The Oklahoma Mesonet …and Ongoing Collaborative Projects Relevant to SMAP Cal/Val

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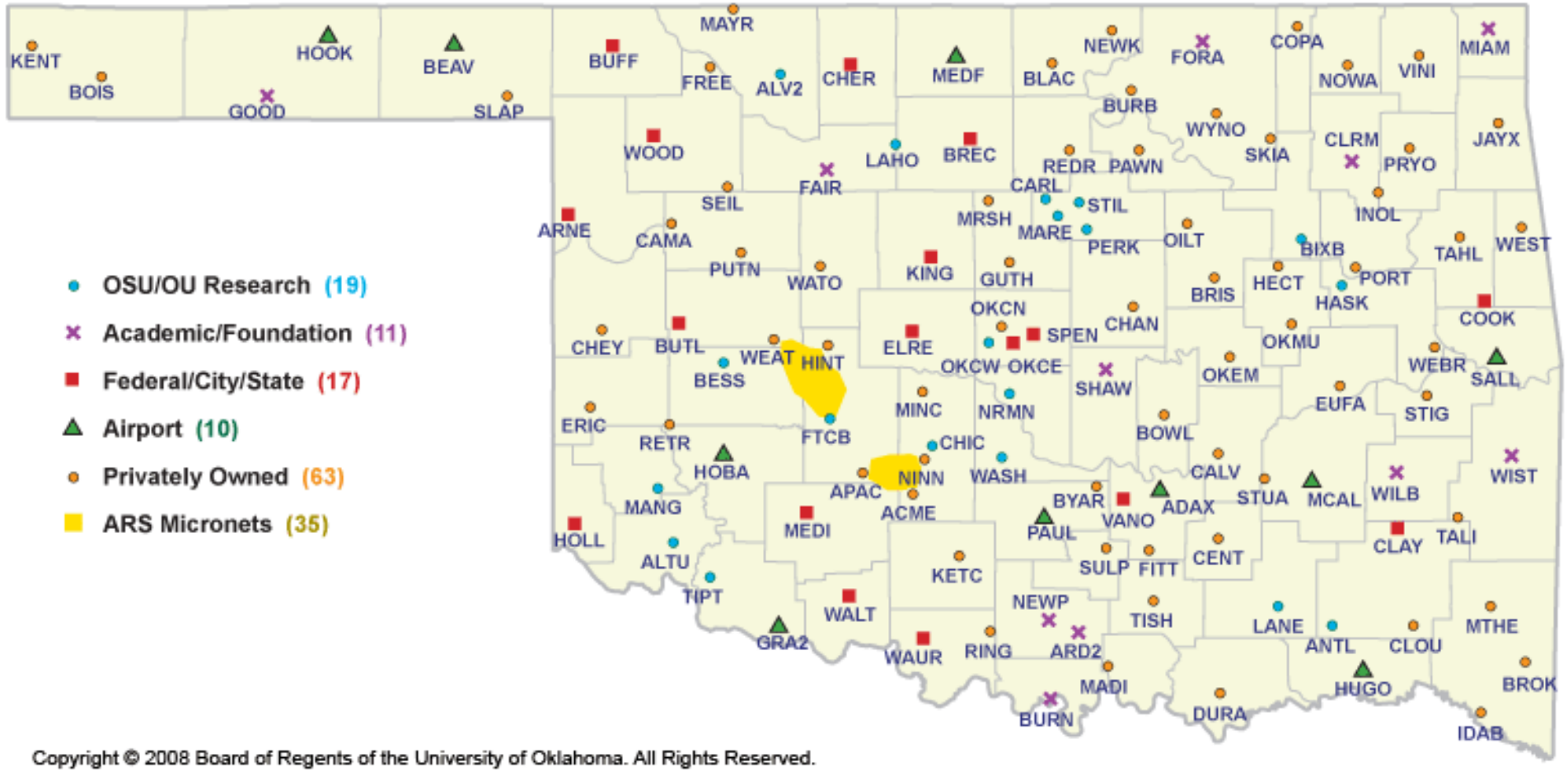
The Oklahoma Mesonet

- Weather and climate network of **120 sites** covering 181,186 km^2
- Commissioned in 1994
- Joint project between the **Oklahoma State University** and the **University of Oklahoma**.
- Extensive quality assurance is applied to the collected observations (real-time and archived ←→ automated and manual)
- Over 5 billion observations archived
- Operational funding supplied by the State of Oklahoma – Research funded mainly by grant awards
- Over 500 peer-reviewed publications, over 100 M.S. theses, and over 40 Ph.D. dissertations have used Oklahoma Mesonet data.

