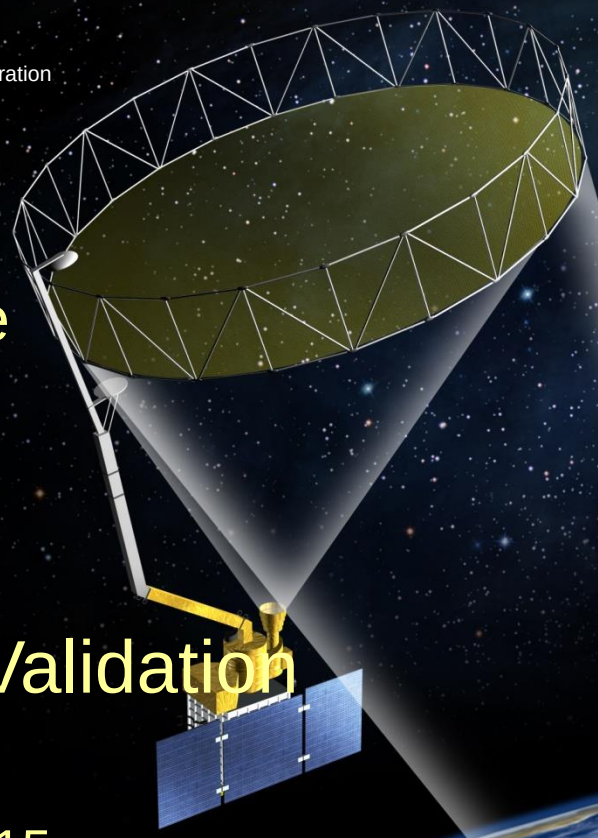
National Aeronautics and Space Administration



SMAP Science Team Perspectives

Soil Moisture Active Passive Mission

SMAP

Dara Entekhabi, MIT

Calibration/Validation Meeting #6

September 1, 2015

Columbia, Maryland

SMAP Data So Far

- Exceptional quality global L-band radiometry.
- Limited-duration but valuable L-band active-passive *global* field campaign
- Available beta-data L1 products at NSIDC and ASF public-access (since August)
- Soon-available (mid-September and ahead of schedule) beta-version of L2_SM_P
- Intense Cal/Val Period on-going
- 2015 field campaigns completed (August for SMAPVEX15) and to-start (September for SMAPEx-5)

Timing and Objectives of This Community Workshop: Science Team Perspective

1. Review Intense Cal/Val Period early results

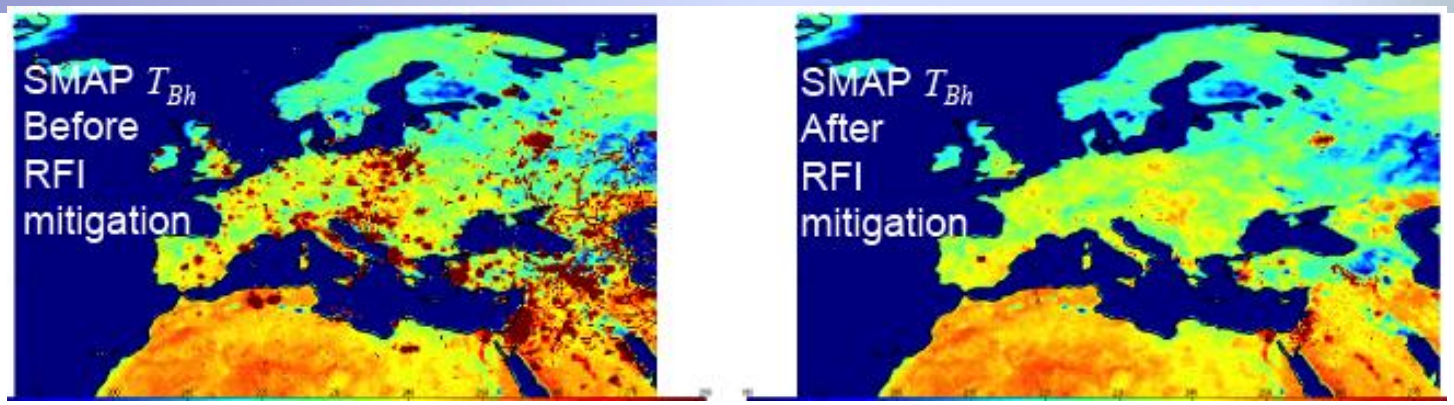
2. Review the forthcoming early-release of L2_SM_P product

