

# Bridging the gap between observation and model scales for better identifying near-surface soil moisture patterns:

## The case study of the Alento CZ Observatory

*Nunzio Romano*

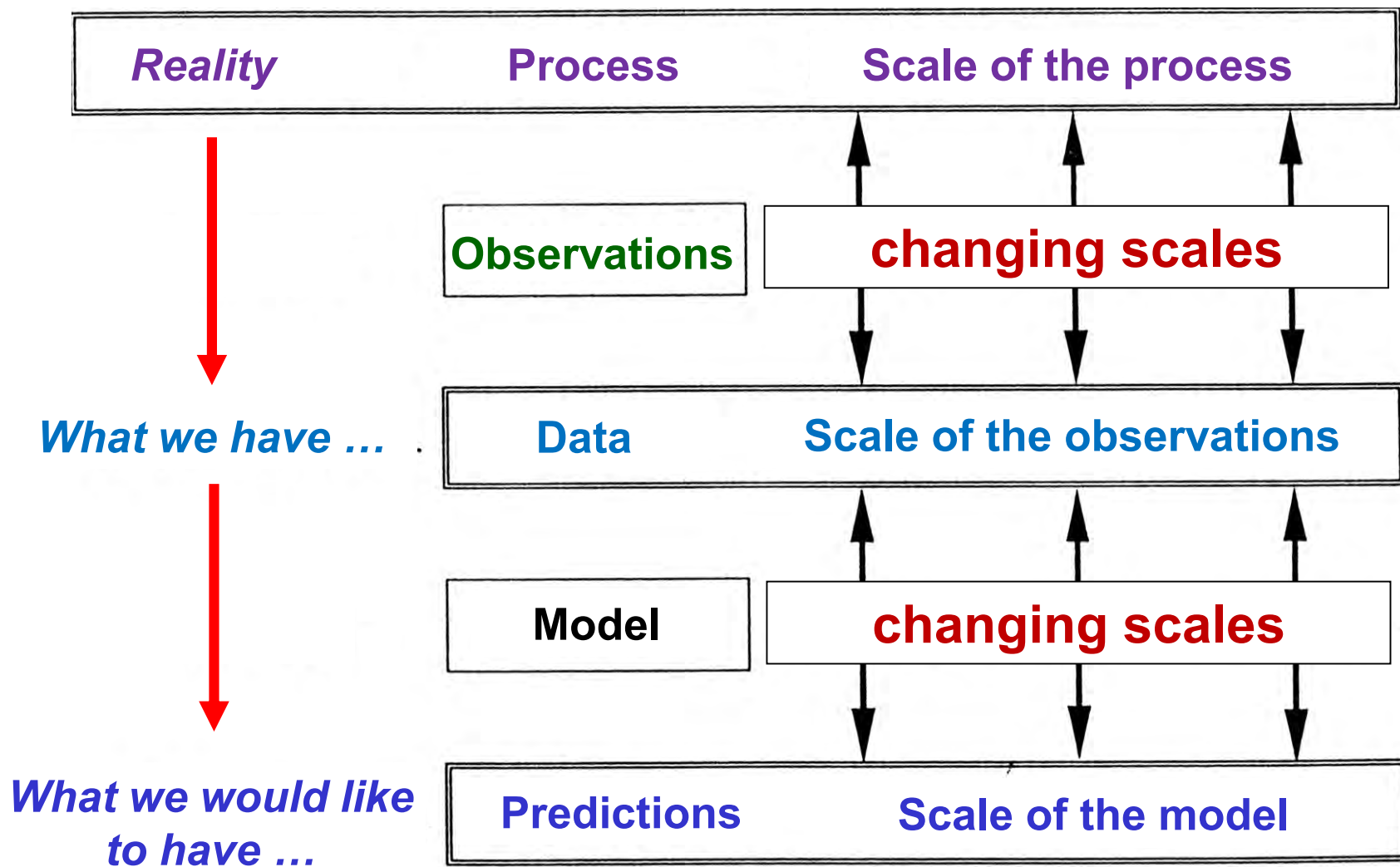
*Chair of Interdepartmental Research Center «Environment», C.I.R.A.M.*

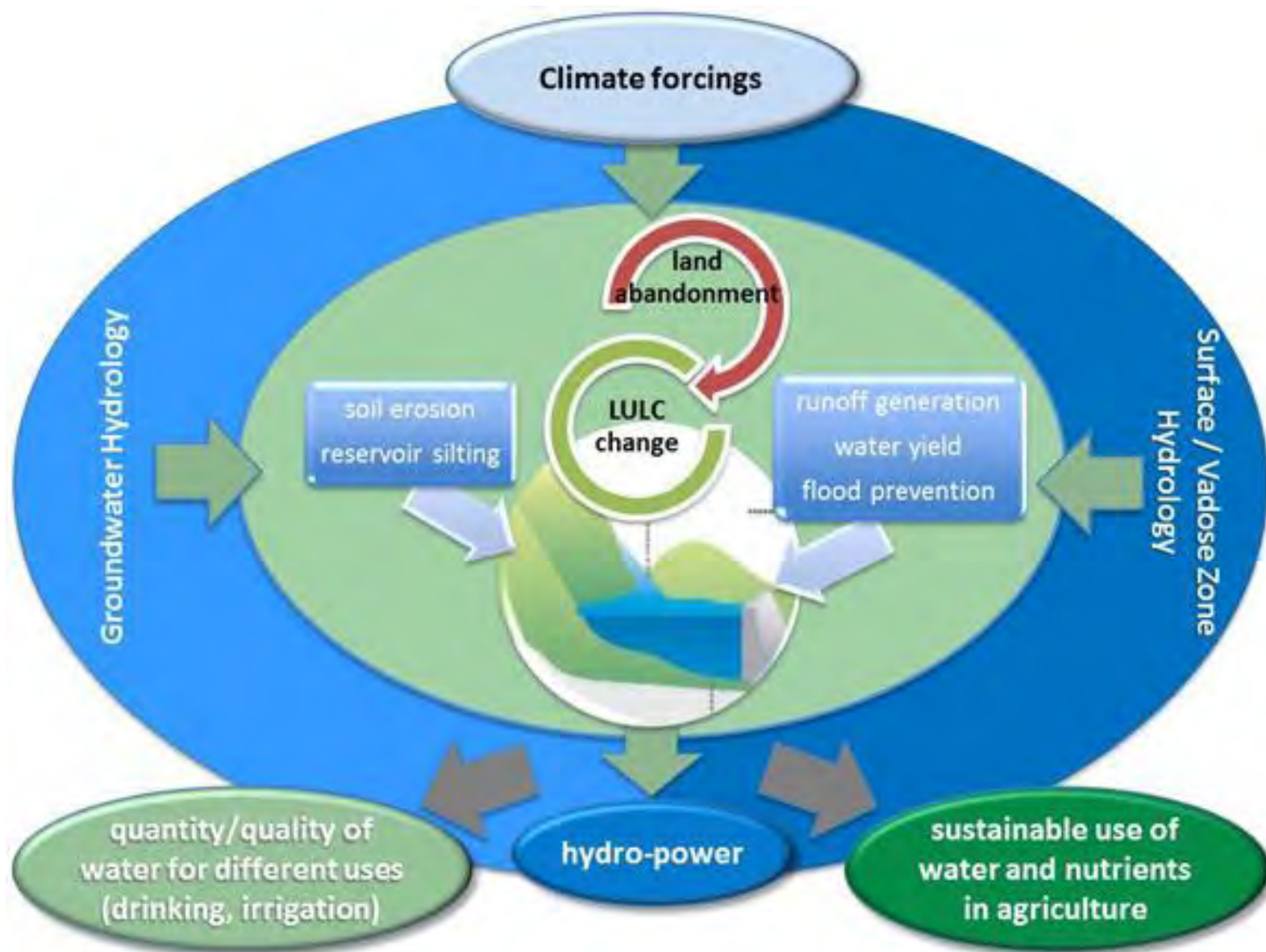
*with contributions from: P. Nasta, H. Bogen, S. Schönbrodt-Stitt et al.*



