National Aeronautics and Space Administration

Soil Moisture Active Passive Mission

SMAP

Objectives of the Workshop

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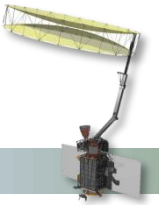
2) USDA ARS Hydrology and Remote Sensing Laboratory

Cal/Val Workshop #9

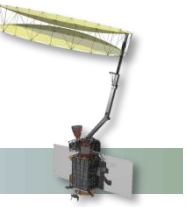
October 22-23, 2018

Where we are?



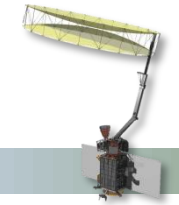
- SMAP completed the prime mission in June
- Now in the extended phase for the next 6 years (at least)
  - This is the first cal/val workshop in the extended phase
- SMAP radiometer-based soil moisture product meets the original requirement of 0.04 m^3/m^3 over areas with vegetation < 5kg/m^2 (etc.)
  - Several studies by the mission and other teams
- Mission developed a combined active passive product with Sentinel-1 upon the SMAP radar failure

Themes



- SMAPVEX19: SMAP Validation Experiment in July and October 2019 (forests)
  - Objective: Review and discuss the tentative experiment design and protocols
- High-res validation: Development of high-resolution (1-km) validation network
  - Objective: Way forward for validation of high-resolution soil moisture products
- Validation methodologies: Continued development of validation methodologies and improved practices
  - Objective: discuss and identify the next most important aspects to address in validation, review best practices proposal

