

Update on Validation of Satellite Soil Moisture Algorithms Using Watershed Networks

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Validation Goal

- Provide a *close approximation* of soil moisture within the area and depth measured by low frequency passive microwave sensors that would result in a robust data set for validating retrieval algorithms as well as models

Close Approximation

- The satellite footprint size is ambiguous
- The center and orientation of the elliptical footprint changes with every pass
- Contributing depth varies with frequency and moisture condition (level and profile distribution)
- Soil moisture variability (spatial and temporal) and spatial extent of footprints impose logistic constraints on replication

Lessons Learned

Standards

Infrastructure

Diverse Conditions

Replication

Installation

Calibration

Scaling

Archive

Algorithm Validation

Validation of AMSR-E
Soil Moisture Products
Using Watershed
Networks

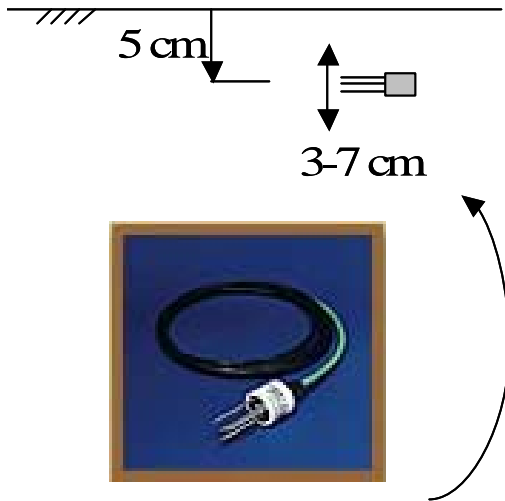
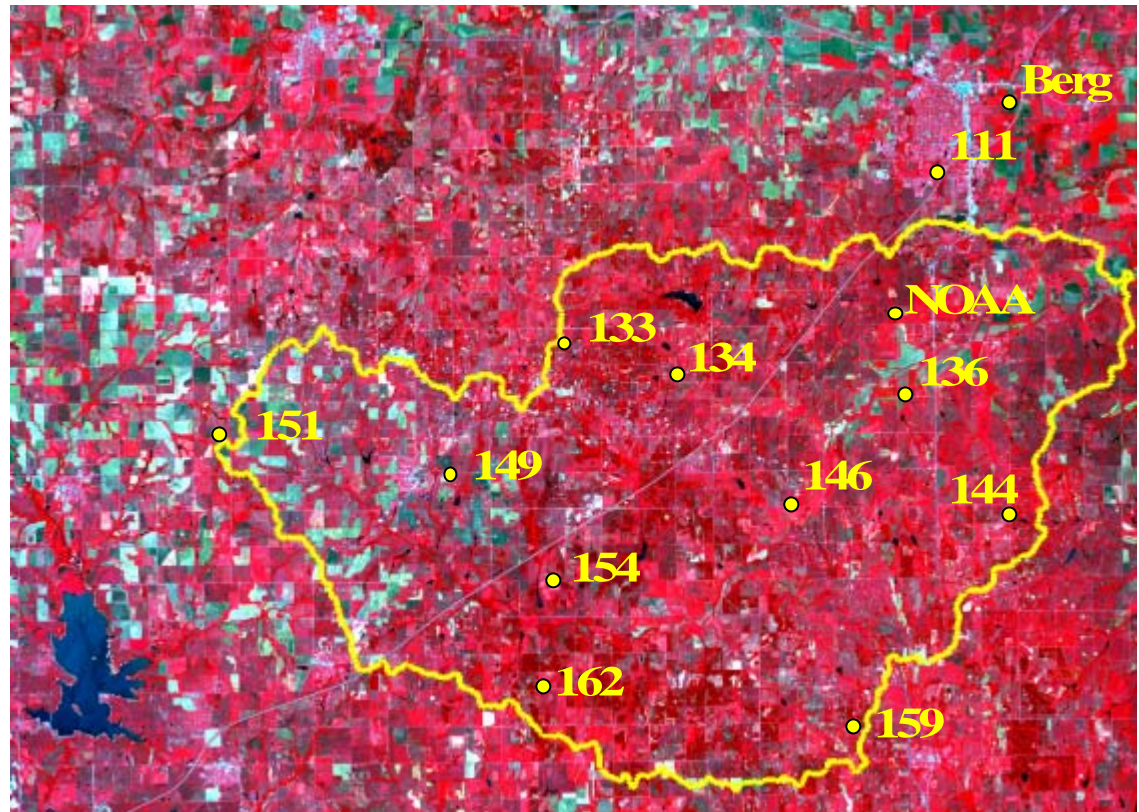
Complete Incomplete