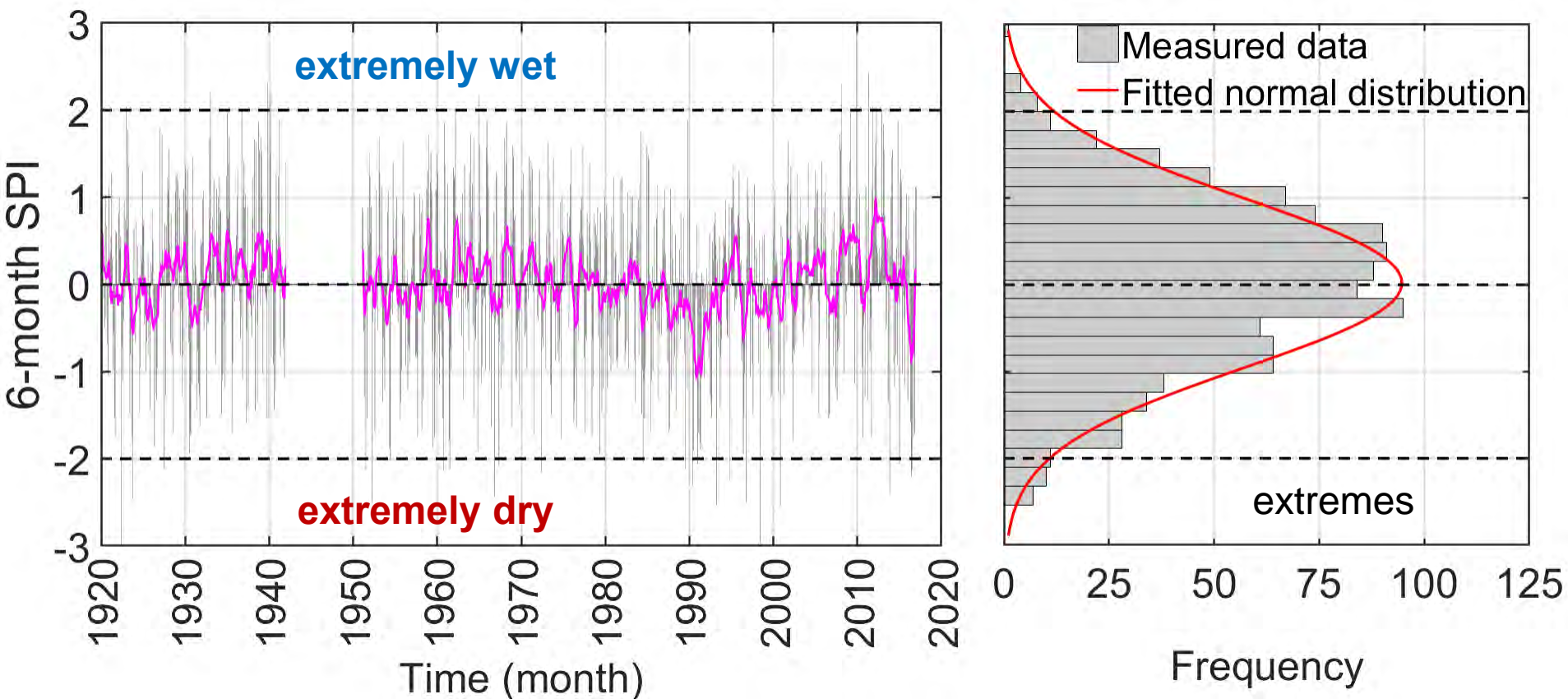
Division of Agricultural, Forest and Biosystems Engineering  
University of Napoli Federico II







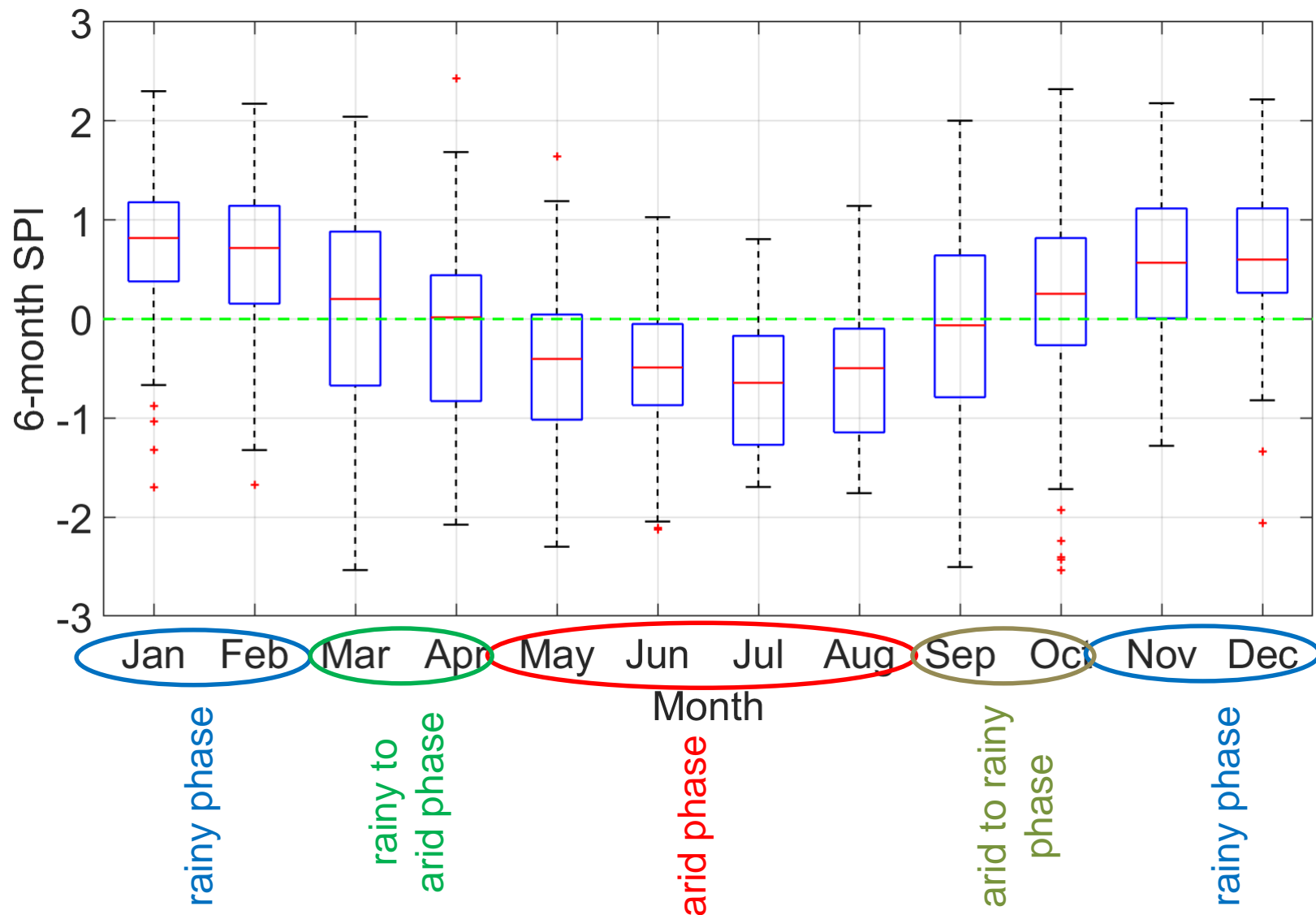
Time series of 6-month SPI and statistical distribution (normal).  
The **magenta line** depicts the 12-month moving average



