

SMAP and Agricultural Drought Applications

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Soil Moisture Active/Passive Workshop

July 9, 2007

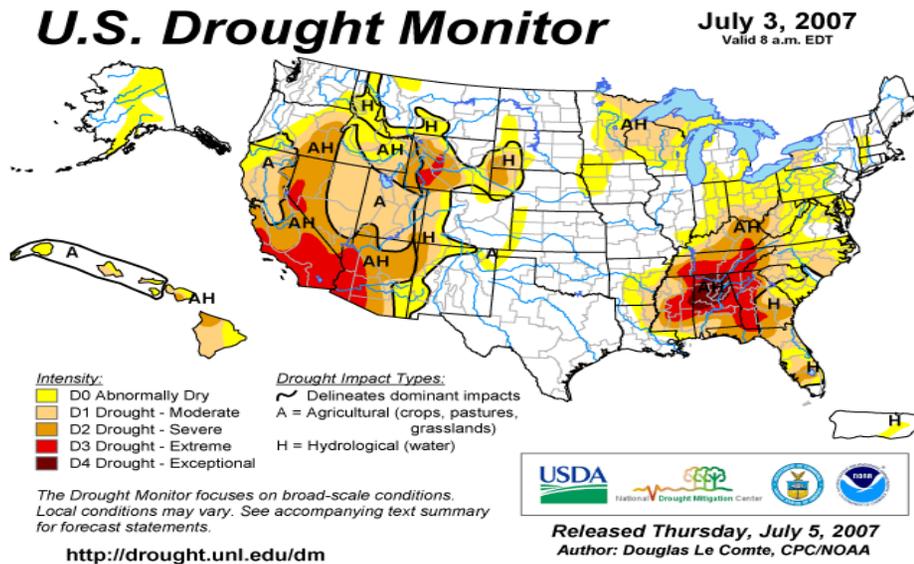
Outline:

I. Drought Monitoring

II. Drought Mitigation

III. Quantification of SMAP Added Value

USDA Drought Monitoring Activities:



Released Thursday, July 5, 2007
Author: Douglas Le Comte, CPC/NOAA

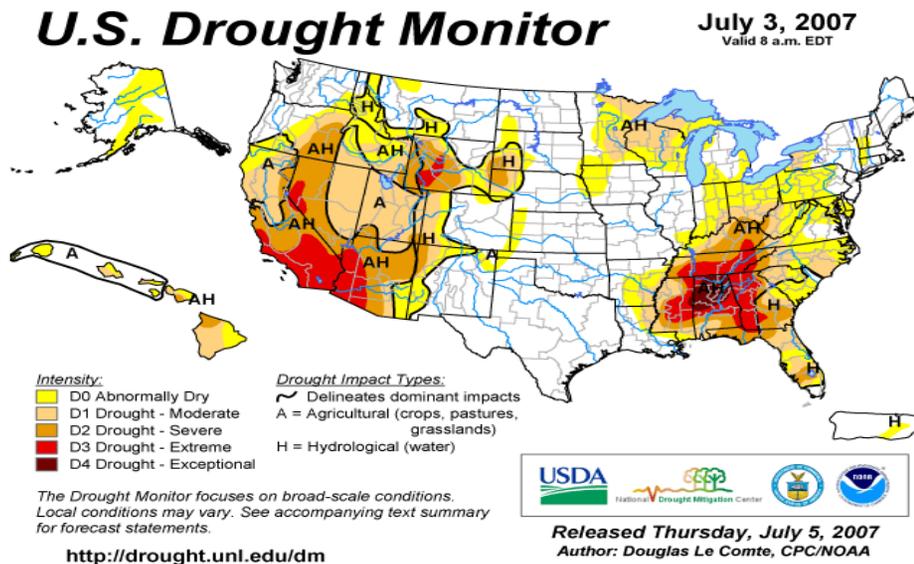
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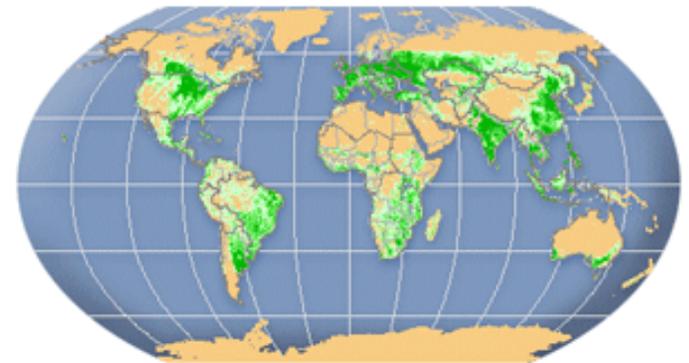
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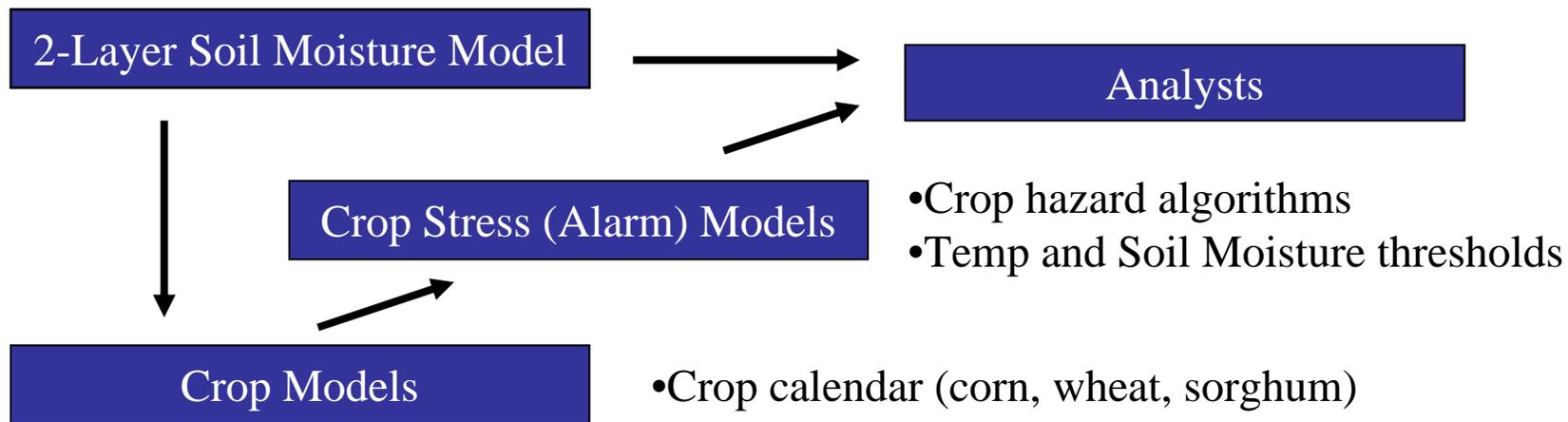
Linking U.S. Agriculture 
FAS to the World



