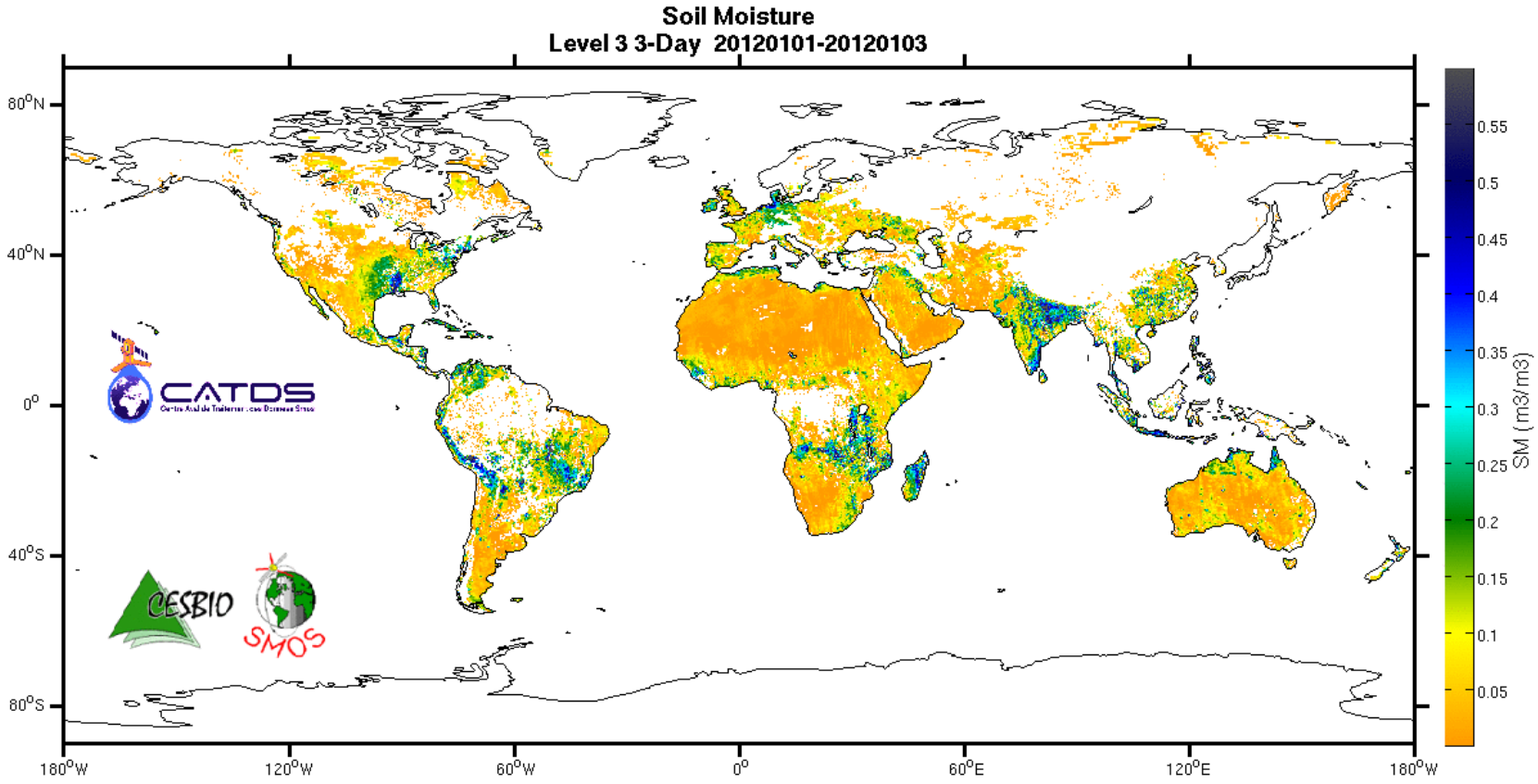
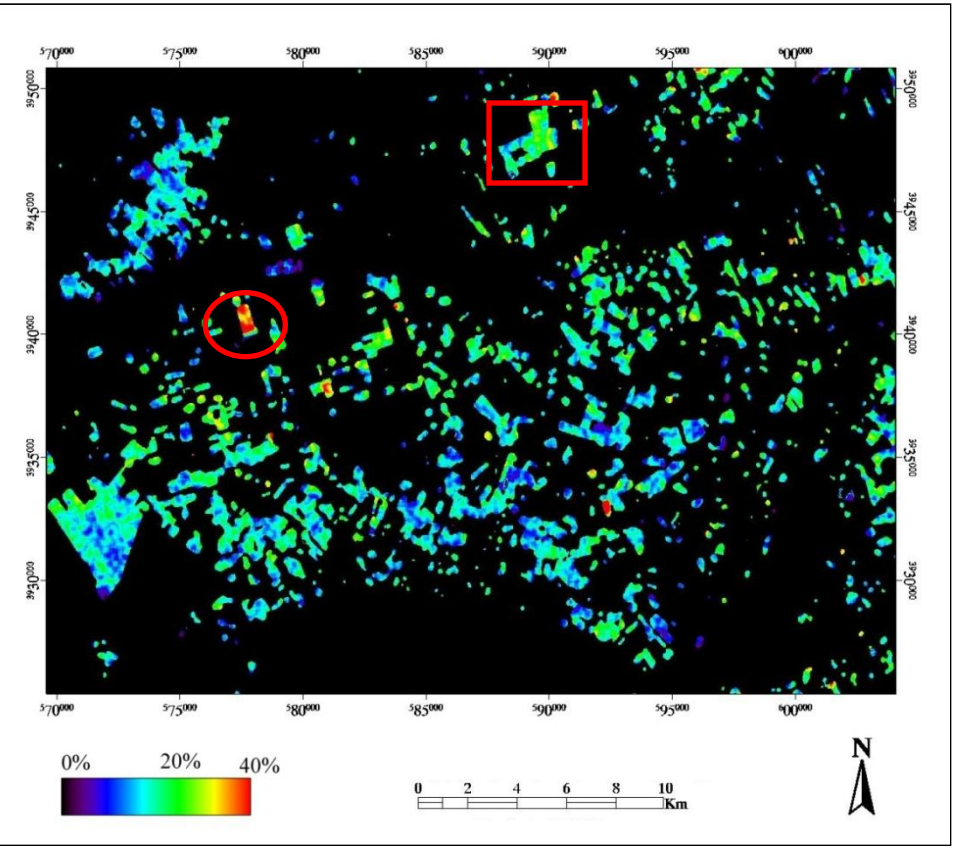

Soil Moisture
Level 3 3-Day 20120101-20120103
80°N
40°N
0°
40°S
80°S
180°W
120°W
60°W
0°
60°E
120°E
180°W
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
SM (m3/m3)
CATDS
CESBIO
SMOS

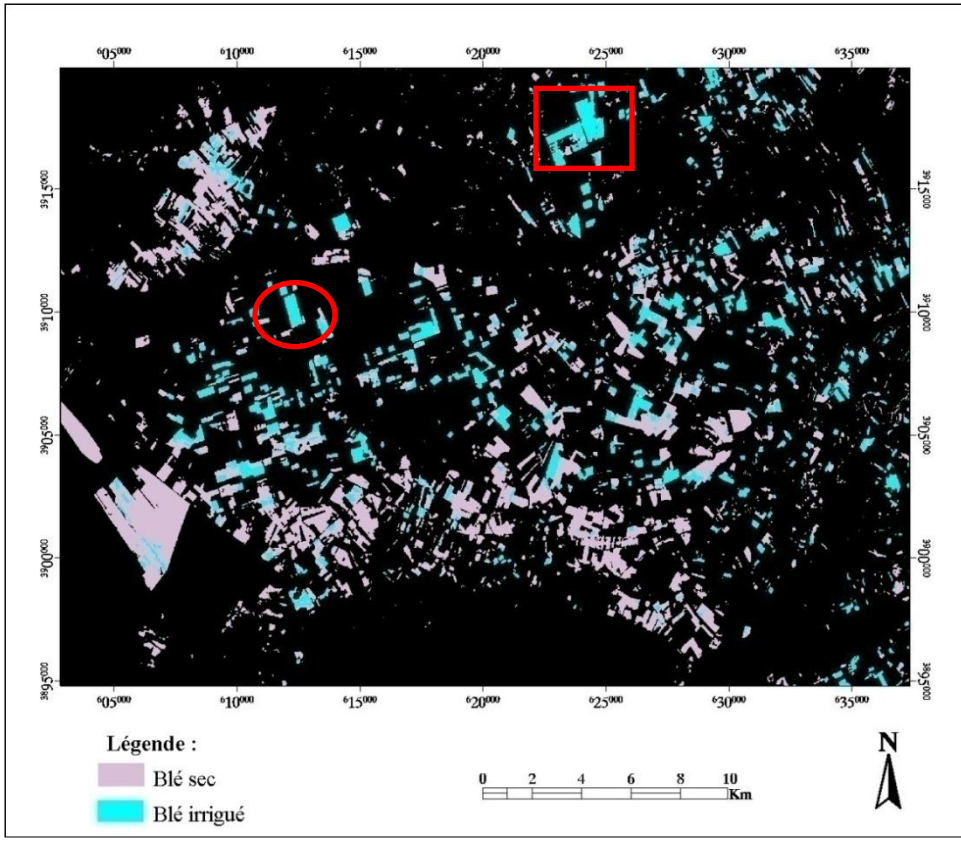
Layout

- Différentes approches
  - Actif
  - Passif
  - Actif Passif
  - Multi-capteurs
- Cal Val
- Produits dérivés

Cartographie de l'humidité du sol

Irrigation. Parcelles de blé (ASAR HR)





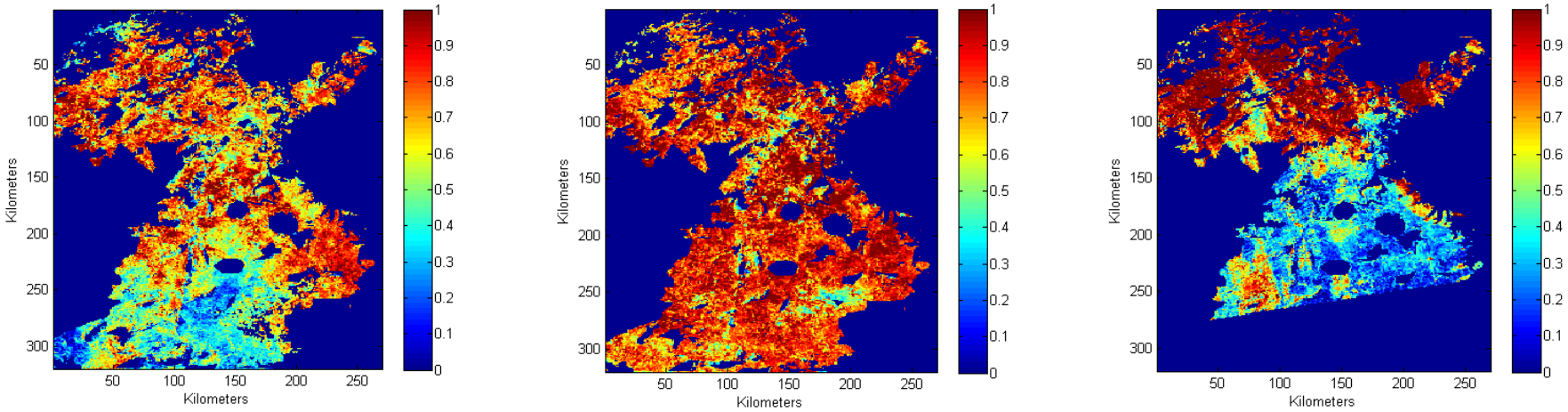
Carte d'Humidité pour blé sec et irrigué du 07/03/2009 (date sèche)

- Détection de l'irrigation + suivi de l'évaporation (résolution: 100m)
- Synergie Radar/optique (SENTINEL1&2), inversion d'un modèle de surface après correction de l'effet de la végétation (Cloud Water Model).

