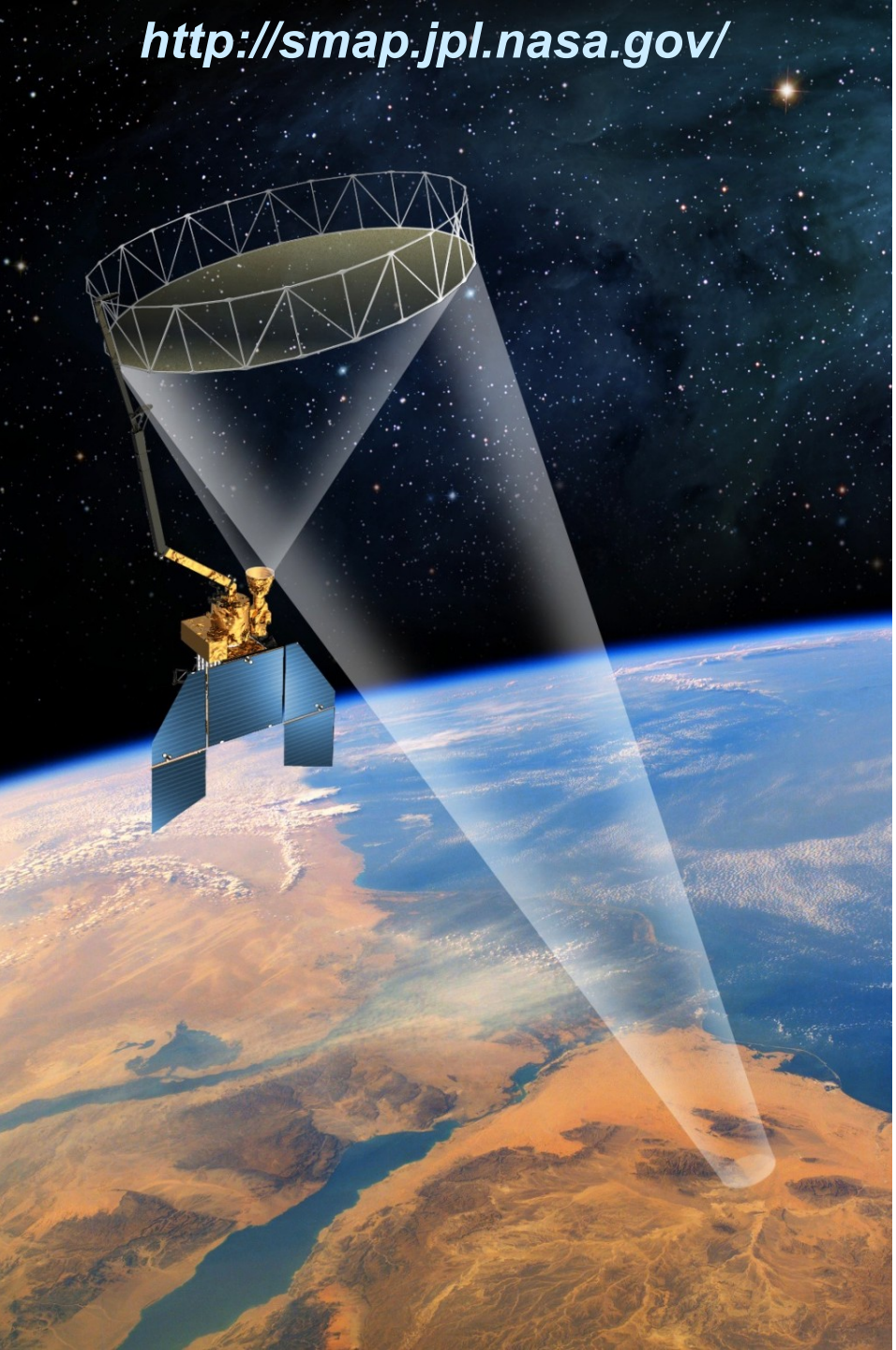


SMAP Cal/Val Plan Overview

T. Jackson
A. Colliander

February 25, 2011

Summary

- Broad overview of the the SMAP C/V Plan with a focus on soil moisture.
- Give you a better idea of what is needed and why we need it.
- Some details on our activities (Andreas)

SMAP Science Cal/Val Overview

- *SMAP Mission Requirements for Cal/Val*
  - These define what we need to do in Cal/Val
- Objective and Approach
- Methodologies
- Field Experiments

SMAP L1 Req. Impacting Cal/Val

Level 1 (Baseline) Science Requirements and Mission Success Criteria

Provide estimates of soil moisture in the top 5 cm of soil with an error of no greater than *0.04 m3/m3 volumetric (one sigma) at 10 km spatial resolution* and 3-day average intervals over non-excluded regions.

