SMAP Assimilation at SPoRT: Results and Plans

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Outline

- Updates
 - Web products
 - Data Assimilation of Enhanced SMAP Retrievals
- Case Study
 - Correction of Forcing-Related Anomalies via SMAP DA
- Future Plans

SPoRT LIS Web Interface



https://weather.msfc.nasa.gov/sport/case_studies/lissmapda_CONUS.html or https://weather.msfc.nasa.gov/sport ->Real-Time Data ->Land Information System

-> SPORT LIS + SMAP DA

LIS Web Products from SPoRT: SMAP LIS

Column-Integrated Relative Soil Moisture (%) valid 15z 18 Oct 2016



• 0-10 cm model soil moisture

https://weather.msfc.nasa.gov/sport/case_studies/lissmapda_CONUS.html

Update: Experimental Assimilation of SMAP Enhanced (9-km) Product

0-10 cm Volumetric Soil Moisture (%)



Note linear and square features (e.g., at arrows) on right resulting from the coarse 36-km resolution of the SMAP data. Reduced on left due to using 9-km Enhanced SMAP data.

SMAP Assimilation Reduces Errors due to Poor QC in Forcing Data

- Land surface models such as SPoRT LIS are forced using precipitation inputs (NLDAS-2 in this case)
- In 2015, NLDAS-2 included data from a bad rain gauge (consistently near zero) in southern Arkansas causing an anomalously dry soil moisture "bullseye" (upper left, arrow).
- Through assimilation of SMAP L2 soil moisture fields, which do not exhibit this feature (lower left), this anomaly is greatly reduced over time (upper right) to provide a more representative soil moisture field.
 - Snapshot is 24 days after beginning of assimilation.
- This results in a more accurate depiction of local conditions.



Credit: Clay Blankenship (USRA), Jonathan Case (ENSCO, Inc.), William Crosson (USRA), Bradley Zavodsky (NASA MSFC)

Better Blending of Soil Moisture Across US-Canada Border

48N

45N

42N

39N

39N -

- Soil moisture discontinuities can occur in regions where different precipitation inputs are blended
 - NLDAS-2 uses radar-derived precipitation over U.S. and reanalysis outside of U.S.
 - Results in anomalous dry conditions in southern Ontario (upper left, oval)
 - SMAP retrieved soil moisture (lower left) does not have this feature.
- Through assimilation of SMAP L2 soil moisture fields, this anomaly disappears ^{48N} over time (upper right) to provide a more ^{45N} representative soil moisture field ^{42N}
- This should help forecasters better assess current regional conditions and provide more accurate initialization of NWP models.

12Z 4 Jun 2016 **Baseline SPoRT LIS SPORT LIS with SMAP DA** 48N 45N 42N 39N 84W 81W 78W 75W 72W 87W 69W 90W 87W 84W 81W 78W 90W 93W 75W 72W 15 20 25 30 80 10 35 50 60 65 70 75 85 90 40 45 55 95 48N 45N 42N 39N 69W 72W -4 -2 -1 1 **SMAP Retrieved Soil Moisture** LIS Difference

0-2 m Column Integrated Relative Soil Moisture (%)

0-5 cm, volumetric (m³/m³ x100) Non-localized CDF-matching bias correction applied LIS Difference (SMAP DA Minus Baseline SPoRT) Column Integrated RSM (%)

Credit: Clay Blankenship (USRA), Jonathan Case (ENSCO, Inc.), William Crosson (USRA), Bradley Zavodsky (NASA MSFC)

Future Plans

- Validation of soil moisture against ground probes
- Investigation of bias correction methods
- NWP Initialization using NASA Unified WRF
 - Validation of 48-hr NWP forecasts
- Implement Africa domain
- Possible Alaska domain



SMAP L2 Enhanced SM





https://weather.msfc.nasa.gov ->Realtime Data ->SMAP Soil Moisture