3. Plan and refine continuing Intense Cal/Val activities plan and cal/val to EOM

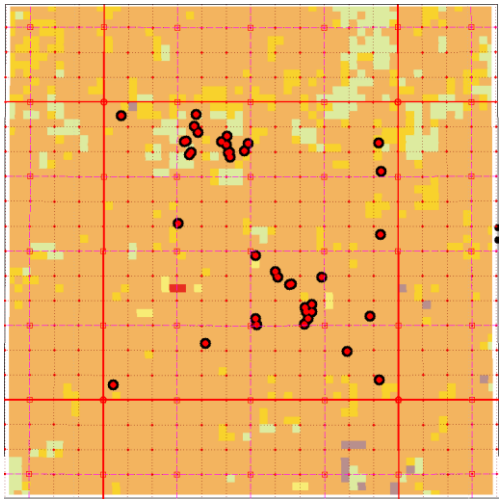
4. Collect and integrate new ideas on:

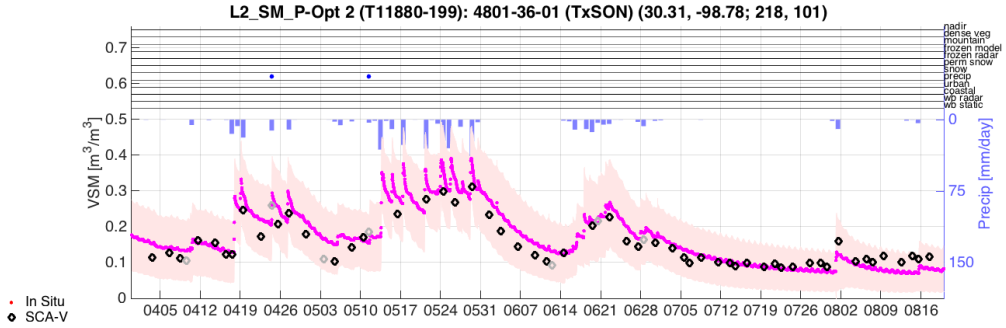
    a) Algorithm calibration priorities
    b) Dealing with bias
    c) SMOS-Aquarius-SMAP science products transitions
    d) New validation assets
    e) New ideas on metrics and error characterization (e.g. representativeness)

Radiometer Products: Reduced RFI Data Loss and High Performance

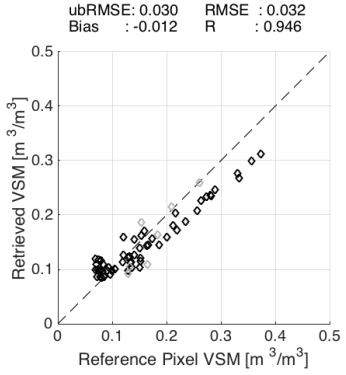


Example of radiometer-based soil moisture cal/val





Texas Soil Observation Network (TxSON):

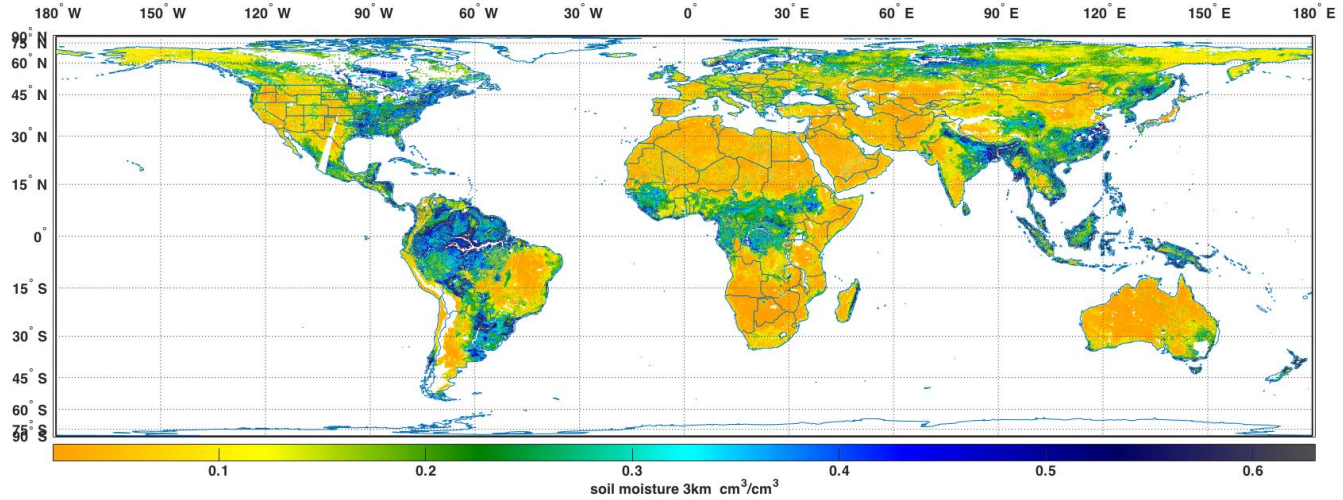


Pick example of a good comparison.