Zribi et al., 2011, HESS

Cartographie de l'humidité du sol

Approche opérationnelle pour préparation Sentinel (ASAR WS)



Produits: ASAR/WS

Résolution: 1km

Approche développée:

- détection de changement (en fonction de la dynamique du couvert végétal)
- prise en compte du couvert végétal à partir des données SPOT-VGT
- application avec une synergie SENTINEL1&2

M. Zribi, F. Kotti, W. Wagner, R. Amri, M.Shabou, Z, Lili-Chabaane, N. Baghdadi, ***2014****, Operational soil moisture mapping in a semi-arid region, based on ASAR/Wide Swath satellite data, WRR.*

Passif

- Historique
  - SMMR, AMSR, SMOS, AMSR-2, … SMAP

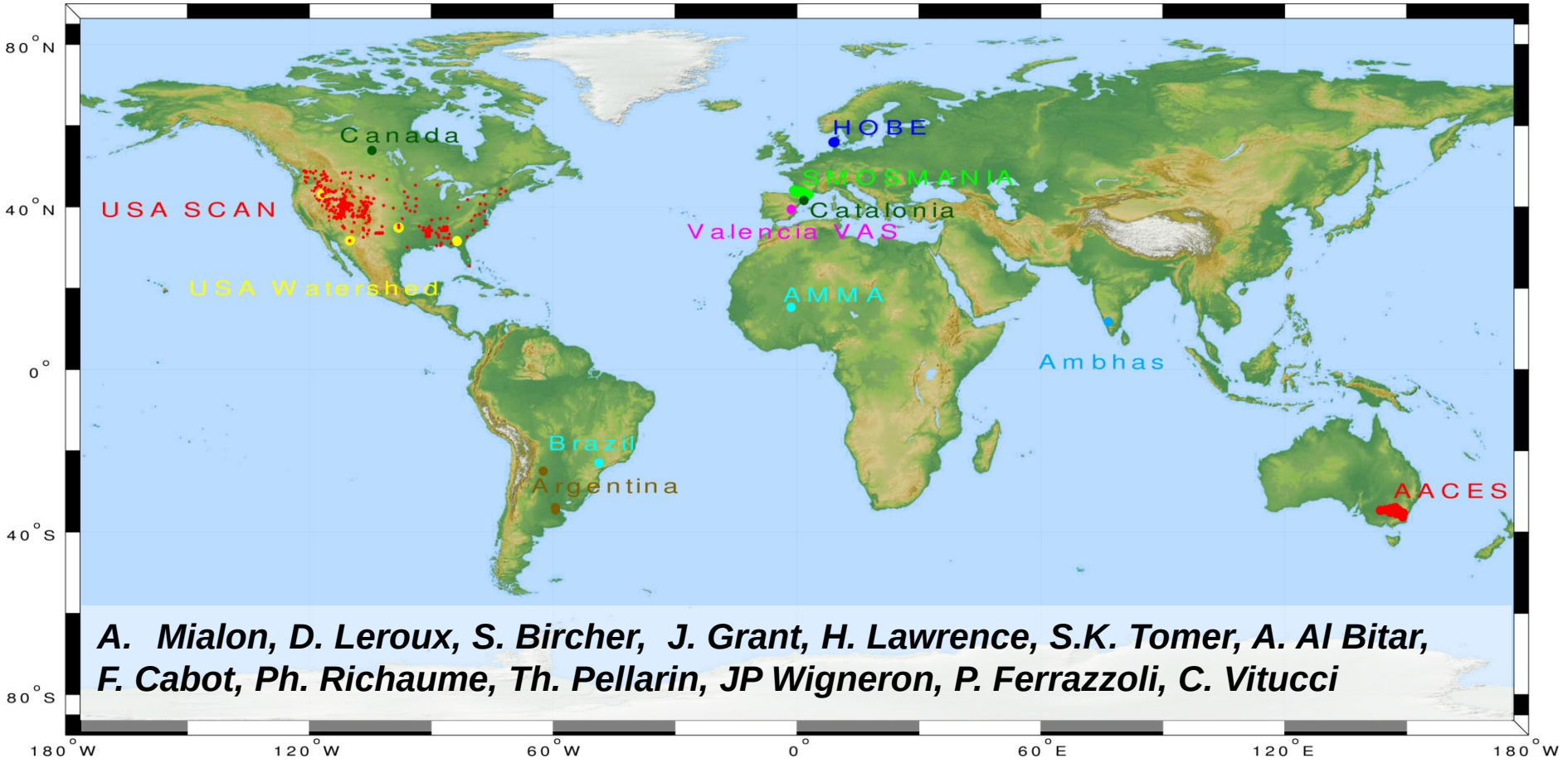
SMOS
Principle and key points

- 2D L band Interferometric fully polarimetric radiometer
- Complete coverage of the globe in less than 3 days at both 6 am and 6 pm and multiangular acquisitions
- 43 km average (real) resolution
- Estimates of
  - Soil moisture, Vegetation opacity
  - Sea surface salinity
  - Wind speed (Hurricane)
  - Thin sea ice
  - drought, RZM
  - .....
- Launched november 2 2009

Passif

- Historique
  - SMMR, AMSR, SMOS, AMSR-2, … SMAP
- Pros and cons
  - - Résolution spatiale
    - Dis aggregation
  - + resolution temporelle
  - + qualité estimation à basse fréquence
  - + cal val “globale”

Cal val : Many in situ datasets

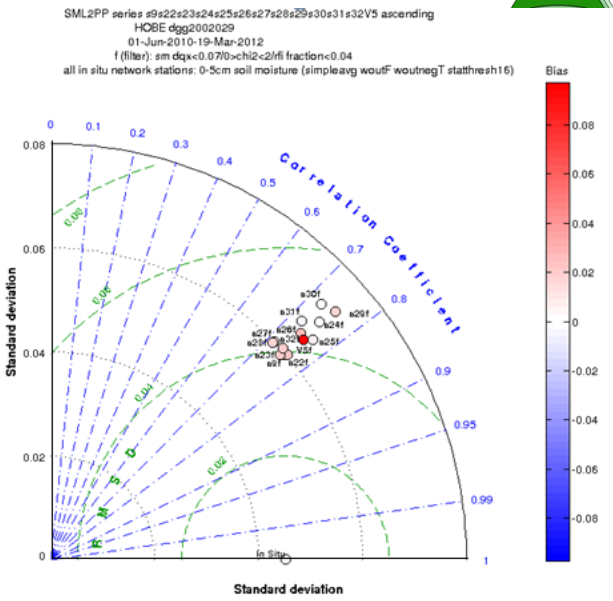


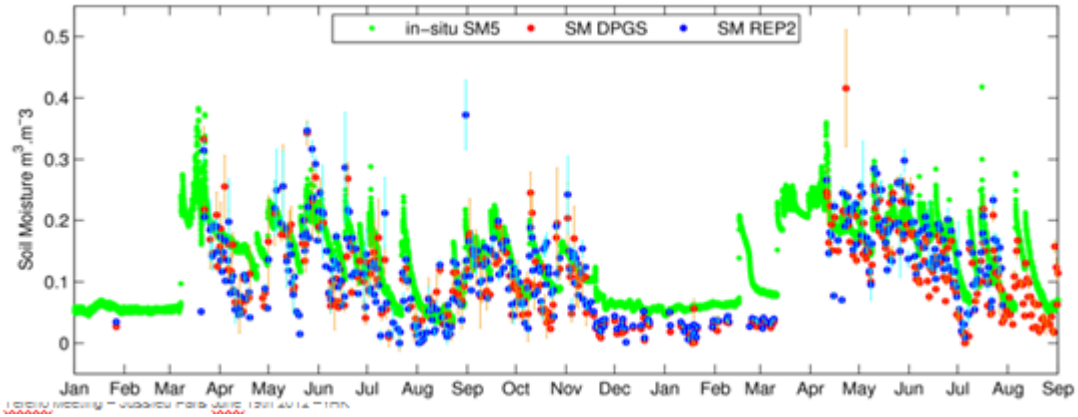
A. Mialon, D. Leroux, S. Bircher, J. Grant, H. Lawrence, S.K. Tomer, A. Al Bitar, F. Cabot, Ph. Richaume, Th. Pellarin, JP Wigneron, P. Ferrazzoli, C. Vitucci

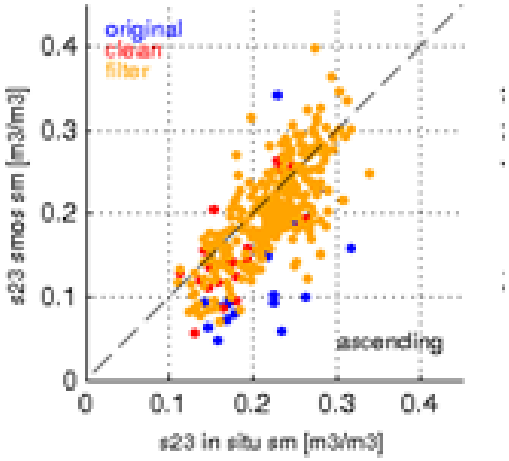
Collaborations : T. Jackson, R. Bindlish, E. Lopez, M. Sekhar, J. Walker, C. Rudiguer, E. Wood

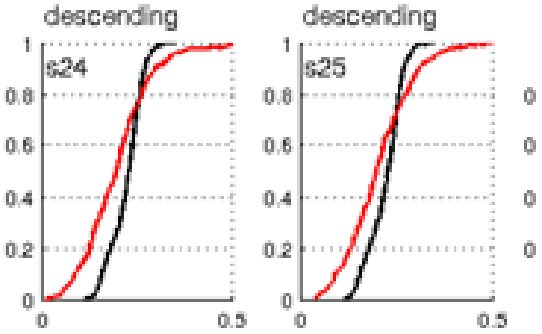
What do we need?