Provide estimates of surface binary freeze/thaw state in the region north of 45N latitude, which includes the boreal forest zone, with a *classification accuracy of 80% at 3 km spatial resolution* and 2-day average intervals.

Conduct a calibration and validation program to verify data delivered meets the requirements.

Threshold mission requirements are 0.06 m3/m3 and 70%

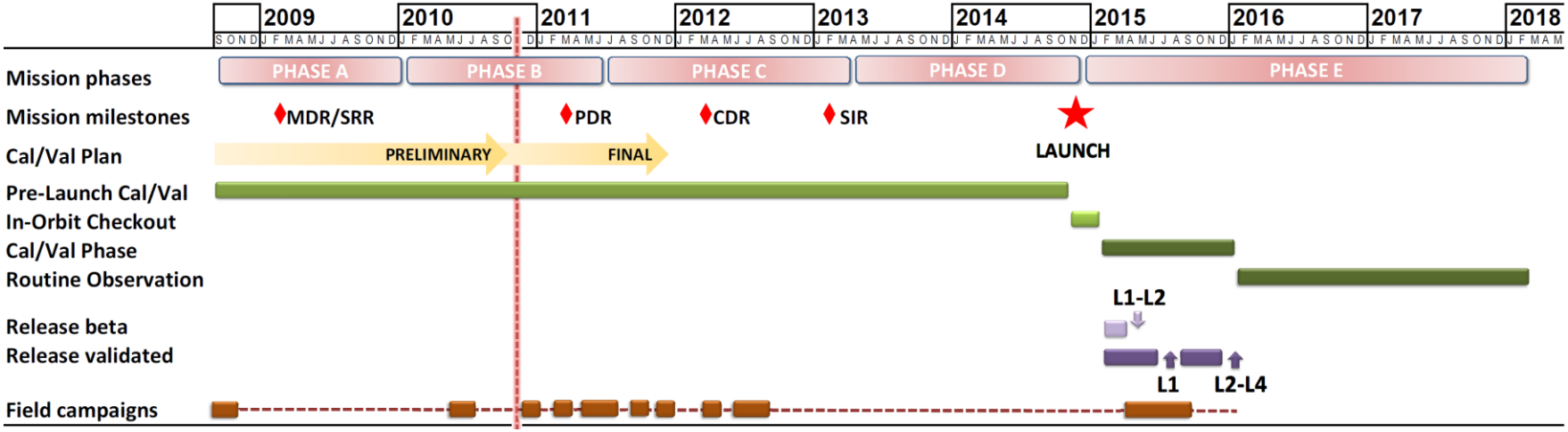
SMAP Science Cal/Val Overview

- SMAP Mission Requirements for Cal/Val
  - These define what we need to do in Cal/Val
  - In addition to the L1 requirements, there are Level 2 requirements for all mission products
  - Time line is another requirement on Cal/Val
- *Objective and Approach*
- Methodologies
- Field Experiments

SMAP Cal/Val Objective and Approach

- Objective: Calibrate and validate L1 through L4 algorithms and products relative to the mission requirements and schedule constraints.