Shows height/upper-limit of what comparisons can be if algorithm and in situ representativeness errors can be minimized.

Value of Limited-Duration But High-Quality Data Active-Passive Data

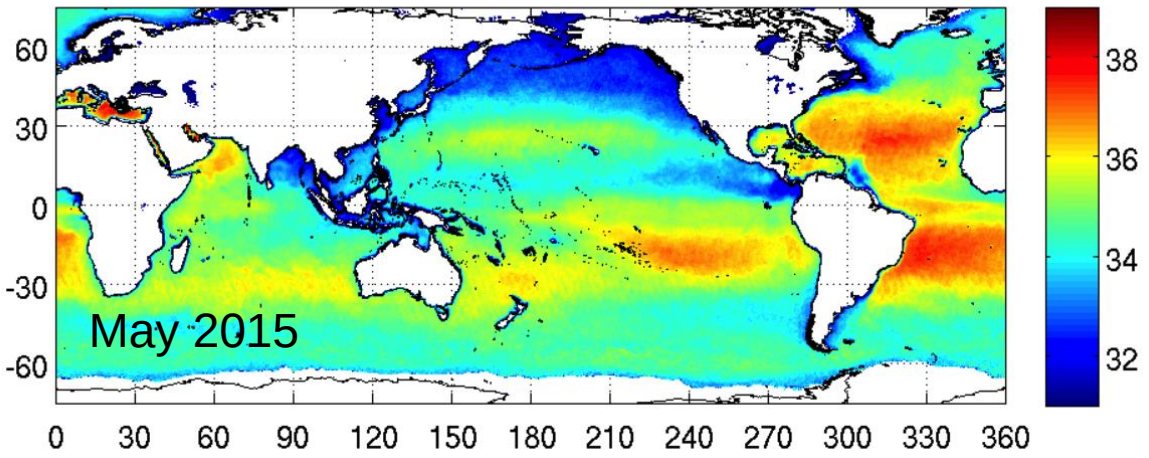
- April 14 to July 7 (2.5+ months = 84 days) of high-quality 3km and 9km *Global* surface soil moisture data

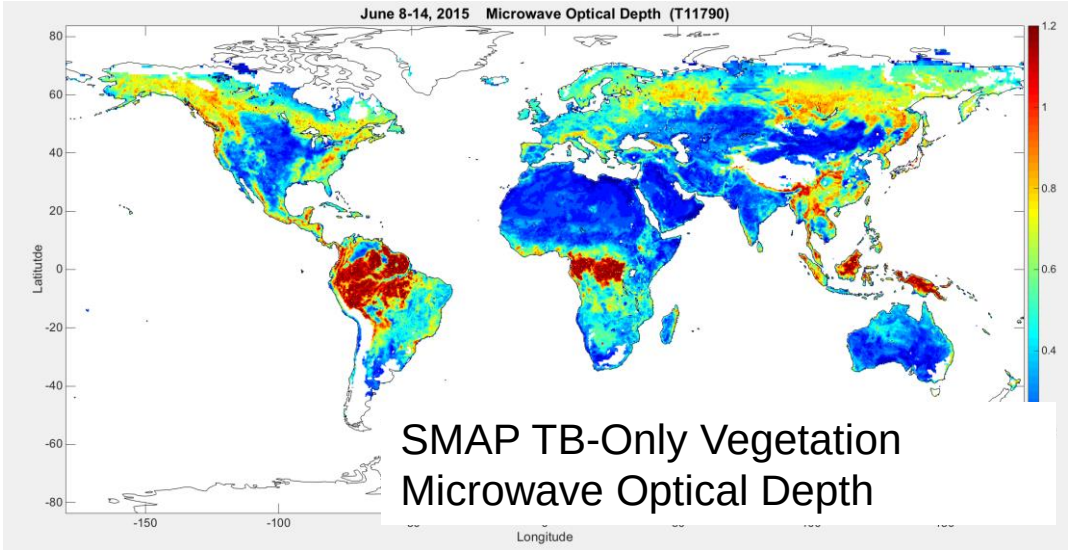


- NH Spring/Summer science analyses
- Test-bed for resolution-enhancement and disaggregation approaches