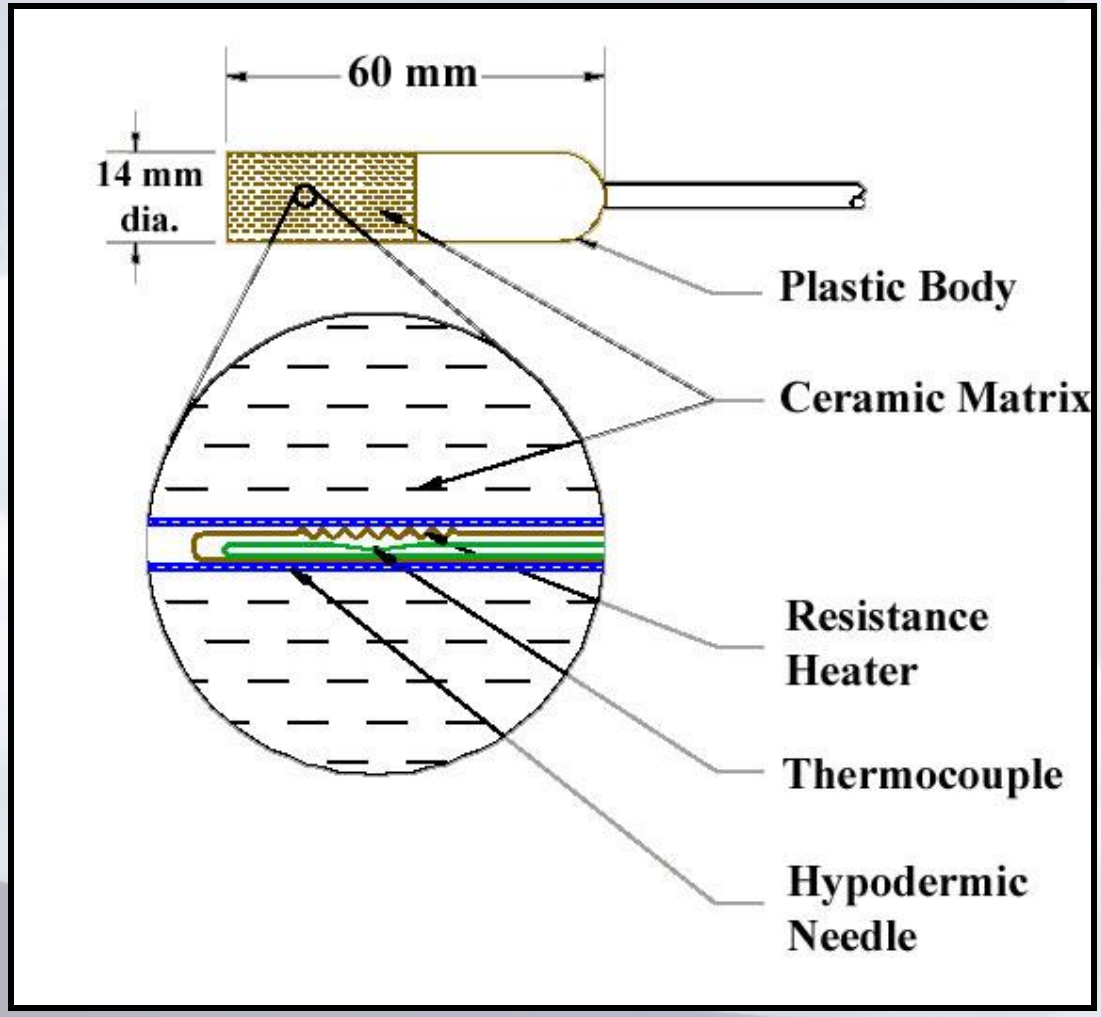
Oklahoma Mesonet

The Oklahoma Mesonet



McPherson, R. A., C. Fiebrich, K. C. Crawford, R. L. Elliott, J. R. Kilby, D. L. Grimsley, J. E. Martinez, J. B. Basara, B. G. Illston, D. A. Morris, K. A. Kloesel, S. J. Stadler, A. D. Melvin, A.J. Sutherland, and H. Shrivastava, 2007: Statewide monitoring of the mesoscale environment: A technical update on the Oklahoma Mesonet. *J. Atmos. Oceanic Tech.*, ***24, 301–321.***