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USDA FAS PECAD

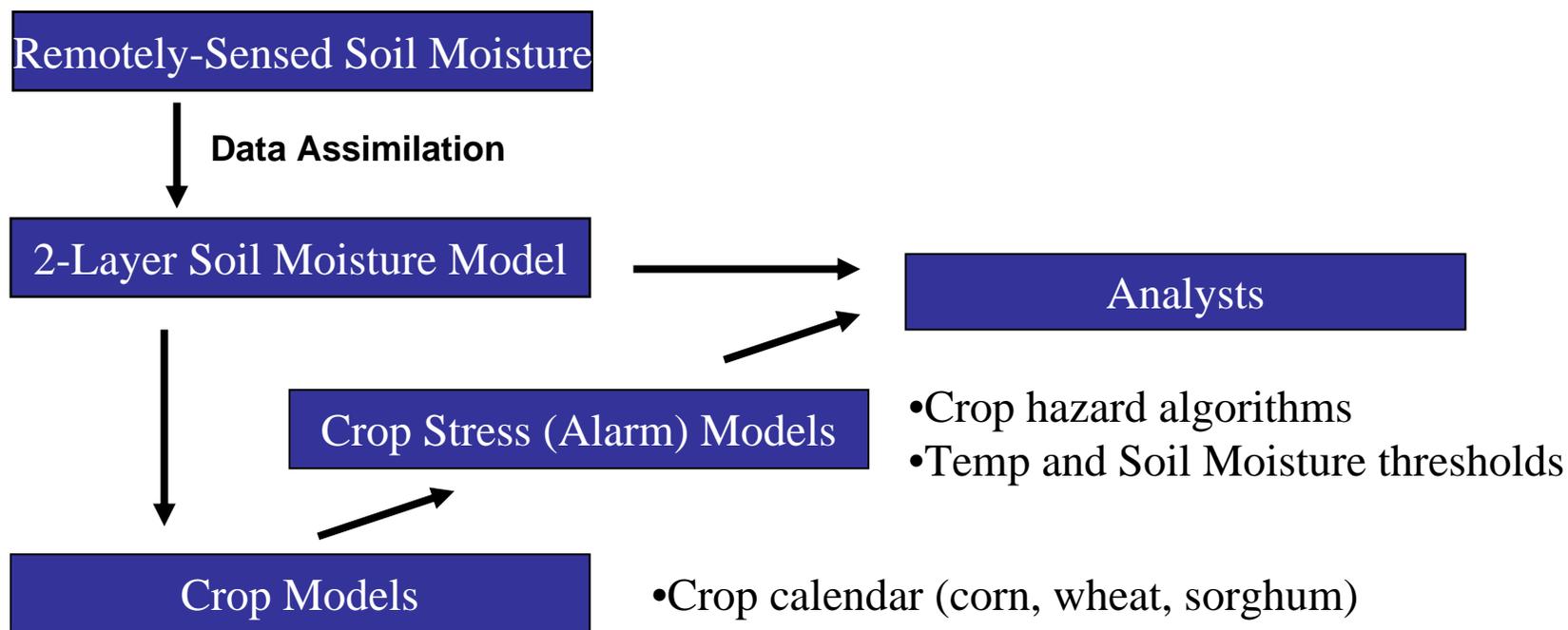
- USDA PECAD (Production Estimate and Crop Assessment Division) provides monthly global crop production estimates to meet national agricultural competitiveness and food security needs.
- Analyst assessments are based on satellite data sources, input databases, climate data, and crop models to arrive at yield and regional harvest area estimates.
- **Soil moisture estimates are essential for analyzing crop growth stage and crop stress.**