Focus here is on the L2-L4 Products



- Approach: Mission Phase Focus
  - Pre-Launch: validating that there are means in place to fulfill the mission objectives
    - Algorithm development (ATBD identified activities)
    - Infrastructure needed for post-launch
  - Post-Launch: validating that the science products meet their quantified requirements
    - Validation
    - Product Improvement

SMAP Science Cal/Val Overview

- SMAP Mission Requirements for Cal/Val
- Objective and Approach
- *Methodologies*
- Field Experiments

SMAP Validation Methodologies

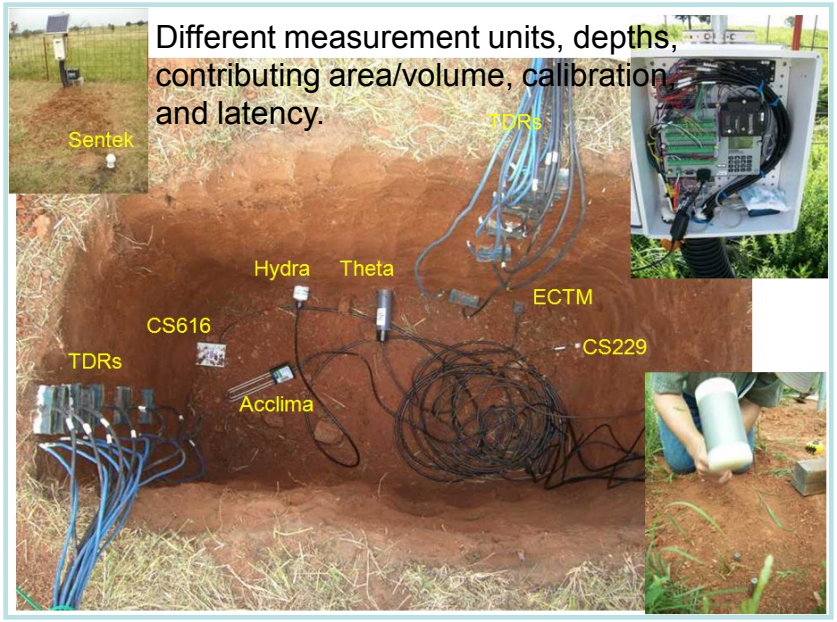
Methodology	Role	Issues	Actions
In Situ Observations	Direct measurement of mission products	Calibration Comparability	Survey
Satellite Products	Estimates over a very wide range of conditions at matching scales	Validation Comparability Continuity	Validation Studies CDF Matching
Model Products	Estimates over a very wide range of conditions at matching scales	Validation Comparability	Validation Studies CDF Matching
Field Campaigns	Detailed estimates for a very limited set of conditions	Resources Schedule Conflicts	Simulators Partnerships Communication

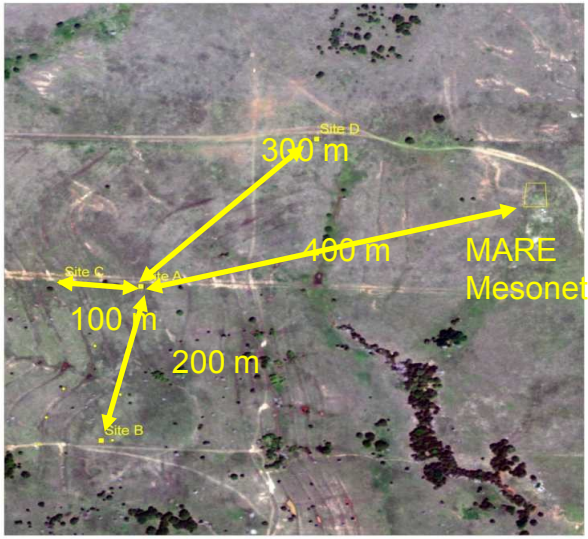
SMAP Validation Methodologies

Methodology	Role	Issues	Actions	
Core Sites	Accurate estimates of products at matching scales for a limited set of conditions	Calibration Comparability Limited number	In Situ Testbed NSPIRES DCL	✓
Sparse Networks	One point in the grid cell for a wide range of conditions	Calibration Comparability Up-Scaling	In Situ Testbed Scaling Methods NSPIRES DCL	✓
Satellite Products	Estimates over a very wide range of conditions at matching scales	Validation Comparability Continuity	Validation Studies CDF Matching	
Model Products	Estimates over a very wide range of conditions at matching scales	Validation Comparability	Validation Studies CDF Matching	
Field Campaigns	Detailed estimates for a very limited set of conditions	Resources Schedule Conflicts	Simulators Partnerships Communication	✓