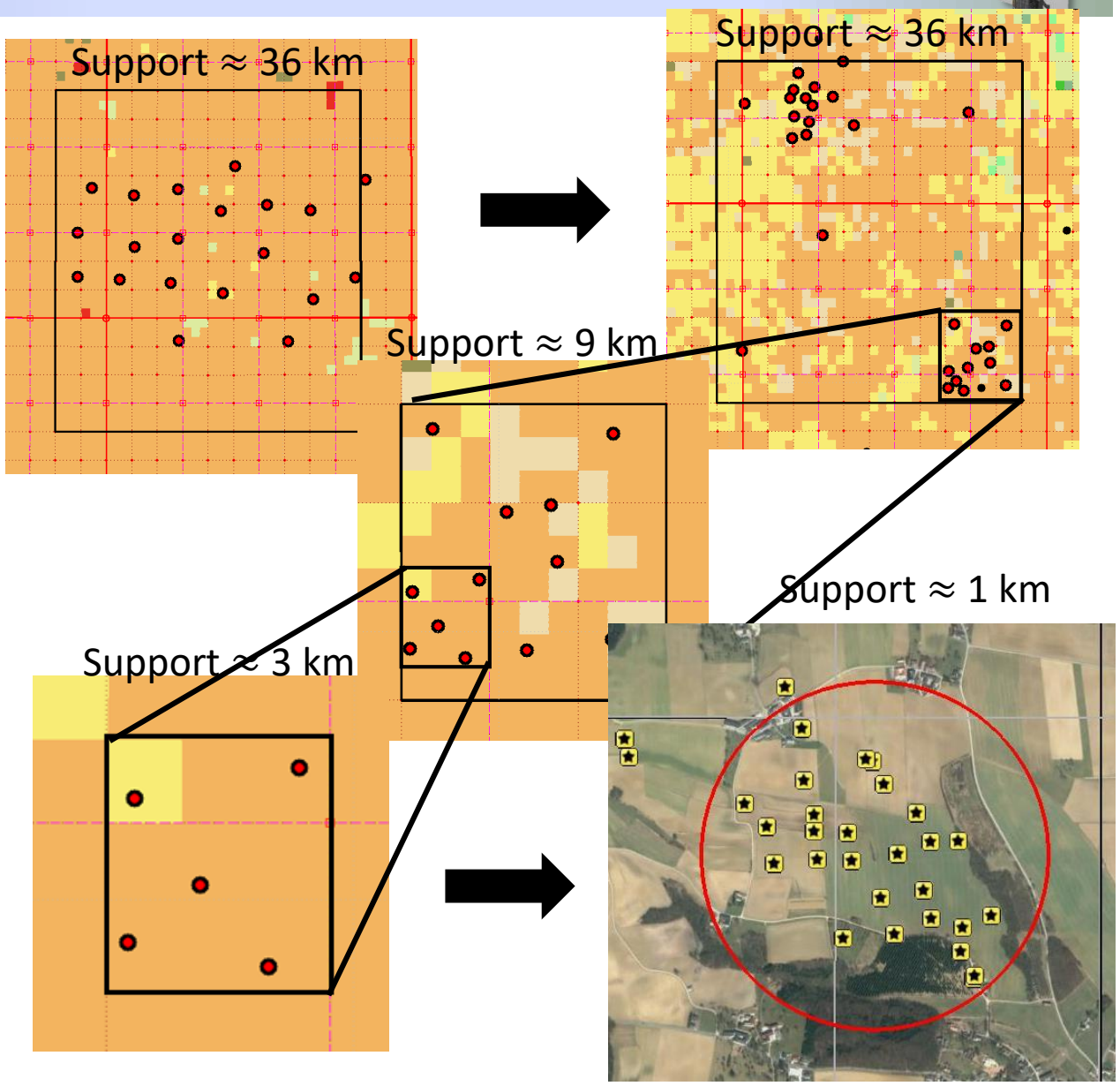
SMAPVEX19



- Goal of a field experiment is to address a specific issue with a mission product
  - SMAPVEX15: validation of disaggregated product
    - Experiment carried over heterogeneous soil moisture distribution
  - SMAPVEX16: understand the issues over agricultural area
    - Experiment carried over two sites in mid-west
- In the extended phase, the mission seeks to improve 1) soil moisture retrieval over high biomass areas and 2) high-resolution product based on Sentinel-1
- SMAPVEX19 design is focuses on these two goals
  - Two sites in New England chosen as the experiment location with variable forest cover
  - Mixed pixel included because they represent a large fraction of high-biomass pixels
  - Timed so that the effect of seasonal phenology can be studied (July and October)

High Resolution Validation

- For validating the (absolute) soil moisture the <u>support</u> of the in situ network is critical – the support must match the resolution of the product
- Much of the pre-SMAP current focus was on large scale validation (support=40 km)
- SMAP initiated dedicated studies to cover the scales down to 3 km
- Finding a number of good validation pixels at 3 km already has been a challenge
- The new SMAP-Sentinel product generation seeks validation pixels at 1-km scales



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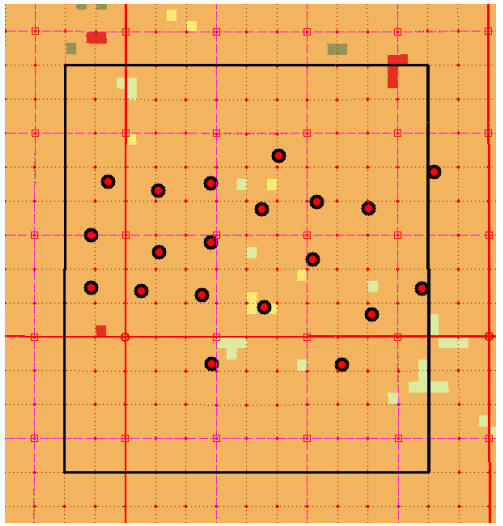
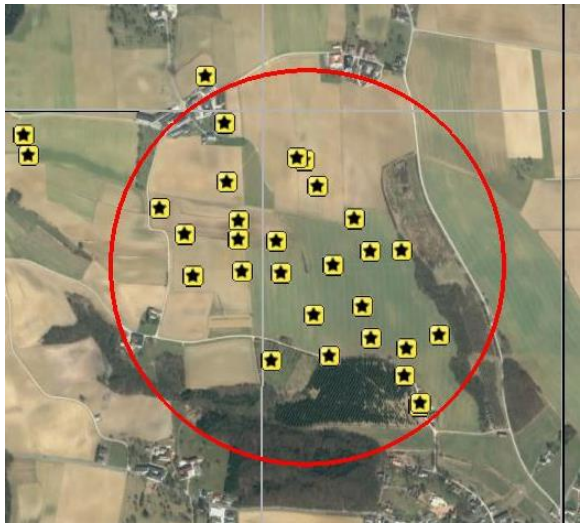
Support ≈ 36 km