Soil Moisture Instrumentation



- Campbell Scientific 229-L Sensor
- Heat Dissipation Sensor
- Raw measurement is a change in temperature (ΔT) following the introduction of a heat pulse
- Provides relative measures of soil "wetness"
- With soil texture information, soil water content is empirically estimated
- Does not work well in sand

Illston, B.G., J.B. Basara, D.K. Fischer, R.L. Elliott, C. Fiebrich, K.C. Crawford, K. Humes, and E. Hunt, 2008: Mesoscale Monitoring of Soil Moisture Across a Statewide Network. *J. of Atmos. and Oceanic Tech,* ***25, 167-182.***

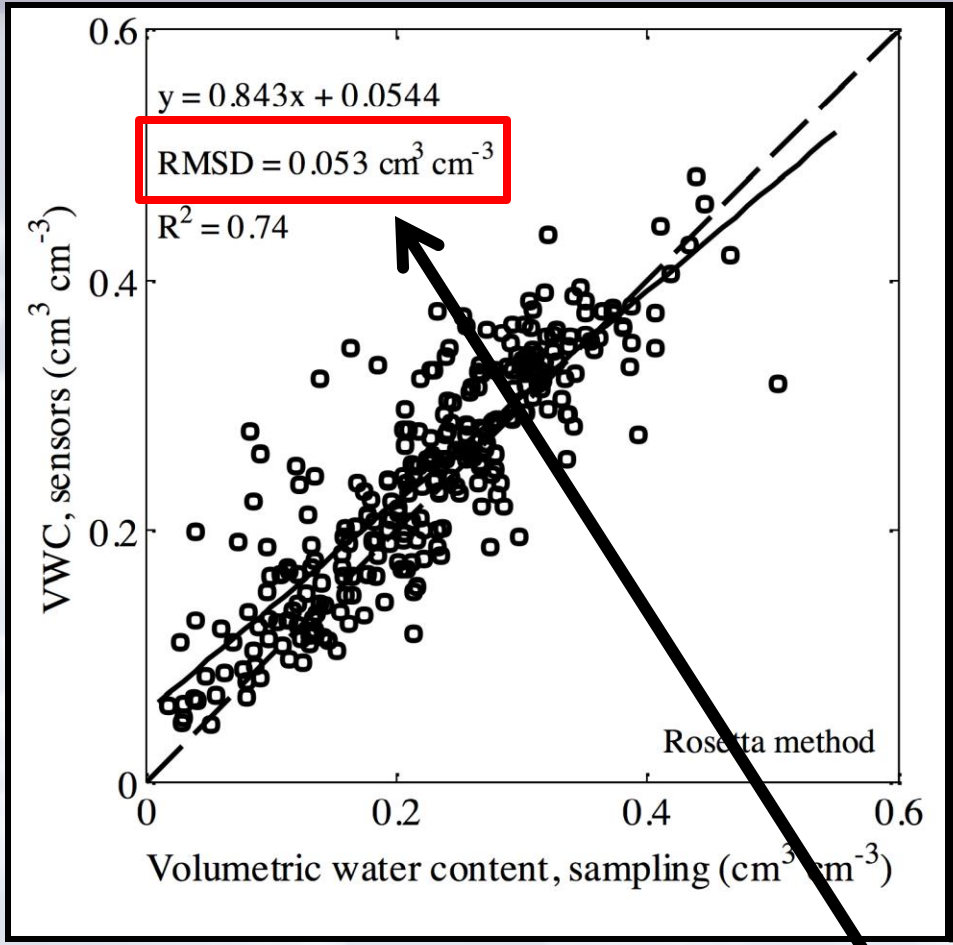
Oklahoma Mesonet Soil Moisture

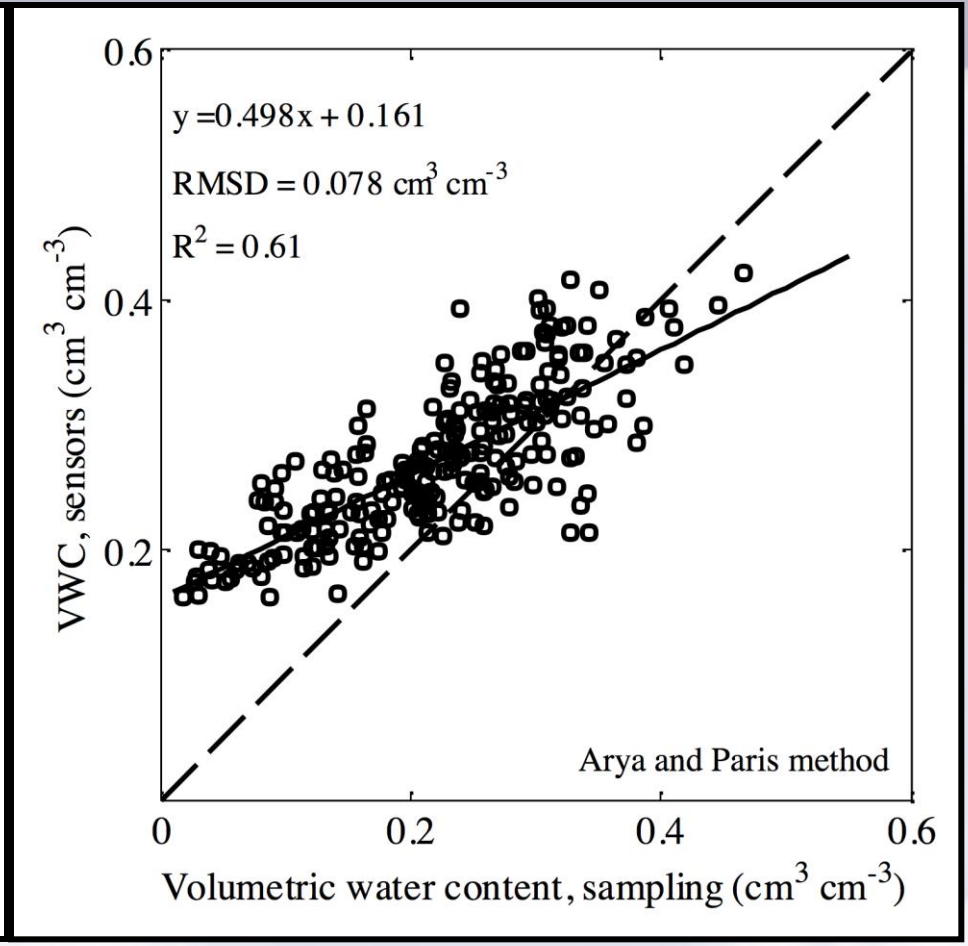
- **Core Measurement** of the Oklahoma Mesonet at 5, 25, and 60 cm – i.e. fully supported both now and into the future.
- Current technology does not measure **Water Content** directly – empirical relationships exist and have been improved via collaborative efforts at Oklahoma State University.
- Over **15 years** of soil moisture data collected thus far – data available in near real time or via archived datasets.
- Coincident metadata available (soil texture, vegetation, bulk density, etc.).

Mesonet Water Content Calibration

- New empirical technique applied to 229-L sensor response (Rosetta) to estimate VWC and compared with original Mesonet method (Arya-Paris).