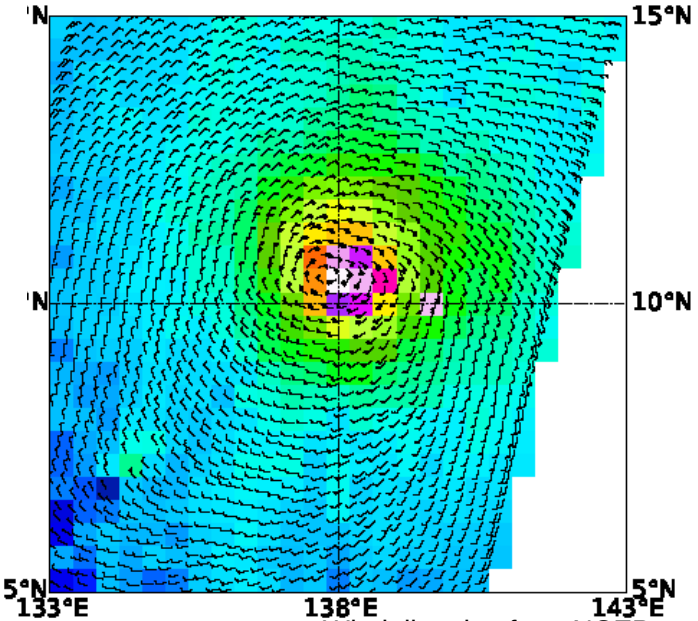
Additional Radiometer-Based Products that Increase Science Returns

SMAP TB-Only Salinity [psu]

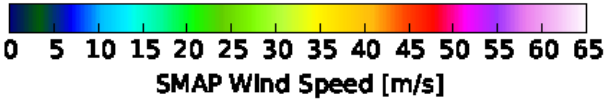




SMAP TB-Only Vegetation Microwave Optical Depth



Wind direction from NCEP



SMAP Radiometer Wind Speed for Super Typhoon Maysak on Mar 31, 2015 reached 120 knots

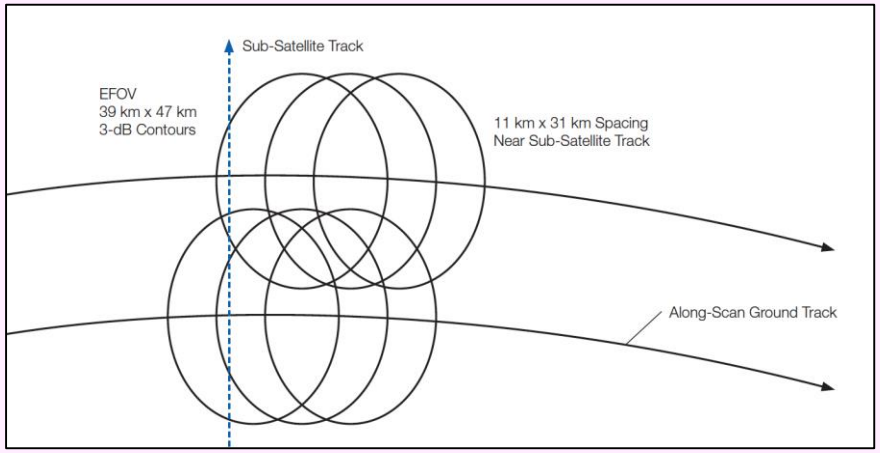
Path Forward: SMAP Resolution Enhancement

Process Over-Sampled SMAP Radiometer Data

Take advantage of SMAP radiometer over-sampling to produce 20 km[1] (TBC) resolution brightness temperature product

Global coverage every 2 – 3 days

Compares to global 10 km active-passive SMAP baseline



[1]Adequate resolution of an object can only be achieved if at least two samples are made for each resolvable unit

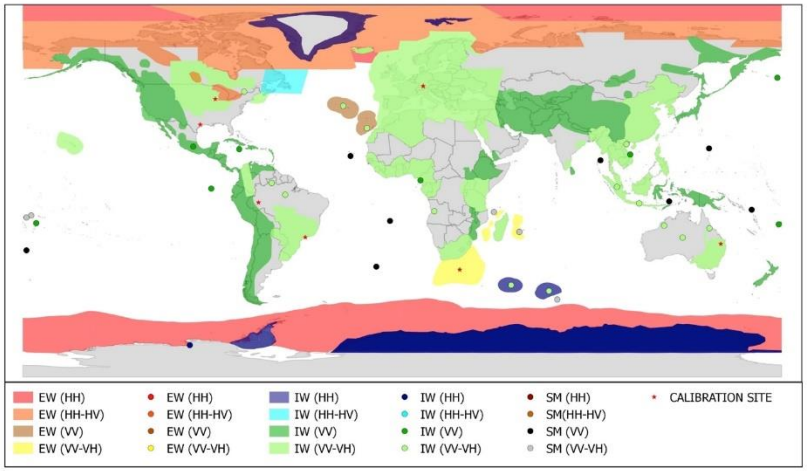
Use Multi-Platform Data

Use other radar data in SMAP's active-passive algorithm

- Better-than 10 km resolution but
- 8-day revisit
- Regional coverage (60% of land)
- C- versus L-band