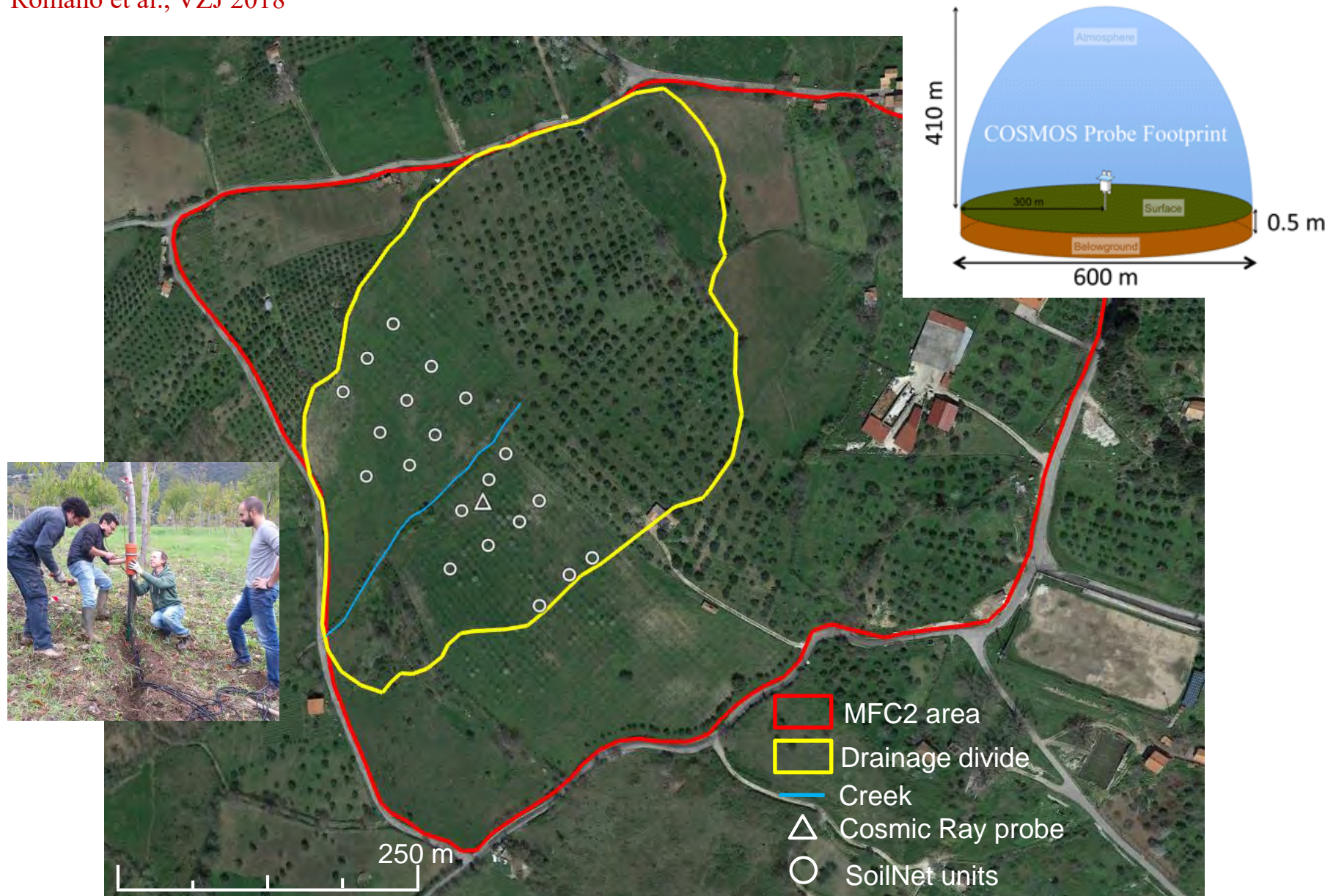
no such a big change in about 100 yrs actually, but...

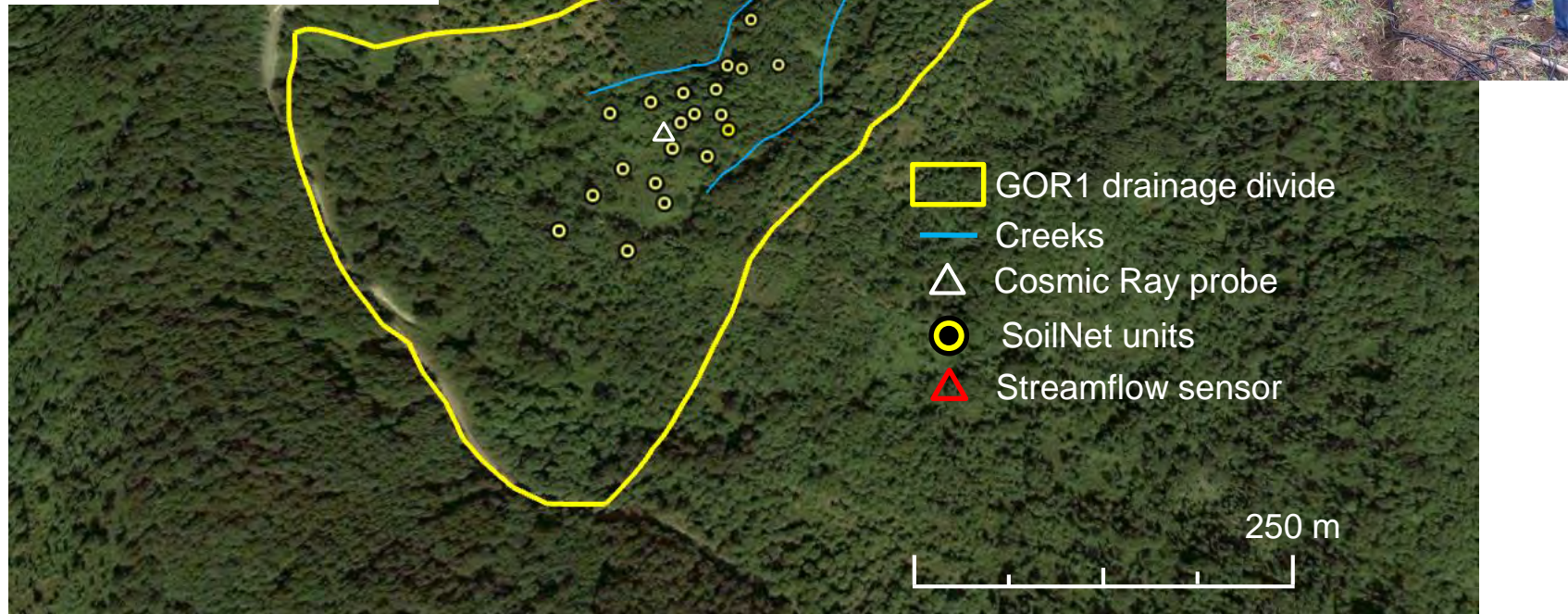
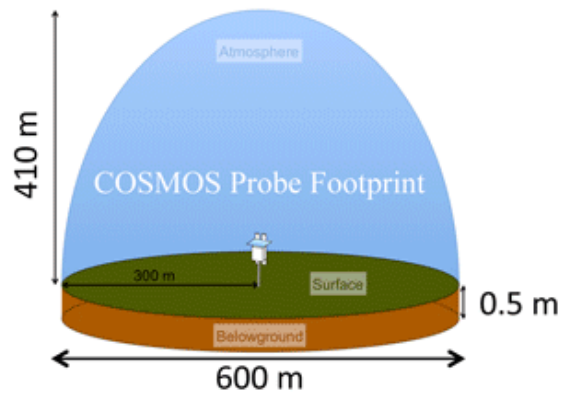
## On characterizing the Mediterranean seasonality