- Some common sense first
- Some reliable and characterised in situ data
- A panoply of tools
- Some mastering of statistics
- And …. a close look

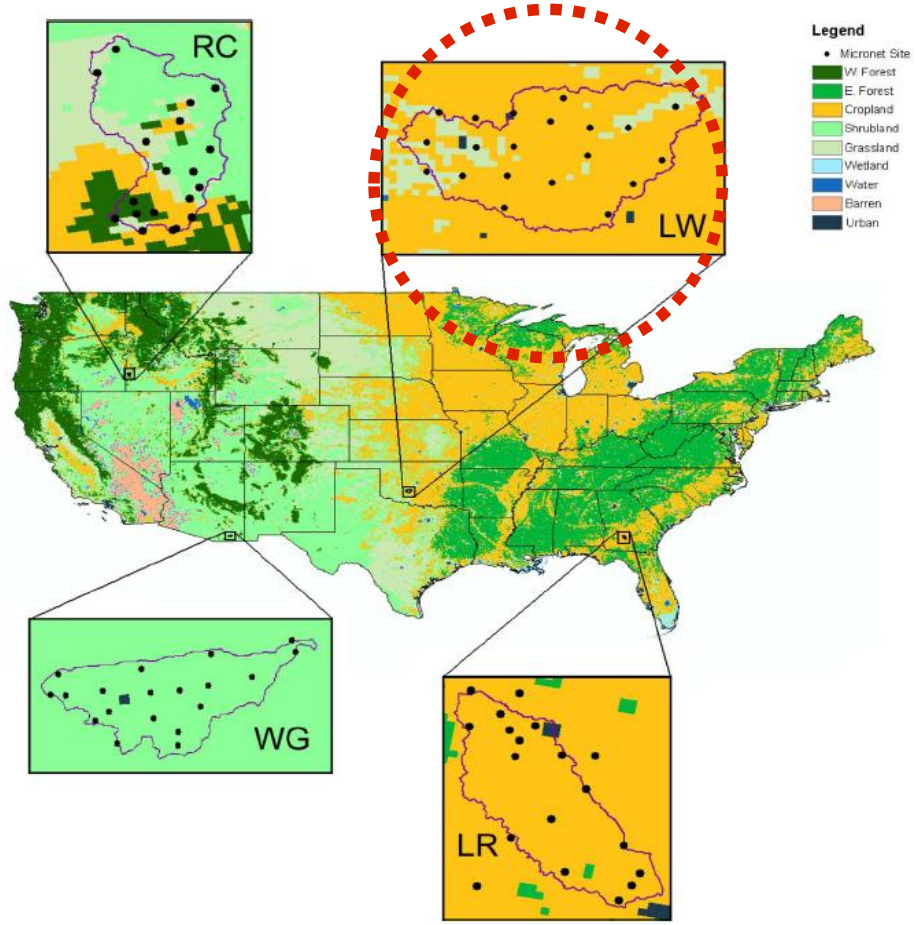








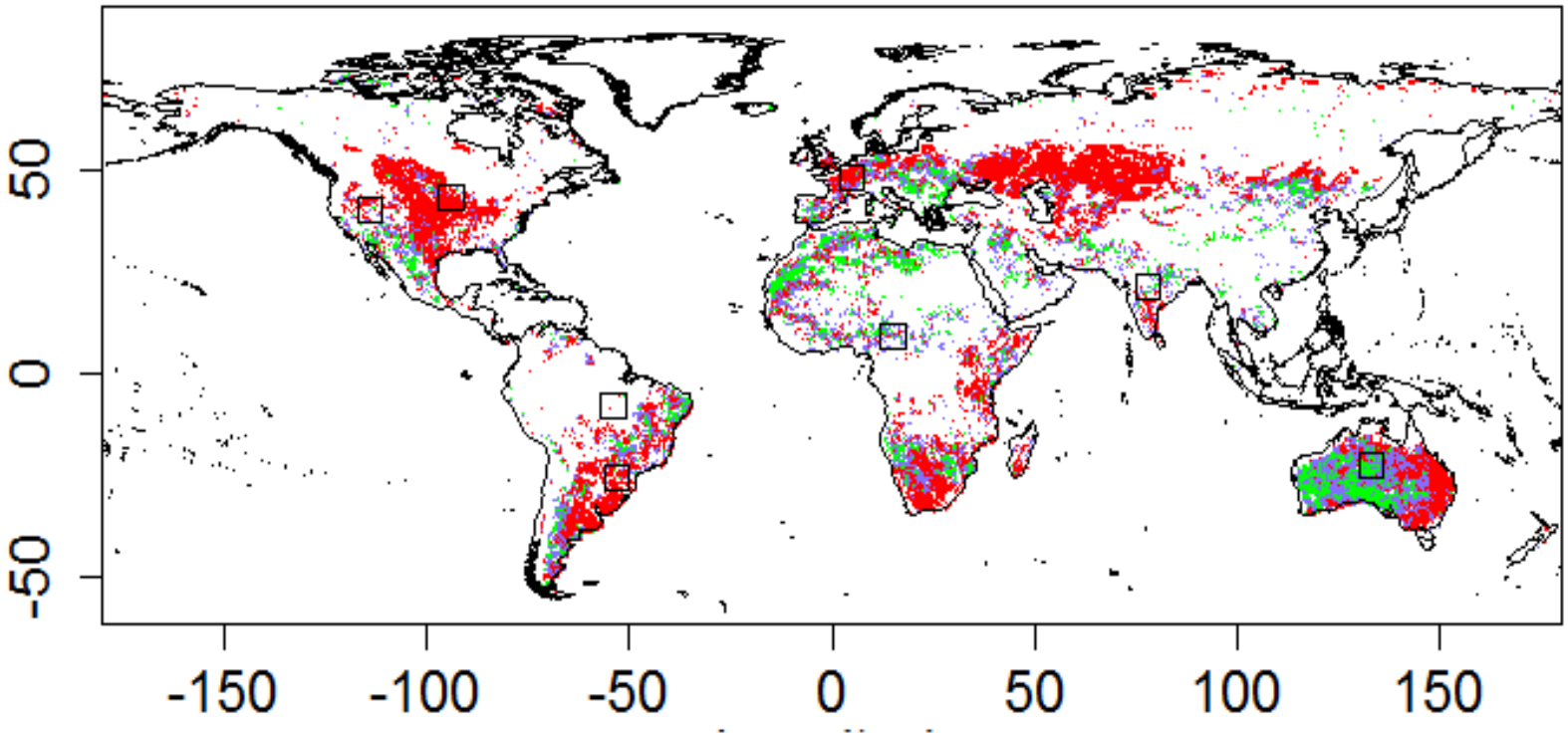
Little Washita



Climate : sub humid
Topography : rolling
Land use : range, wheat

Jackson et al., Validation of AMSR soil moisture products, IEEE Transactions on Geoscience and Remote Sensing, vol. 48, 2010.

Global Comparison between SMOS-L3 and AMSR surface soil moisture with SSM calculated by SM-DAS-2 .



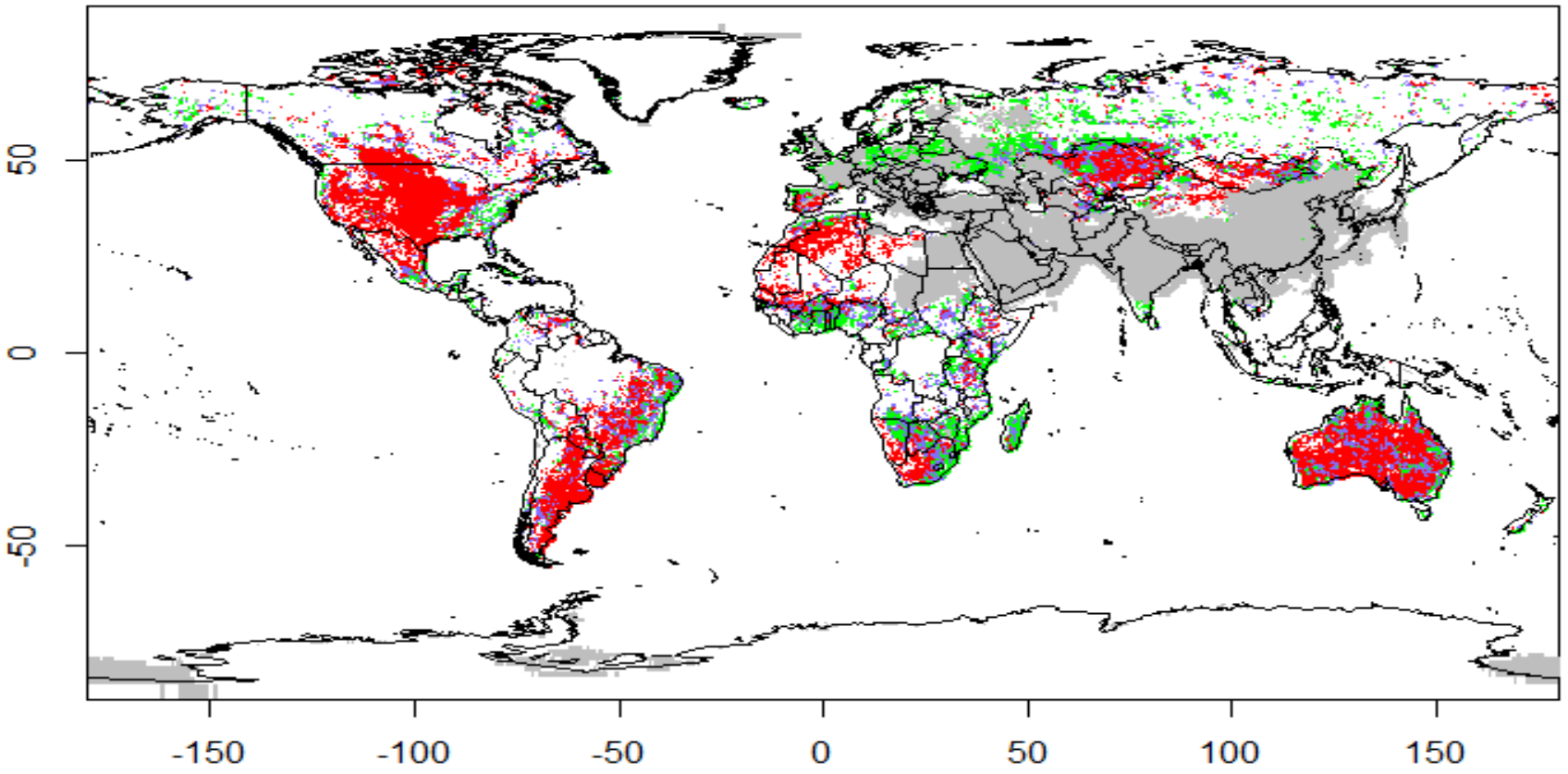
SMOS

correlates better to SM-DAS-2

AMSR

R coeff.
SM Anomalies (34 day window)