Goal = Regional-scale assessment

PECAD

- USDA PECAD (Production Estimate and Crop Assessment Division) provides monthly global production estimates for commodity crops.
- Uses combination of satellite data sources, input databases, climate data, crop models, and data extraction routines to arrive at yield and area estimates.



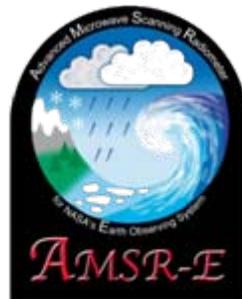
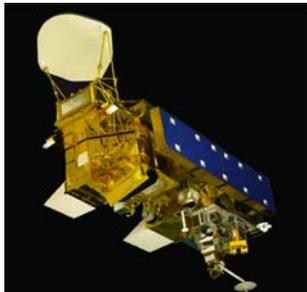
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AMSR-E/PECAD Integration

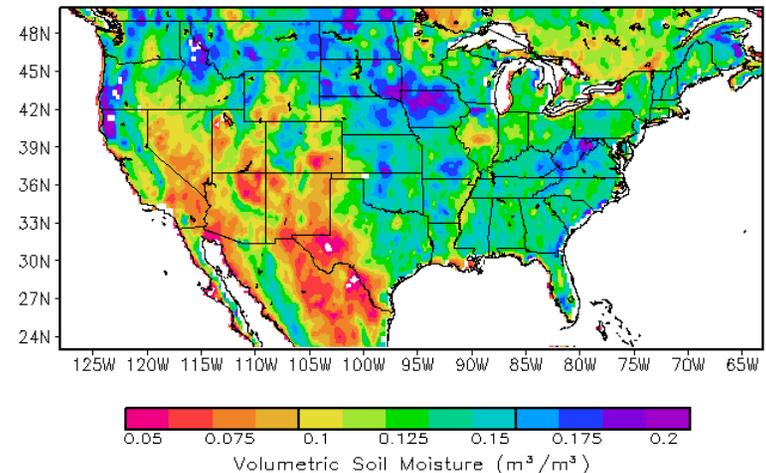
Current global soil moisture estimates are based primarily on a simple 2-layer water budget modeling forced by global precipitation products and a Penman-Monteith model.

2006-2008 NASA Integration System Solutions project to mainline daily soil moisture from the EOS Advanced Microwave Scanning Radiometer (AMSR-E) into the FAS PECAD system (joint with USDA-ARS, USDA-FAS, NESDIS and GMU)

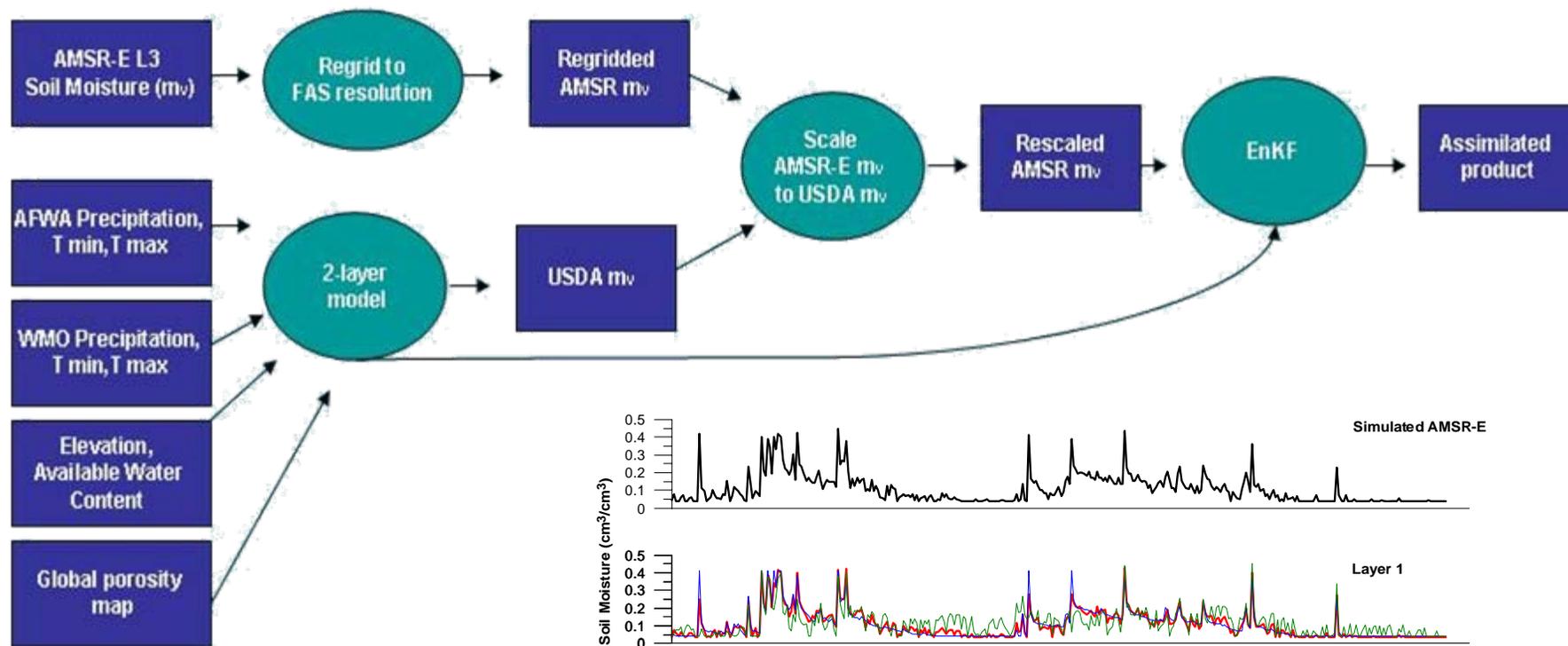
Hypothesis: Assimilation of AMSR-E soil moisture products into the PECAD system can enhance regional yield forecasting.