### Presence of two transition phases



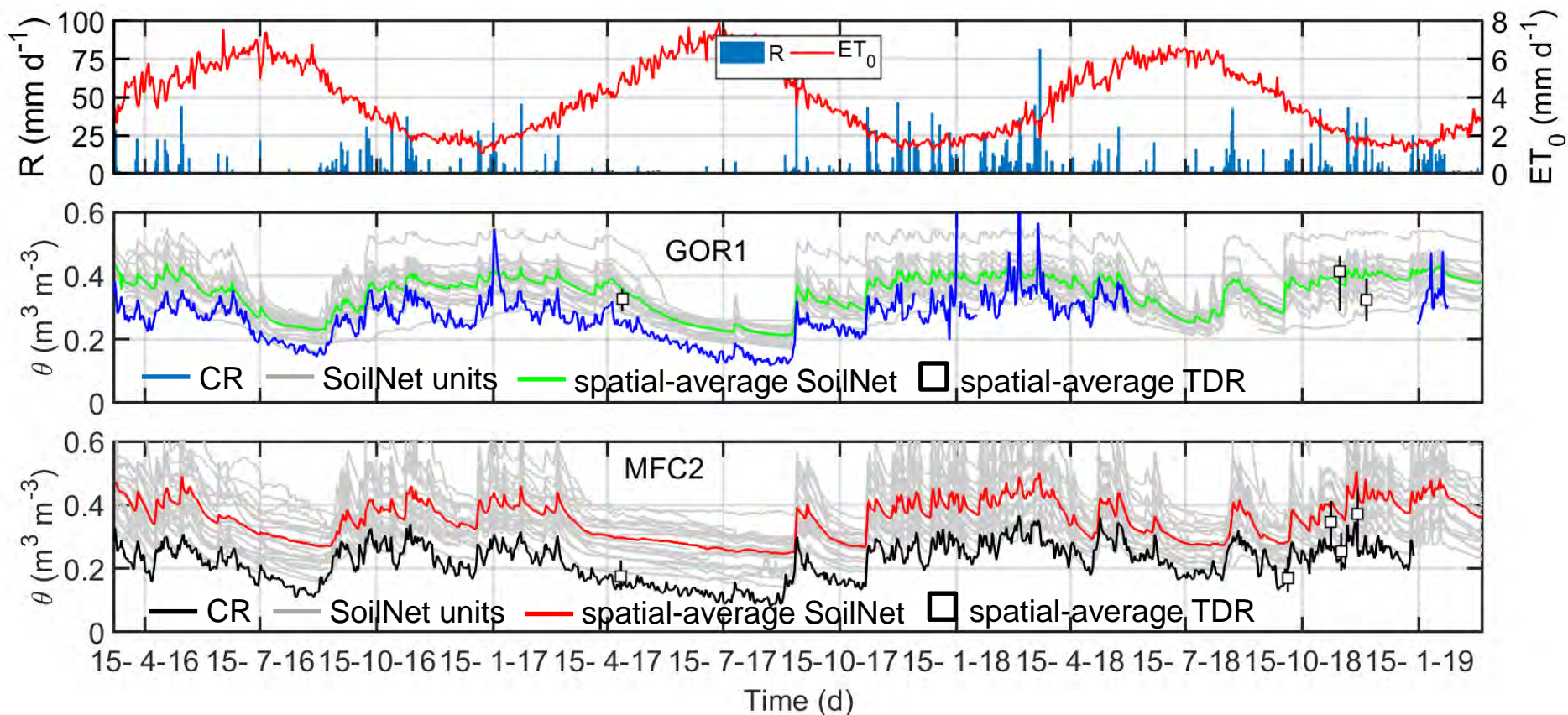
Romano et al., VZJ 2018





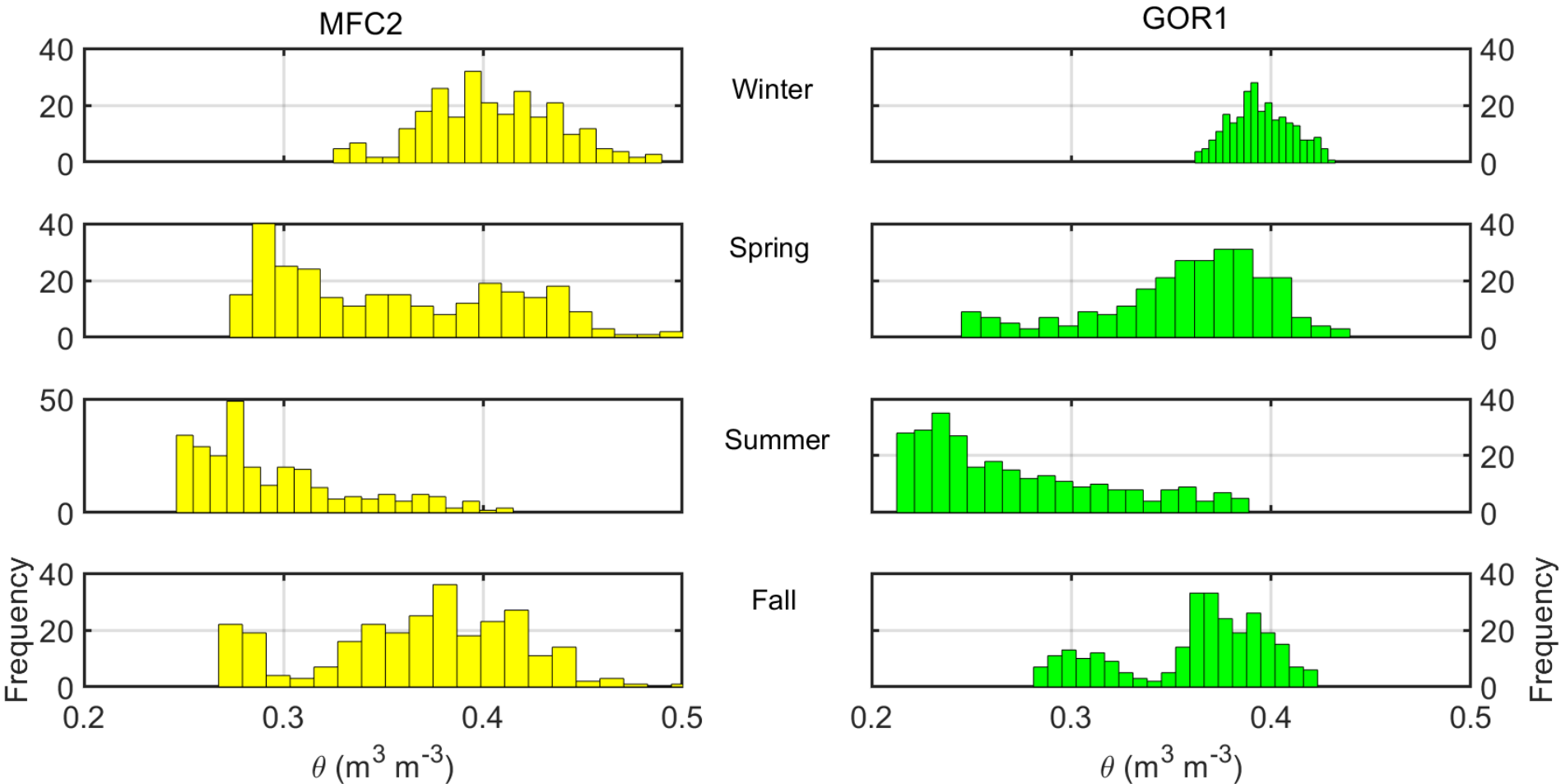
Romano et al., VZJ 2018

## Soil moisture (SM) measurements by TDR, sensor net, and cosmic-ray probe at **GOR1** and **MFC2** sub-catchments



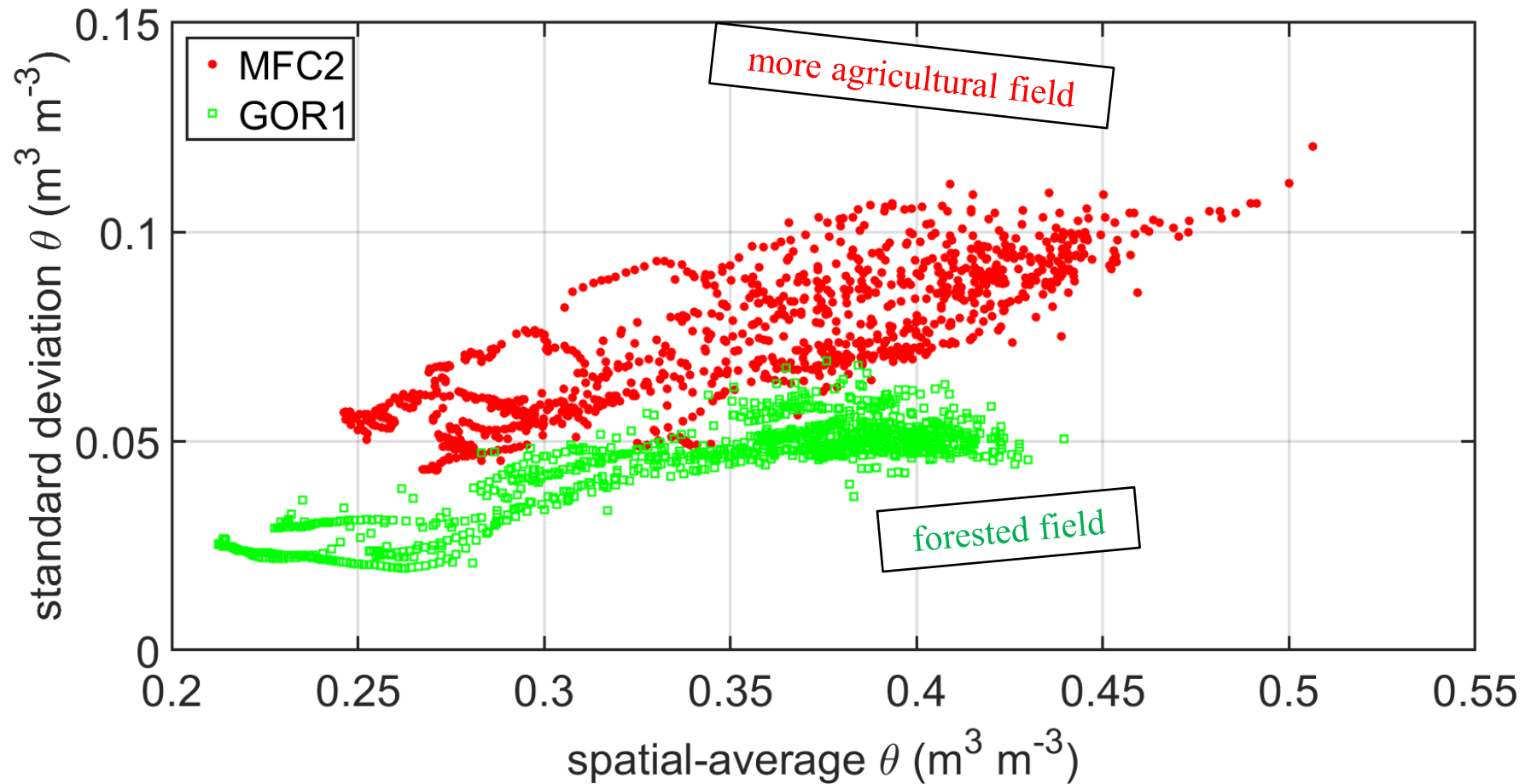
Romano et al., VZJ 2018

## Comparisons among seasonal PDFs of spatial-average soil moisture