Correlation of SMOSL3 and ASCAT SM vs MERRA/land SM product (P value < 0.05) 2010–2012 period (Anomalies)



ASCAT: Global R=0.22
SMOS: Global R=0.29

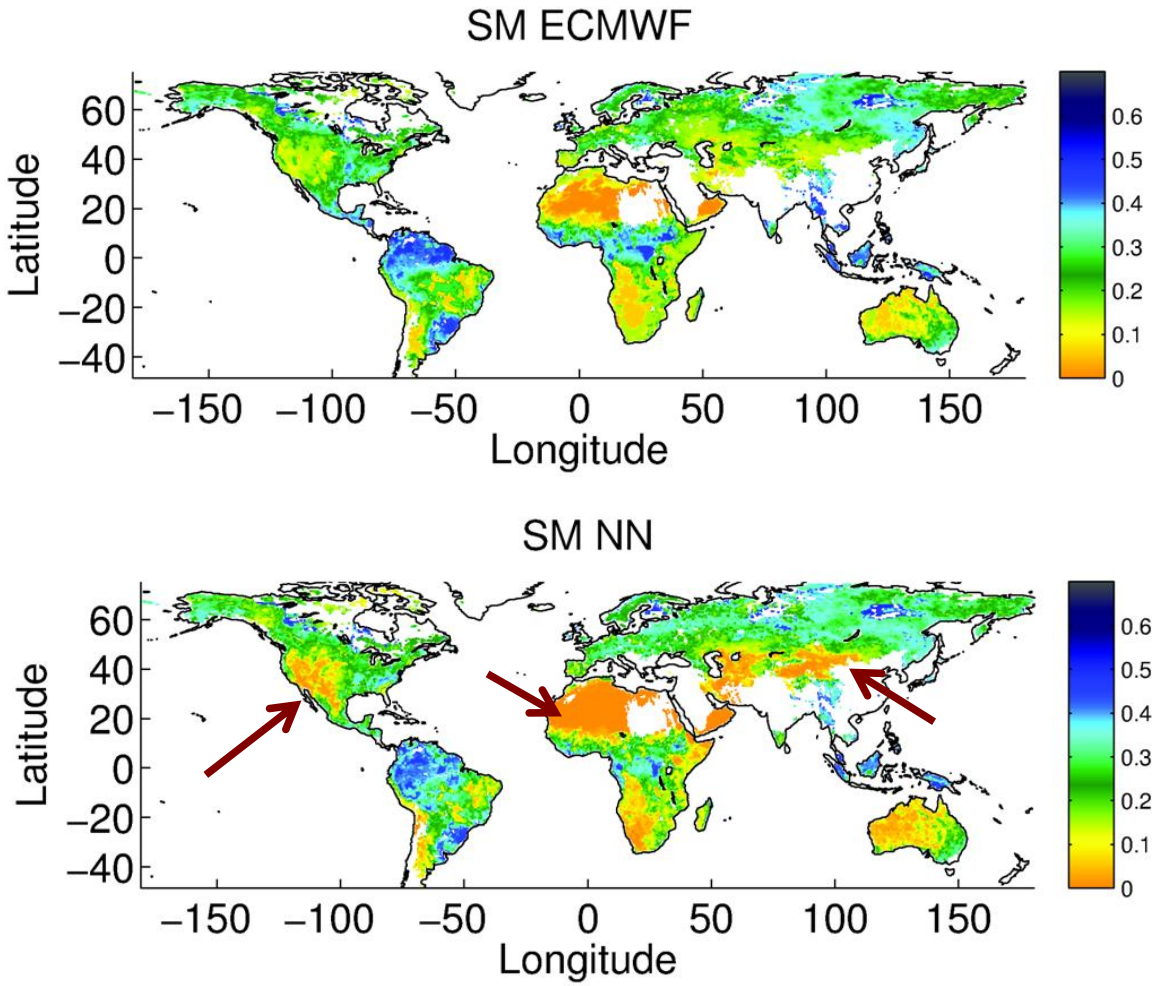
A. Alyaari

Passif

- Historique
  - SMMR, AMSR, SMOS, AMSR-2, … SMAP
- Pros and cons
  - - Résolution spatiale
    - Dis aggregation
  - + resolution temporelle
  - + qualité estimation à basse fréquence
- Production opérationnelle routinière pour SMOS
  - L2 delai 1 jour (ESA)
  - L3 (SM, TB et pseudo L2) → délai jusqu'à 7 jours (CATDS)
  - Produit NRT pour 2015 (avec ECMWF)

NN retrievals

Juillet 2010



- Somewhat drier than ECMWF

Evidence of possitive bias of ECMWF

- Muñoz-Sabater et al. (in prep)
- Albergel et al. 2012

N Rodriguez

Passif

- Historique
  - SMMR, AMSR, SMOS, AMSR-2, … SMAP
- Pros and cons
  - - Résolution spatiale
    - Dis aggregation
  - + resolution temporelle
  - + qualité estimation à basse fréquence
- Production opérationnelle routinière pour SMOS
  - L2 delai 1 jour (ESA)
  - L3 délai 7 jours (CATDS)
  - Produit NRT pour 2015 (avec ECMWF)
- Produits dérivés
  - Humidité zone racinaire
  - Produits désagrégés 100m -1km
  - Indices de sécheresse
  - Estimation des pluies
  - *Estimation des risques d'inondation*
  - *Surfaces en eau libre*
  - …

Root zone soil moisture

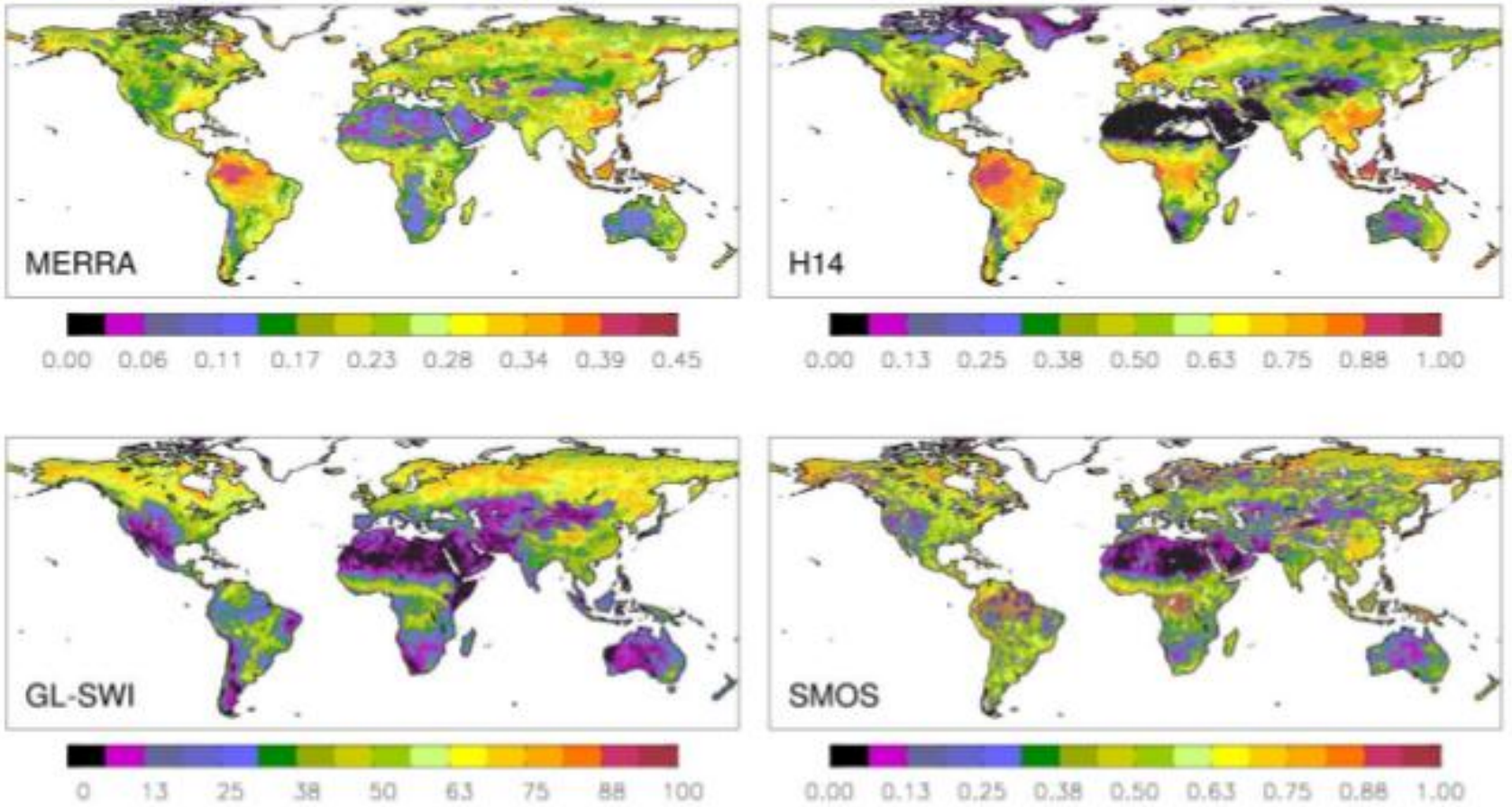
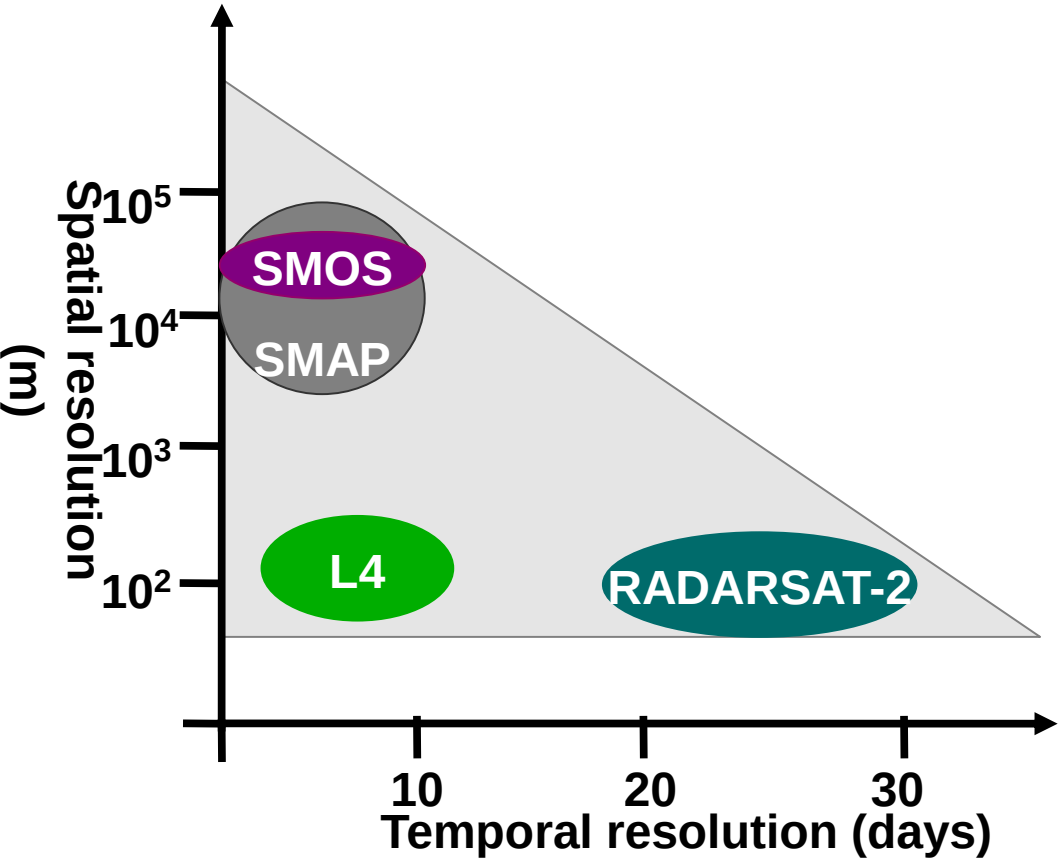


Figure 1: Annual mean root-zone soil moisture maps for MERRA, H14, GL-SWI and SMOS.

