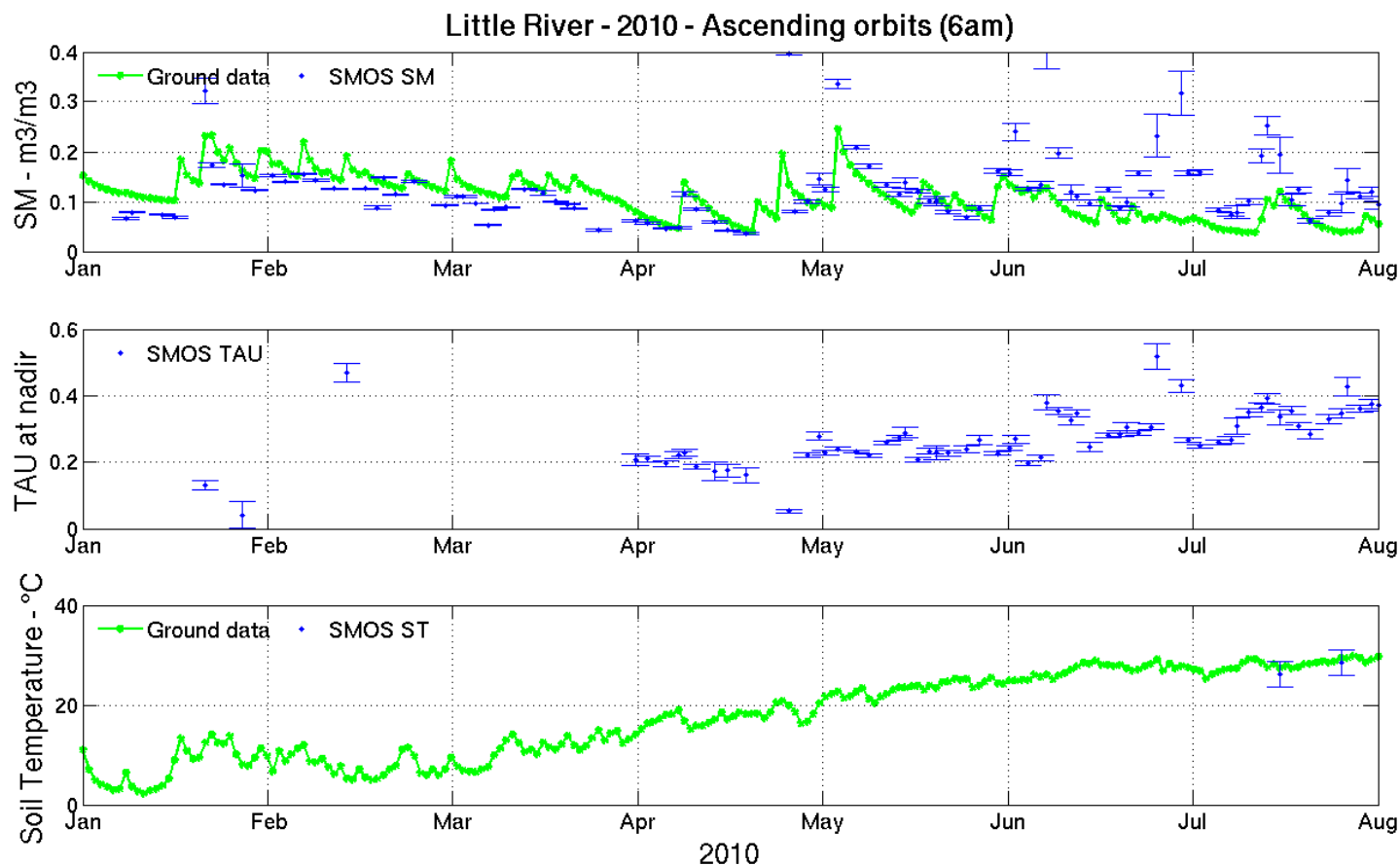
AMSR-E sites

- Well monitored
 - 4 reference sites in the US
 - Rather clean
 - But mean values
-
- T. Jackson, R. Bindlish and D Leroux

Little Washita



Little River





SCAN Sites

- Well selected and monitored
 - Large range of ecosystems
 - Sometimes too good to be true!
-
- A. Albitar, A. Sahoo