at **MFC2** and **GOR1** sub-catchments

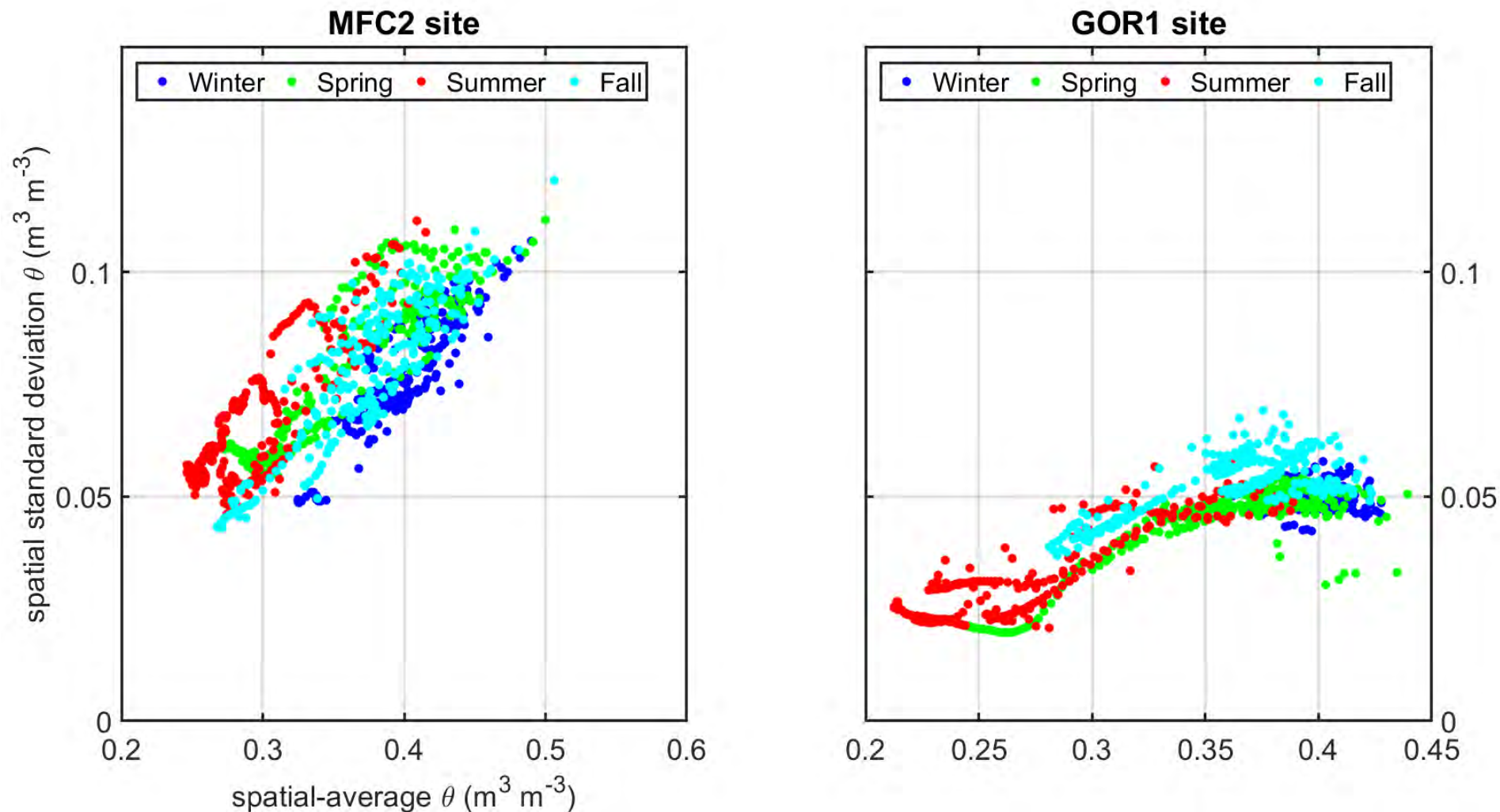


Romano et al., VZJ 2018

## Relationship between spatial-average and standard deviation of soil moisture at **MFC2** and **GOR1** sub-catchments



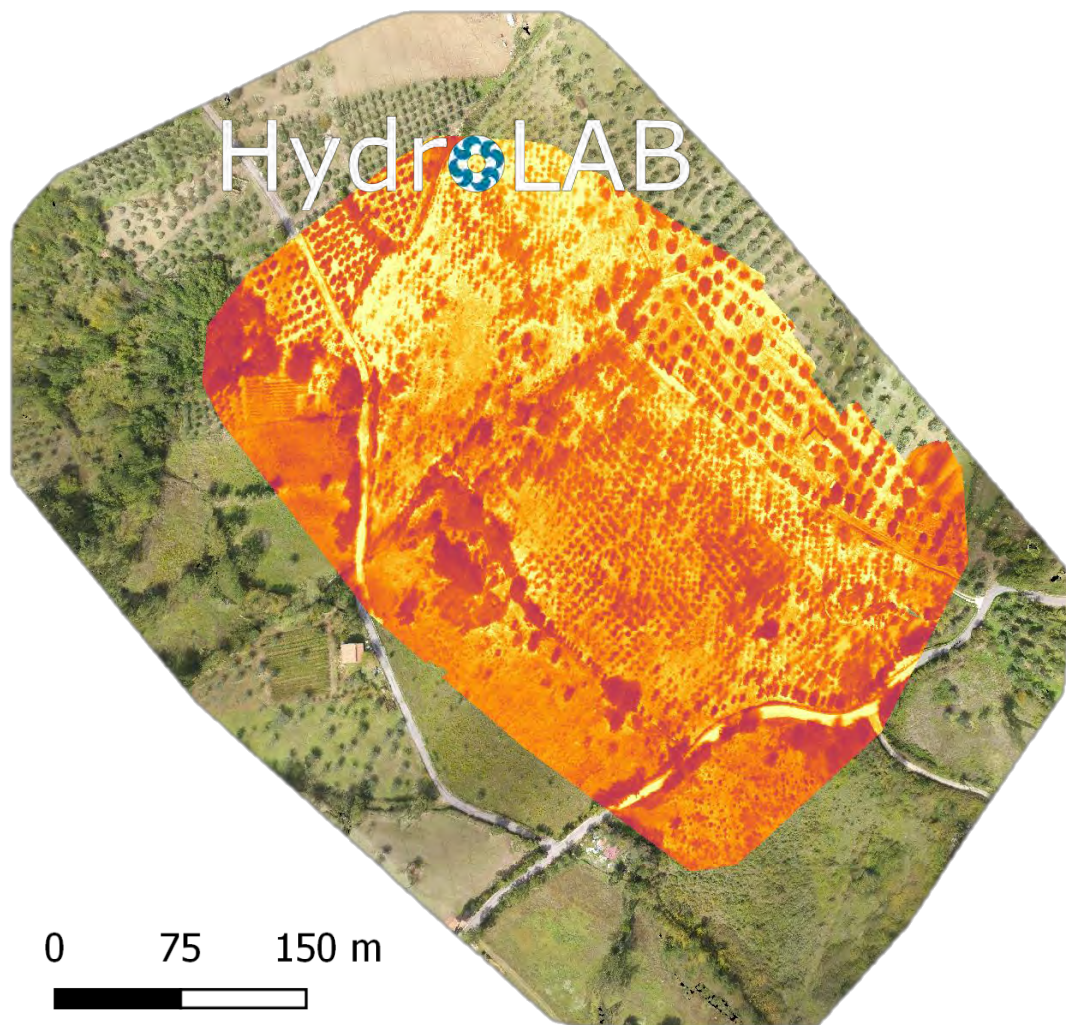
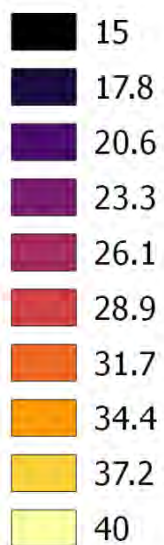
## Seasonal relationship between spatial-average and standard deviation soil moisture (sensor net) at MFC2 and GOR1

