National Aeronautics and Space Administration

Jet Propulsion Laboratory
California Institute of Technology

Soil Moisture Active Passive Mission

SMAP

Cal/Val Rehearsal 1: Achievements and Plans: L2_SM_A

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Objectives – Rehearsal 1 (L2 SM A)

- Objectives
  - Prepare for the postlaunch cal/val
  - Find out what needs to be done before the Cal/Val Rehearsal 2 in May-June 2014 and the launch in October 2014

- Tasks
  - Development of cal/val methodologies and tools
  - Identify core validation sites
  - Test in situ data processing for executing calibration and validation of SMAP data products:
    - Evaluation is limited due to core site date being current as 2013 but retrievals being simulation of 2001 since there are no current sigma0 data.

Summary of activity

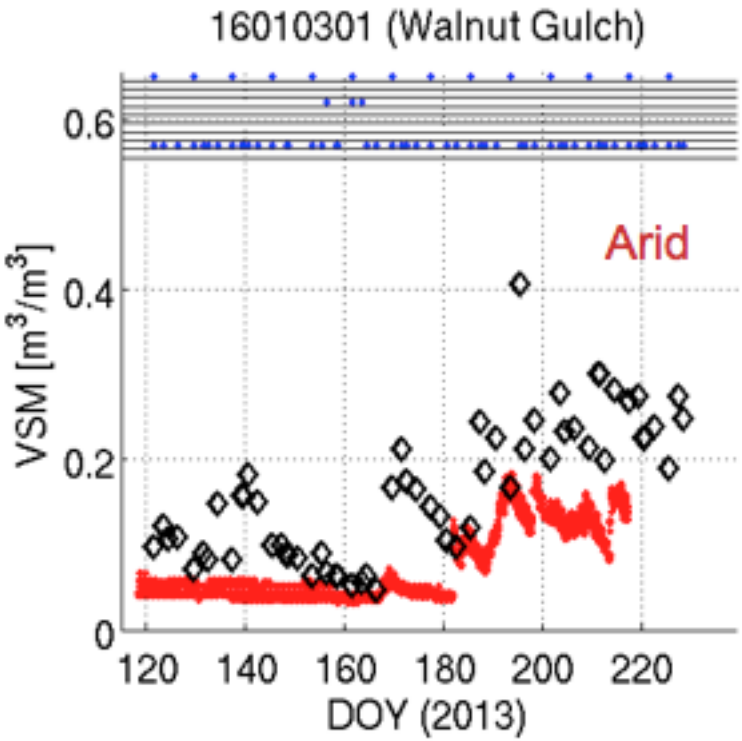
Methodology	Importance	Rehearsal Performed?	Plan
Core Sites	Primary	8 locations from 4 sites (different year)	Improve the comparison Include mode sites
Sparse Networks	Secondary	Not yet	Perform triple collocation (needs a high resolution model)
Satellite Products	Secondary	Data not available	Data not availability unlikely
Model Products	Secondary	Data not available	Needs model fields
Field Experiments	Primary	Yes but not within the work scope	Continue current activity

Summary of Core Site Validation

ID	Site Name	Country	Suitable for 3km	Rehearsal Performed
0201	**TERENO**	Germany	Yes	
0301	**REMEDHUS**	Spain		
0401	**Reynolds Creek**	USA, Idaho	Yes	
0501	**Kuwait**	Kuwait		
0701	**Yanco**	Australia	Yes	Yes
0702	**Kyeamba**	Australia	Yes	
0703	**Adelong**	Australia		
0801	**VASKAS**	Tunisia	Yes	
0901	**Brunkild**	Canada		
0902	**Casselman**	Canada		
1201	**Naqu**	Tibet		
1202	**Maqu**	Tibet		
1203	**Ngari**	Tibet		
1204	**Twente**	Holland		
1601	**Walnut Gulch**	USA, Arizona	Yes	Yes
1602	**Little Washita**	USA, Oklahoma		
1603	**Fort Cobb**	USA, Oklahoma		
1604	**Little River**	USA, Georgia		Yes
1605	**Walnut Creek**	USA, Iowa	Yes	
1606	**St. Joseph's**	USA, Indiana	Yes	
1607	**South Fork**	USA, Iowa		
1701	**Sodankyla**	Finland	Yes	
1901	**Bell Ville**	Argentina	Yes	
2401	**Mpala**	Kenya	Yes	
2501	**Tonzi Ranch**	USA, California	Yes	Yes
2701	**Kenaston**	Canada	Yes	
3201	**Zapotes**	Mexico		
4101	**Valencia**	Spain		