SMEX+

Little Washita Vitel Network



Little Washita River Washita



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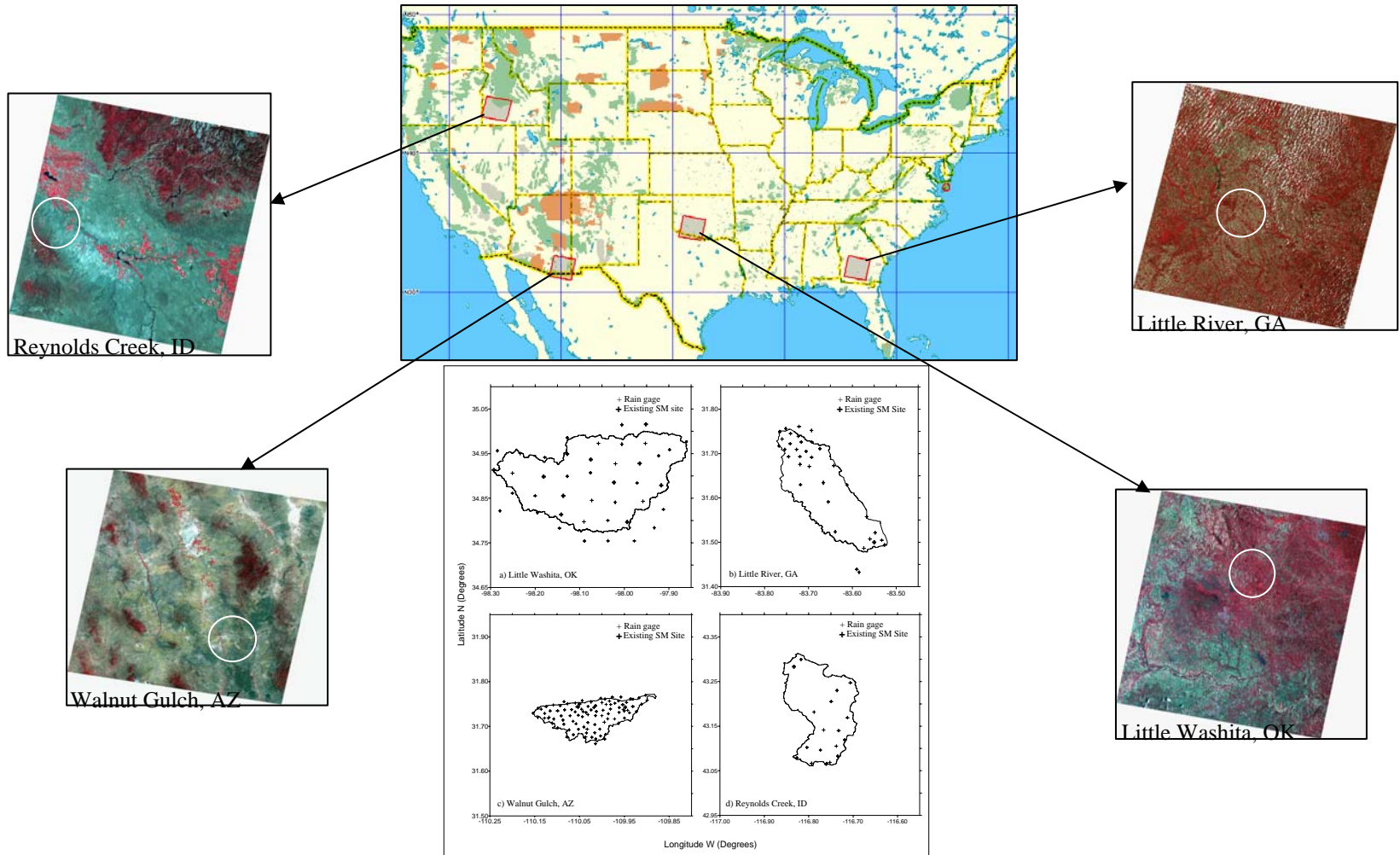
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AMSR-E U.S. Soil Moisture Validation Sites