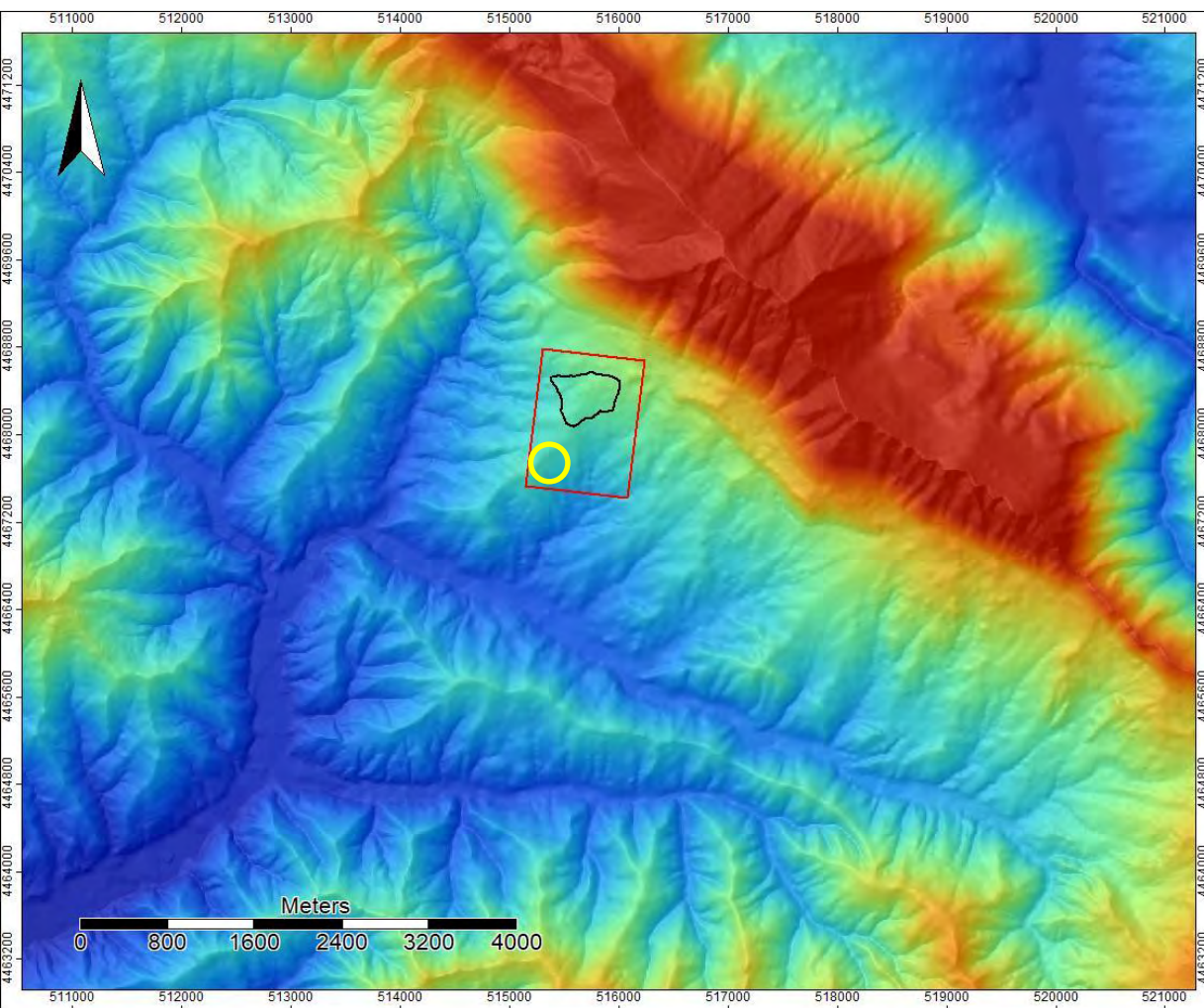




Thermal mosaic  
17 cm resolution

Legend





MFC2 sub-catchment

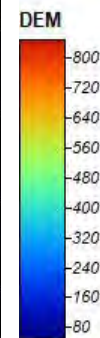


Bounding box (considered for spatial processing and analysis)



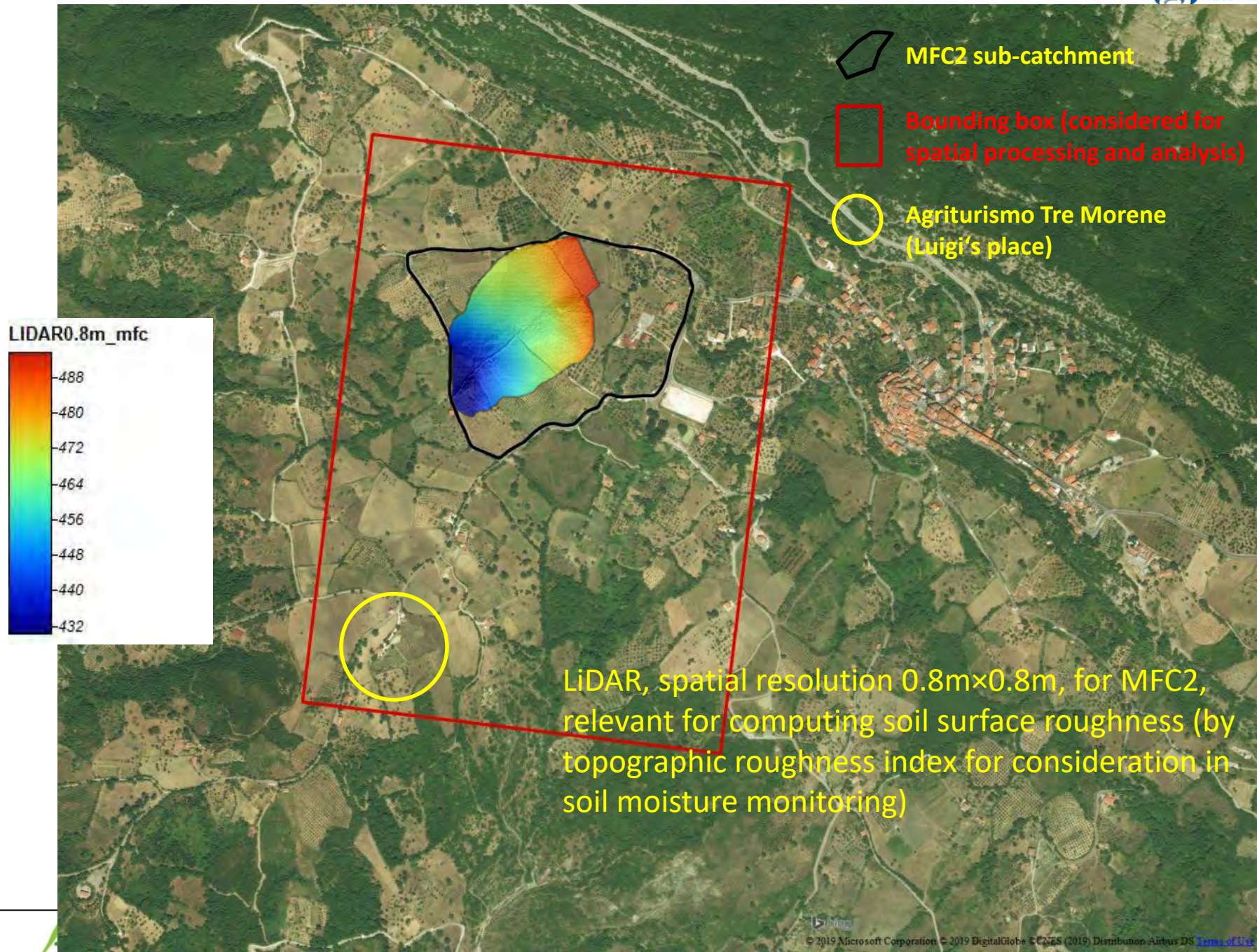
Agriturismo Tre Morene (Luigi's place)