AMSR-E Soil Moisture- June Climatology

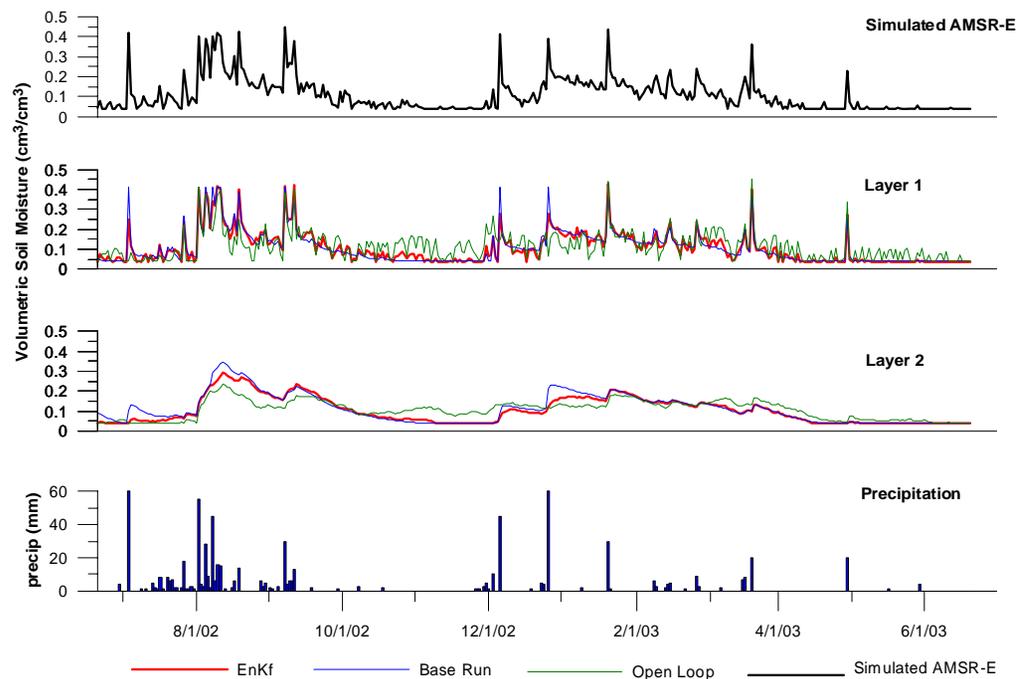


EnKF Assimilation Scheme



•Global assimilated soil moisture product provided to PECAD every 3 days

•4 day latency



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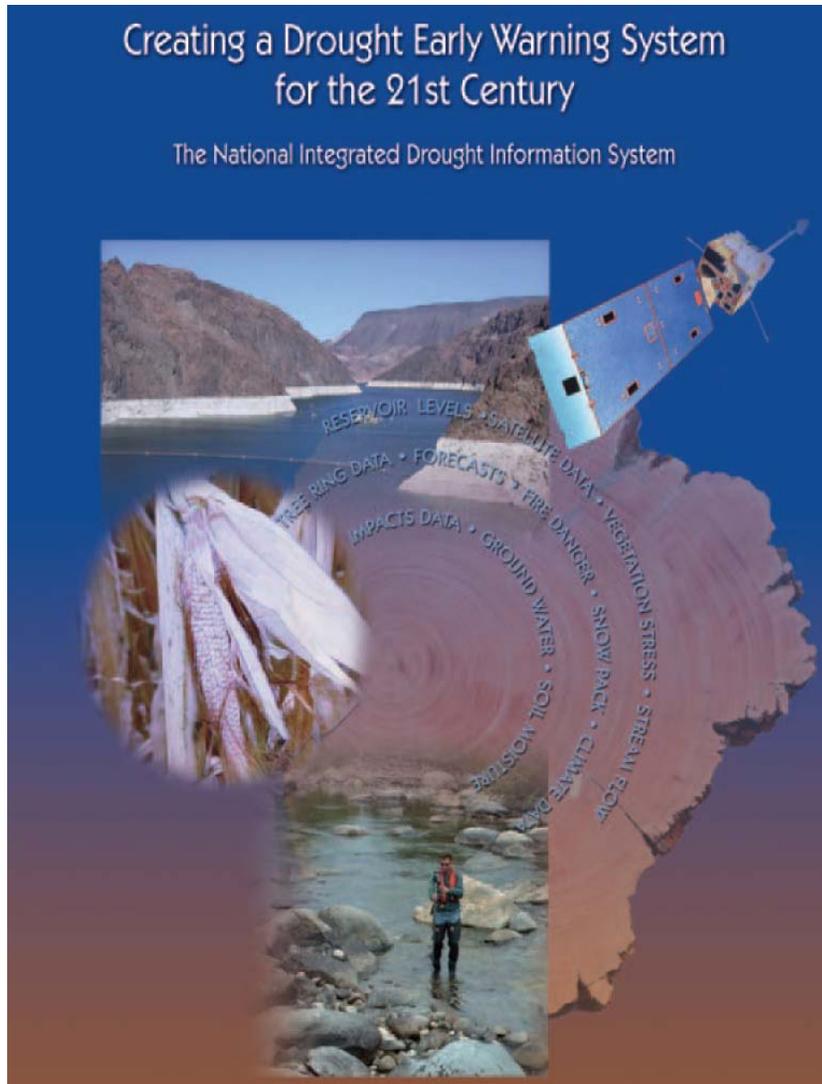
II. Drought Mitigation

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Mitigation:

Early Detection + Modified Management = Reduced Impacts

National Integrated Drought Information System



2004 – Report by the Western Governors Association

2005 - President's FY07 budget (NOAA lead)

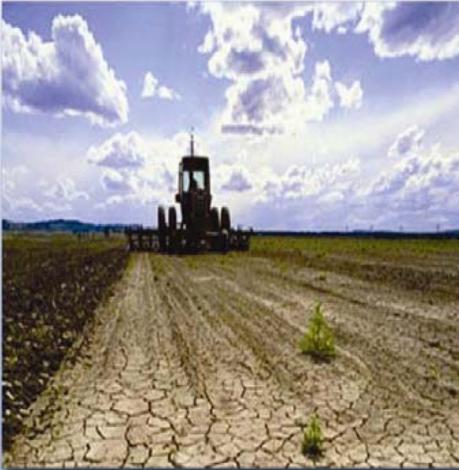
Fall 2006 – Passed House and Senate and signed by President

Enhance our ability to predict and efficiently mitigate drought effects.

Envisioned as a cost effective means of reducing crop insurance and drought relief costs (6-8 billion \$/yr).

National Integrated Drought Information System

National Integrated Drought Information System (NIDIS)
Near-Term Opportunity Plan



PRE-PUBLICATION



September 2006

“..soil moisture [is] one of the most critical parameters for understanding drought throughout the country”

..however...

“the total number of [in situ] sites is not sufficient for understanding soil moisture conditions on a widespread basis”

Opportunities for Remotely Sensed Soil Moisture:

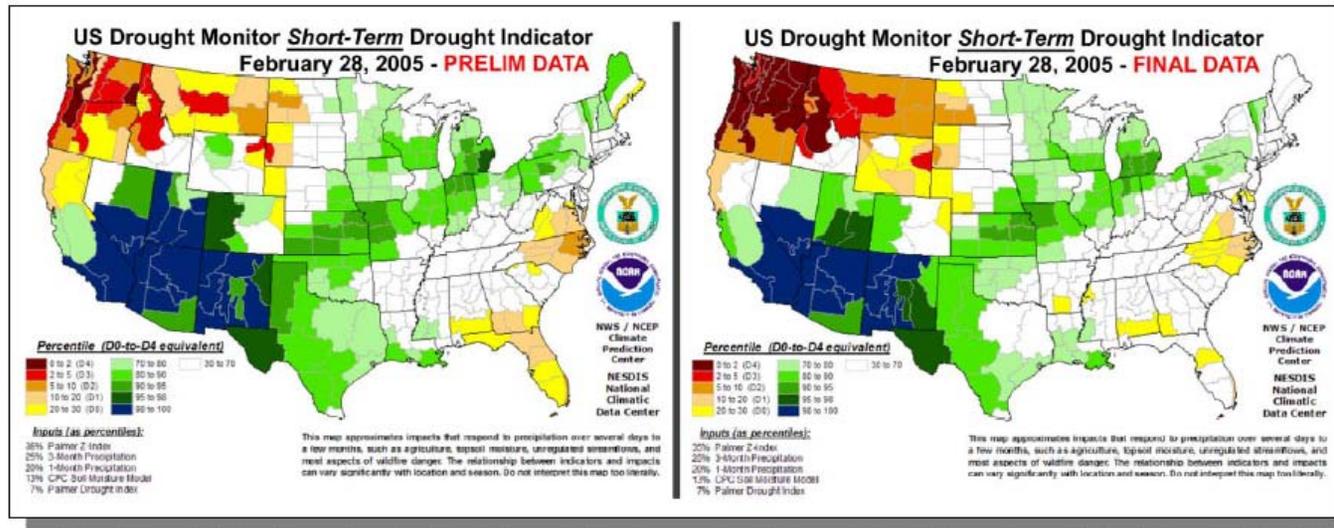


Figure 2. Due to the current time lag in receiving data, the severity of drought can be significantly under- or overestimated for many areas of the Pacific Northwest, and the Southeast as illustrated in this diagram. Colors reflect the severity of drought – deep red is exceptional drought, red is extreme drought, orange is moderate drought, and yellow is mild drought-like conditions

- Latency issue with ground-based monitoring activities
- Direct measurements of agricultural drought (versus downstream proxy)
- Local scale information (5 to 10 km) is valuable
- Require measurement through mature canopies (L-band needed)

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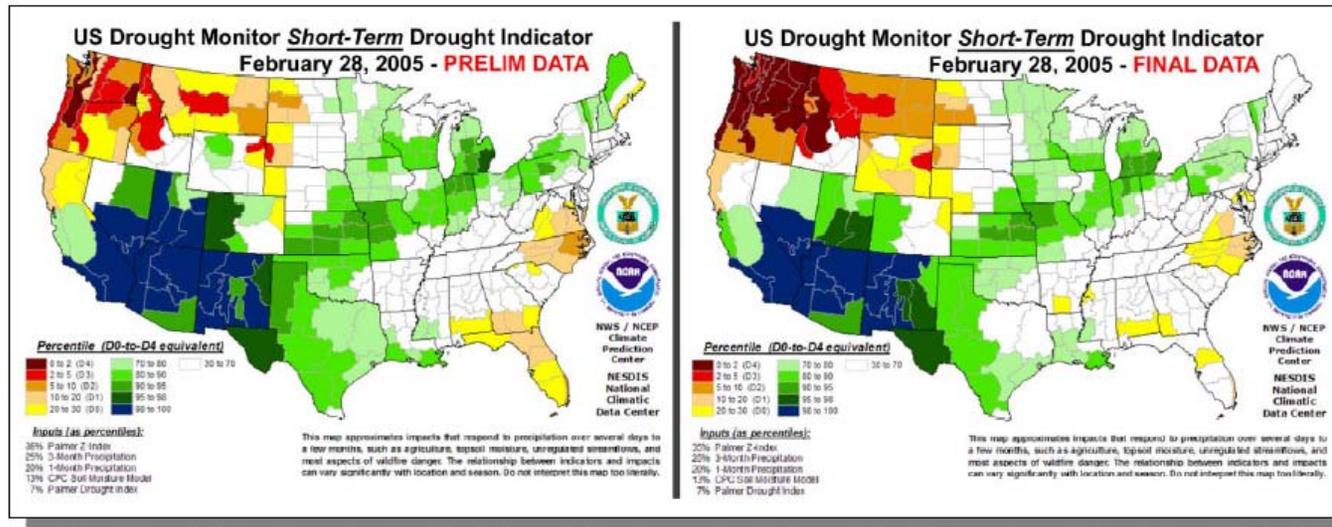


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SMAP-type mission specifications are required....

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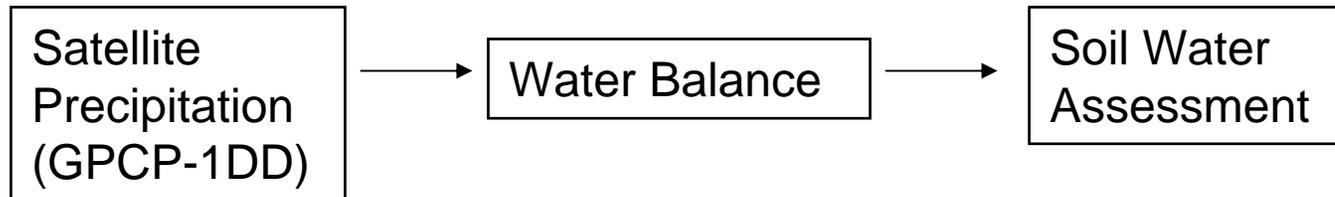
III. Quantification of SMAP Added Value

Current drought detection approaches are dominated by soil moisture information derived from water balance modeling...

Can remotely sensed soil moisture contribute added value to such products?

