Soil Moisture Anomaly Detections Using SMOPS and Its Applications in Drought Monitoring

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NOAA Soil Moisture Operational Products System (SMOPS)

- **Combines soil moisture (SM) products from GPM, SMAP, GCOM-W1, SMOS, and MetOp-B satellites**

- **Cumulative Distribution Function (CDF) is used to generate the merged SM product from all sensors**

- **Individual SM layers are also retained in SMOPS product**

- **Blended SM product has daily global coverage with no gaps**

- **Spatial resolution: 0.25-degree**

Project Objectives

- **Surface soil moisture anomaly detections using SMOPS Blended Soil Moisture product**

- **Applications of anomaly maps for drought monitoring purposes**

Right panel - From top to bottom:
Soil Moisture Climatology for Week 10
Soil Moisture Standard Deviation for Week 10
*Soil Moisture Anomaly Map for Week 10 of 2018*
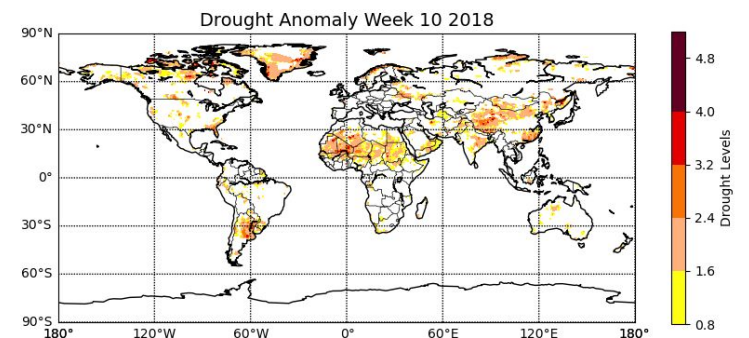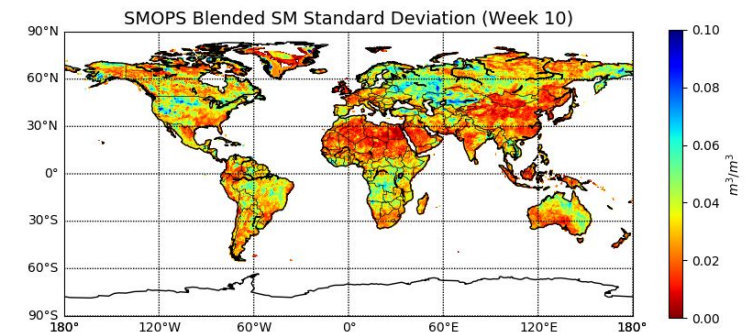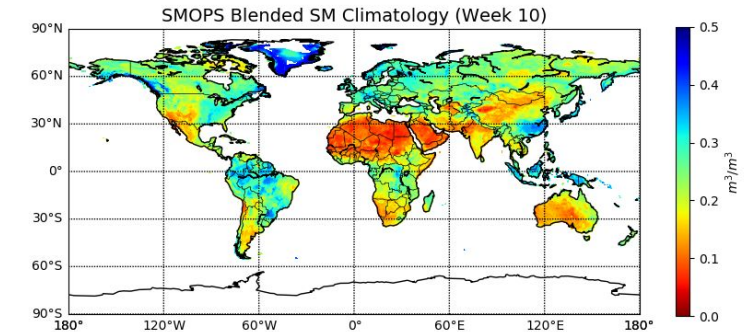
SMOPS Blended SM Climatology (Week 10)

SMOPS Blended SM Standard Deviation (Week 10)