Support ≈ 1 km



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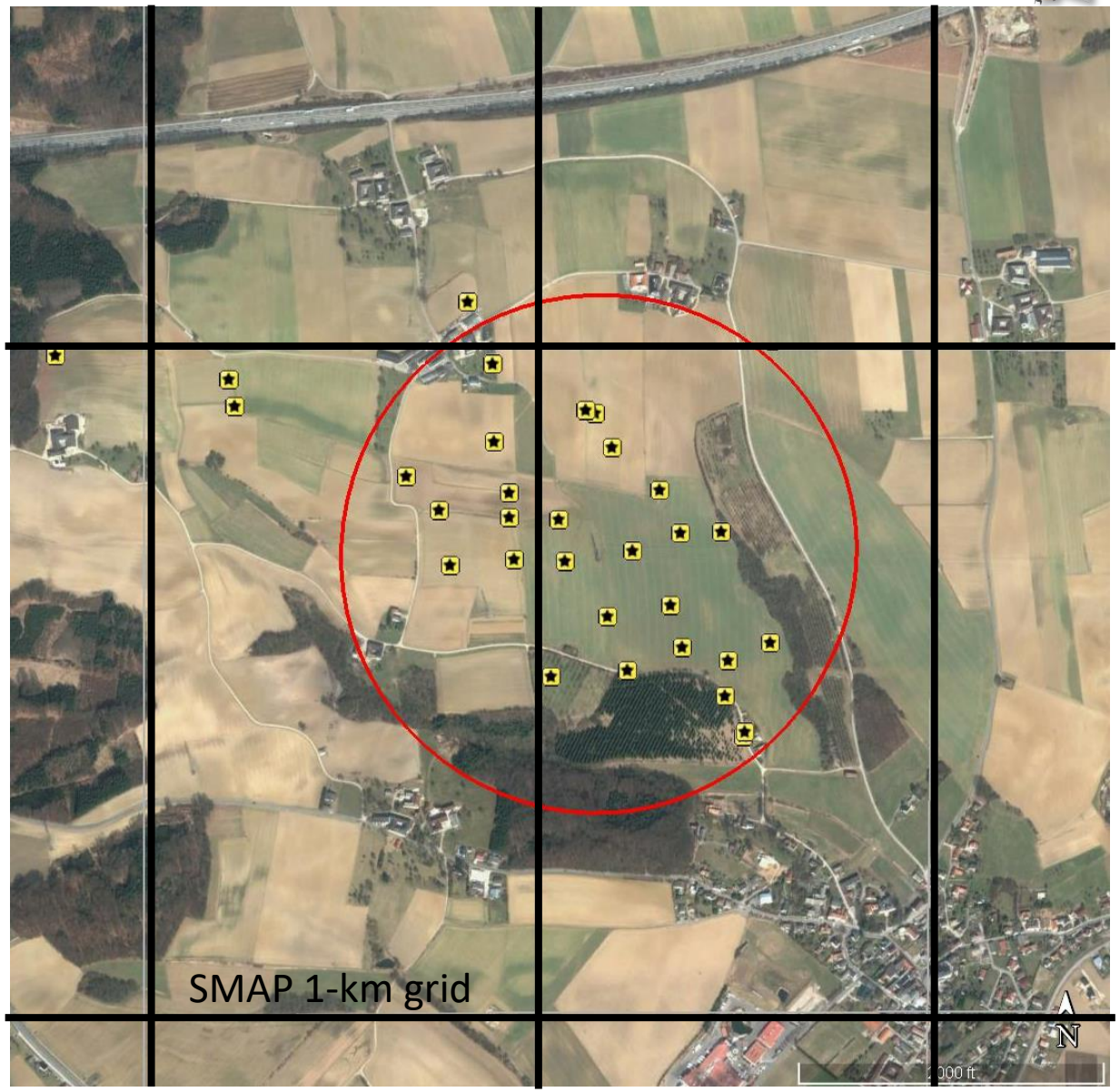
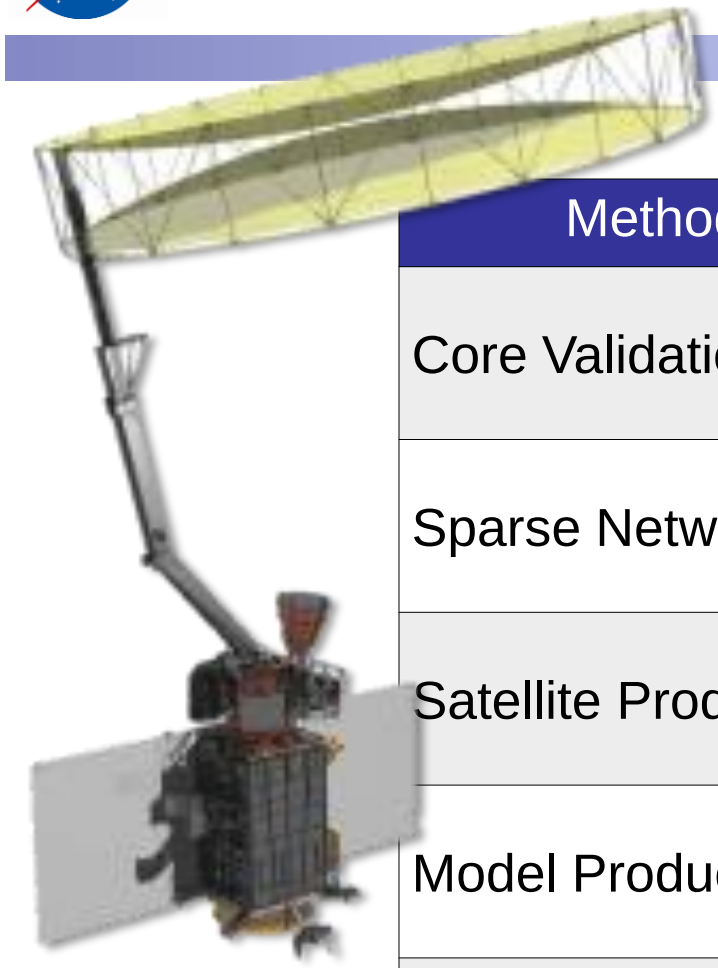


