

Soil Moisture Scaling Function Development for the Little River Experimental Watershed

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Yueh³

¹USDA-ARS-Hydrology and Remote Sensing
Laboratory

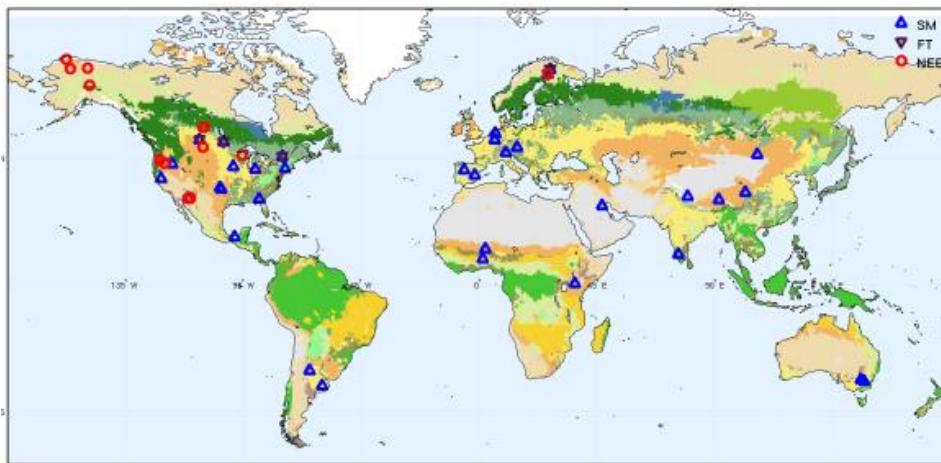
²USDA-ARS-Southeast Watershed Research Laboratory

³NASA Jet Propulsion Laboratory

⁴NASA Goddard Space Flight Center

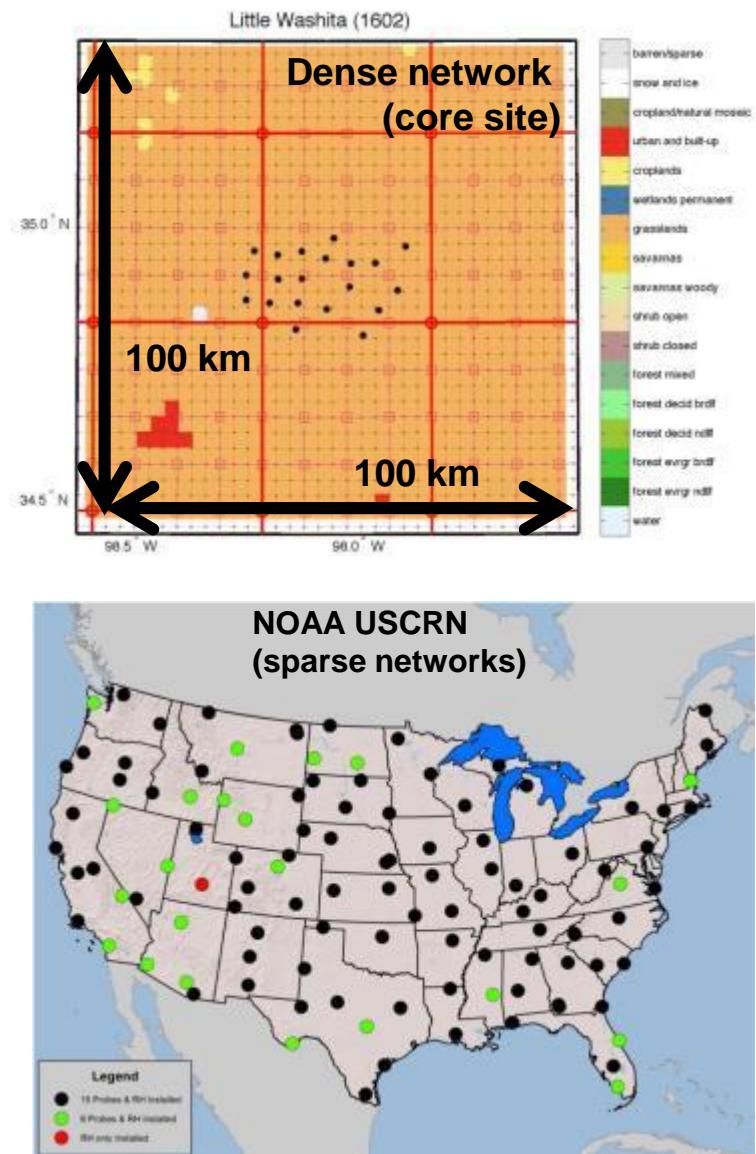
SMAP Soil Moisture Cal/Val Approach

- Primary calibration and validation approach is utilization of dense in situ soil moisture measurements (multiple soil moisture measurement within the 3-km to 36-km SMAP footprint)



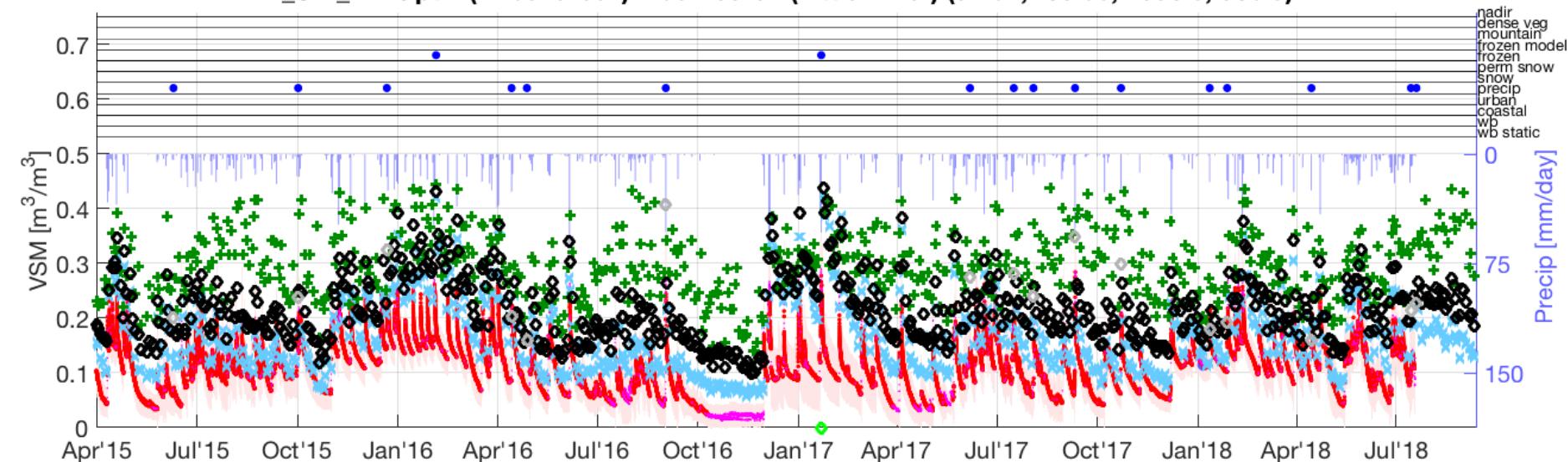
Global distribution of core validation sites