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Description and Status of Watershed Networks

<u>Watershed</u>	<u>Type</u>	<u># Sensors</u>	<u>Reporting</u>
Walnut Gulch, AZ	Semi-Arid	21	20 min
Reynolds Creek, ID	Mountainous	16	1 hour
Little River, GA	Forest	19	30 min
Little Washita, OK	Grazingland	19	30 min

*All watersheds currently downloading daily.

Period of Record ~ March 2002

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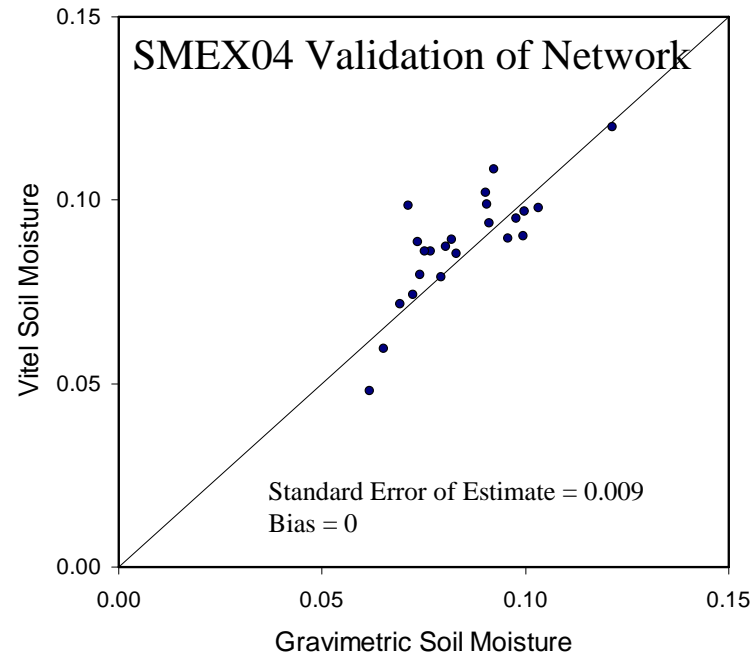
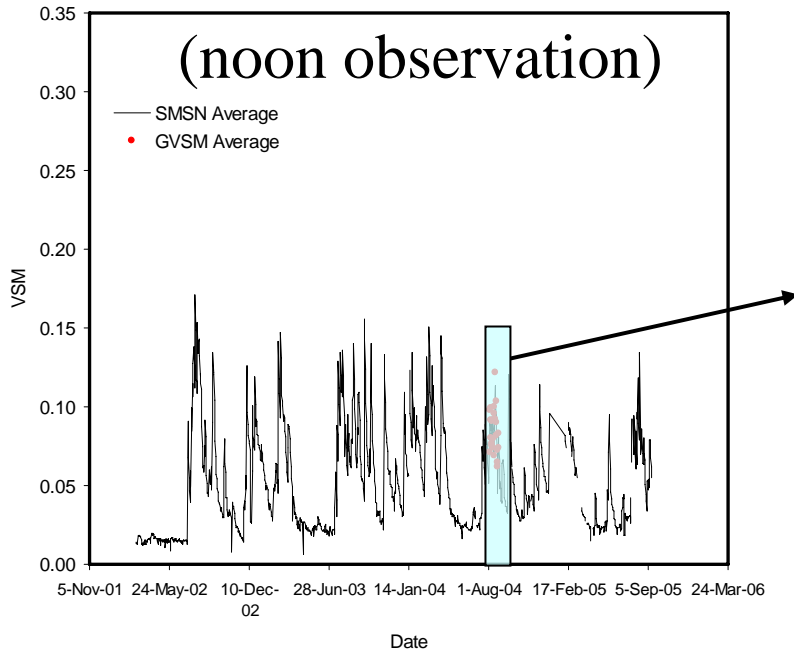
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SMEX+