Drought Anomaly Week 10 2018

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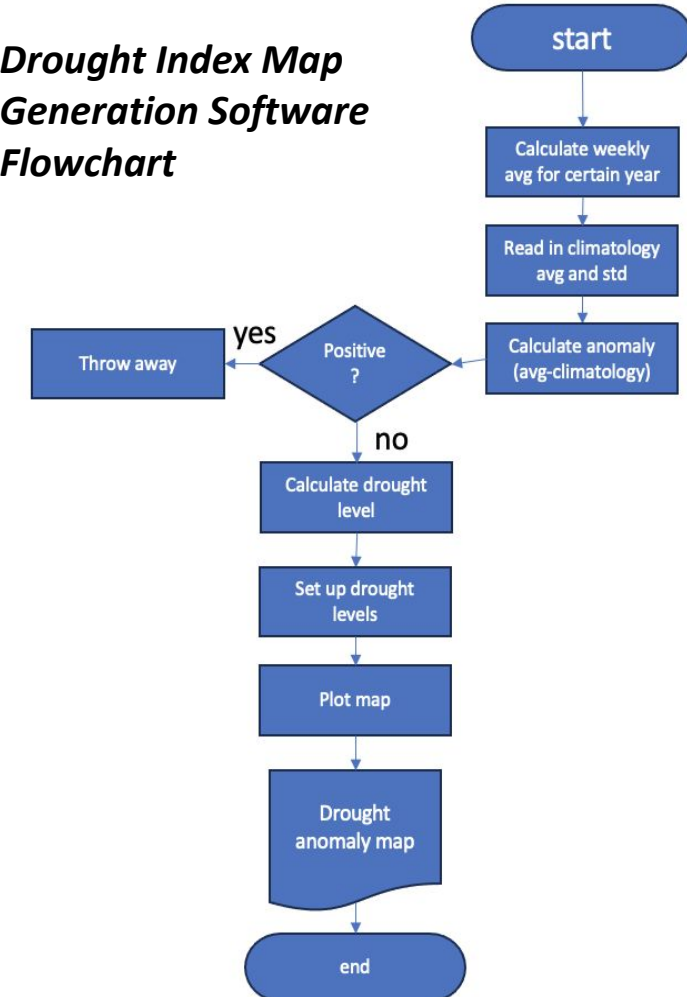
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Methodology

- **Generate weekly soil moisture climatology and standard deviation using SMOPS data from 2014 to 2021**

- **Calculate weekly mean SM for certain year being tested**

- **Calculate SM anomaly**

- **Determine drought levels based on standard deviations in the climatology and SM anomaly**

Climatology Calculation Software Flowchart
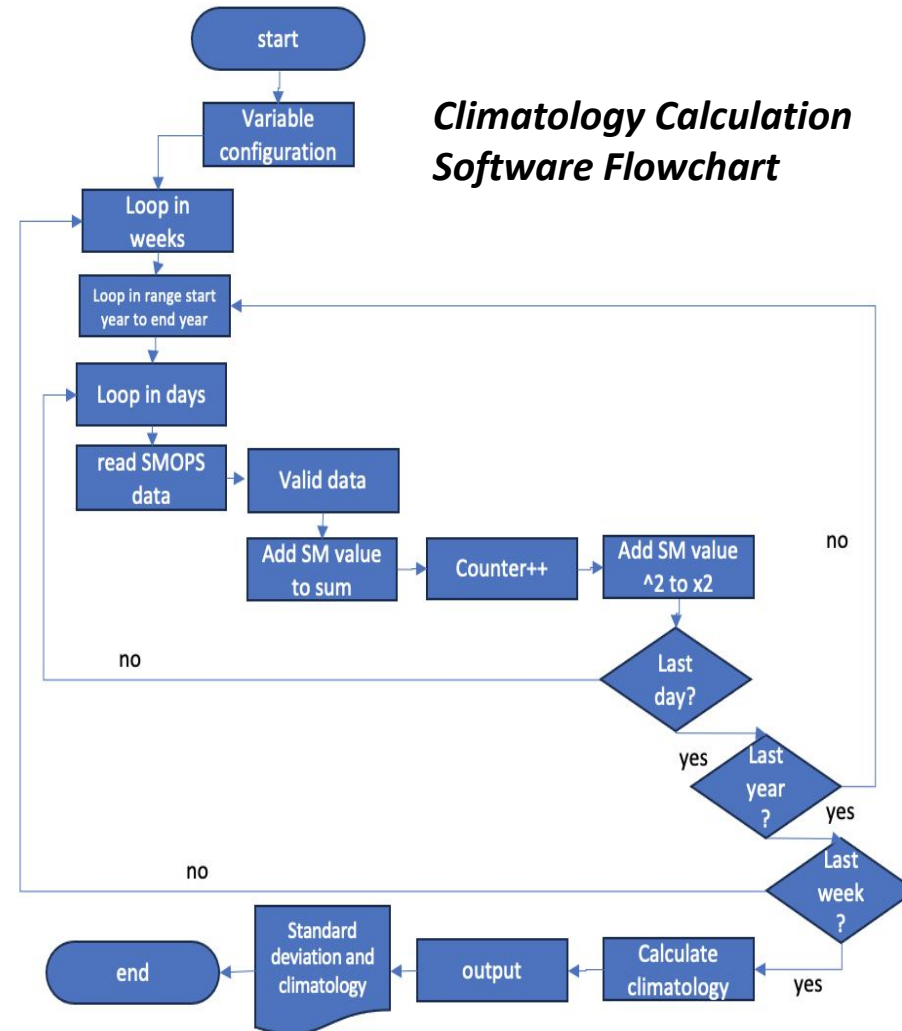
Drought Index Map Generation Software Flowchart