- Supplemental approach will utilize large-scale sparse networks (one measurement within footprint), and global remote sensing and model-based soil moisture data products



Little River (Core Pixel)

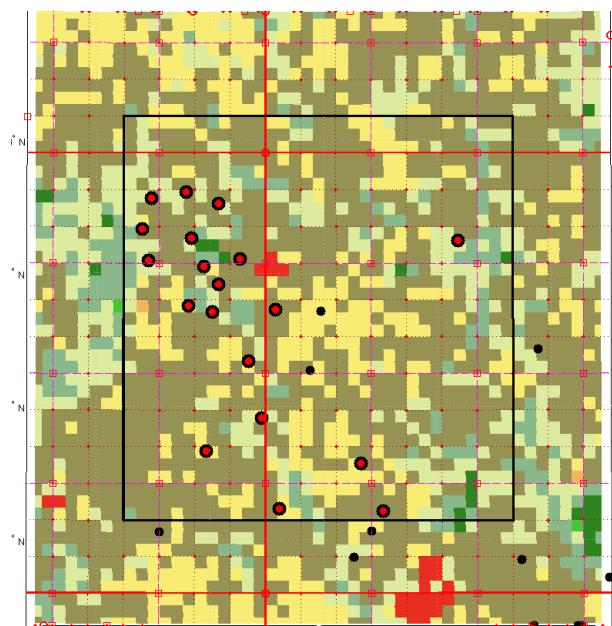
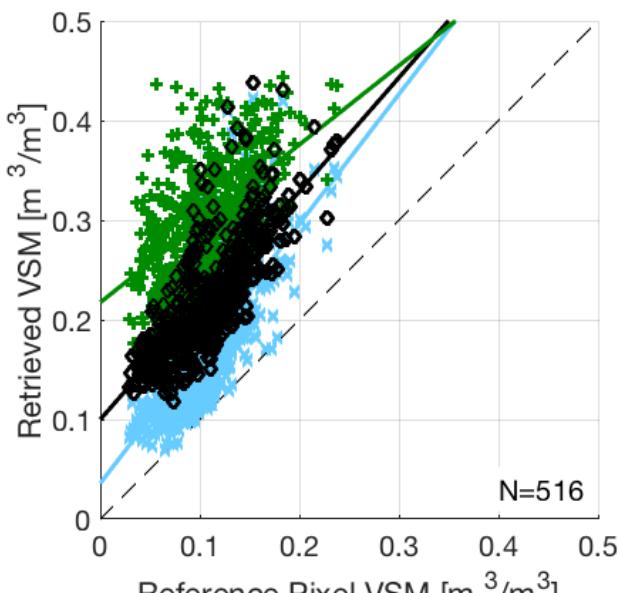
L2_SM_PE-Opt 2 (R16010-002): 1604-33-02 (Little River) (31.67, -83.60; 1033.0, 386.0)



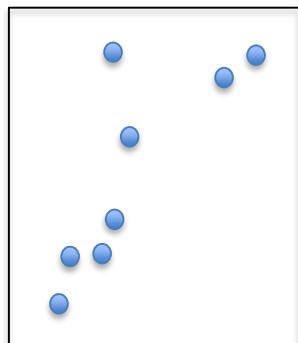
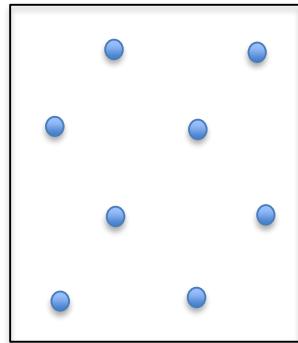
Alg.	ubRMSE	Bias	RMSE	R	Slope
SCA-H	0.045	0.068	0.082	0.758	1.301
SCA-V	0.036	0.115	0.121	0.782	1.144
DCA	0.049	0.195	0.201	0.538	0.792
In Situ					

Climate class: Temperate (Cfa)
 Landcover: Cropland/natural mosaic

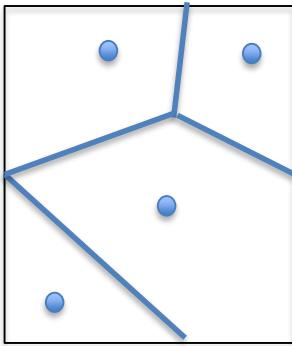
Soil texture:
 S-%: 80
 C-%: 7
 BD: 1.47