Core Site Validation - I

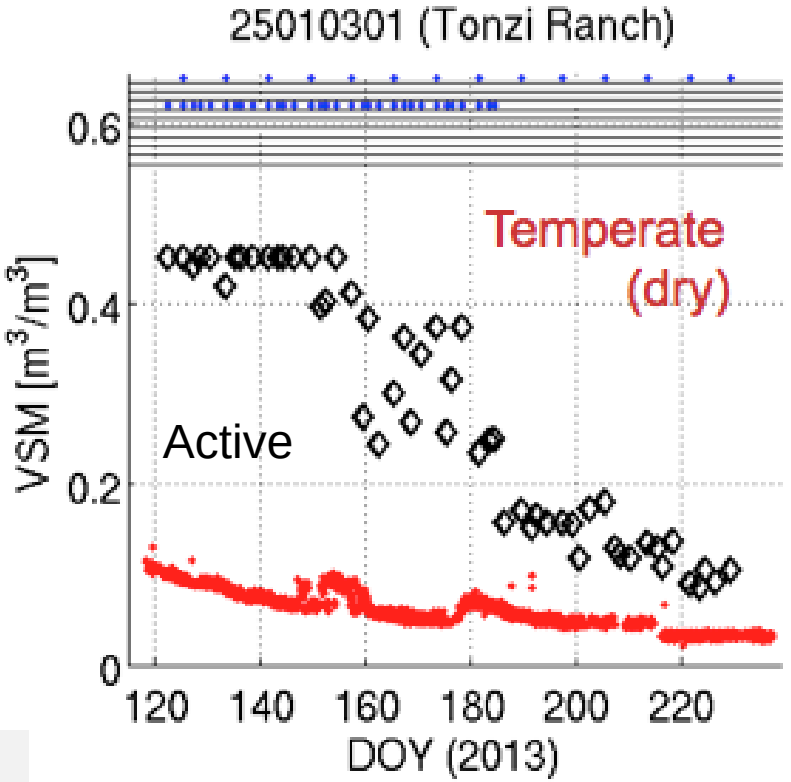
- Despite the discrepancy in time, seasonality is well captured.



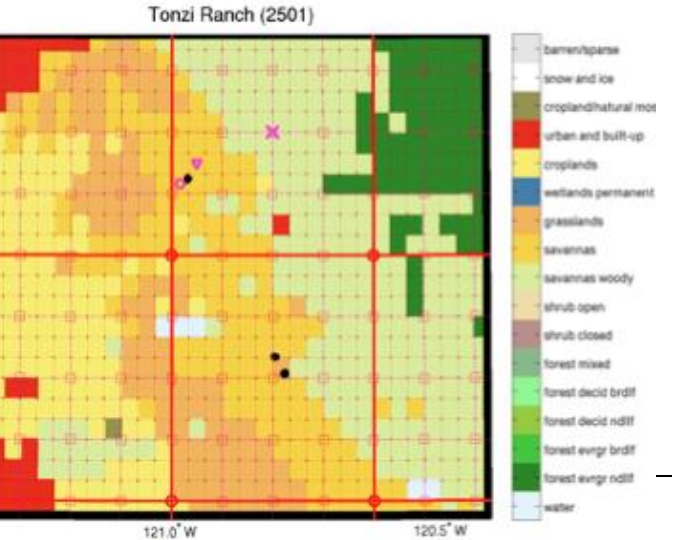
Black: recommended retrieval
Red: in situ

