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Outcomes of the National Soil Moisture Pilot Project

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2017 Workshop at MOISST
5/24/17

USDA United States Department of Agriculture

NIDIS

Target Applications

1. Operational Drought Monitoring: NOAA, U.S. Drought Monitor
2. Experimental Land Surface Modeling: NOAA/ NOHRSC, Snow Modeling
3. Operational Hydrological Modeling: NOAA RFCs

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Pilot Goal

Aggregate In-Situ Soil Moisture Data:

- Near real-time
- Use common measure (VWC)
- Use discrete and common depths
- Relate recent to 30 yr record,
- Extra Credit: Use USDM colors in map display

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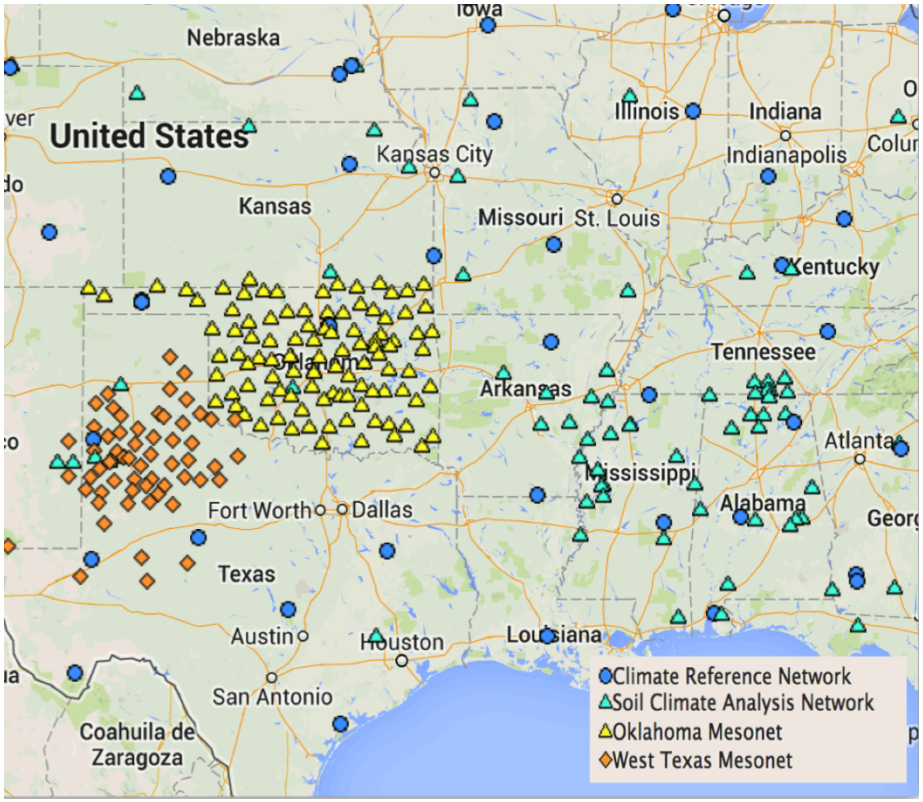
Pilot Data Sets

- In Situ:
  - Climate Reference Network
  - SCAN & SNOTEL
  - Oklahoma Mesonet
  - West Texas Mesonet

- Station & Soil Metadata aggregated by NASMD



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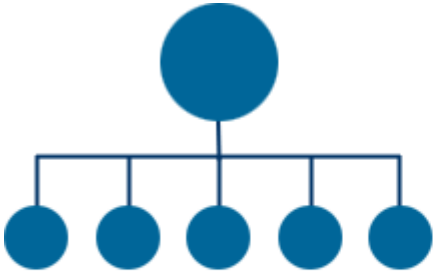
Strategy



SELECTED

Data Warehousing

Pros:

- Lower overhead for provider
- Efficient for large datasets

Cons:

- Harder to reuse data

Service Oriented

Pros:

- Platform Independent
- Reusable & Scalable

Cons:

- Higher overhead for provider

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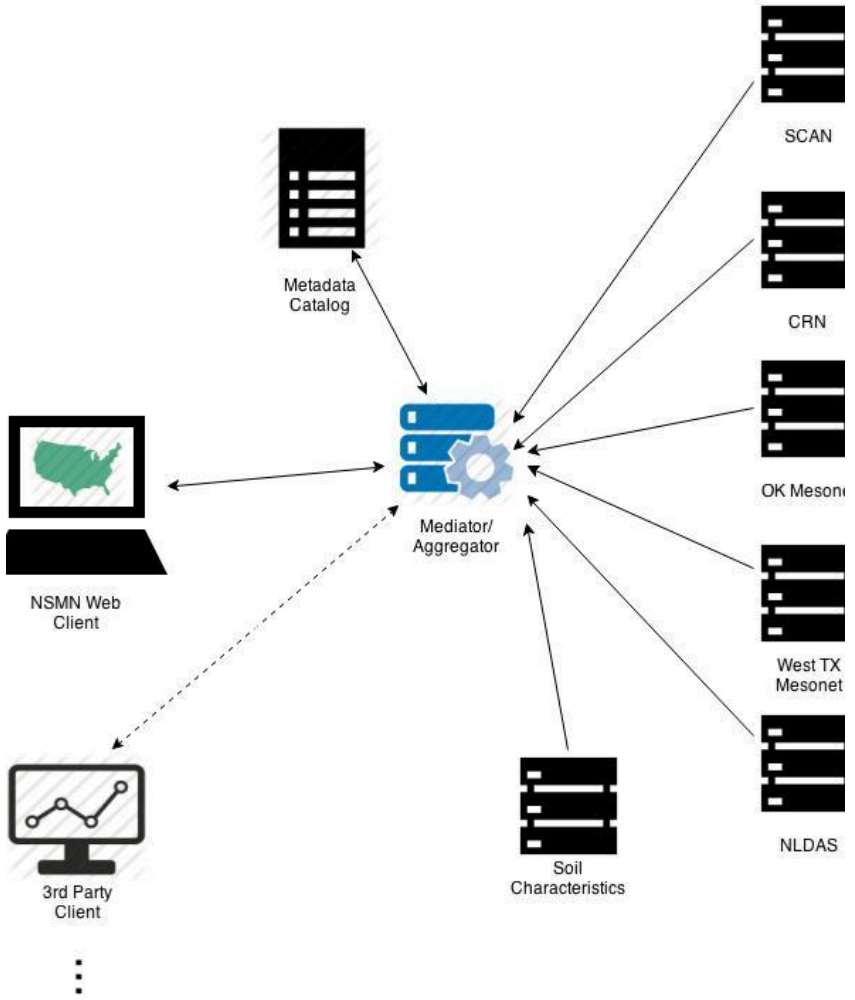
System Components

- Source web services
  - CRN web service - NCDC ArcServer (does not include soil moisture)
  - SCAN web service - AWDB SOAP
  - OK Mesonet web service
  - West TX Mesonet web service
- Site metadata & soil characteristics web service
- Data mediator/aggregator
- Methods for calculating percentiles
- Map-based visualization web tools