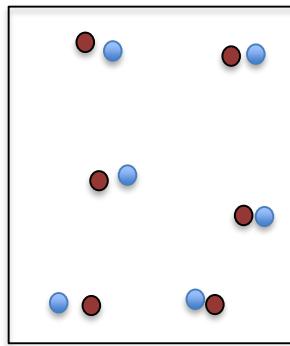
Scaling Function



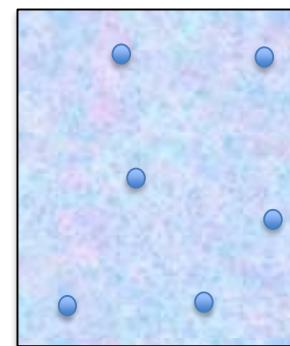
● Perm Station



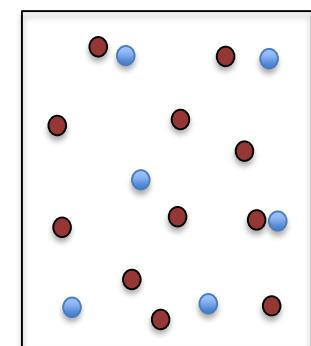
● Perm Station



● Perm Station
● Weekly Samples



● Perm Station



● Perm Station
● Temp Station

Arithmetic

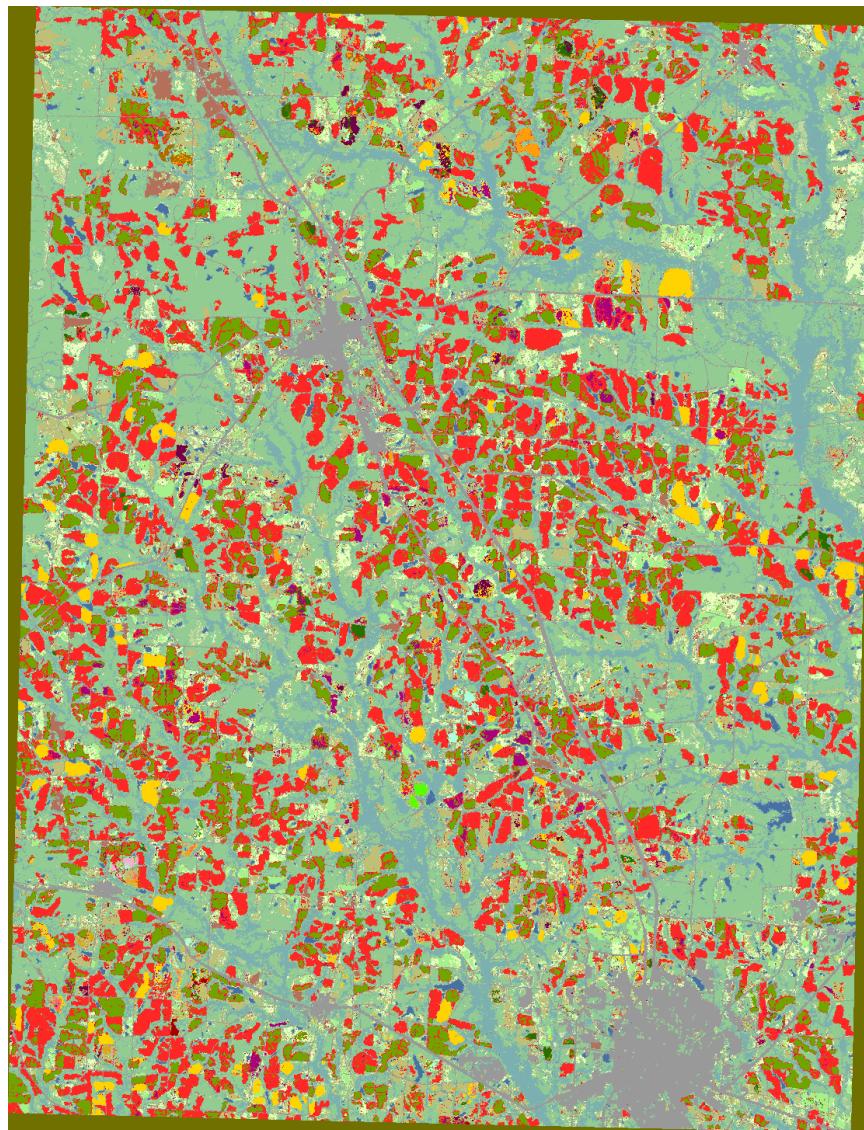
Voronoi

Physical Sampling

Model Matchup

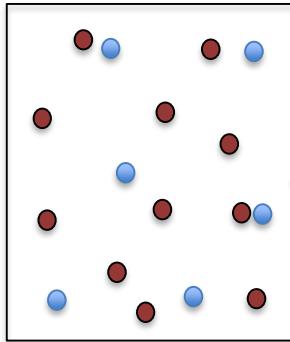
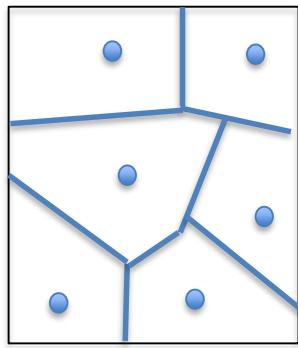
Temp Network

Wet Forest - 25%
Forest – 20%
Agriculture et al. – 55%





Scaling Function



- Perm Station
- Temp Station

Voronoi

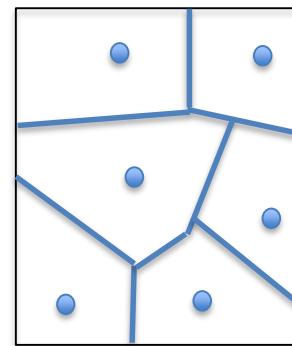
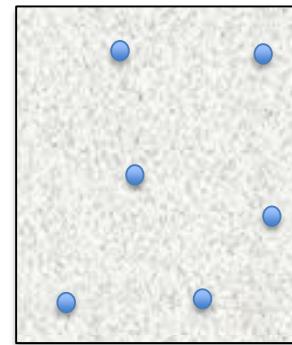