Jet Propulsion Laboratory
California Institute of Technology

SMAP Mission Cal/Val Methodologies



Methodology	Role
Core Validation Sites	Accurate estimates of products at matching scales for a limited set of conditions
Sparse Networks	One point in the grid cell for a wide range of conditions
Satellite Products	Estimates over a very wide range of conditions at matching scales
Model Products	Estimates over a very wide range of conditions at matching scales
Field Campaigns	Detailed estimates for a very limited set of conditions

Validation Methodologies

- Continuous effort to improve the validation methodologies
- Sensor calibration and spatial scaling
- Vertical profile effects
  - Not only deeper layers but surface impact as well
- Uncertainty analysis and definition of errors across space and time
  - Core site biases, seasonal characterization
- Support and participate in the development of the best practices

Agenda

Day 1

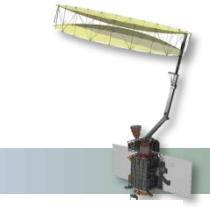
Morning 1: Meeting Objectives & SMAP status (Chair: A. Colliander)

8:30	Welcome	J. Qu
8:45	Objectives of the Workshop	A. Colliander
9:00	Mission Status	S. Yueh
9:15	Science and Applications Update	D. Entekhabi, S. Yueh
9:30	NASA HQ	J. Entin
9:45	***Break***	

Morning 2: Product validation status (Chair: P. O'Neill)

10:10	Status of SMAP Radiometer Calibration	J. Peng
10:30	Soil Moisture Passive Products	S. Chan
10:50	SMAP-Sentinel High-Resolution SM Product	N. Das
11:10	L4 Soil Moisture	R. Reichle
11:30	Freeze/Thaw Products Update	X. Xu
11:50	***Lunch***	

Agenda

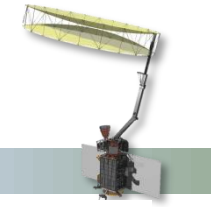


Day 1

Afternoon 1: SMAPVEX19 (Chair: A. Colliander)