SMAP In Situ Sensor (ISST) Testbed

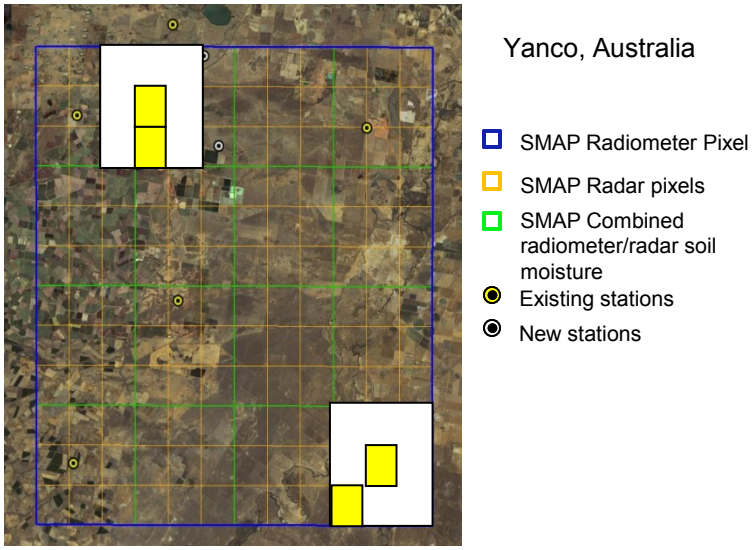
- There are no standards!
- *Objective*: Establish the comparability of data from available networks.
- *Approach* (Initial): ISST-Single location with representative soil moisture sensor technologies and installations
  - Compare and contrast response, calibration, representativeness, and dynamic range.
- Marena, OK site May 2010





SMAP Core Validation Sites/NSPIRES

- Soil moisture and Freeze-Thaw
- Objectives: Increase number of sites, improve data quality (standards), and formalize commitment



- Approach: NSPIRES Dear Colleague Letter (DCL) (No exchange of funds and allows international part.)
- Schedule: Closes March 1, 2011
- Also applies to sparse networks and ground-based SMAP simulators

SMAP Sparse Networks and Up-Scaling

- Advantage of operational networks is that the data are in public domain and provided in a timely manner.
- Almost all of these are sparse.
- Subject to the same calibration and comparability issues as Core Sites.
- *Objective*: Develop an up-scaling methodology.
- *Approaches*:
  - Triple co-location
  - Temporary networks (used in CanEx)
  - Others will be evaluated.
- Of particular value for L4 soil moisture because dense networks typically support surface products.
- White paper draft in review.

SMAP Validation Methodologies

Methodology	Role	Issues	Actions
Core Sites	Accurate estimates of products at matching scales for a limited set of conditions	Calibration Comparability Limited number	NSPIRES DCL In Situ Testbed
Sparse Networks	One point in the grid cell for a wide range of conditions	Calibration Comparability Scaling	NSPIRES DCL In Situ Testbed Scaling Methods
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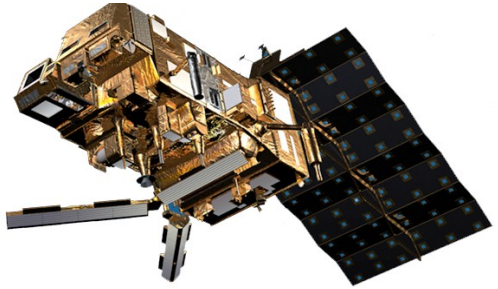
SMAP Cal/Val and Satellite Products

ALOS
Backscatter
2006-TBD

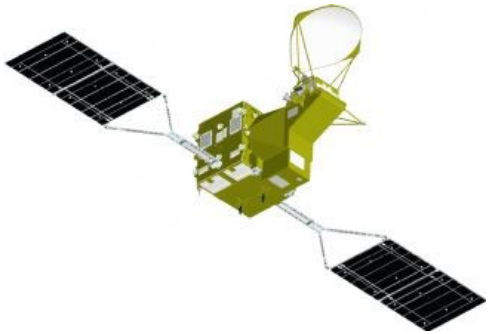
SMOS
Brightness Temperature
Soil Moisture
2009-2013