Temporary Network



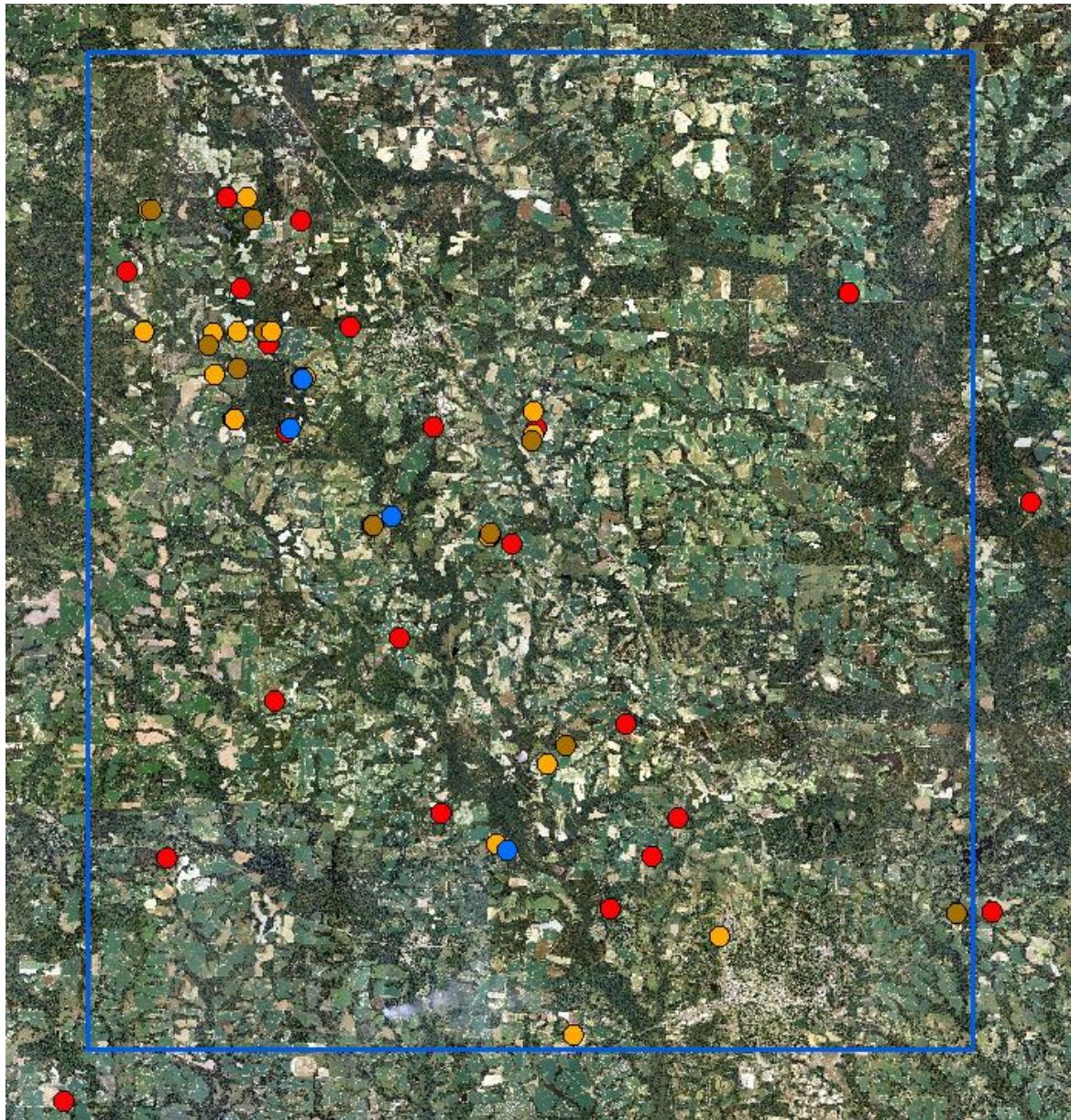
Adjusted Voronoi

Land cover info



Weighted Average Soil Moisture (WASM)