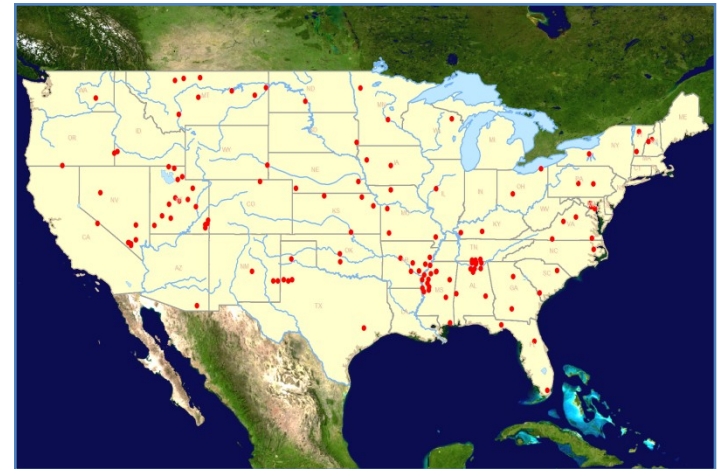


Location of SCAN sites

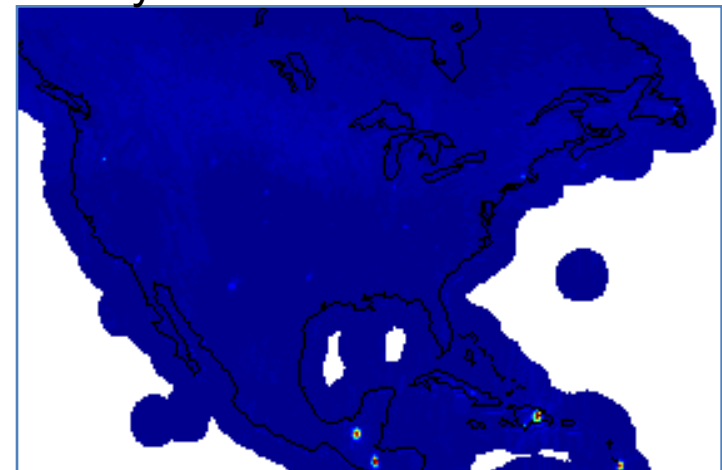
SCAN network:

“The Soil Climate Analysis Network consists of automated remote sites which collect soil moisture and soil temperature data along with precipitation, wind, and solar radiation data. ”

The SCAN products are provided by the National Resource Conservation Service (NRCS) of the United States Department of Agriculture (USDA).



SCAN sites location used for this study

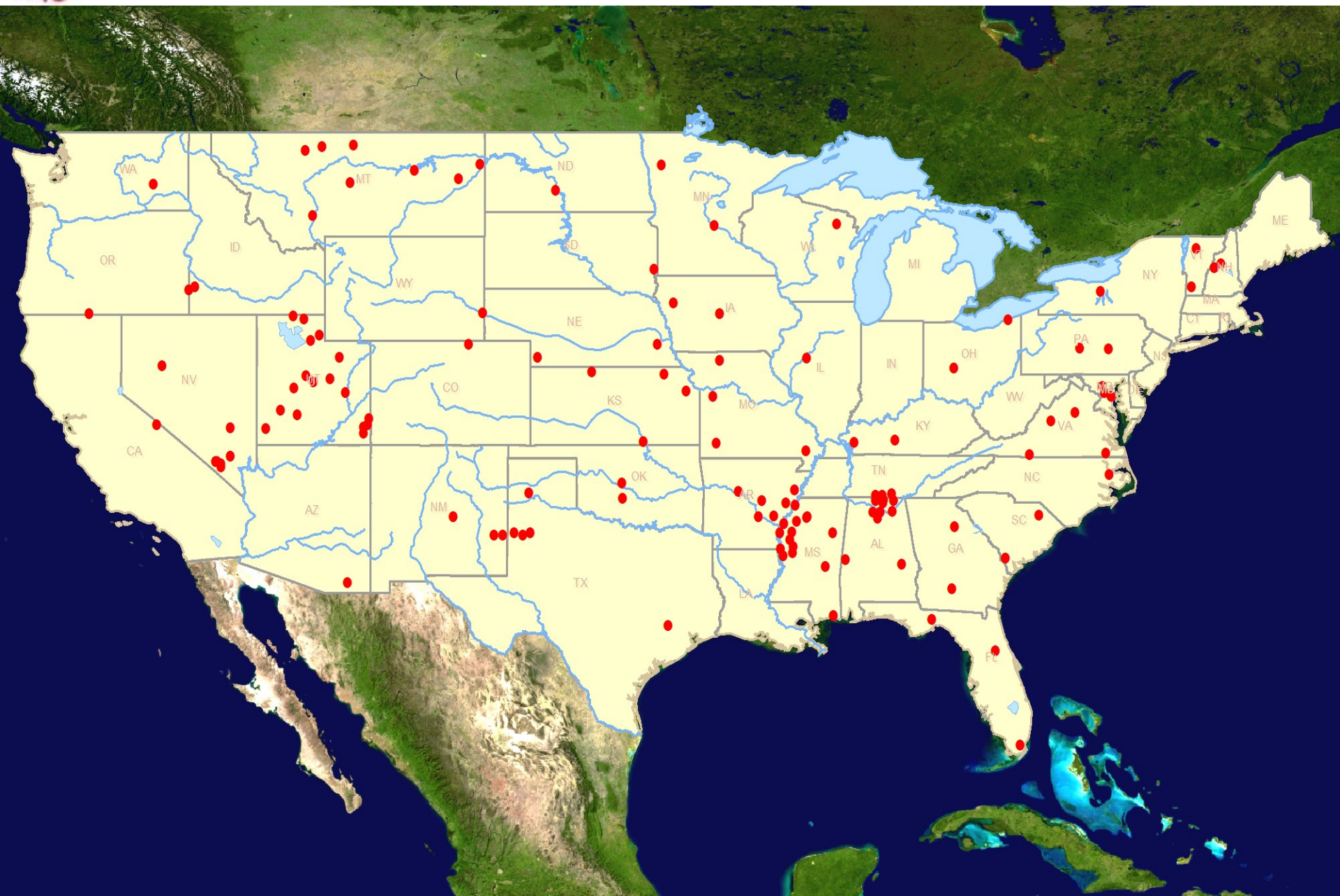


L-Band RFI probability map
(Richaume 2010)