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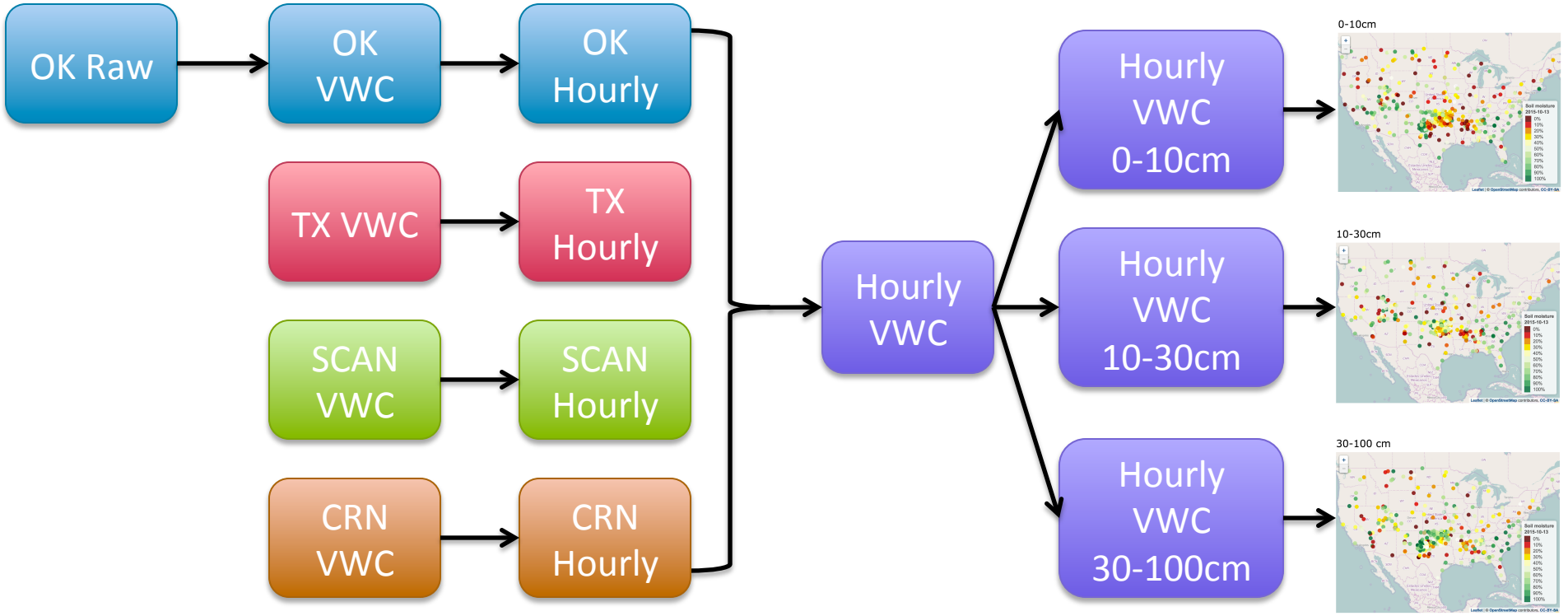
Data Processing Pipeline



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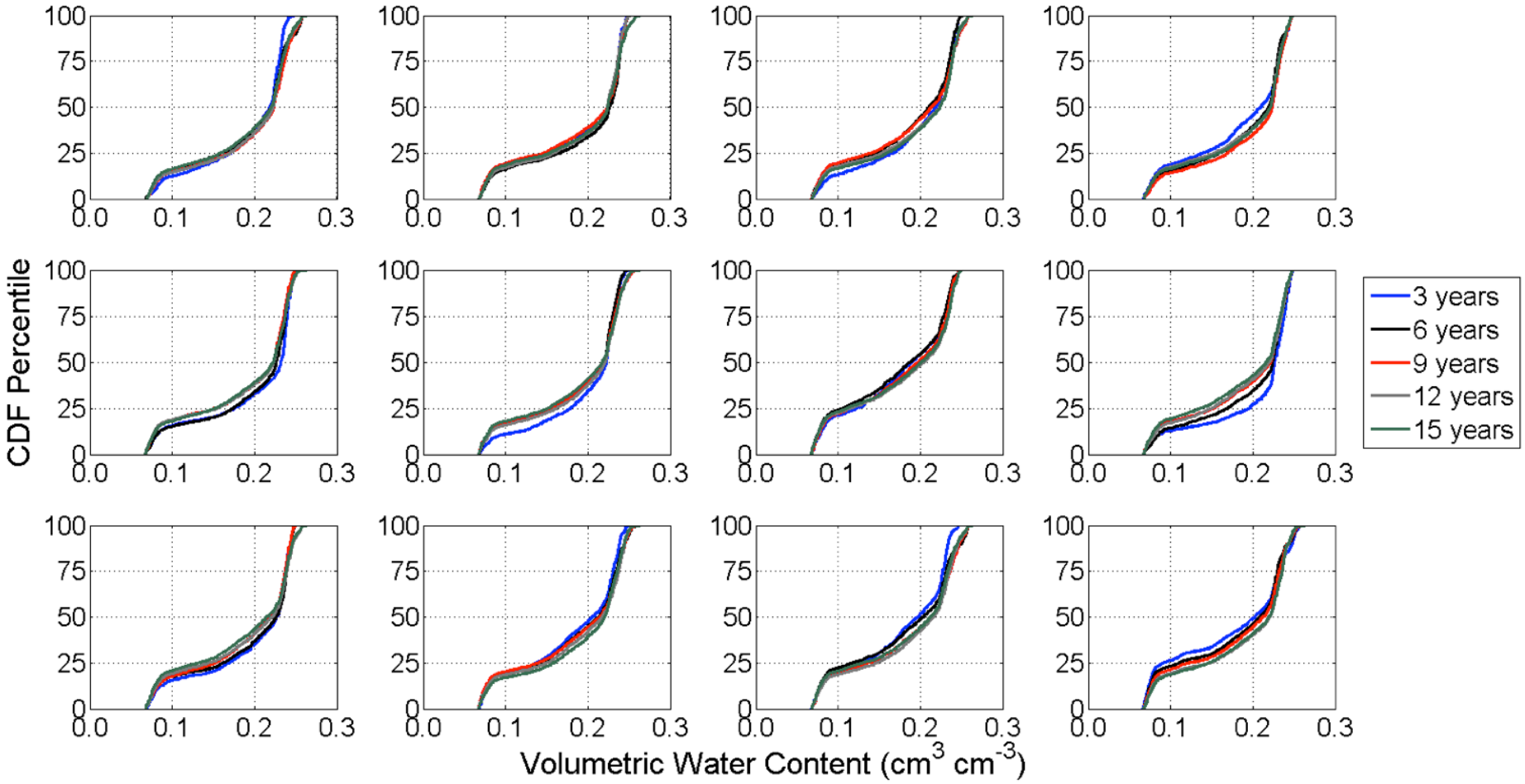
Pilot Outcome: Soil Moisture Percentiles