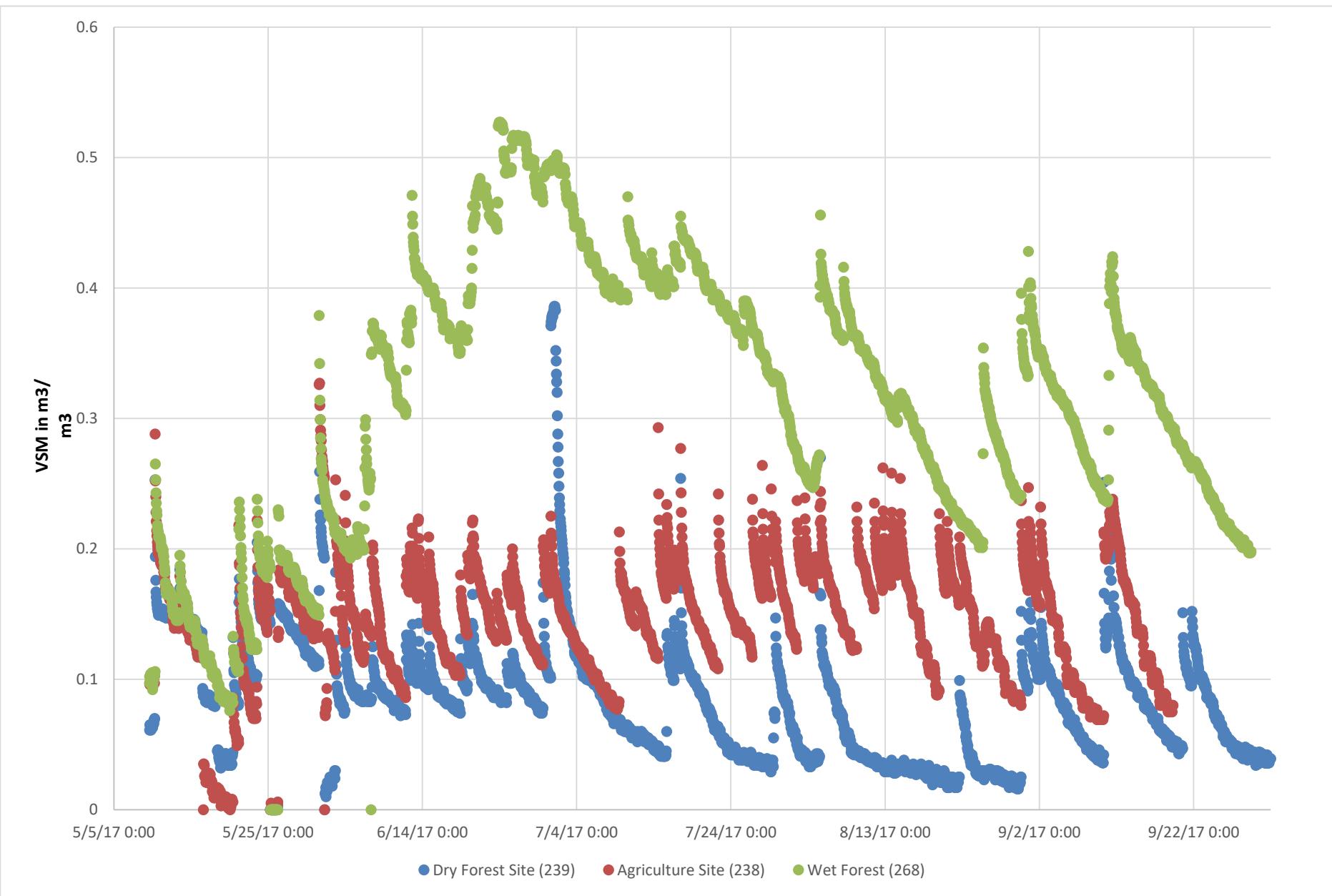
New SM = $f(\text{WASM})$



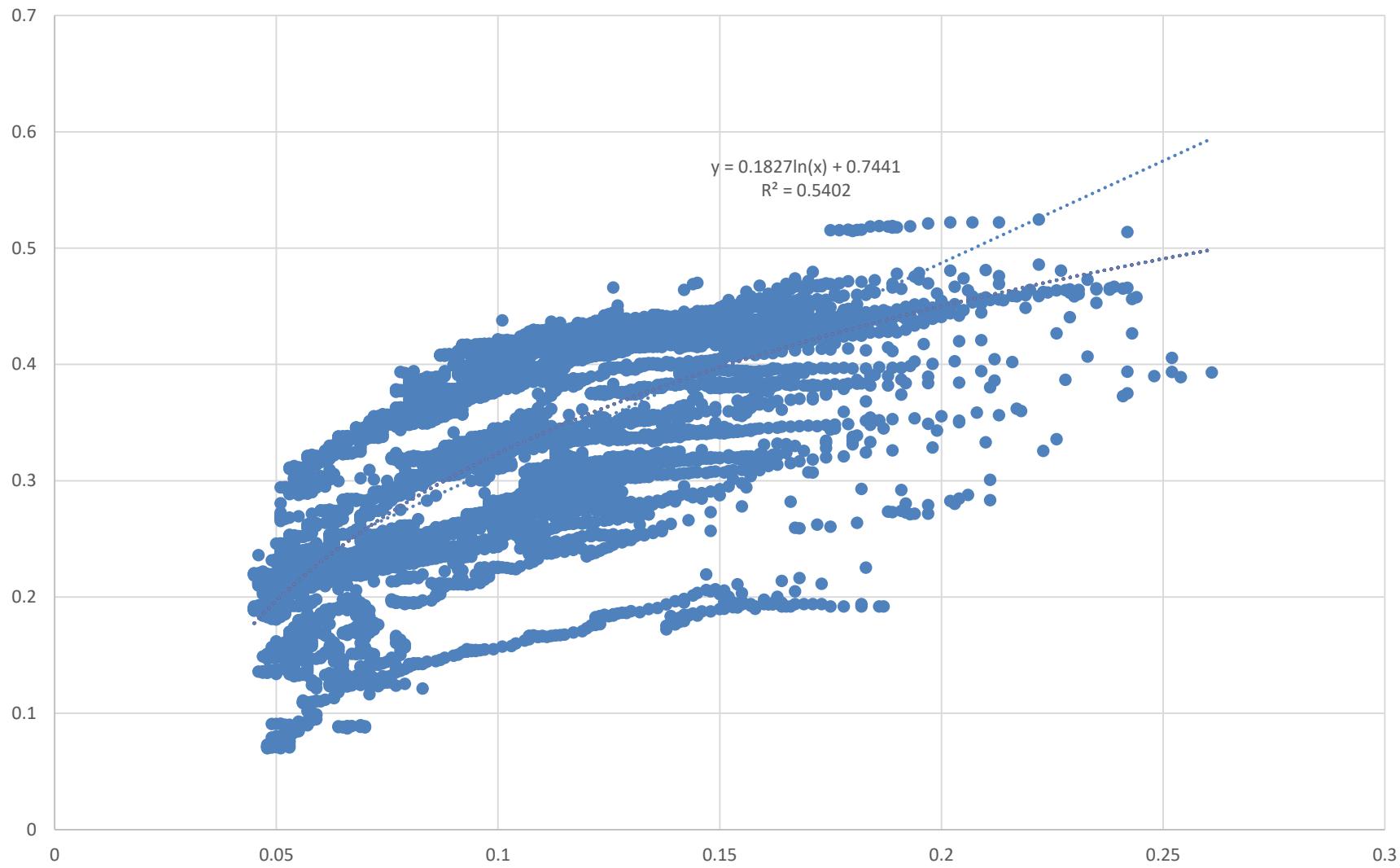
Temp Network in early summer of 2017

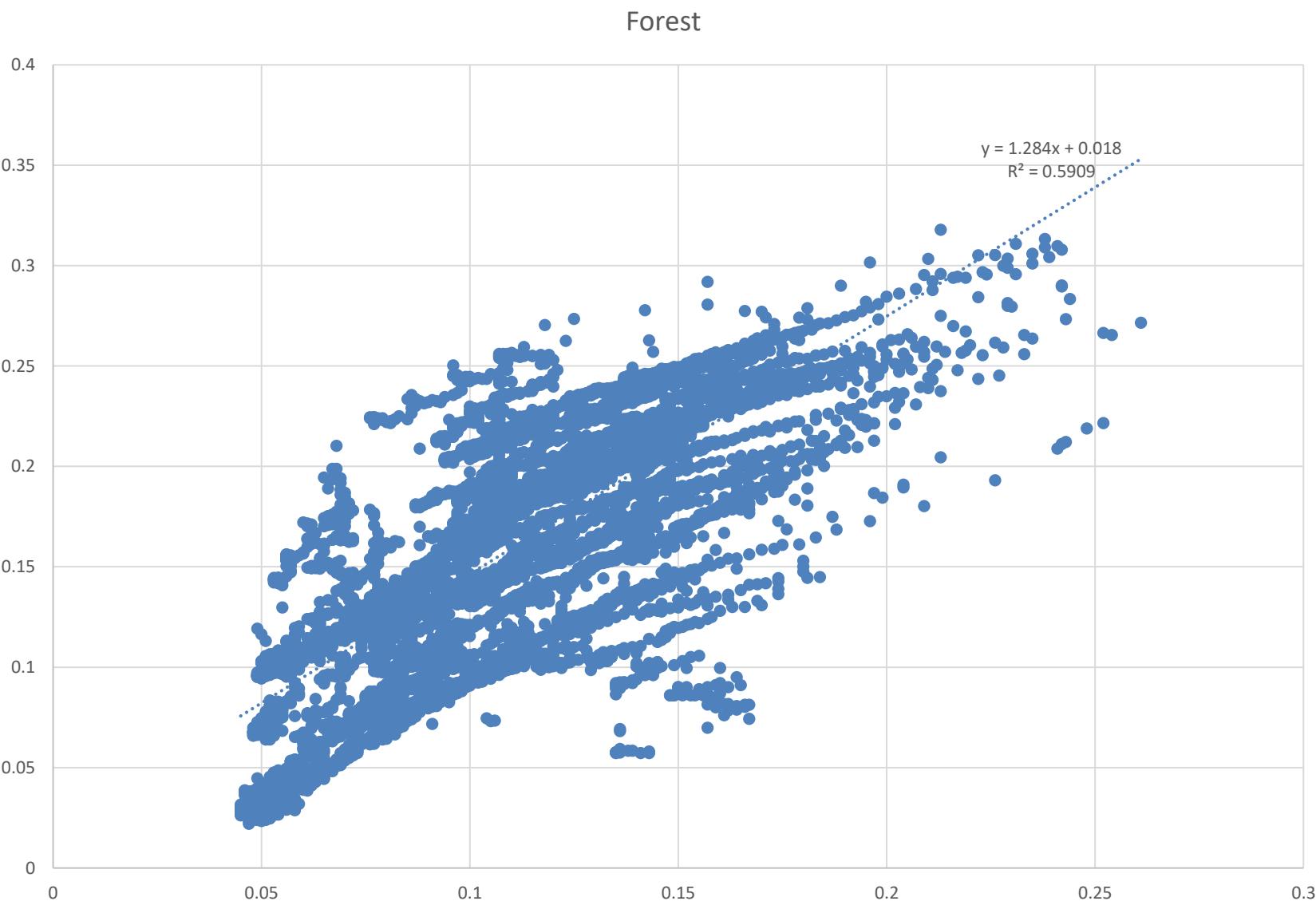