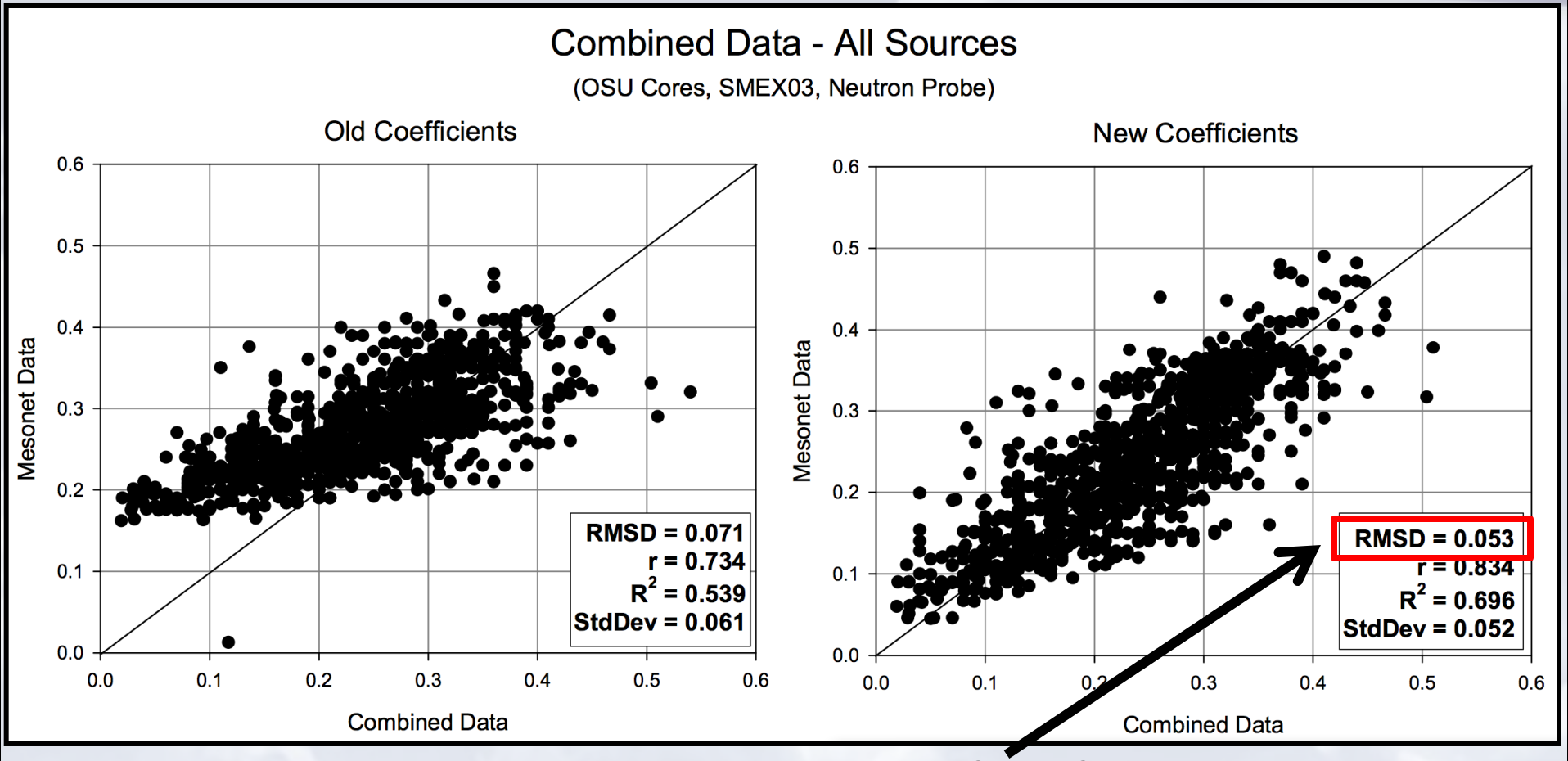
- Compared with gravimetric samples (OSU soil cores) collected during the empirical analysis as well as gravimetric samples collected at Mesonet site during SMEX03 as well as neutron probe measurements collected at the sites.