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Results

- Soil moisture anomaly data from 2014 to 2021
- Associated drought level maps
- Validation using National Integrated Drought Information System (NIDIS: drought.gov)
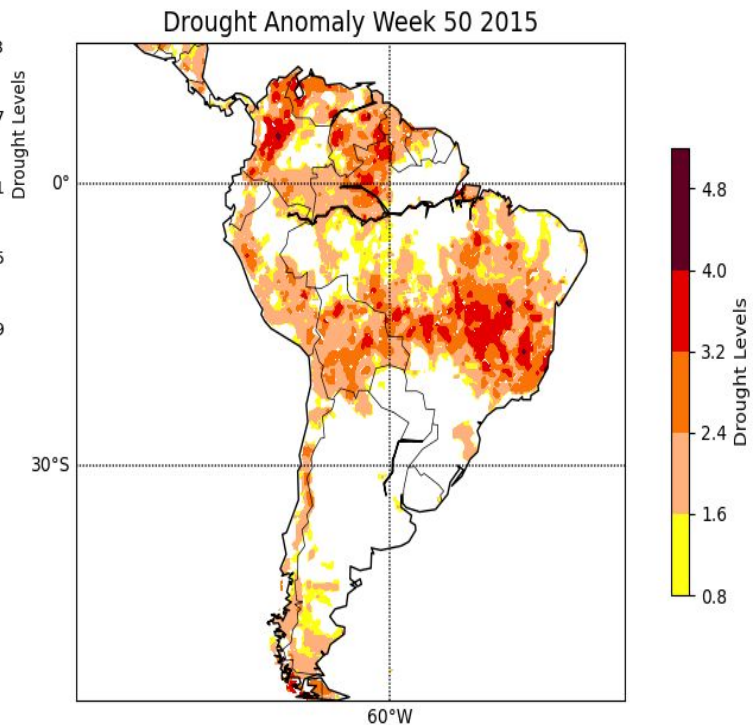- SMOPS Blended SM product has potential to catch some drought events

Potential Improvements

- Apply same methodology to SM products from all individual sensors, and generate a combined drought level map
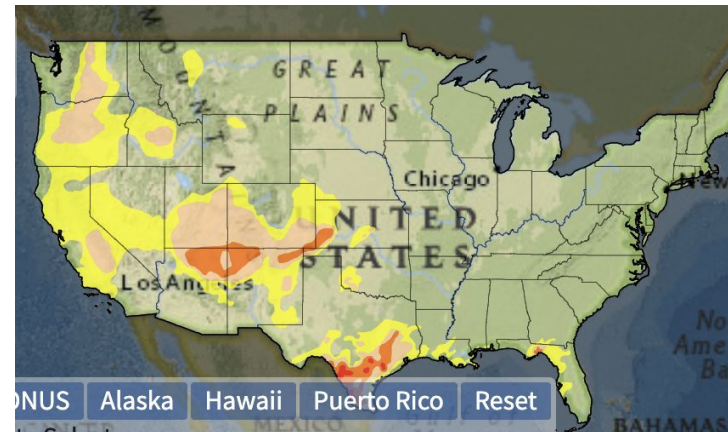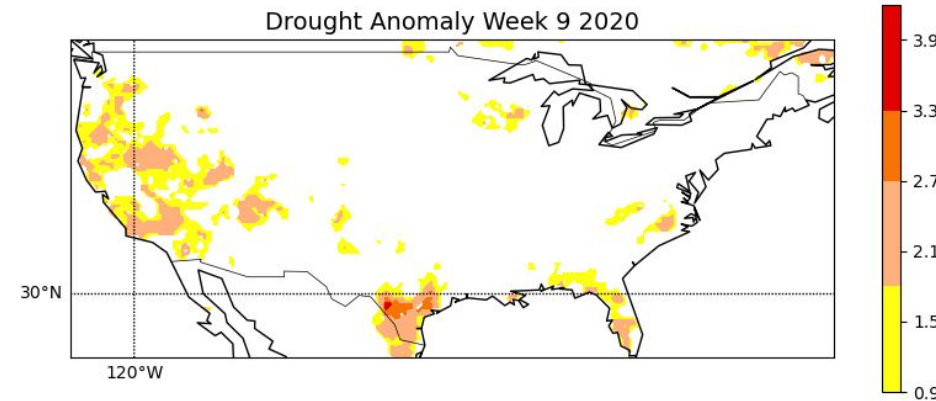
Source: U.S. Drought Monitor

SMOPS SM Anomaly Drought Map (top) compared with U.S. Drought Monitor Map (bottom) for the same week

SMOPS SM Anomaly Drought Map for week 50 of 2015. From 2015-2016, due to El Niño, several regions of South America were impacted by severe drought.