Interrupted at harvest 2017

Many reinstalled for the winter of 2017-18

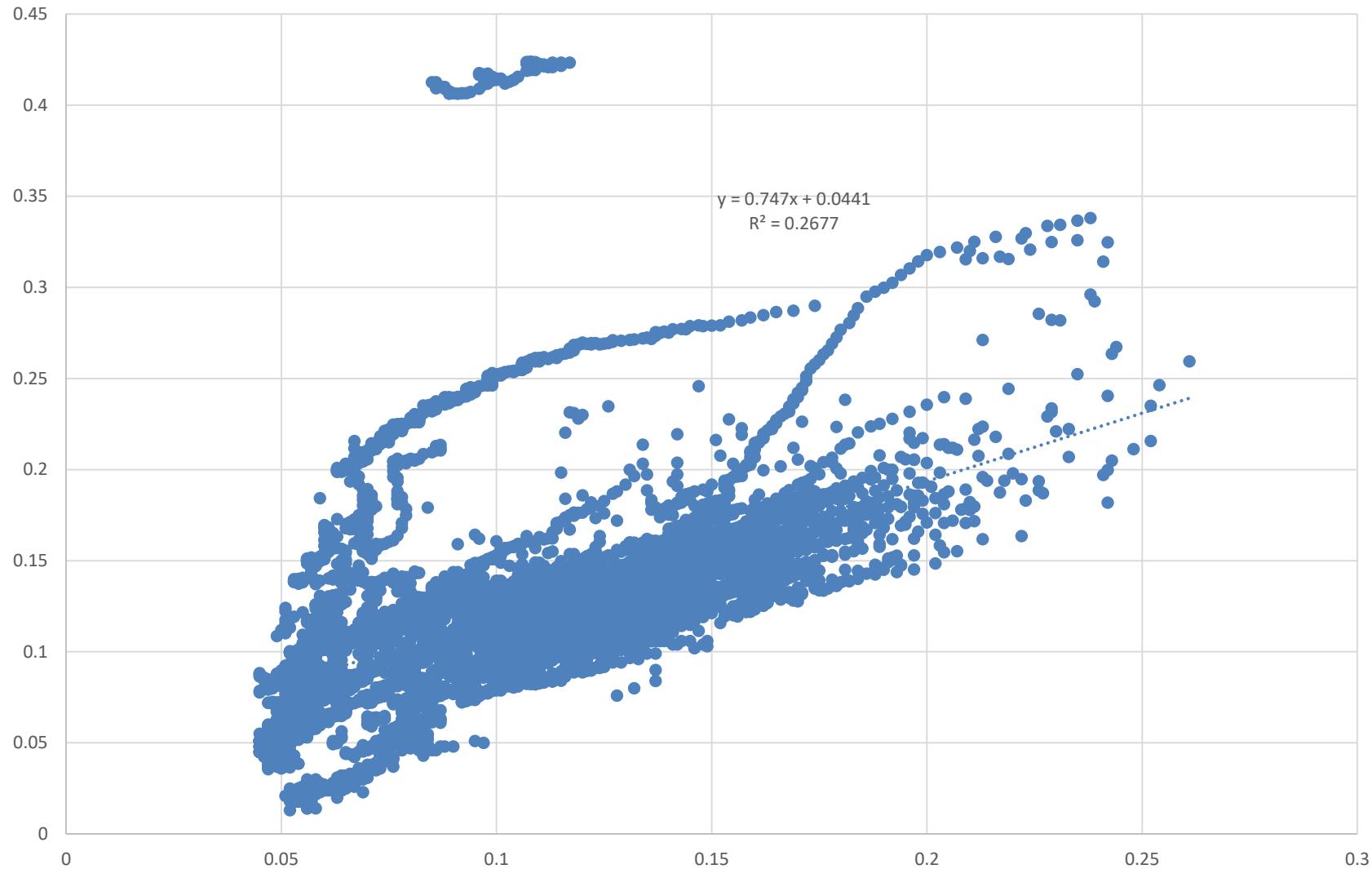


Wetland Hydra 1

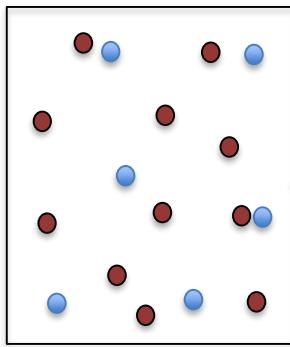
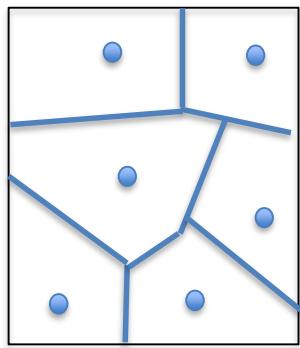