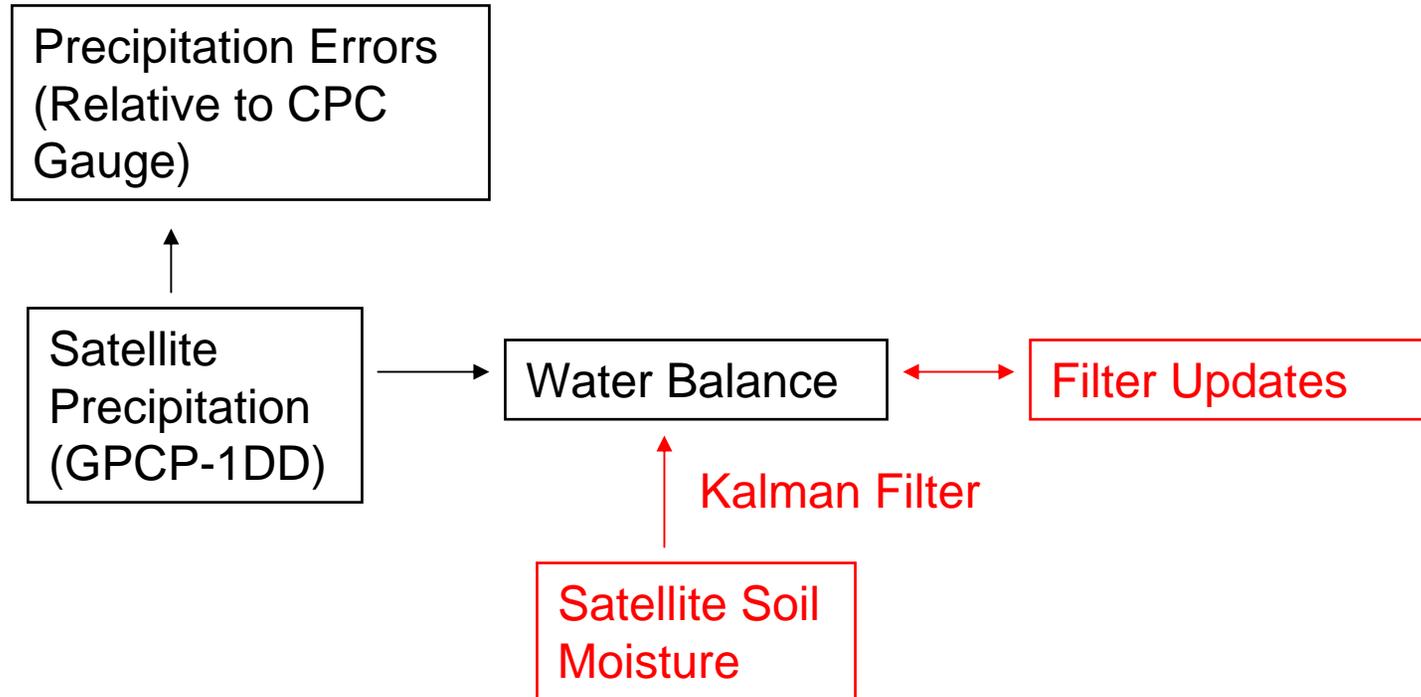
Contributing value to rainfall-driven water balance modeling:

Baseline Global Monitoring Systems (e.g. the FAS PECAD system)