"Error" = 0.053 cm^3 cm^{-3}

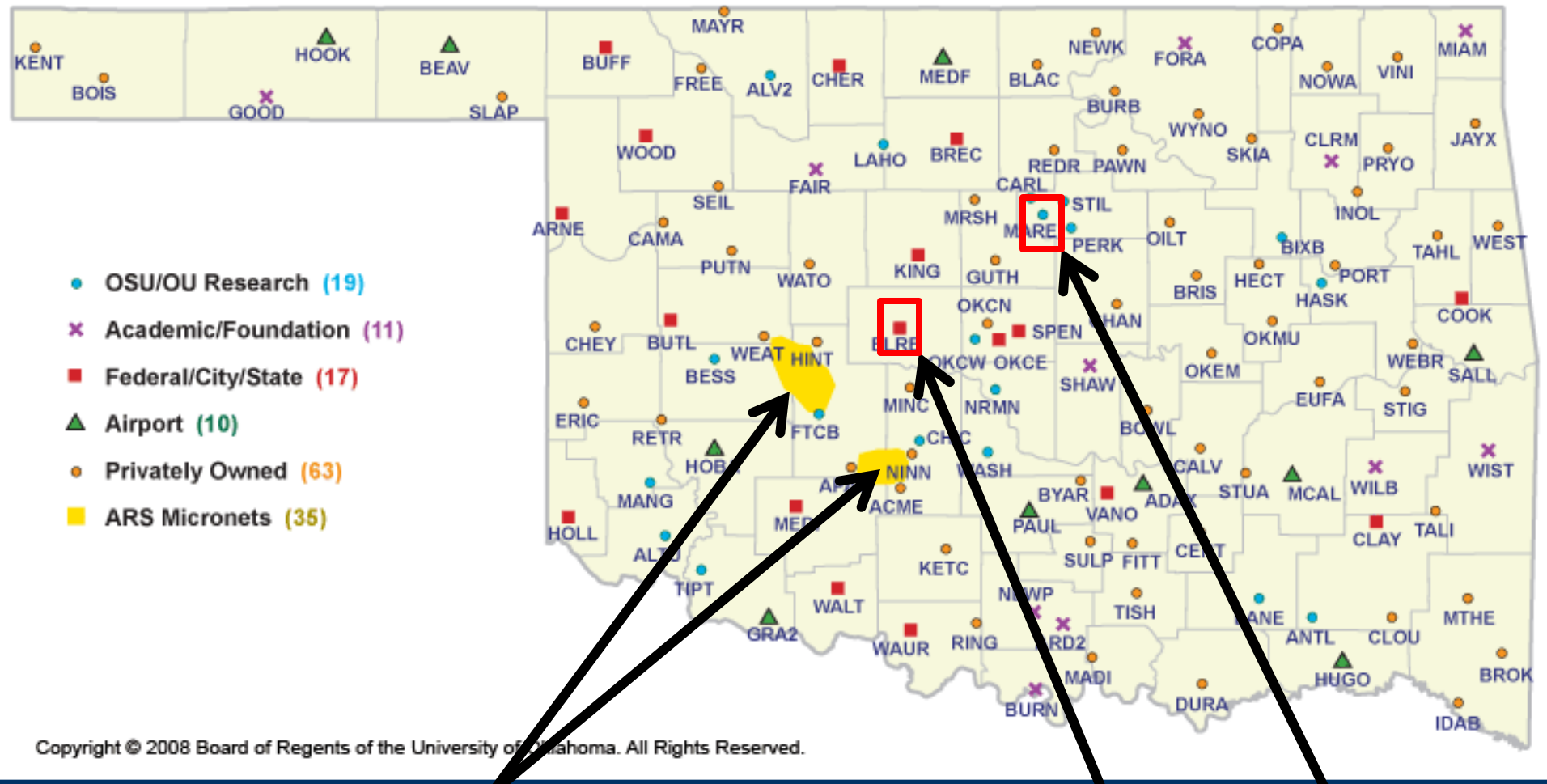
Scott, B., T. Ochsner, B. Illston, C. Fiebrich, J. Basara, and A. Sutherland, 2013: New Soil Database Improves Oklahoma Mesonet Soil Moisture Estimate. *J. of Atmos. and Oceanic Tech,* ***in press.***



"Error" = 0.053 cm^3 cm^{-3}

Mesonet Water Content Data – 5 cm observations represents the 0-5 cm SMAP Product