Irrigated Crop

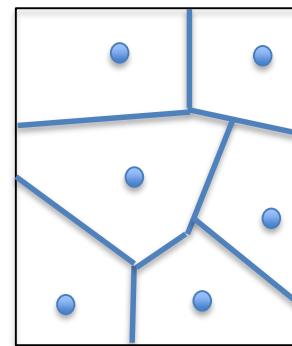
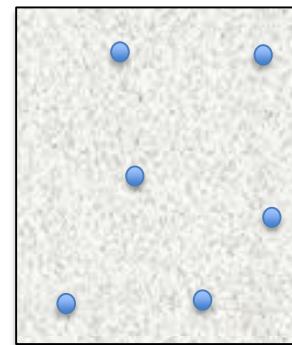


Scaling Function



- Perm Station
- Temp Station

Land cover info



Weighted Average Soil Moisture (WASM)

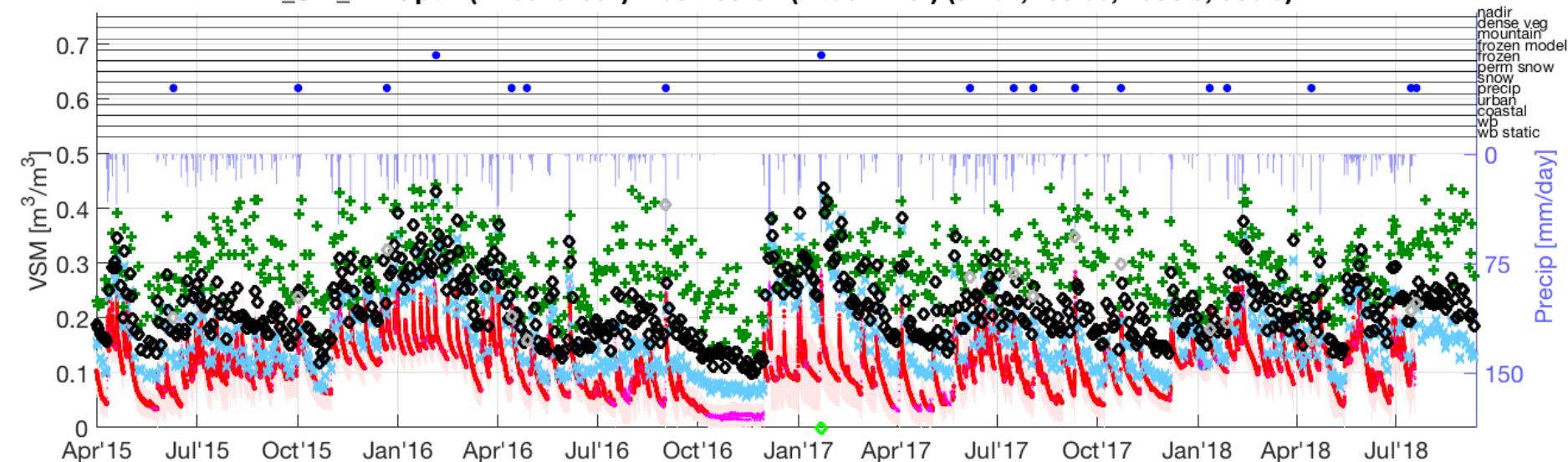
New SM = $f(\text{WASM})$

Voronoi → Temporary Network → Adjusted Voronoi

$$\begin{aligned} \text{New_WASM} = & 0.25*(0.1864*\ln(\text{WASM})+0.7387) + 0.2*(1.2566*\text{WASM}+0.0186) + 0.2*(0.747*\text{WASM}+0.0441) + 0.35*(0.715*\text{WASM} - 0.0044) \\ \text{New_WASM} = & \quad \text{Wetland Forest} \quad + \quad \text{Dry Forest} \quad + \quad \text{Irrigated Crop} \quad + \quad \text{Non-irrigated Crop} \end{aligned}$$

Little River (Core Pixel)