Does the Vitel Network Provide a Good Estimate of the Watershed Average Volumetric Soil Moisture?

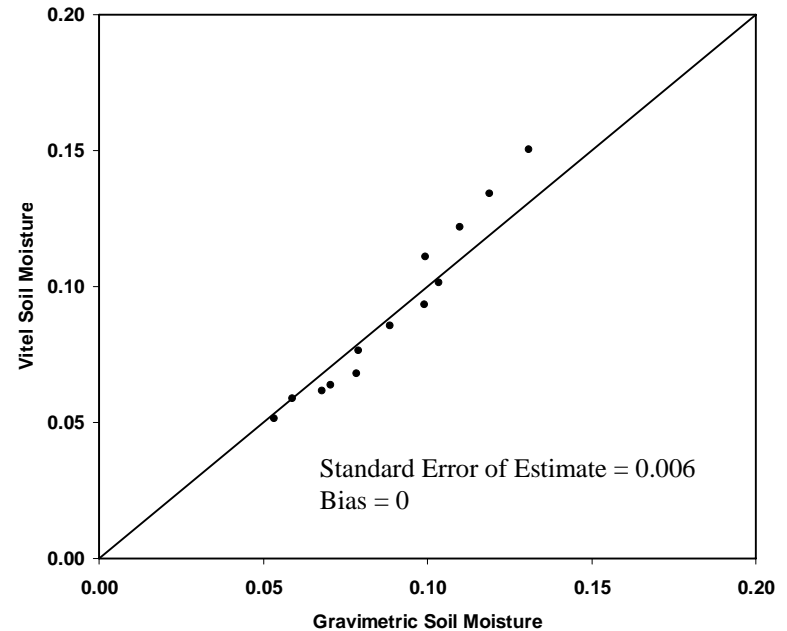
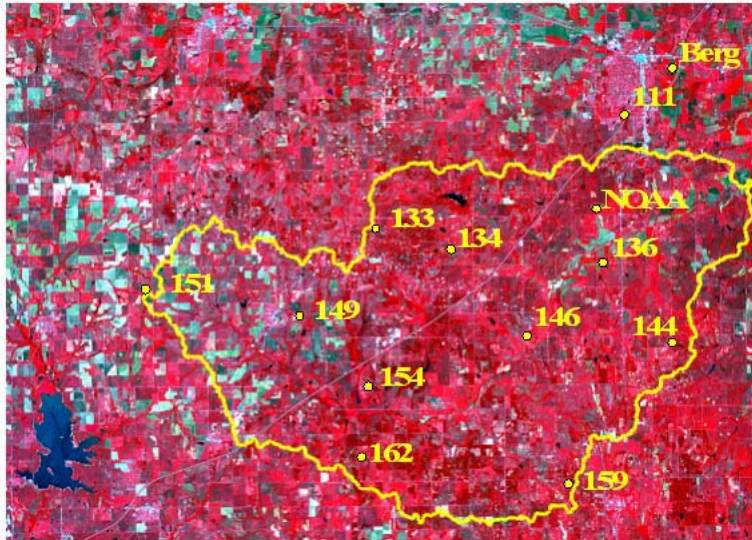
Walnut Gulch, AZ SMEX04



SMEX04 comparison of the average of 19 automated *in situ* sensors (solid-line time-series) and 69 sites sampled using a gravimetric method (red symbols). The example demonstrates that reliable area average soil moisture can be obtained using the automated sensors.