Pellarin et al

Active Passive disaggregation (S Tomer)

- **L4: Combined high resolution active and passive Microwave soil moisture product**



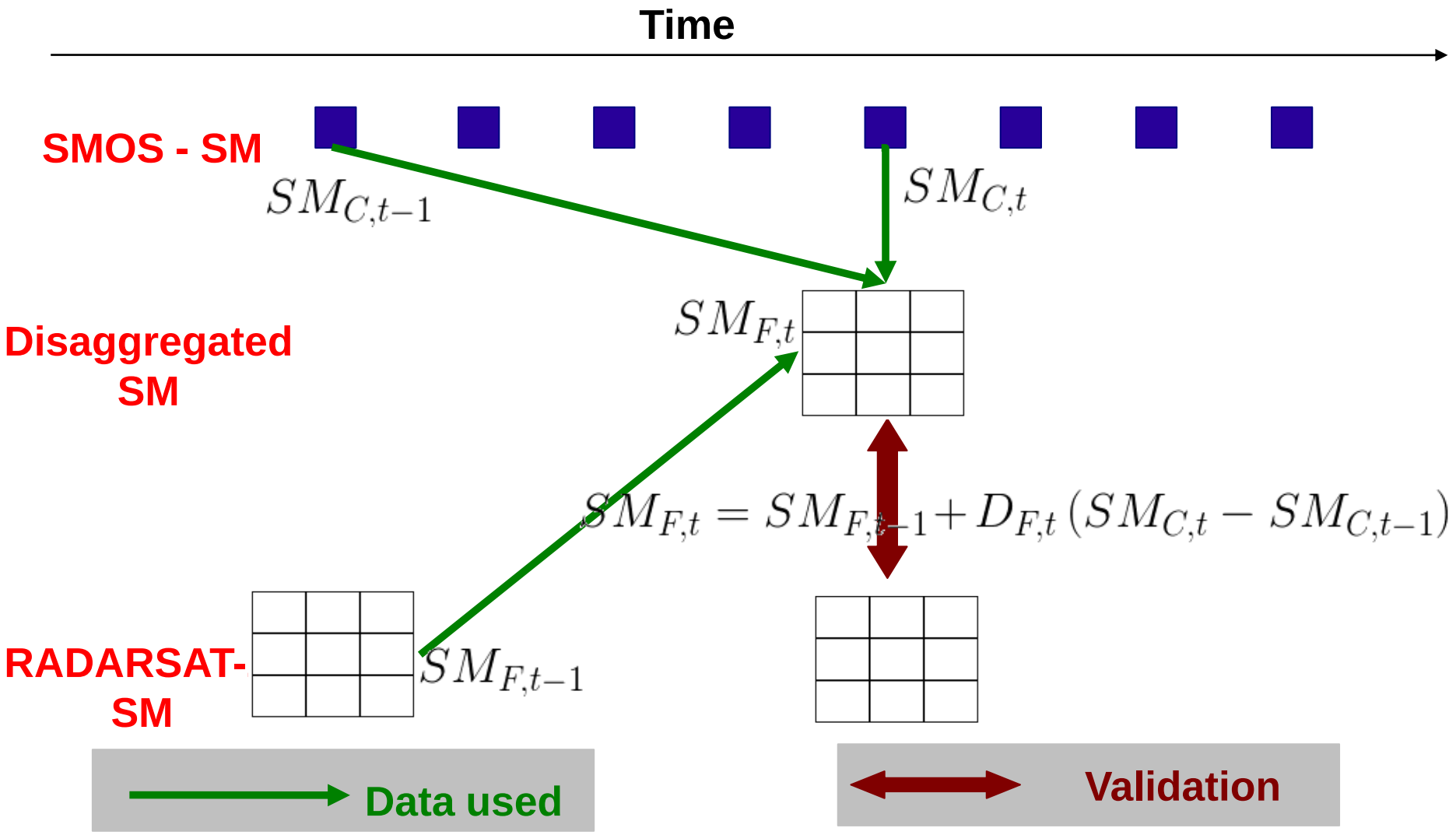
Passive (SMOS)

Spatial res. --> ~25 km
Temporal res. --> ~3 days

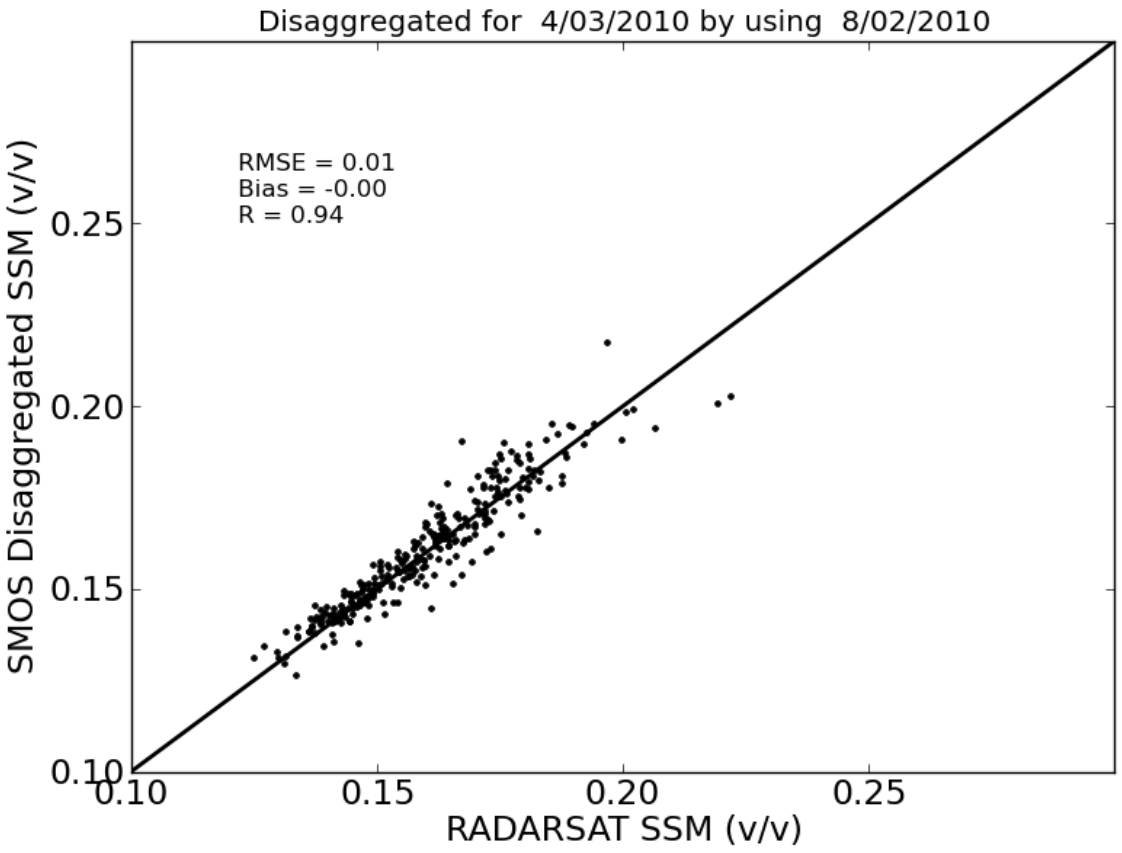
Active (RADARSAT-2)

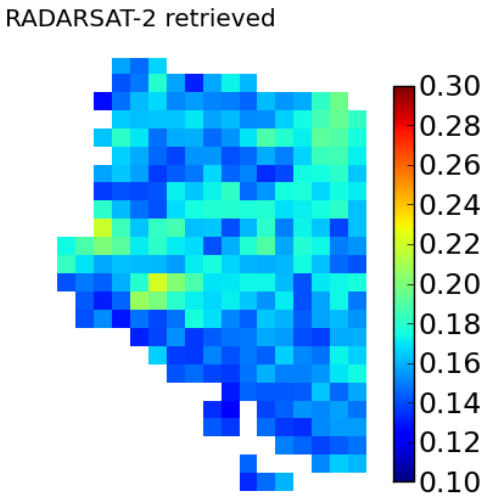
Spatial res. --> ~100m
Temporal res. --> ~24 days

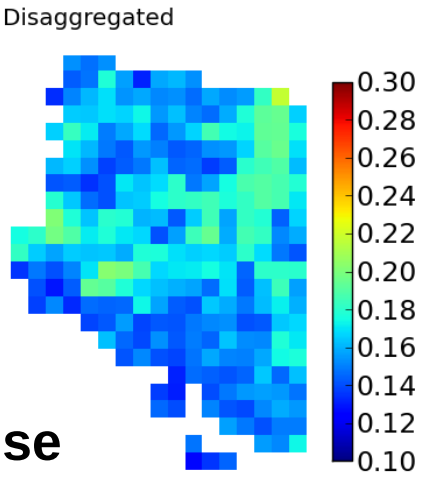
Spatio-temporal disaggregation



Validation of downscaled SMOS soil moisture with respect to RADARSAT-2 soil moisture