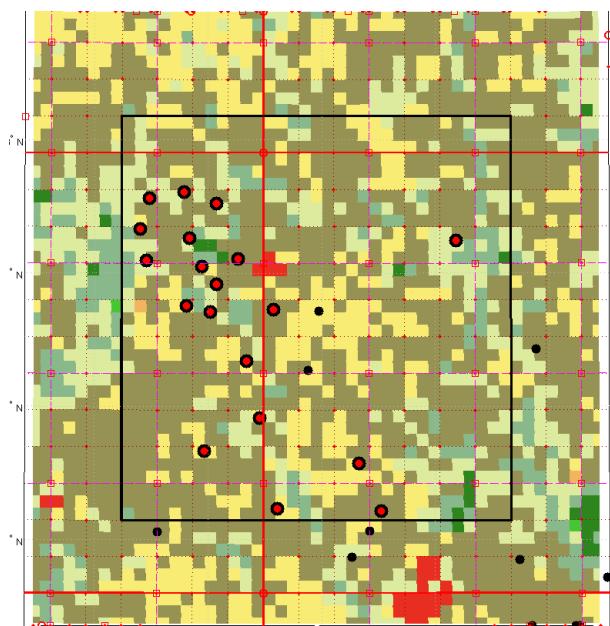
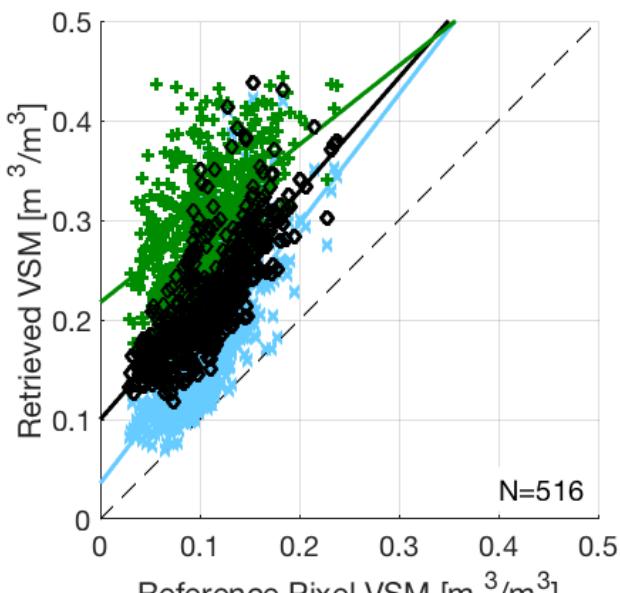
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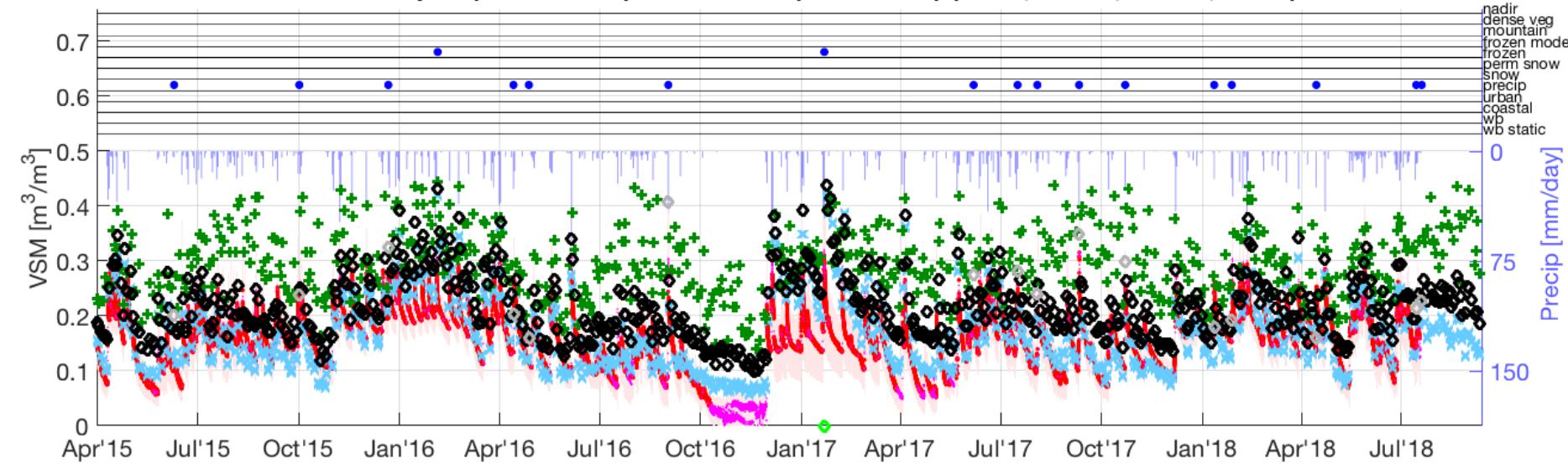
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L2_SM_PE-Opt 2 (R16010-002): 1604-33-06 (Little River) (31.67, -83.60; 1033.0, 386.0)



Alg.	ubRMSE	Bias	RMSE	R	Slope
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SCA-H	0.045	0.020	0.049	0.750	1.173
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SCA-V	0.036	0.068	0.077	0.773	1.028
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DCA	0.050	0.148	0.156	0.529	0.708
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In Situ					
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Climate class: Temperate (Cfa)

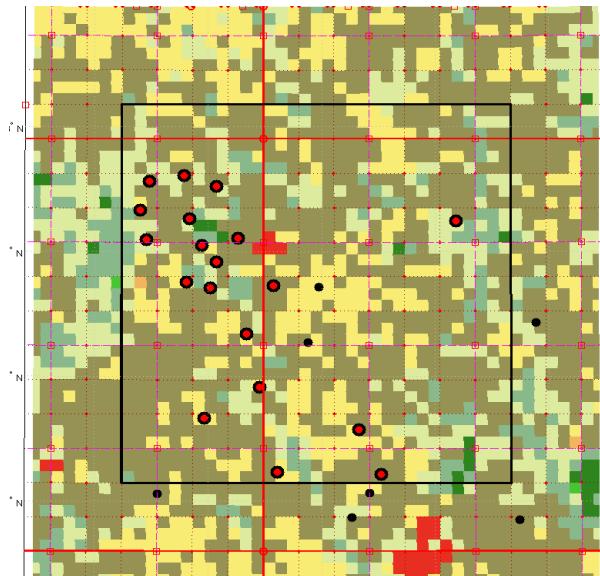
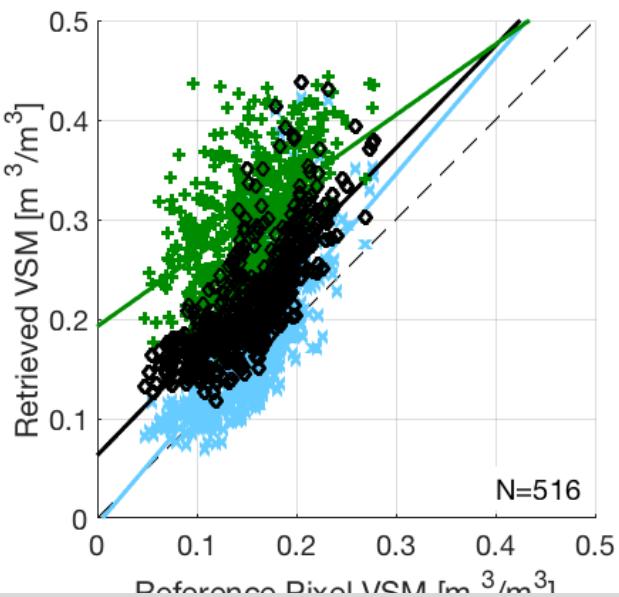
Landcover: Cropland/natural mosaic

Soil texture:

S-%: 80

C-%: 7

BD: 1.47



Black: Use recommended [Retrieval Quality Flag bit(0)=0]

Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]

Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]

Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]