A. Al Bitar

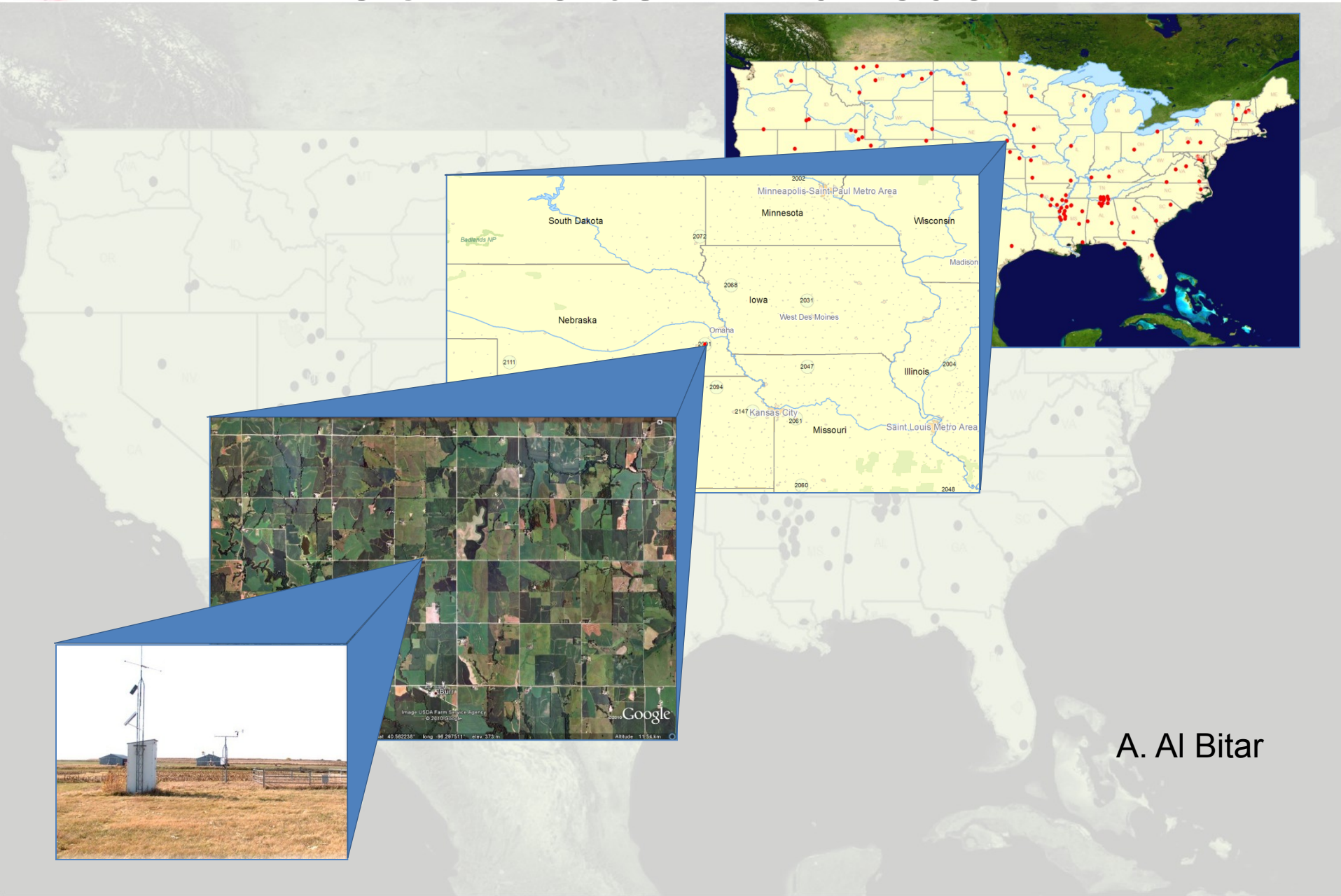


Location of processed SCAN sites





SCAN site in Kansas