SMAP Cal/Val Sites in the Region



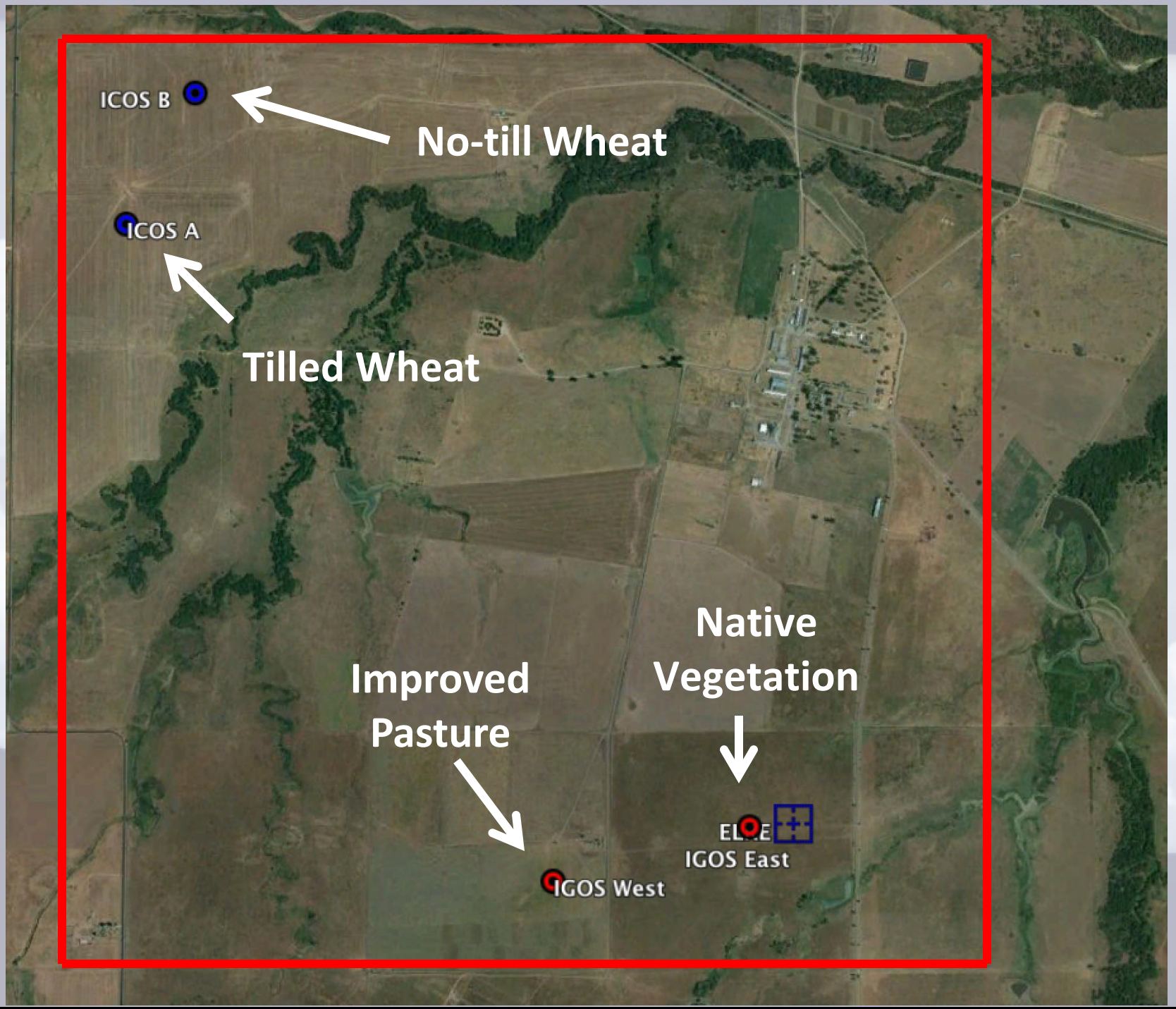
ARS Micronets – 36, 9, and 3 km?

MOISST – 36, 9, 3 km

El Reno – 36, 9, 3 km?

Integrated Grassland/Crop Observing Systems at El Reno – To be completed in 2014


ICOS B
ICOS A
IGOS East
IGOS West


ICOS B
No-till Wheat
ICOS A
Tilled Wheat
Native
Vegetation
Improved
Pasture
IGOS East
IGOS West


marena - NetCam SC - Mon May 27 2013 16:00:05 CST
Temperature: 50.5
Exposure: 24


marena - NetCam SC - Thu May 09 2013 09:44:03 CST
Temperature: 43.0
Exposure: 28


marena - NetCam SC - Wed Sep 12 2012 10:30:05 CST
Temperature: 55.0
Exposure: 22

Thoughts Concerning The Use of Oklahoma Mesonet Data for Cal/Val of SMAP Products

- For Validation at Specific Locations, Choose "Representative" Sites – Especially for the 36 km spatial scale:

- Gu, Y., E. Hunt, B. Wardlow, J. B. Basara, J. F. Brown, and J. P. Verdin, 2008: Evaluation and validation of MODIS NDVI and NDWI for vegetation drought monitoring using Oklahoma Mesonet soil moisture data. *Geophys. Res. Lett.*, **35**, L22401, doi:10.1029/2008GL035772.

- Utilize Selected/Enhanced sites including MARE/MOISST and ELRE to address scaling and scaling representativeness challenges/issues.

- Conduct field campaigns at ELRE and MARE during planned IOPS related to the project needs and SMAP needs.

Questions?

Oklahoma Mesonet