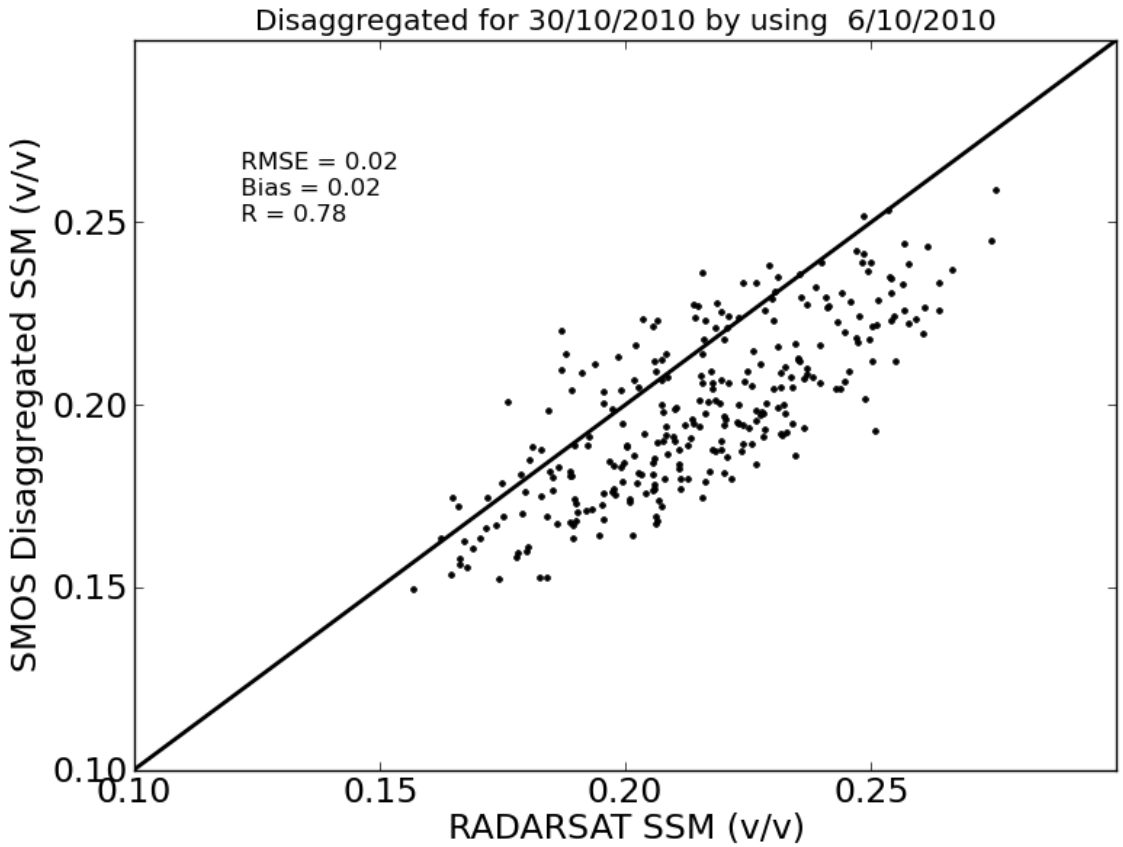


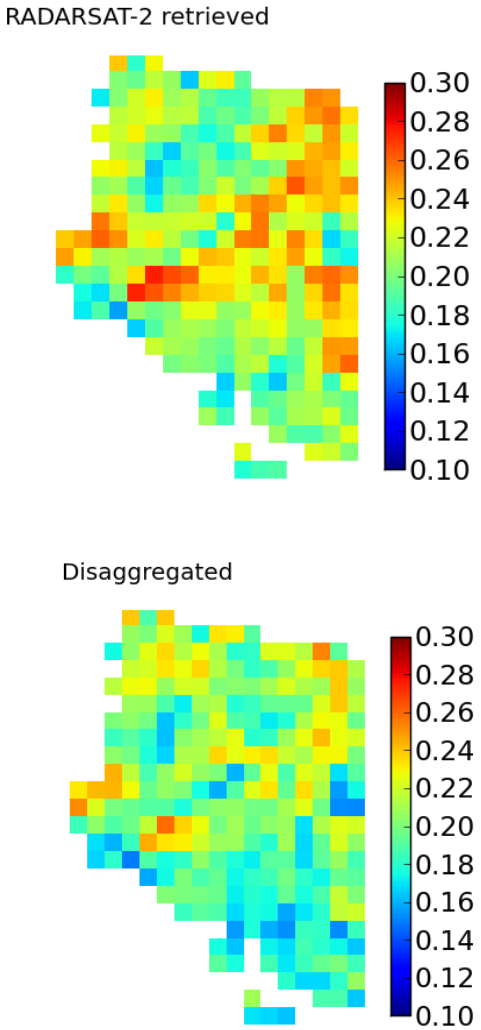




➢ **Disaggregation is not performed for the forest land use**

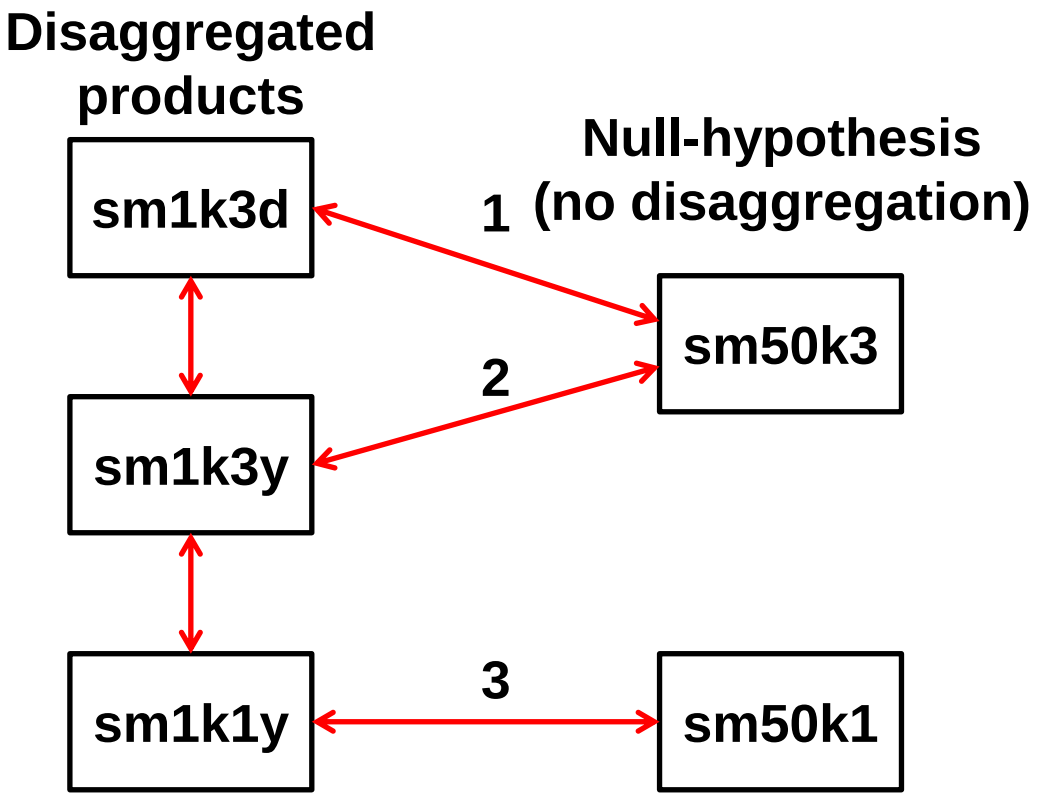
Validation of downscaled SMOS soil moisture with respect to RADARSAT-2 soil moisture