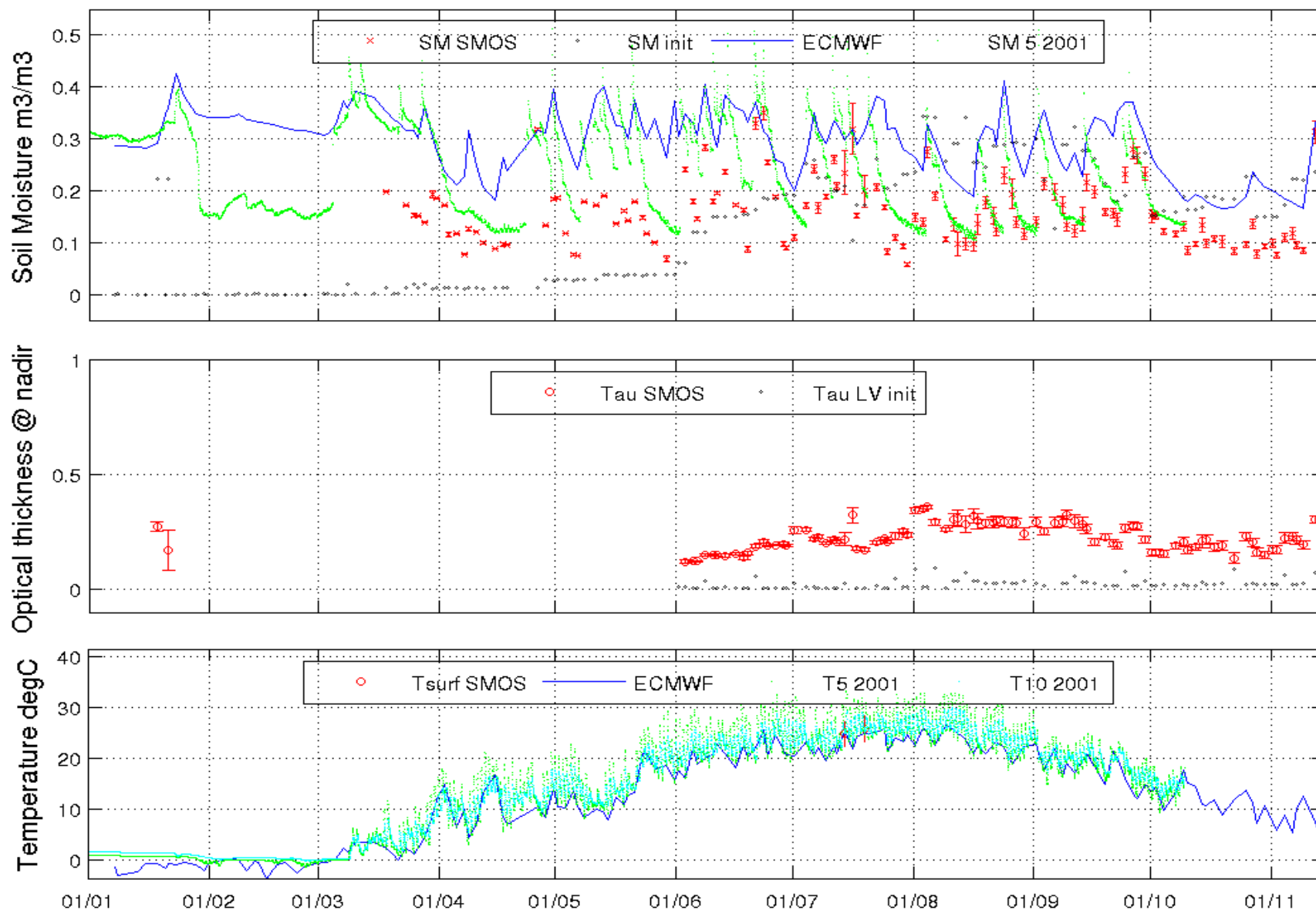
A. Al Bitar

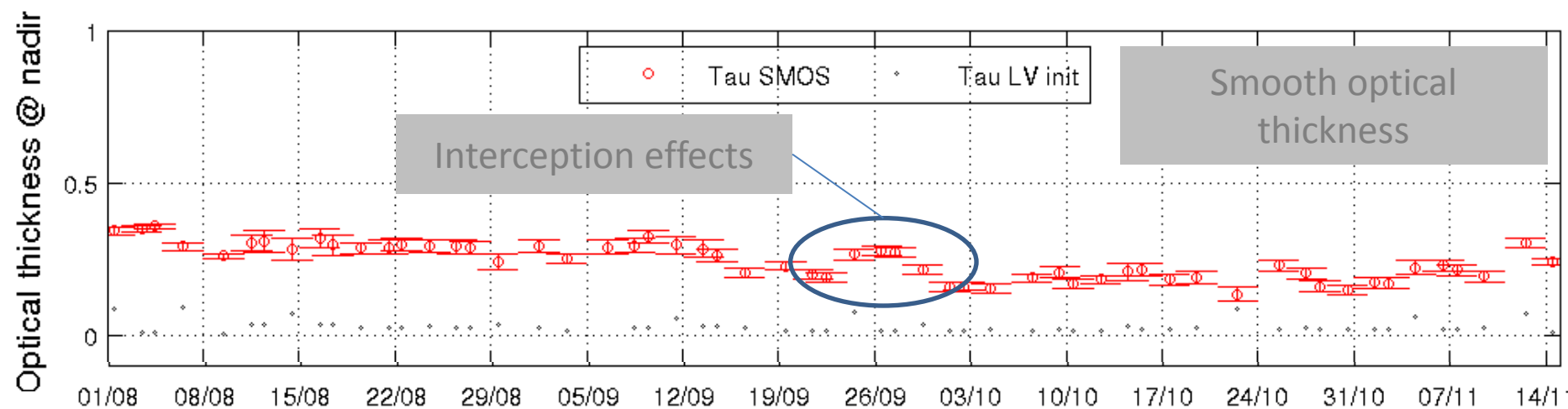
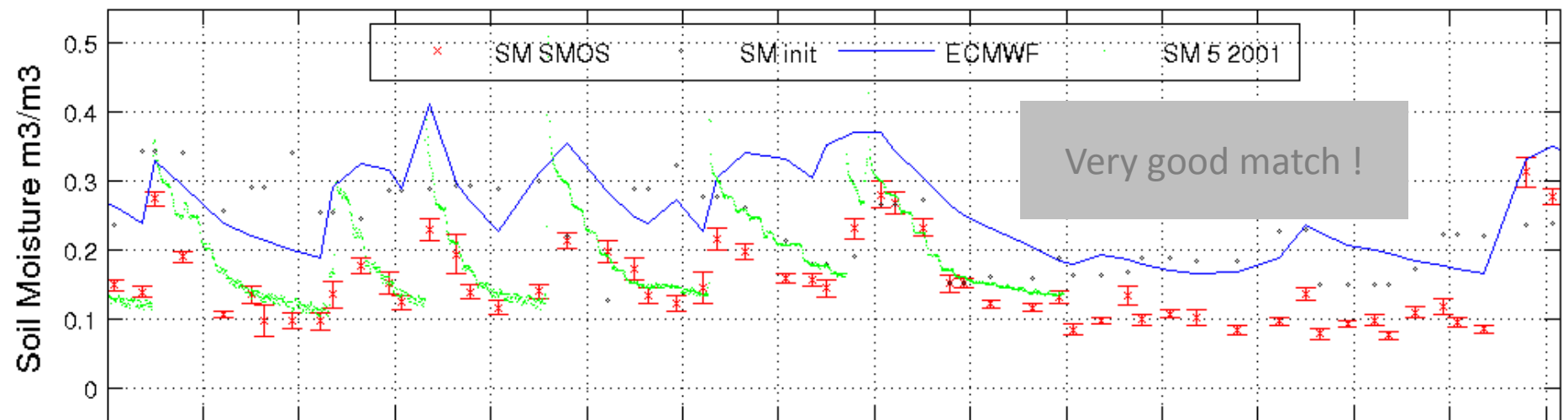