13:15	SMAPVEX19 Motivation, Objectives, Overview	A. Colliander
13:30	PALS Airborne Instrument	S. Misra
13:45	Sites and Soil Moisture Measurements	M. Cosh
14:00	Vegetation Characterization Plans	L. Bourgeau-Chavez
14:15	Sherbrooke Tower Radiometer	A. Roy
14:30	NISAR and UAVSAR 2019	B. Chapman
15:00	Discussion	A. Colliander, M. Cosh
15:40	***Break***	

Agenda

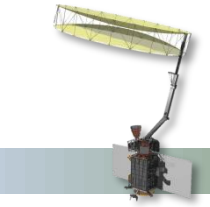


Day 1

Afternoon 2: New Directions in Soil Moisture Validation and Observation [POSTERS with 5 min talks]
(Chair: D. Entekhabi)

16:05	Multi-scale L-band freeze/thaw retrieval in boreal forest	A. Roy
16:10	Dielectric characterization of vegetation	A. Mavrovic
16:15	BERMS soil moisture network	A. Berg
16:20	NMM3D forest modeling	H. Huang
16:25	Evaluating the SMAP and SMOS soil moisture values together with the results obtained from four land surface models	F. Lahoud
16:30	Temporal and spatial mismatch effect between SMAP and SMOS soil moisture	N. Yang
16:35	Validation strategy for high resolution soil moisture product	A. Balenzano
16:40	A non-stationary geostatistical framework for soil moisture prediction in the presence of surface heterogeneity	B. Mohanty
16:45	Evaluating the sensitivity of surface soil moisture dynamics to soil profile layering schemes	P. Shellito
16:50	An in-situ data based model to downscale radiometric satellite soil moisture products	I.-Y. Yeo
16:55	Standardizing short-term satellite soil moisture datasets	R. Leeper
17:00	***Adjourn***	

Agenda



Day 2

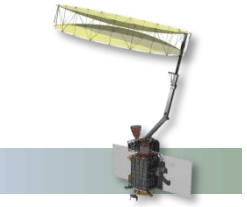
Morning 1: Cal/Val Synergies with Other Missions (Chair: S. Yueh)

8:30	SMOS Long-Term Validation and Forest Retrieval Development	Y. Kerr
9:00	Validation of Merged SMAP-SMOS Soil Moisture Product	R. Bindlish
9:20	CYGNSS and Soil Moisture Product Prospects	C. Ruf
9:40	***Break***	

Morning 2: Validation Methodology 1 (Chair: A. Colliander)

10:00	SMAP Soil Moisture Product Bias Analysis	A. Colliander
10:15	Core Site Uncertainty Analysis	F. Chen
10:30	Sensor Calibration at TxSON	T. Caldwell
10:45	Core Site Bias Analysis using Random Forest	M. Moghaddam
11:00	Upscaling of Little River	M. Cosh
11:15	SMAPVEX16-MB: Upscaling of Carman	M. Friesen
11:30	SMAPVEX16-SF Tower Measurements	J. Judge
11:45	***Lunch***	

Agenda



Day 2

Afternoon 1: Validation Methodology 2 (Chair: W. Crow)

13:15	Evaluation of Multi-frequency TB over Kuwait Validation Site	H. Al Jassar
13:30	International Soil Moisture Network	T. Scanlon
13:45	Time-variable Vegetation Biases	S. Zwieback
14:00	Status of Triple Collocation	W. Crow
14:15	Validation Practices for Satellite Soil Moisture Products - What Are (the) Errors?	A. Gruber
14:30	Discussion	W. Crow
15:00	***Break***	

Afternoon 2: High-resolution Soil Moisture Validation (Chair: M. Cosh)

15:30	Sentinel-1 High-resolution SM Product and Validation	F. Mattia, A. Balenzano
15:45	Julich High Density Network	C. Montzka
16:00	SoilSCAPE Network	M. Moghaddam
16:15	Discussion on Validation of 1-km Soil Moisture Products	M. Cosh
16:45	Closing of Workshop	A. Colliander
17:00	***Adjourn***	