Does the Vitel Network Provide a Good Estimate of the Watershed Average Volumetric Soil Moisture?

Little Washita, OK SMEX03



SMEX03 comparison of the average of 13 automated *in situ* sensors and 13 field sites sampled using a gravimetric method (not the same locations). The example demonstrates that reliable area average soil moisture can be obtained using the automated sensors.

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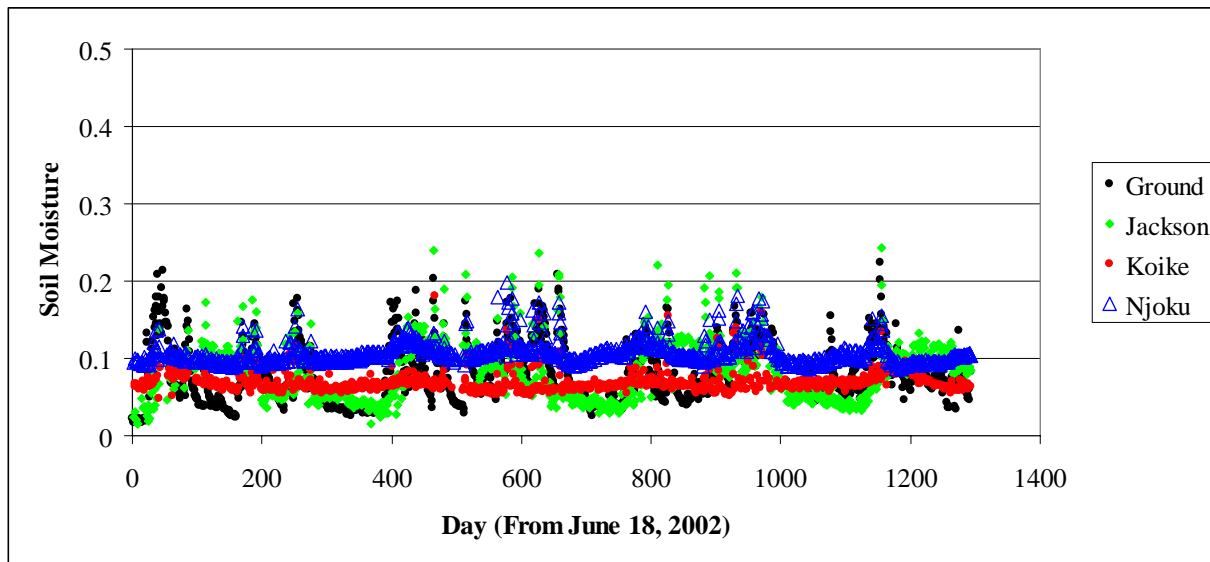
Preliminary Validation/QC

- WG (2003) data provided to JAXA and PIs
- Algorithm package: programmed Koike, Jackson and extract Njoku from NSIDC
- Using NSIDC data
- Application to WG (A&D) and LW (A&D)
- June 2002-Dec. 2005
- Several alternative comparisons

AMSR-E Soil Moisture Algorithm Validation Exercise

Using Data from Walnut Gulch, AZ (WG) and Little Washita, OK (LW) June 18, 2002-Dec. 31, 2005