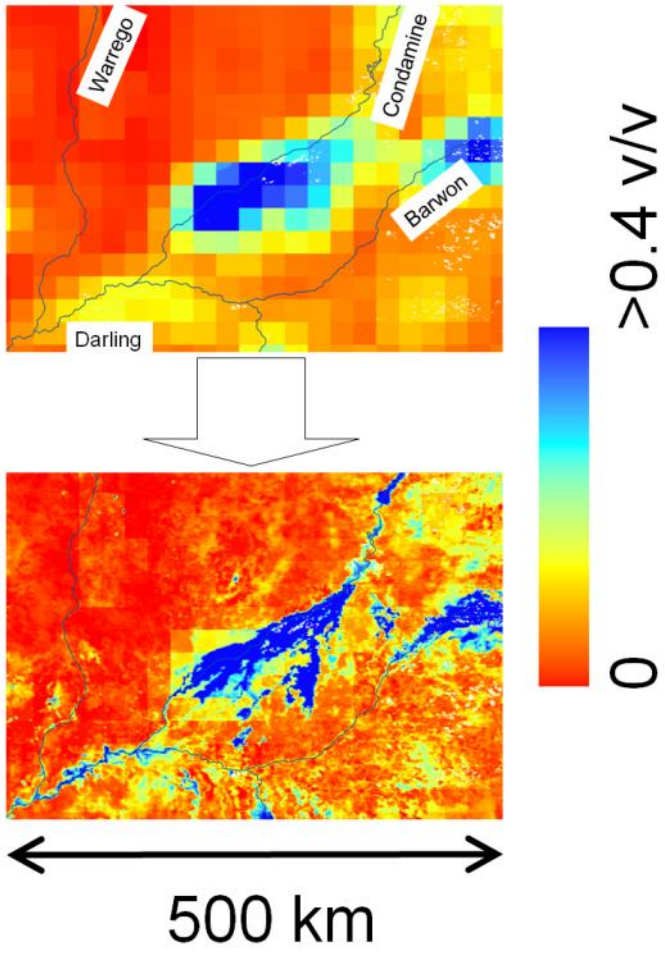




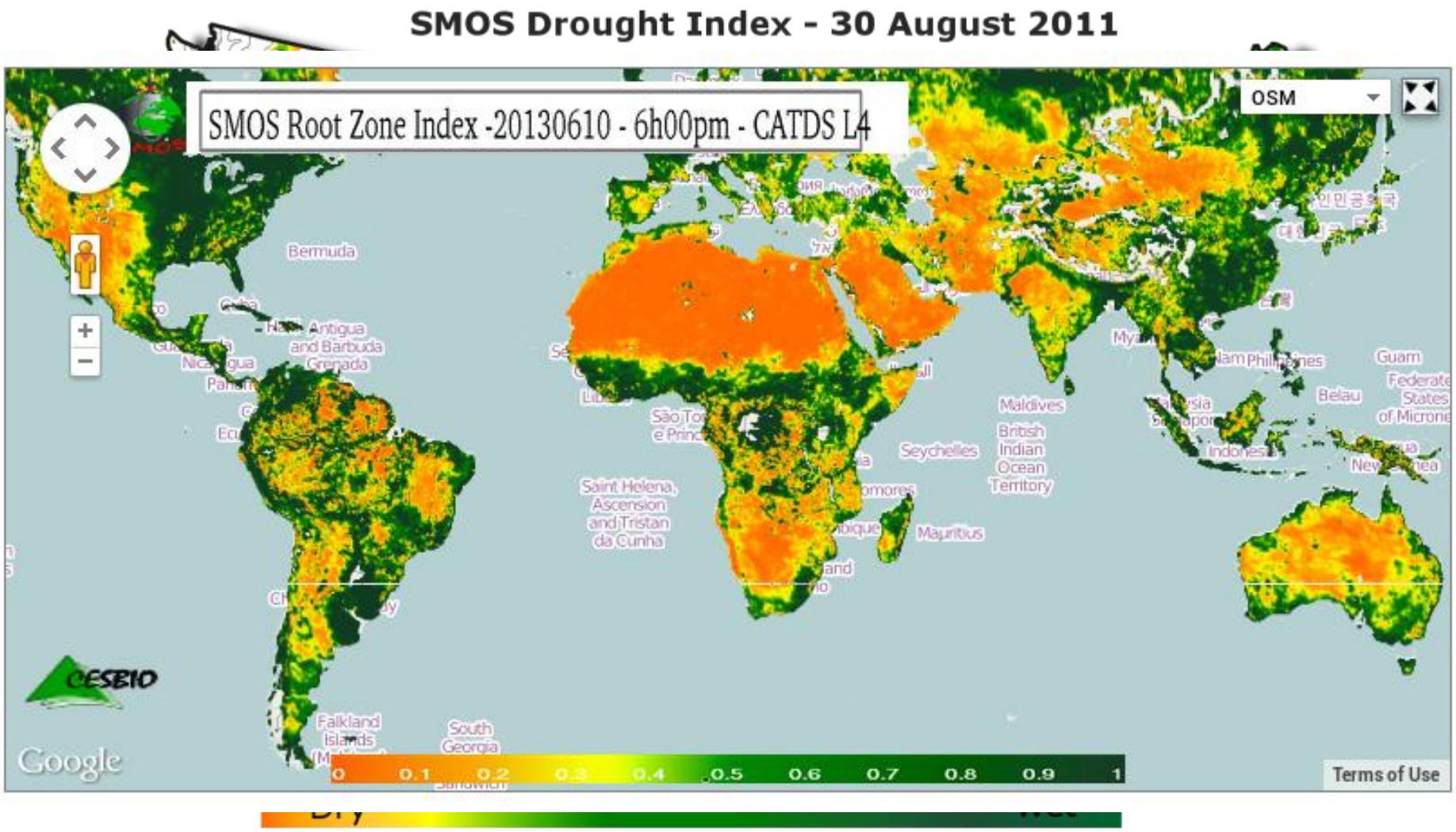
Deliverable DISPATCH products

- MODIS-based products
- 1 km resolution daily
- +Uncertainty+nber data sets

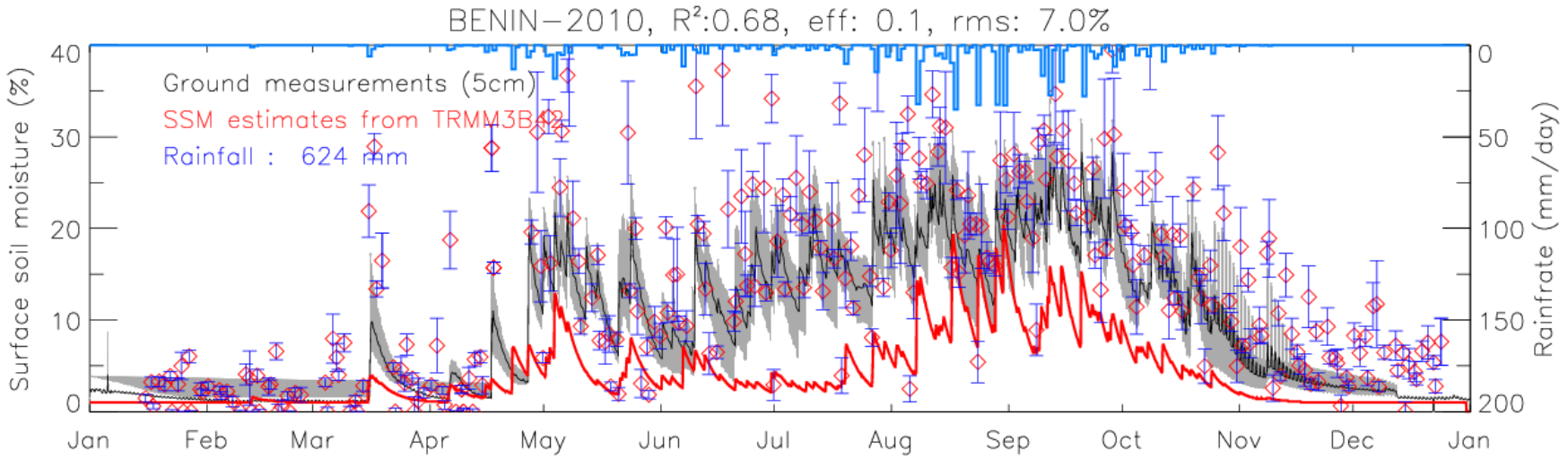


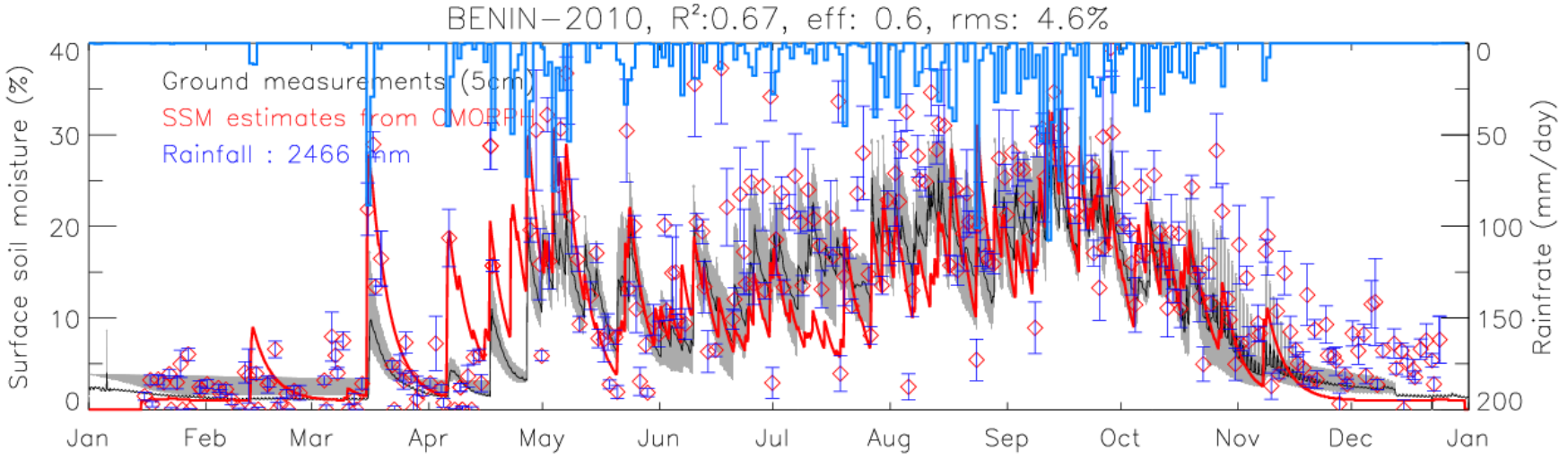


Drought index



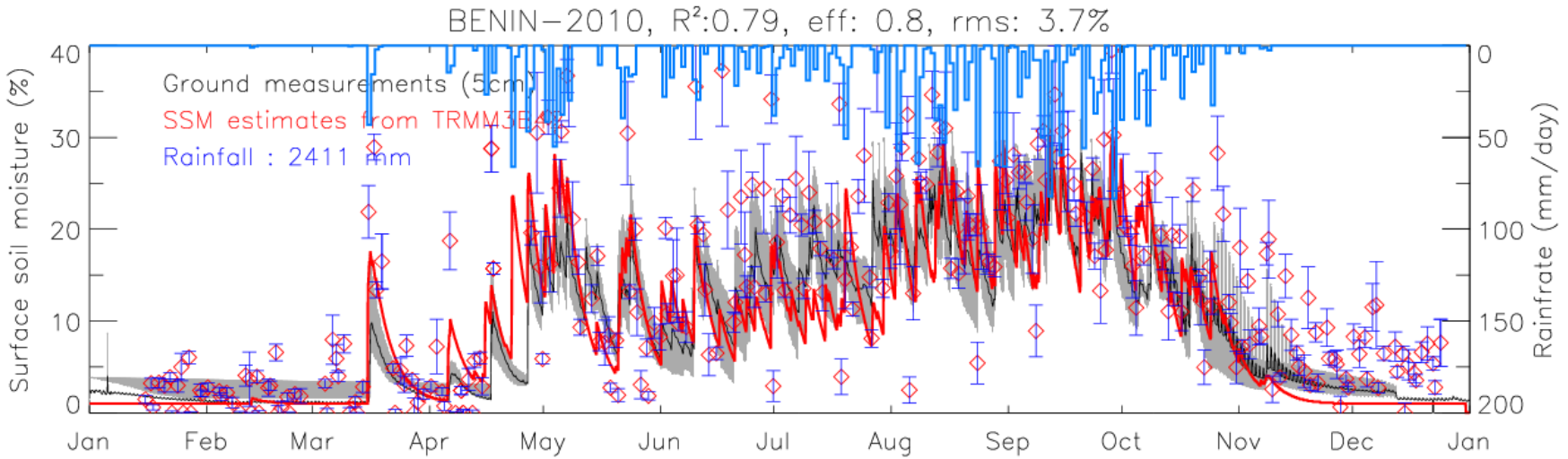
Estimated SSM without SMOS assimilation (Benin site)
Using TRMM-3B42 (top) and CMORPH rainfall products (bottom)