SMOS data since Jan 2010



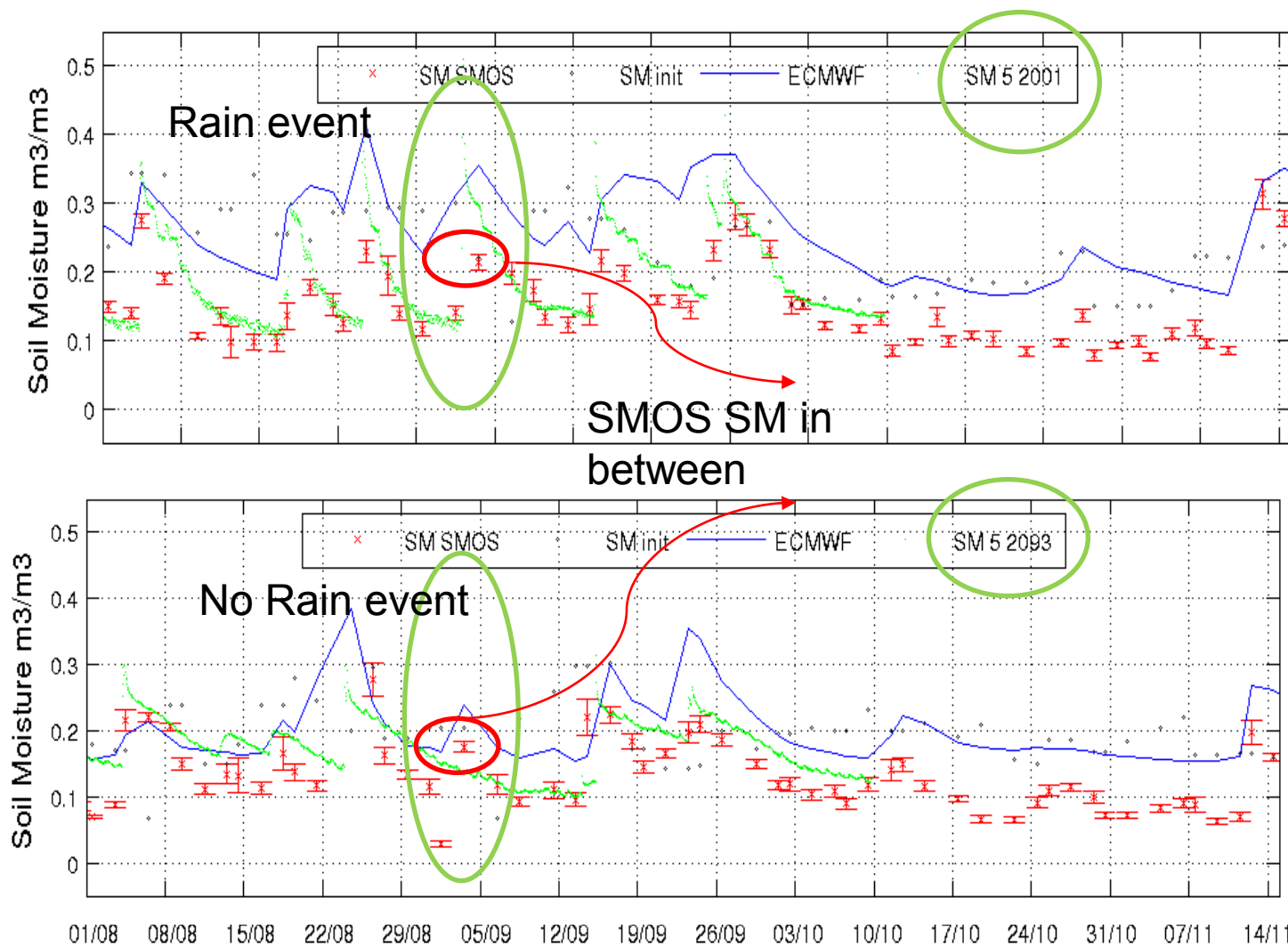
SMOS (SM,Tau,Tsurf) at DGG_204138 vs SCAN site 2001