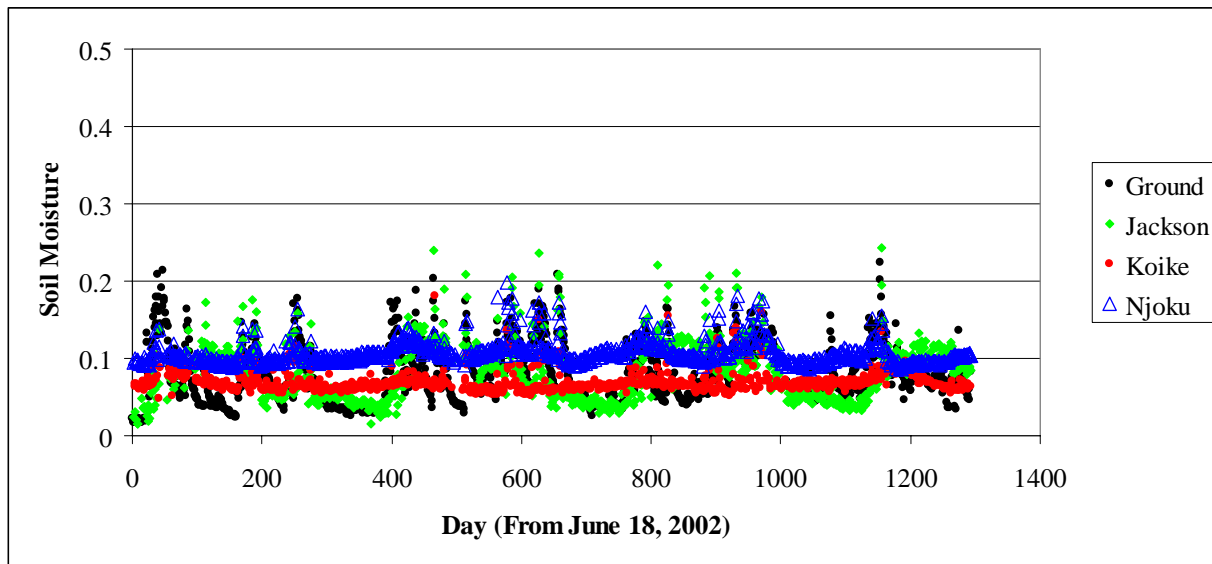
WG



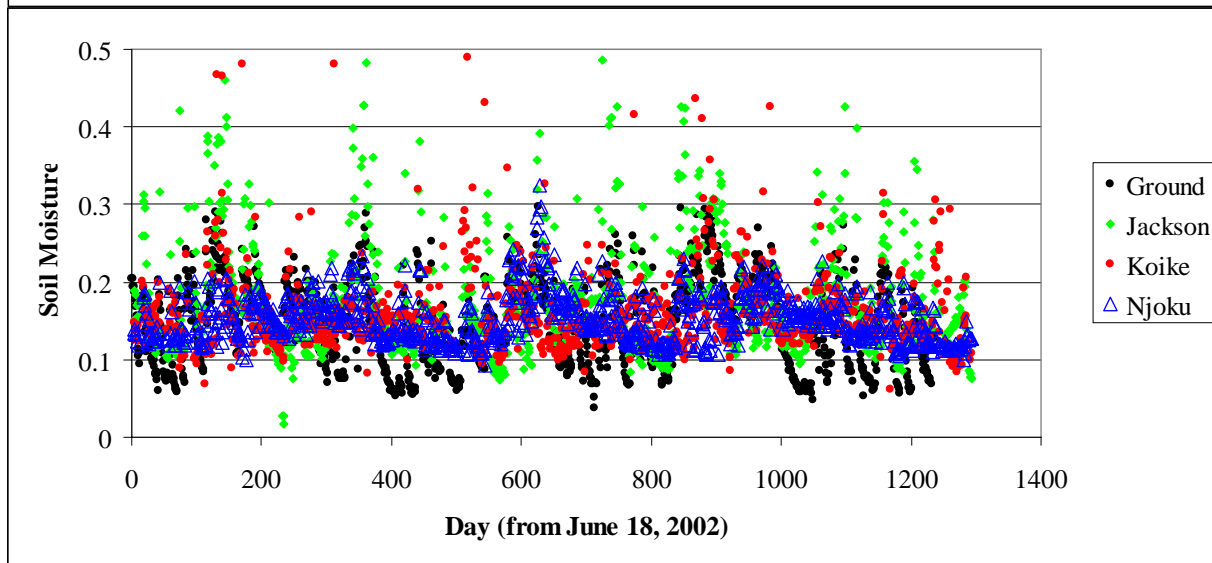
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