METOP/ASCAT
Soil Moisture
2006-TBD

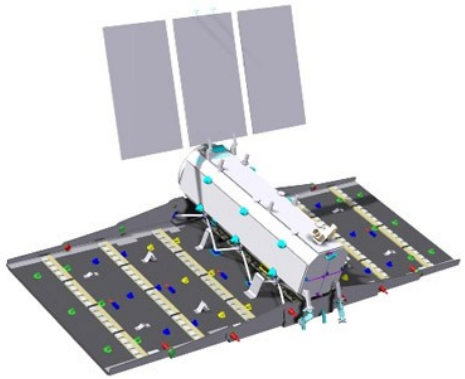


Aquarius
Brightness Temperature
Backscatter
2011-2016

GCOM-W
Soil Moisture
2012-TBD



SAOCOM
Backscatter
Soil Moisture
2012-TBD



SMAP Validation Methodologies

Methodology	Role	Issues	Actions
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SMAP Major Field Experiments

Year/ Quarter	1	2	3	4
2008			SMAPVEX08	
2009				SMOS
2010			SMAPEx-1 CanEx-SM	SMAPEx-2
2011		Aquarius	SMAPEx-3	GCOM-W
2012			SMAPVEX12	SAOCOM CanEx-FT
2013				ALOS-2
2014				SMAP
2015	SMAPVEX15	SMAPVEX15	SMAPVEX15	

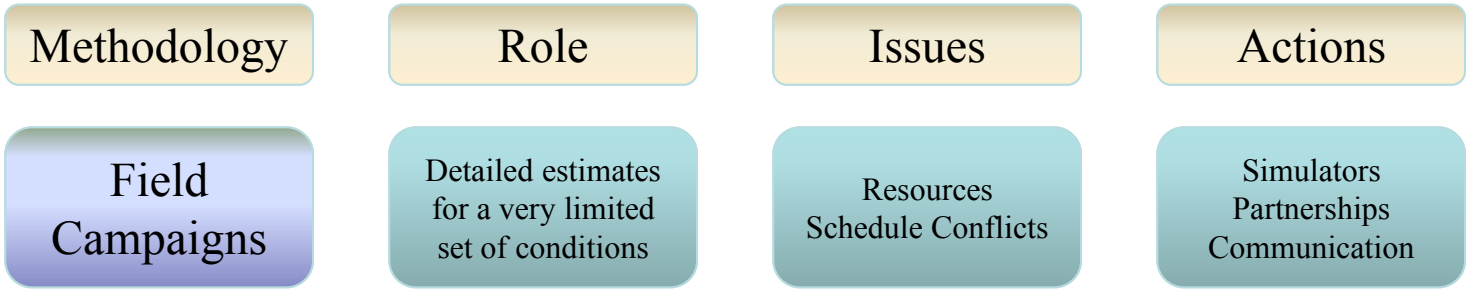
Satellite Launch in Red

International Collaboration

- Canada
- Australia

SMAPVEX12 will focus on the most important algorithm development and validation issues before launch that were not addressed in the collaborative SMAPEx and CanEx campaigns

Drivers for SMAP Pre-Launch Field Campaigns



- Specific algorithm needs; specific land cover types, more robust data sets
- Establishing the calibration and scaling of in situ resources
- Dress rehearsal for post launch campaign

SMAP Soil Moisture Pre-Launch Validation: Specific L2/L3 Algorithm Needs

Product	Algorithm Status	Needs
Radiometer Only	Multiple options: most mature	SMOS, Aquarius, and in situ data for down select
Radar Only	Two directions: Snapshot (not robust), Change- (not mature)	Focus on major vegetation types and domains Radar data must simulate SMAP High quality site characterization Replication Extended time series Varying soil moisture
Combined Radar and Radiometer	Not mature and multiple options	Focus on major vegetation types and domains Passive and active data must simulate SMAP High quality site characterization Replication Extended time series Varying soil moisture

SMAPEx Focus

- Algorithm Development
  - Focus on major vegetation types and domains
  - Passive and active data must simulate SMAP
  - High quality site characterization
  - Replication
  - Extended time series
  - Varying soil moisture
- Infrastructure
  - Calibration of in situ soil moisture
  - Scaling of in situ soil moisture
  - Demonstration of PLMR/PLIS contributions to SMAP L1 Cal/Val
- Aquarius?