Limit of a station to DGG comparison



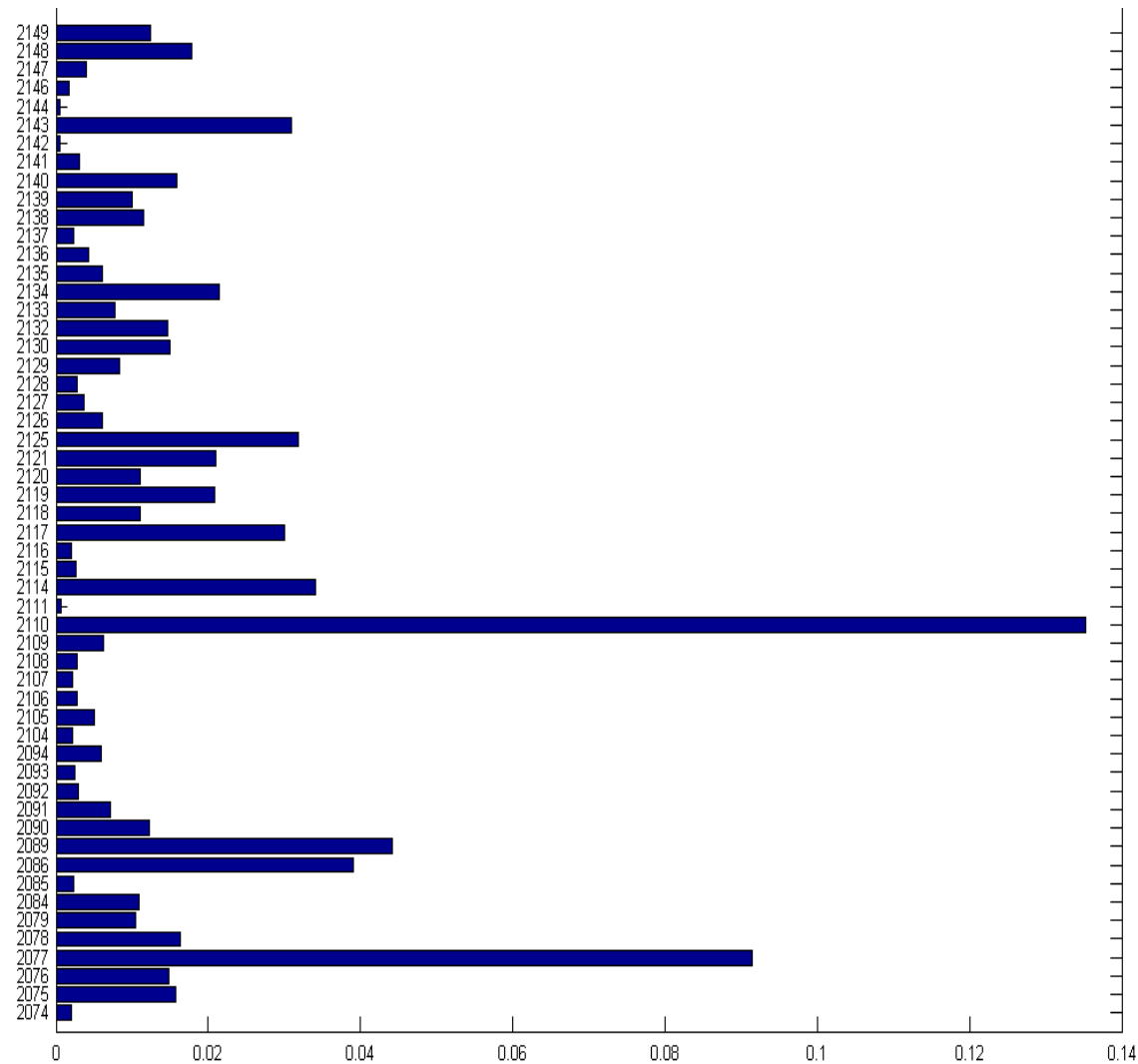
- 2 close SCAN sites in Nebraska
- Rain depicted on one site and not the other
- SMOS data is in between
- Limit of a site to DGG comparison
- Need for disaggregation

A. Al Bitar

RMS (SMOS SM and SCAN SM)



Behaviour in some
Representative
sites



A. Al Bitar

(Preliminary results)



Data Reprocessing

Reprocessing underway

ESA → up to level 1 only!