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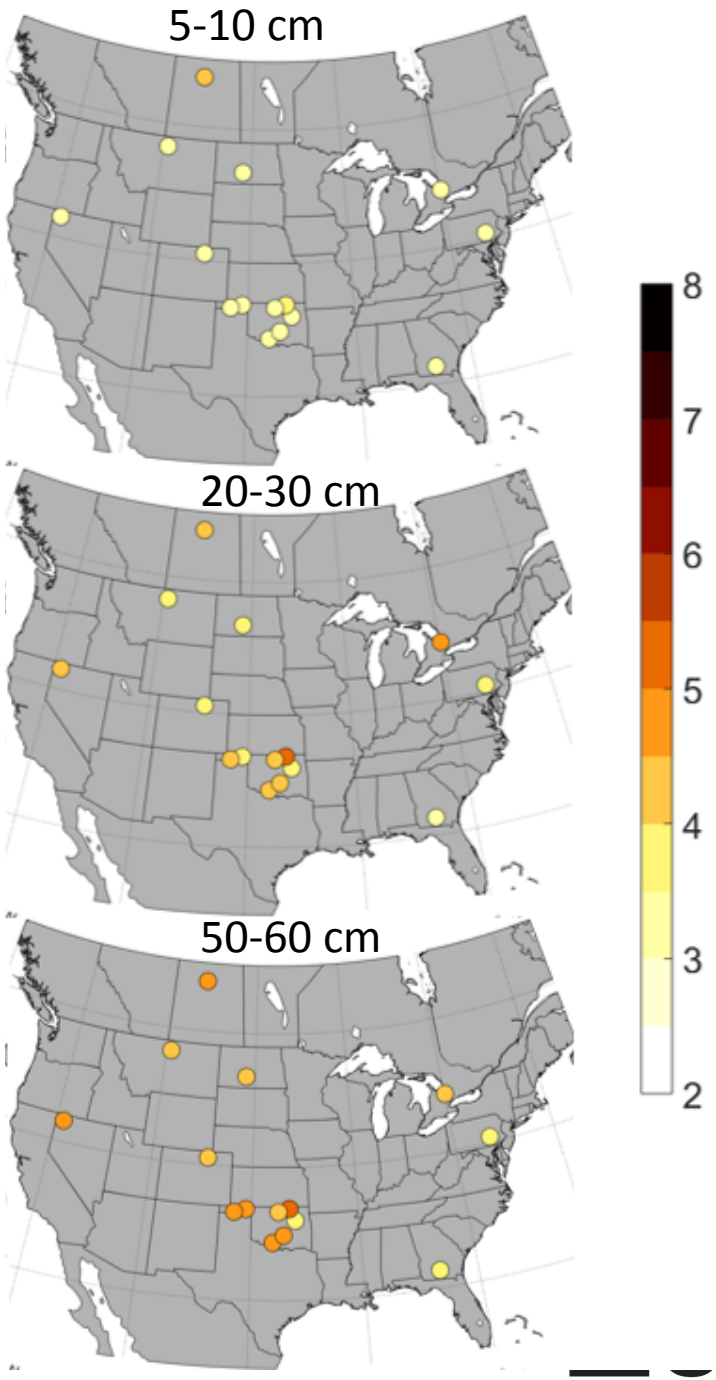
Soil Moisture Percentiles