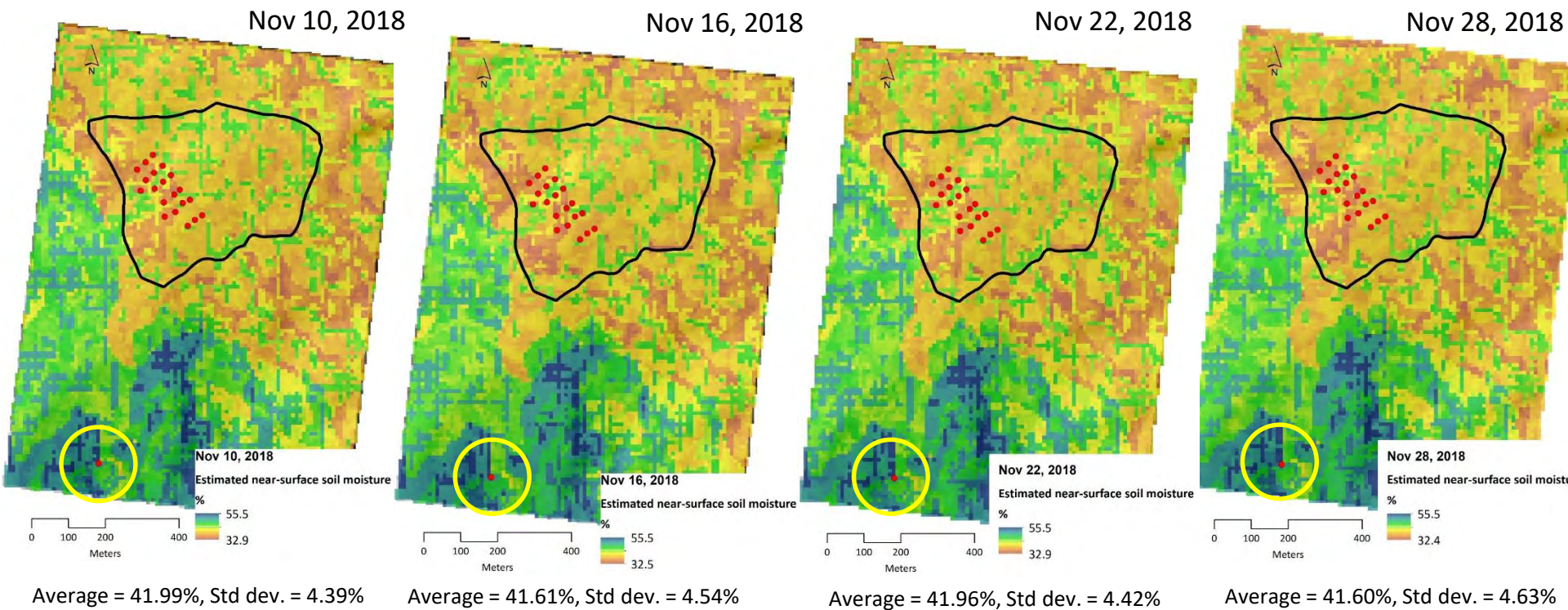
DEM, spatial resolution 5 m, MFC2 and surrounding (also covering bounding box)






File name: DEM5m\_bacino\_MFC2.asc/.tif

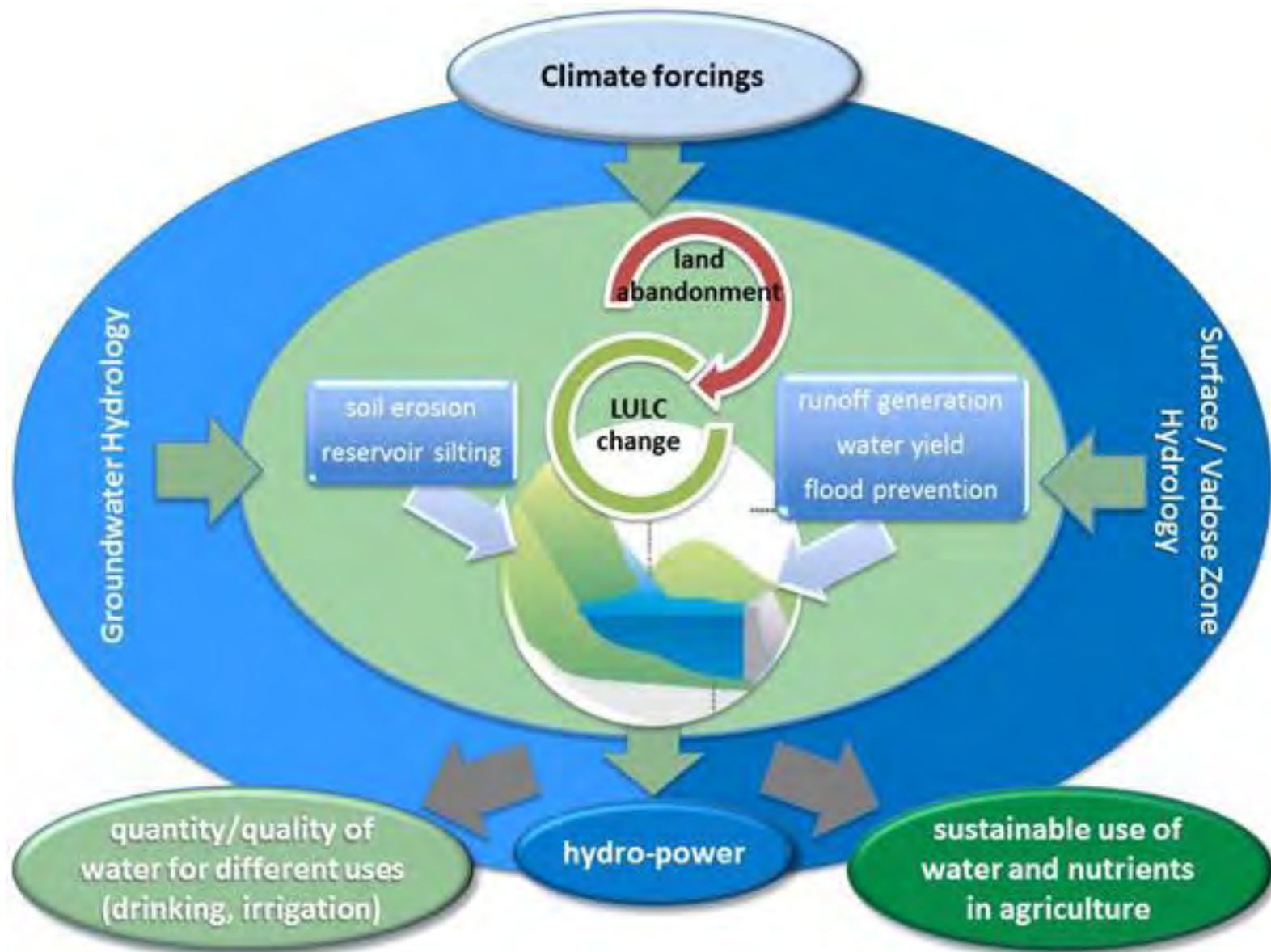
Projection: WGS84 UTM 33N (epsg 32633)