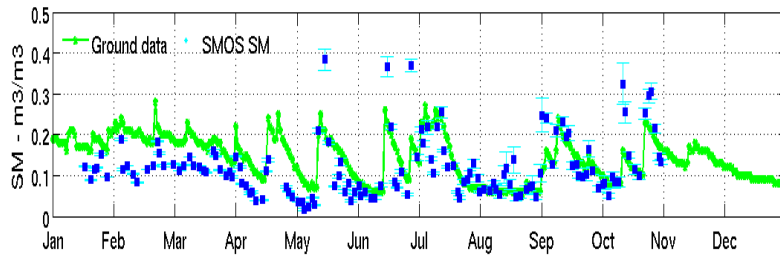
CESBIO → SM done up to October 2010

Data dissemination → an issue

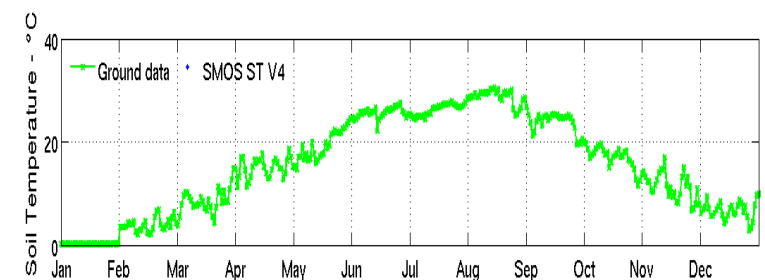
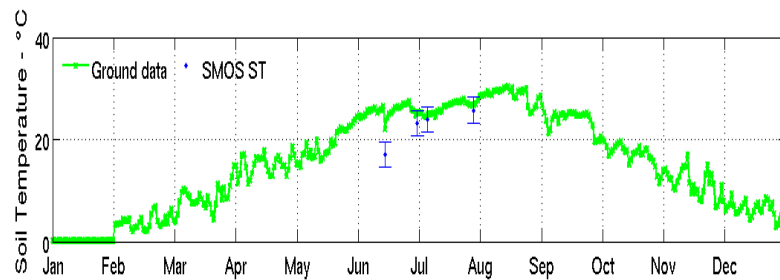
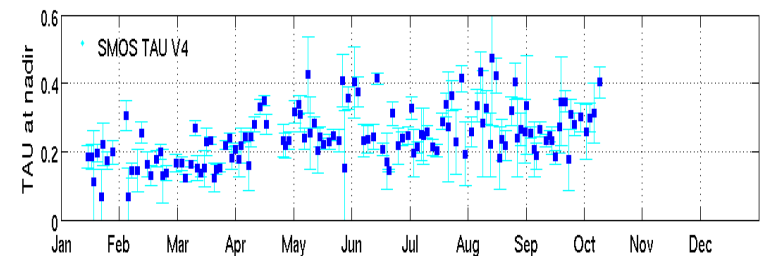
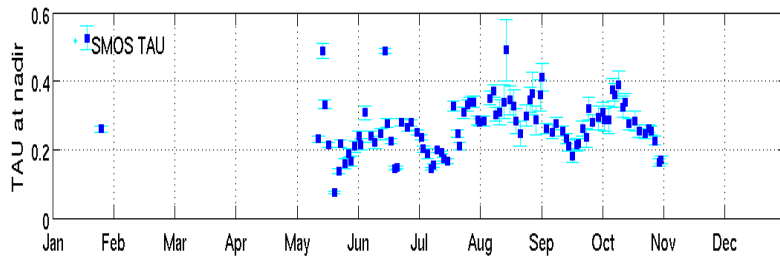
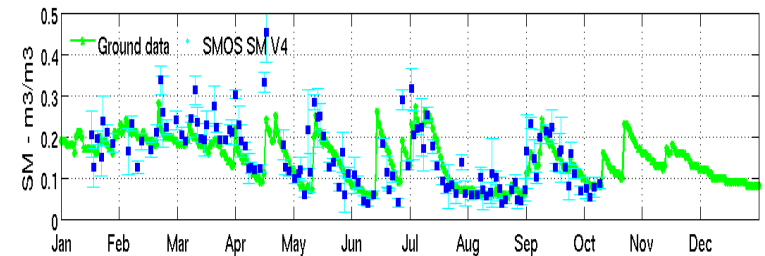
First results

Little Washita

Little Washita - 2010 - Ascending orbits (6am)



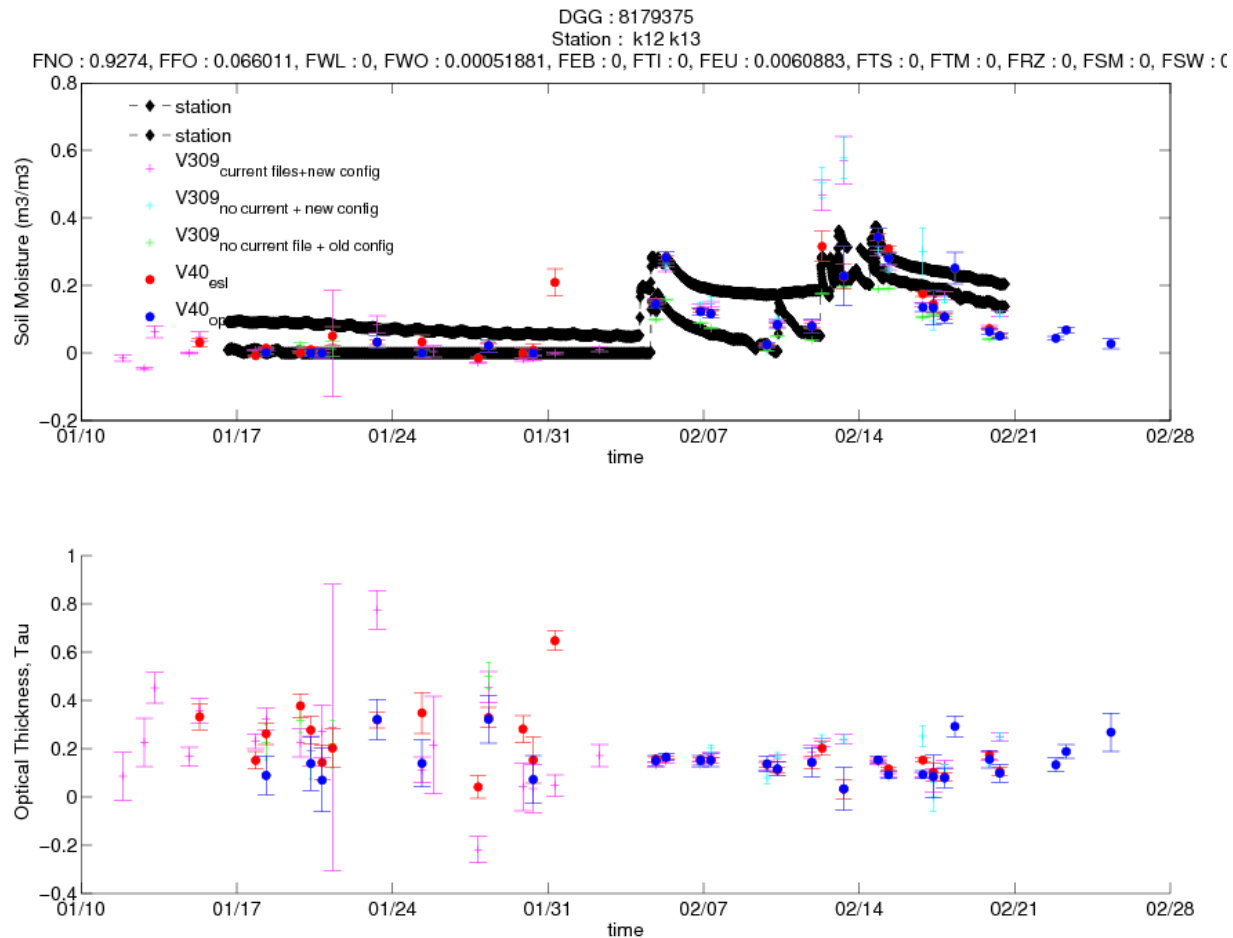
Little Washita - 2010 - Ascending orbits (6am)