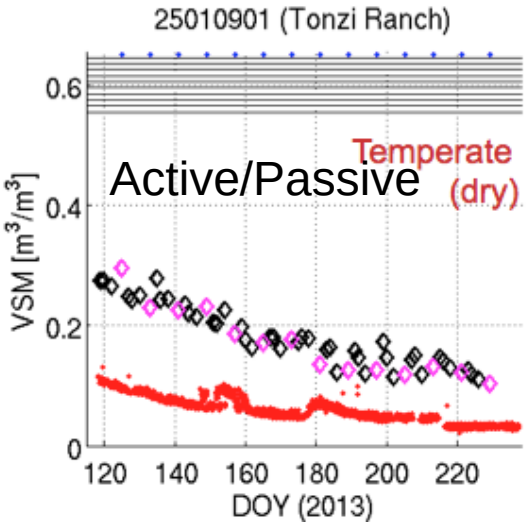
Core Site Validation - II

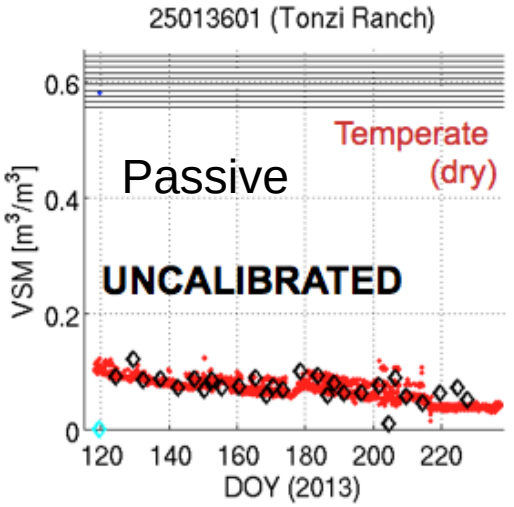
- Active retrieval shows the saturation and too wet retrieval.
  - Active/Passive retrievals are too wet as well (is the discrepancy due to the time gap?)
  - Saturation: forest forward model's sigma0 were raised. Needs to examine simulated retrieval error.
  - Core site is very sparse: representative for Passive?



Black: recommended retrieval
Red: in situ
Magenta: Retrieval succeeded but not recommended



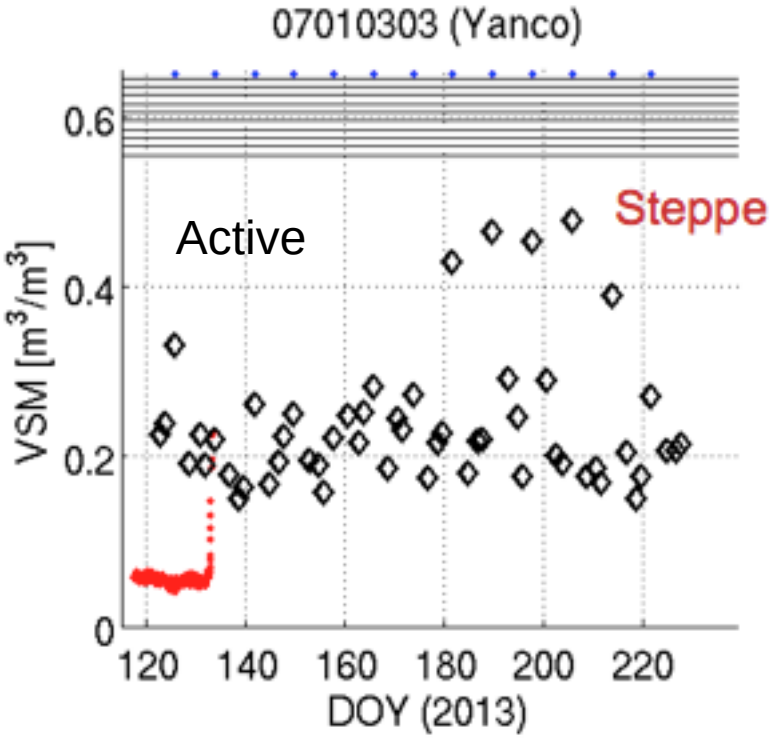


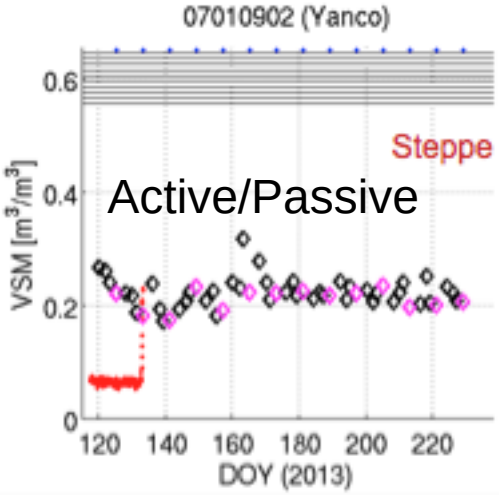


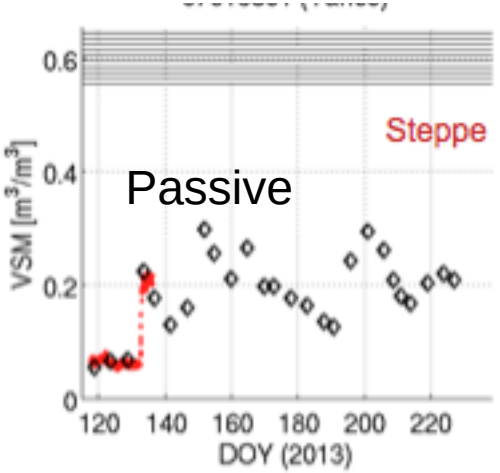
Core Site Validation - III

- Active and Active/Passive are consistent, but not with Passive
  - The time gap may be the reason