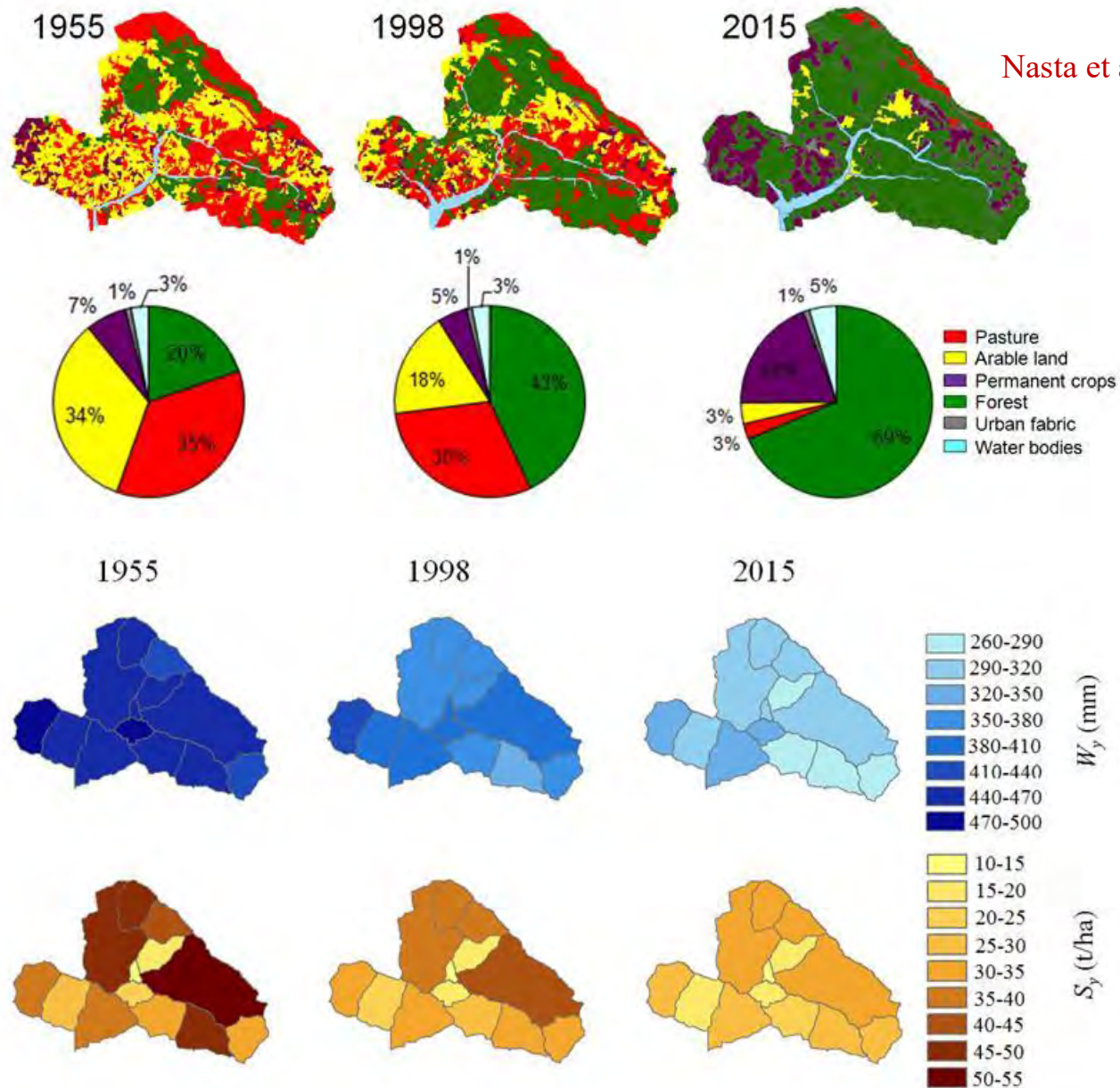


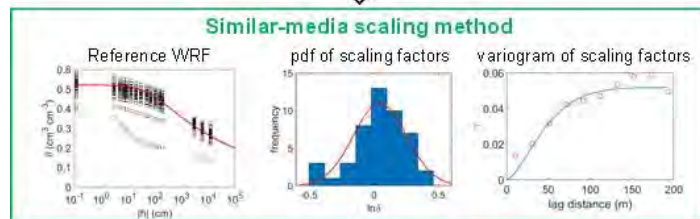
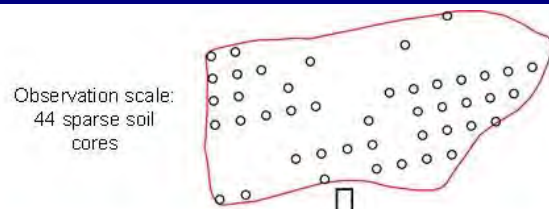
- High spatial-temporal near-surface soil moisture mapping (~ 5 cm) → time series
- Shown are estimated soil moisture maps for four different sensor dates (each at satellite overpass in the morning, **ascending** (e.g., S1A\_a44, S1B\_a44,): **04:51:01 pm – 05:04:48 pm**)
- The observation period refers to the soil moisture field campaign by the Master student
- Mapping algorithm is **random forest**. Please consider that analysis is **not final**
- Spatial resolution is 10 m (based on SAR C-band, Sentinel-1)

-  MFC2 catchment
-  Agriturismo Tre Morene (Luigi's place)
-  Soil moisture monitoring plots



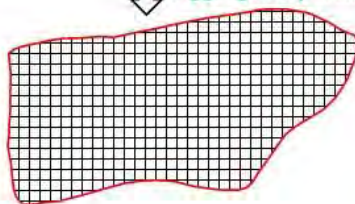
Nasta et al., STE 2017



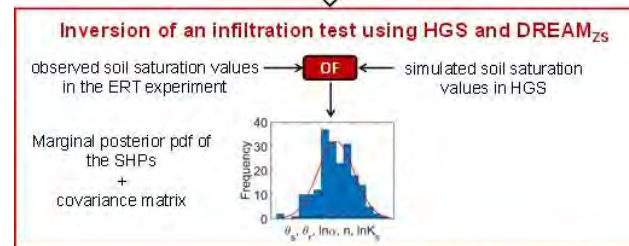


Aggregated parameters

Model scale:  
numerical grid  
in HGS

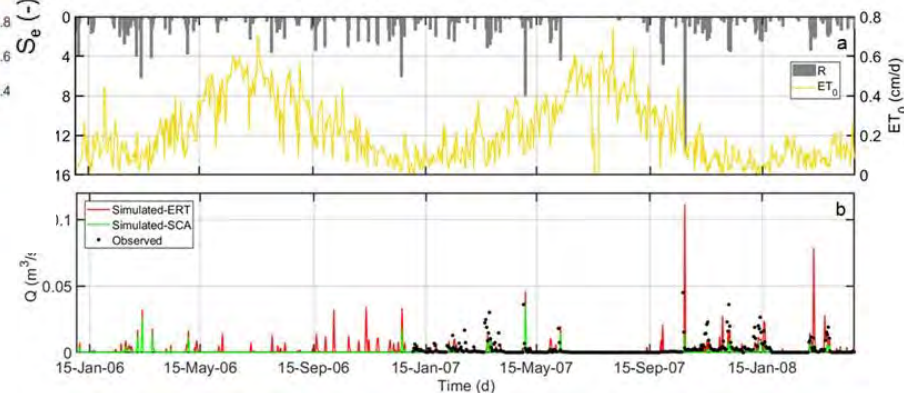
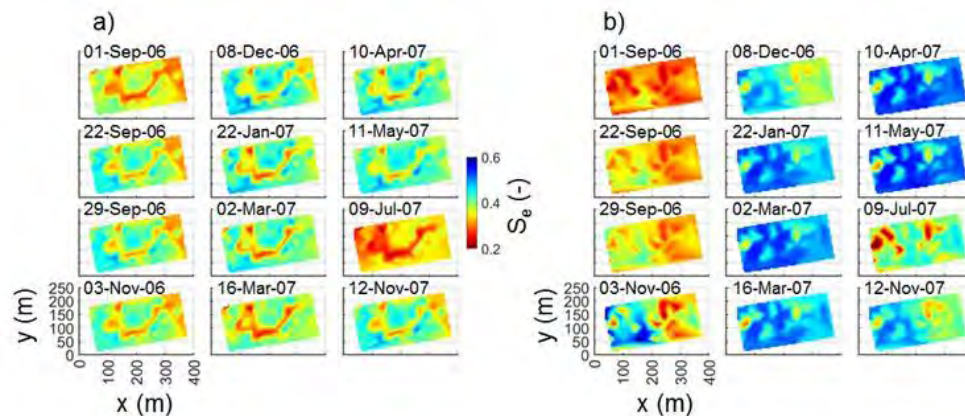
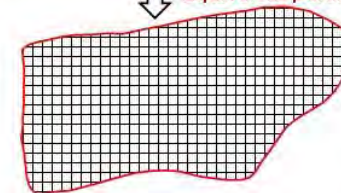


Observation scale:  
ERT-based  
infiltration  
experiment



Equivalent parameters

Model scale:  
numerical grid  
in HGS



- **About the data ...**: improving our monitoring techniques over a broad range of scales (to measure or infer soil hydraulic properties & fluxes at scales of interest for environmental planning).
- **About the models ...**: importance of identifying dominant **vegetation**, **soil** and topography controls on ecosystem dynamics.
- Need to identify new criteria for efficiently moving across scales.