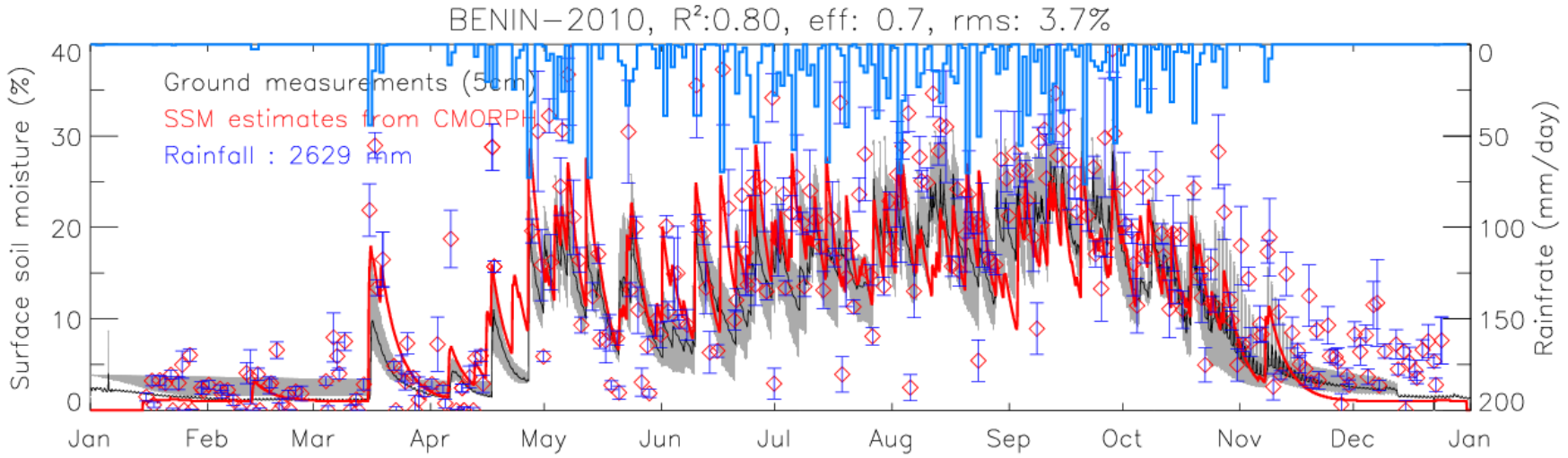




T. Pellarin

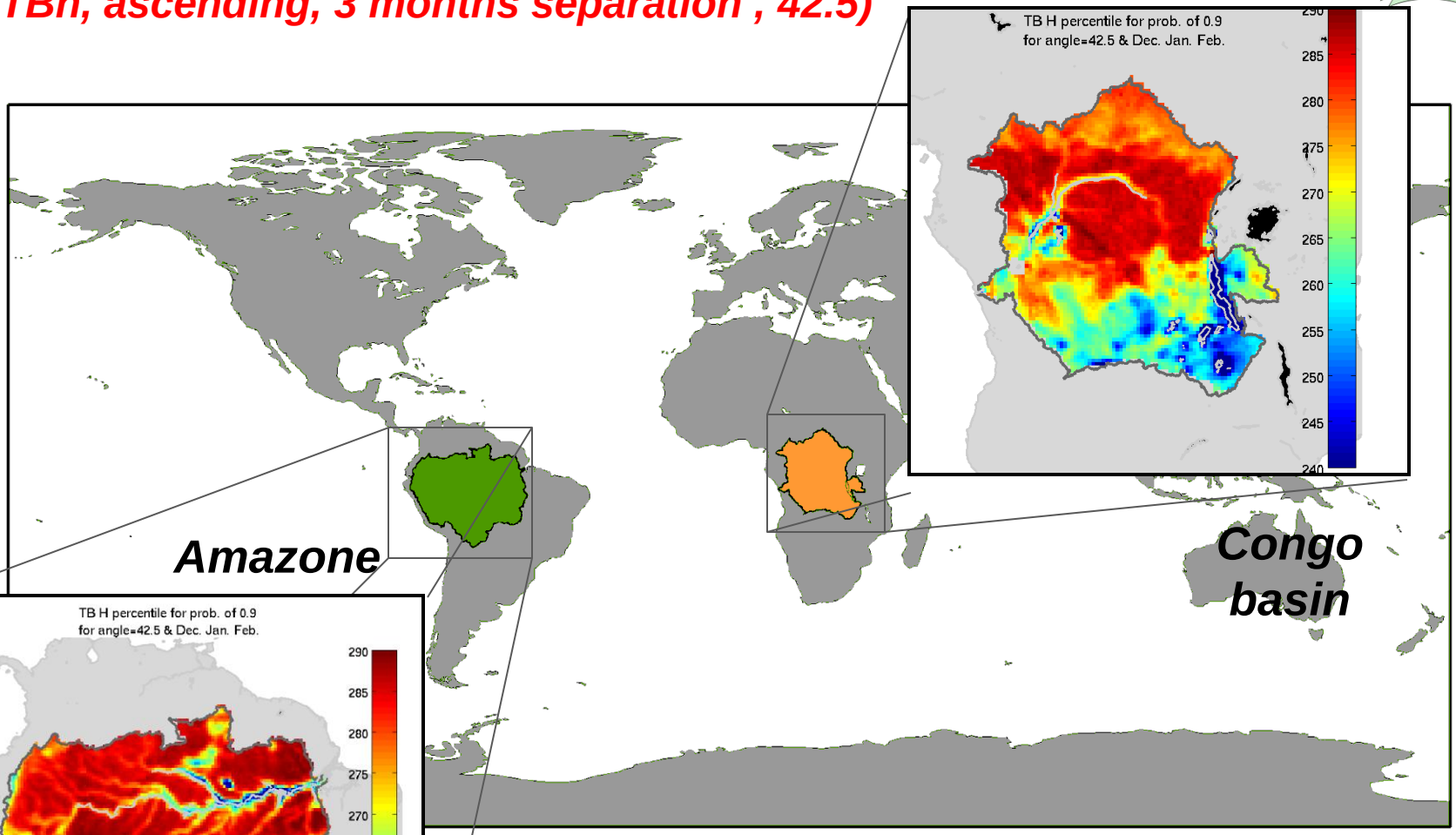
Estimated SSM with SMOS assimilation (Benin site)
Using TRMM-3B42 (top) and CMORPH rainfall products (bottom)





T. Pellarin

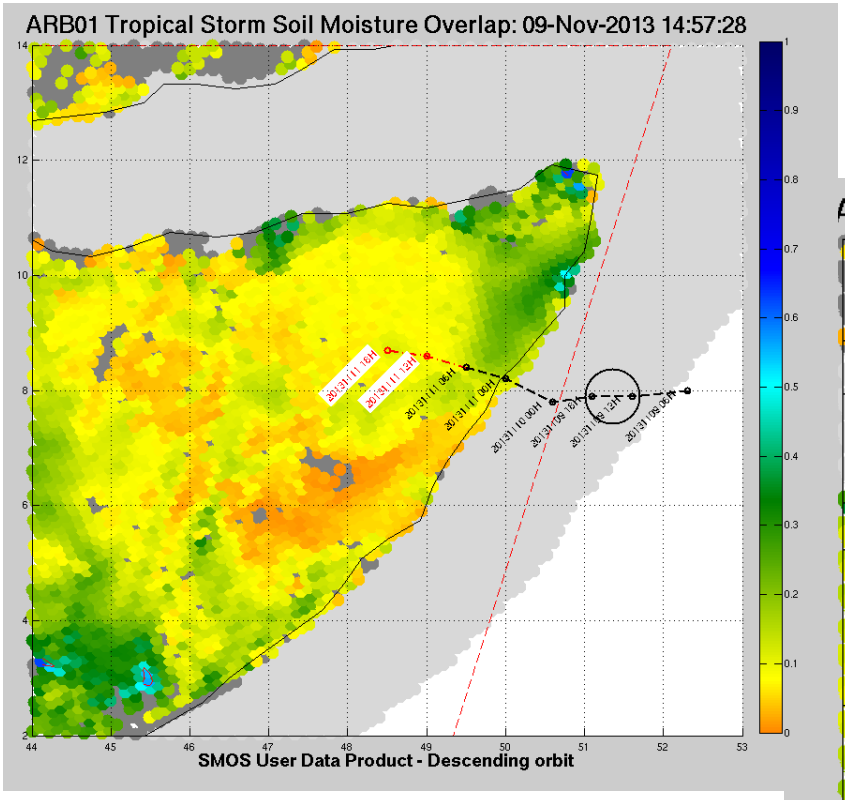
Seasonal dynamics of brightness temperatures
(TBh, ascending, 3 months separation , 42.5)



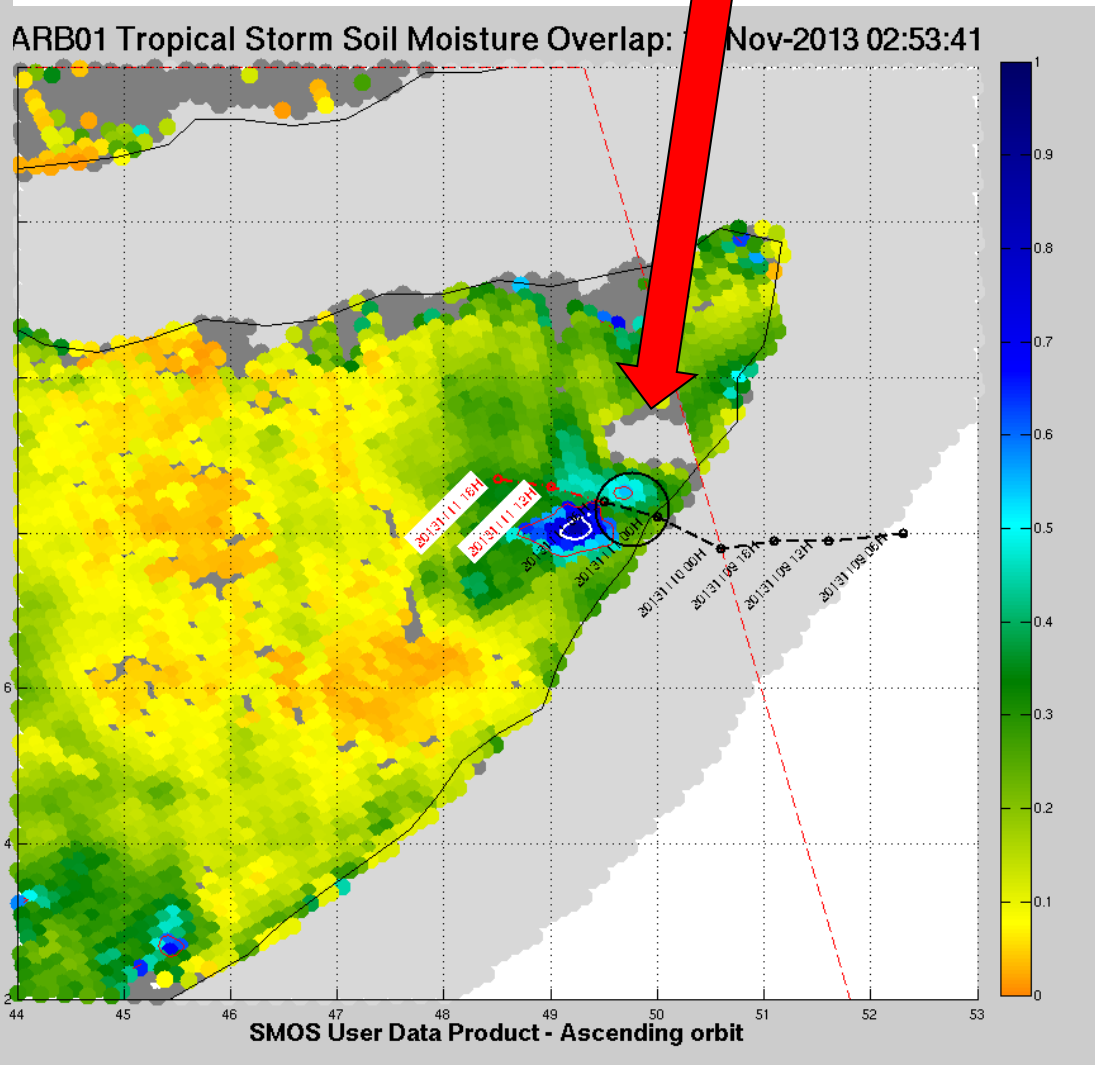
AL Bitar A., CESBIO

Exemple d'orage tropical Nov 2013

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



Rains > 20 mm/h for ECMWF



Des questions?