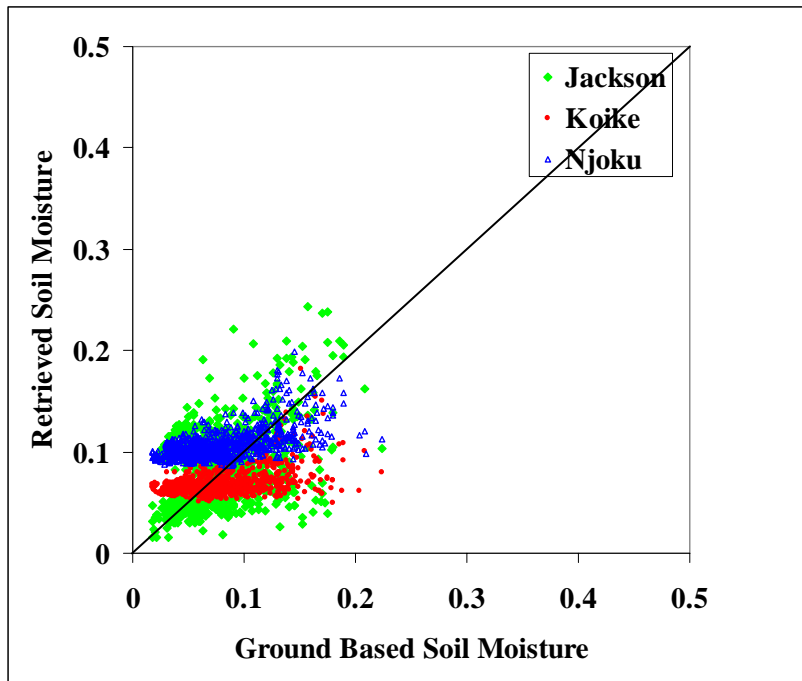
LW



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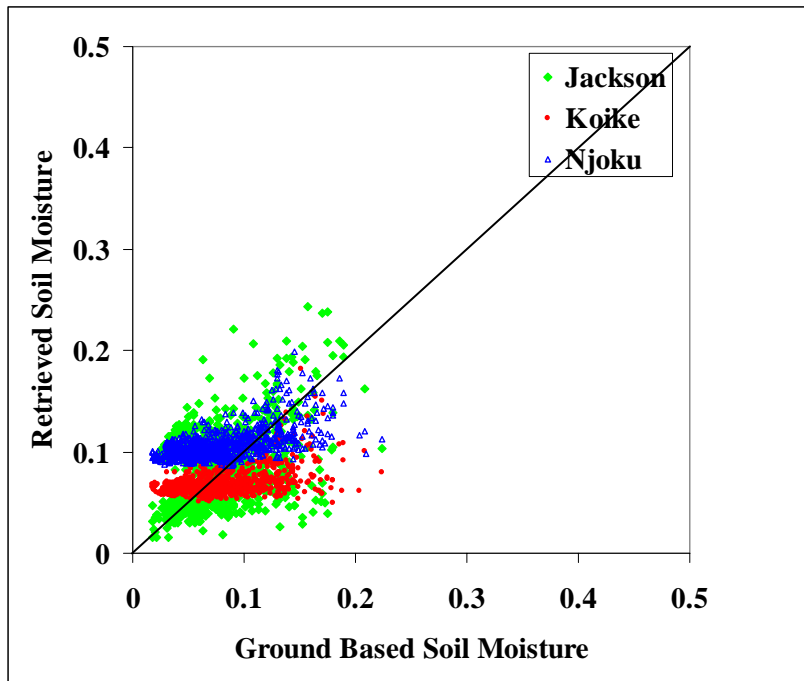
WG