Use geostationary Satellite IR/Vis (10km; 3-day revisit)

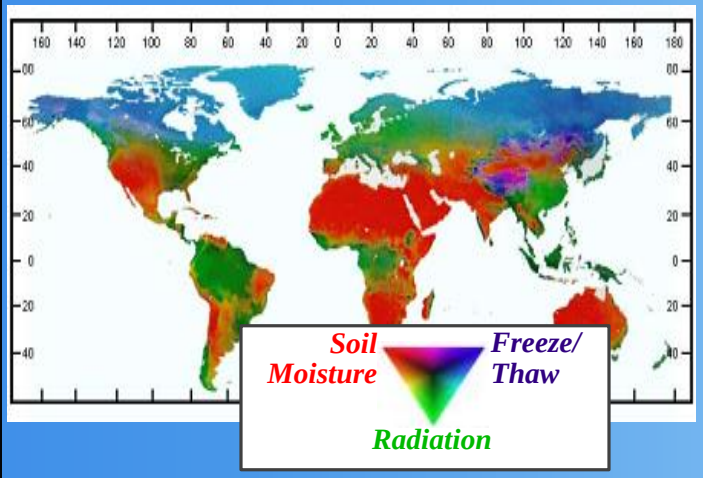
Sentinel-1 *IW* Scan-Mode (**Green**)



SMAP Science and Application Returns
Impact of Lower Resolution Data

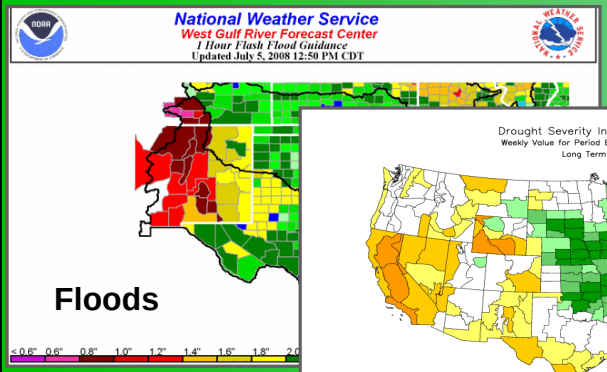
Science Returns

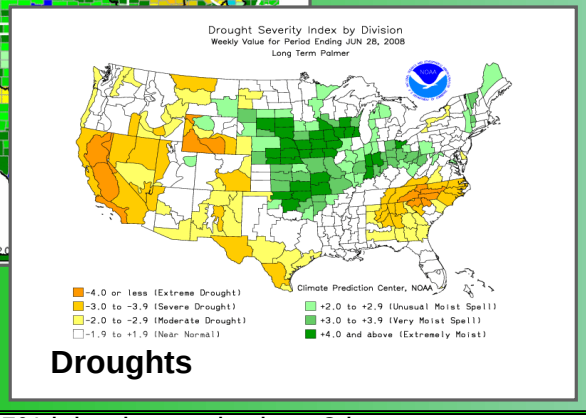
Soil Moisture *Links* the Global Land Water, Energy, and Carbon Cycles



1. Estimating global surface water and energy fluxes } No major impact
2. Quantifying net carbon flux in boreal landscapes } Increase data-loss due to in-land water bodies[1]
3. Reduce uncertainty of climate model projections } No major impact

Applications Returns





4. Enhancing weather forecasts } No impact on global NWP. Reduced capability for regional NWP.[2]
5. Improving flood prediction and drought monitoring } No impact on drought monitoring. Much reduced capability for flood monitoring

[1] ~80% of pixels with less than 5% inland water body at 3 km
~70% of pixels with less than 5% inland water body at 18 km

[2] NWS Global NWP at 13-35 km.
NWS North America NWP at 12 km.

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- Volunteer participation of you (Cal/Val partners and participants): Sharing of data, pre-launch rehearsals, regular on-going interaction,…
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  Tools and more = Andreas Colliander
  L1 Leads = Mike Spencer, Sid Misra and Jeff Piepmeier
  SMAPVEXnn & SMAPEx-n campaigns = Tom Jackson & Jeff Walker

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