2010

2010

Australia (AACES)





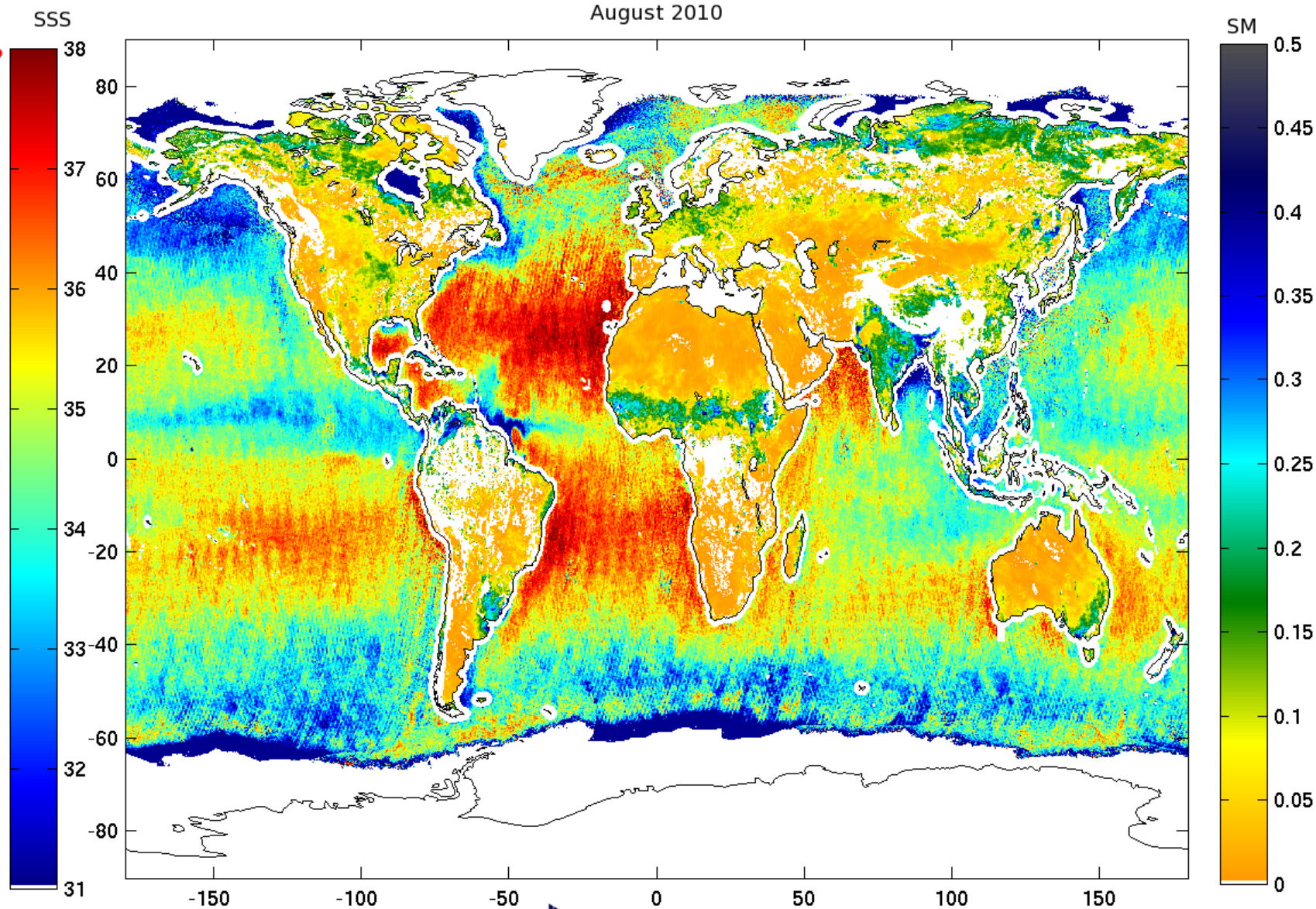
Summary

- SMOS Cal Val still underway
- Issues with
 - Ground data
 - SMOS Calibration
 - Reprocessing
- But still several hurdles and issues to be solved
- Issues
 - RFI
 - drifts and calibration
 - Too low SM
 - SSS with OTT
- See also
 - Our Blog → http://www.cesbio.ups-tlse.fr/SMOS_blog/



http://www.cesbio.ups-tlse.fr/SMOS_blog/

August 2010



Ifremer



CATDS
Centre Aval de Traitement des Données SMOS