Depth of measurement variations: the average number of years of data that are necessary to generate stable soil moisture percentiles at each station.

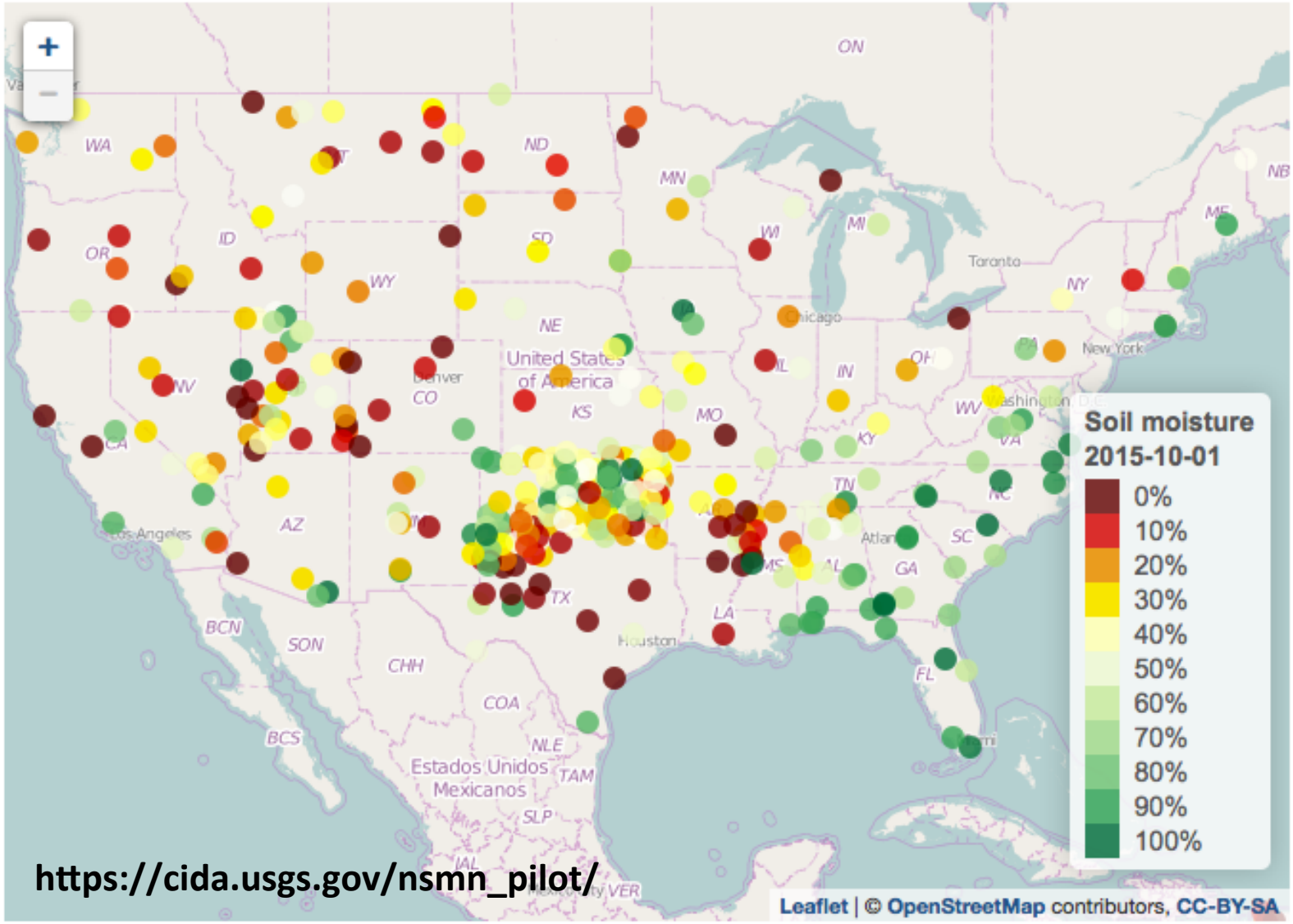
The record length thresholds are determined using the Anderson-Darling test with a Bonferroni adjustment for measurements made at: 5-10 cm, 20-30 cm, and 50-60 cm