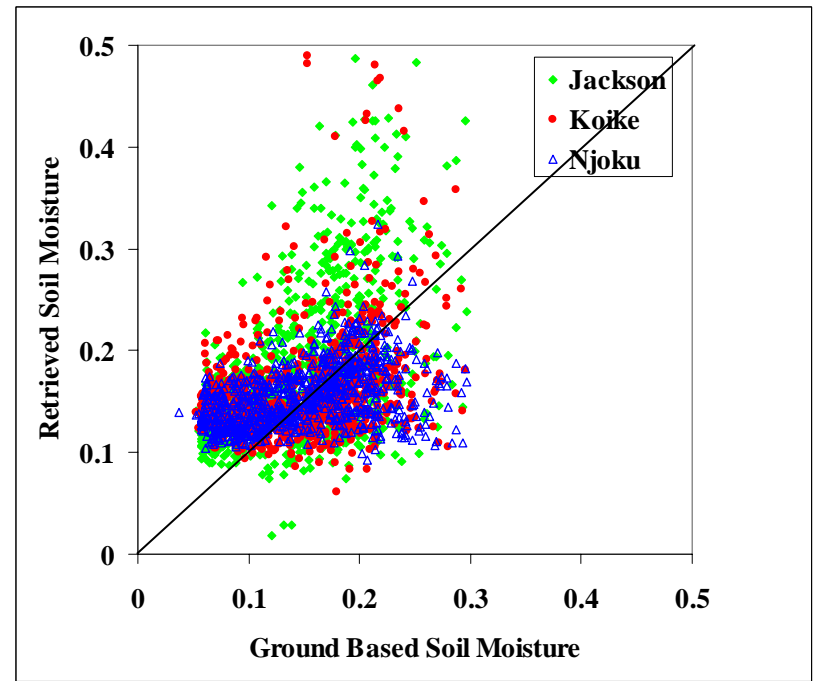
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WG



LW



AMSR-E Soil Moisture Algorithm Validation Exercise
 Using Data from Walnut Gulch, AZ (WG) and
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Site	A or D	Algorithm	N	SEE	Bias	SEE after bias removed	R
WG	A	Jackson	816	0.041	0.006	0.033	0.436
WG	A	Koike	840	0.036	-0.010	0.034	0.429
WG	A	Njoku	865	0.042	0.028	0.031	0.581
LW	A	Jackson	805	0.076	0.035	0.048	0.508
LW	A	Koike	817	0.065	0.013	0.053	0.316
LW	A	Njoku	852	0.052	0.007	0.051	0.415

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Plans for Data access and Archival

- Web page interface with monthly files available.
- Scheduled Beta-testing October 2005
- Full release TBD 2006

Web-Address:

http://hydrolab.arsusda.gov/ARS_Soil_Moisture

Description and Status of Watershed and Other Networks

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Little Washita, OK	Grazingland	19	30 min
<i>Walnut Creek, IA</i>	<i>Cropland</i>	<i>10</i>	<i>30 min</i>
<i>Salamanca, Spain</i>	<i>Cropland</i>	<i>23</i>	<i>60 min</i>
<i>Sonora, Mexico</i>	<i>Semi-Arid</i>	<i>12</i>	<i>60 min</i>

Walnut Creek and Salamanca Design: Addresses the issue of sampling “ditches” to represent agricultural regions

Summary and Plans

- Maintain and quality control existing networks
- Complete analyses of Georgia and Idaho sites
- Through partnerships establish and calibrate new networks