Black: recommended retrieval
Red: in situ







Core Site Validation - summary

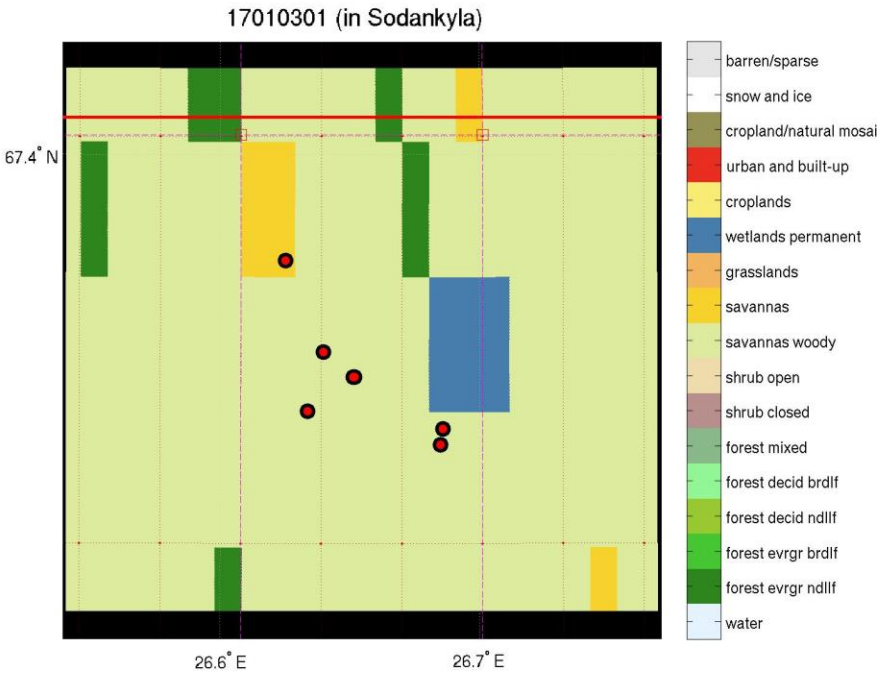
- Successful retrieval at Walnut Gulch
  - Caution needed given the time-gap
- Some differences at Yanco and Tonzi
  - Consistent between Active and Active/Passive
  - Due to time-gap?
  - Saturation: deliberate bias added to forward model?
- Due to the time-gap, the core-site validation does not provide definite conclusions on the retrieval quality

Core Site Validation - additional

- Surface roughness
  - is more influential than soil moisture
  - is estimated by retrieval. An accurate estimate of roughness improves soil moisture estimate.
  - In situ information, if available, will be helpful for soil moisture retrieval
  - Does not change frequently: once a month (agriculture) / a season (natural terrain) is a sufficient frequency

Core Site Validation - additional

- Landcover classification information
  - Guides the choice of forward model
  - Helps choose if a core site is appropriate
  - Is 500m-resolution IGBP
  - Will be better if a local higher resolution information is available



Plan – Rehearsal 2 & Postlaunch

- Core validation sites
  - Identify feasible sites
- Sparse network
  - Identify feasible sites
  - Understand scaling function
  - Exercise triple collocation (needs 3 km model product)
- Satellite data
  - Evaluate datacube – if satellite data become available
- Numerical model
  - Find usable models

Plan – Rehearsal 2 & Postlaunch

- Goal: Understand retrieval error
  - Consistency with L2_SM_P and L2_SM_AP
  - Heterogeneity
  - Prepare feasible solutions to improve the validation results

- Tools
  - Glosim2
  - Field campaign data
  - Globally as well as Core Validation Sites

Backup slides

	Level 2/3 Product			
Issues	**SM P**	**SM A**	**SM A/P**	**FT**
Algorithm questions				
Algorithm selection	○	●	●	○
Time series performance		●	●	●
Heterogeneity	●	●	●	●
Azimuthal dependency		●	○	○
Resolution scaling	●	●	●	○
Topography effects	●	●	●	●
Separability soil and vegetation				●
Vegetation types	●	●	●	○
RFI mitigation	●	●	●	○
Ancillary data				
Soil temperature	●	○	●	
Vegetation temperature	○	○	○	
Soil texture	○	○	○	○
Roughness	○	●	○	○
VWC	●	●	●	○
Dense vegetation mask	●	●	●	●
Mountain mask	●	●	●	●
Land cover mask	●	●	●	●
Urban area mask	●	●	●	●
Water body mask	○	○	○	○
Freeze/snow mask	○	○	○	
● - New input required				
○ - New input useful but not required				
Vacant - Not an issue				