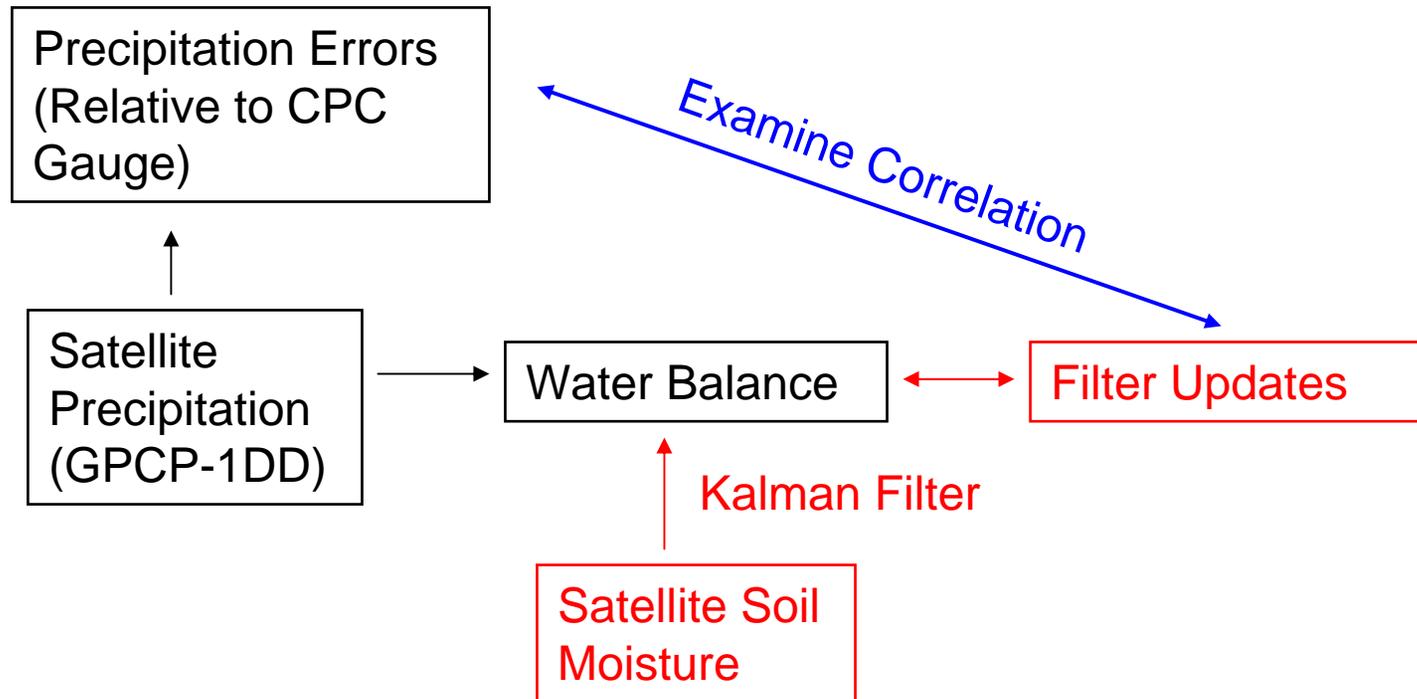
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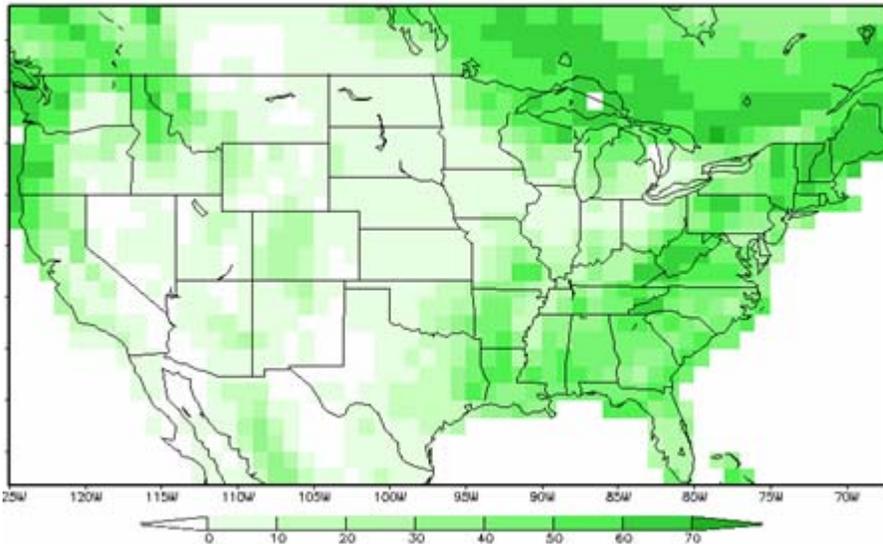
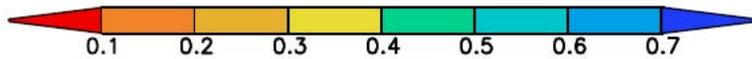
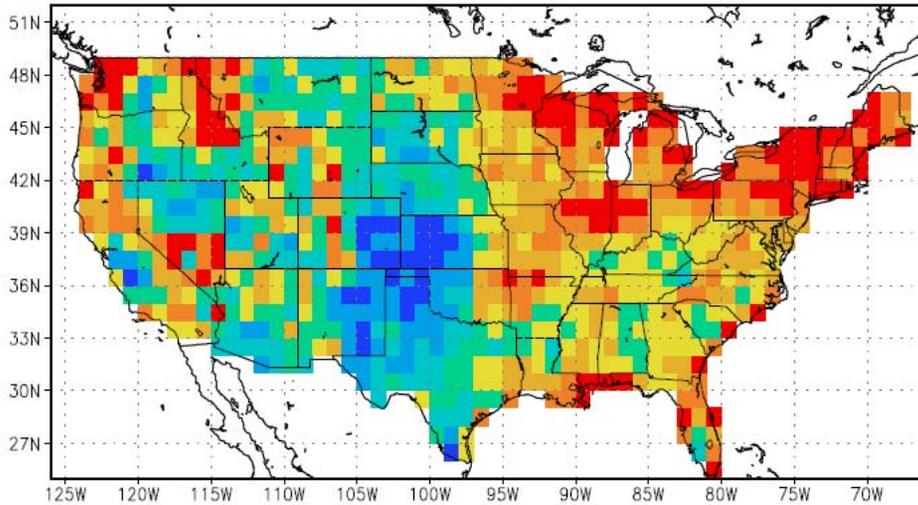
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AMSR-E USDA



Tree Coverage Fraction

- For AMSR-E statistically significant correlations exist for 85% of CONUS land area.
- Even at X-band, soil moisture retrievals make a significant contribution to global-scale agricultural drought monitoring.
- **Clearly an opening exists for SMAP-type measurements.**

Thank you...