Ford et al. (2016)

Pilot Outcome: Web Display

0-10cm



Pilot Outcome: Web service

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Pilot Results

- Station metadata QA/QC process
- Service for station metadata
- Validated method for generating stable percentiles
- Interactive map developed
  - ✓ Dynamically integrates data
  - ✓ Updated hourly
  - ✓ < 6 hr lag time
- Developed an SOS service for aggregated VWC data

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Pilot Outcome: Reports

Quiring, S.M., Ford, T.W., Wang, J.K., Khong, A., Harris, E., Lindgren, T., Goldberg, D.W., and Li, Z., 2016, The North American Soil Moisture Database: Development and Applications: Bulletin of the American Meteorological Society, v. 97, p. 1441–1459.

Lucido, J.M., Quiring, S.M., Winslow, L.A., Ford, T.W. and Strobel, M.L., Building a Coordinated National Soil Moisture Network: A Pilot Study, Journal of the American Water Resources Association (submitted).

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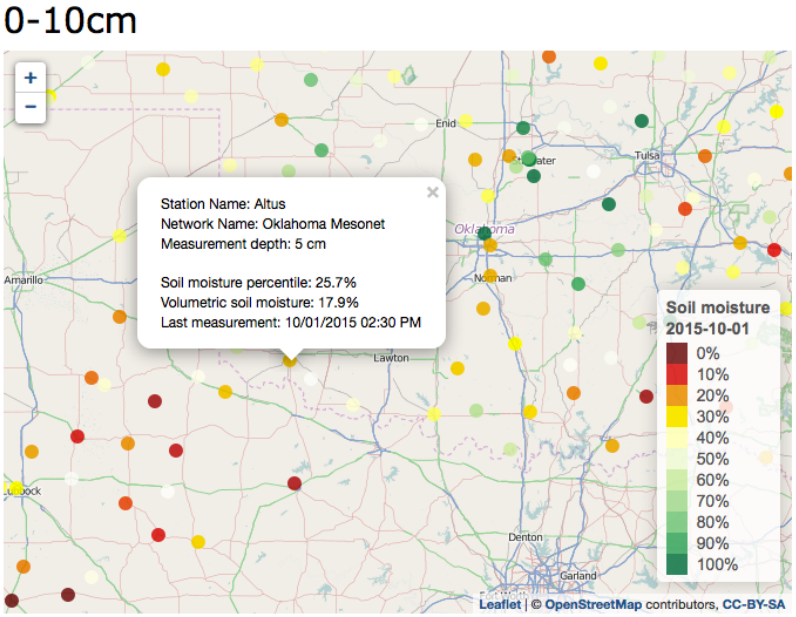
Challenges & Opportunities

- Tremendous potential and interest for NSMN
- Establishing continuity in leadership and support has been a challenge
- Web services are inconsistent across Networks
- Station metadata are not available via services
- Need best practices for minimum metadata elements



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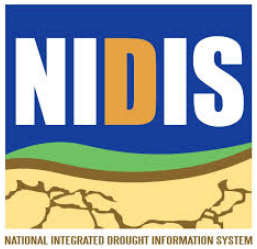
Acknowledgements



Roger Pulwarty, Veva Deheza, Chad Mcnutt, and Lisa Darby

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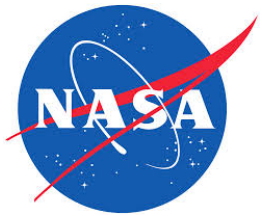
Steven Quiring, Trent Ford, Zhongxia Li, and Partha Baruah



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