

NEON SOIL MOISTURE MEASUREMENTS

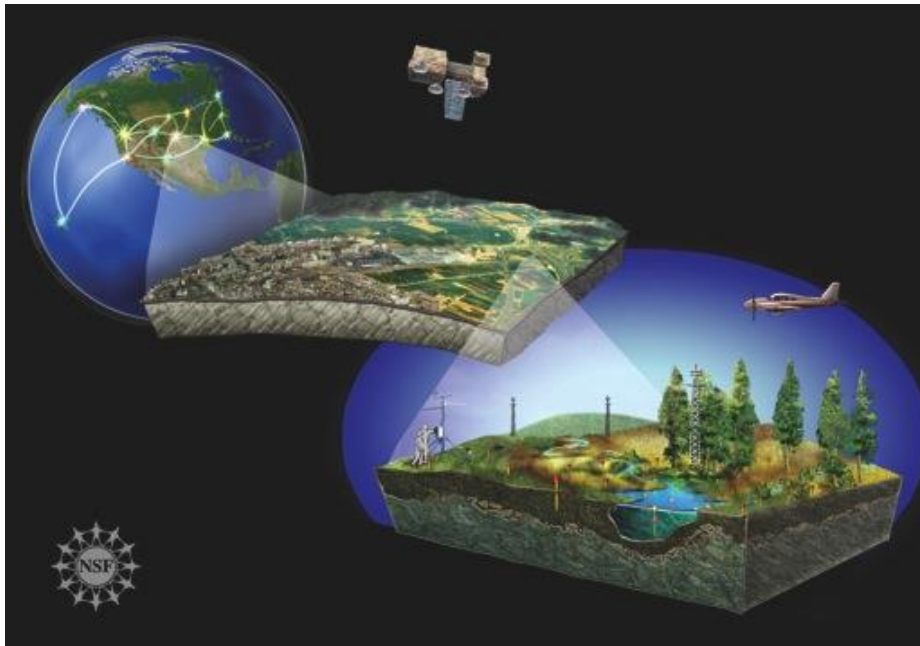
Edward Ayres
National Ecological Observatory Network

SMAP Cal/Val Workshop
5-7 Nov 2013



NEON overview

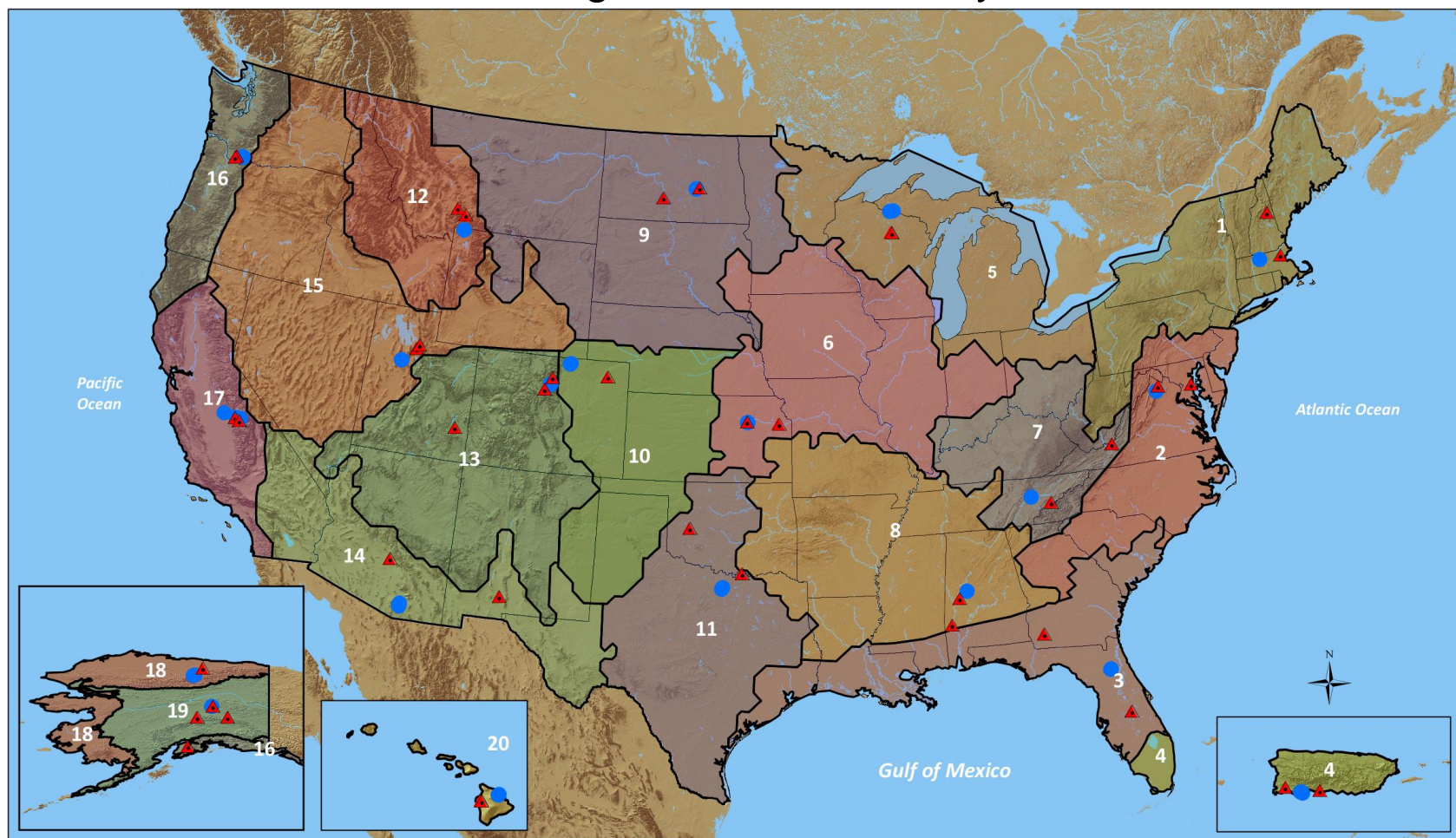
- NEON is a major NSF research facility comprised of scientists and engineers
- Understand how drivers – climate change, land use/land cover change, and invasive species affect ecological patterns and processes
- Enable study and forecasting of long-term ecological trends at multiple scales



- Provide data and physical infrastructure to the public
- Construction complete: 2017
- Data: 2014

NEON sites

60 sites – wildlands & managed/disturbed ecosystems



NEON Domains

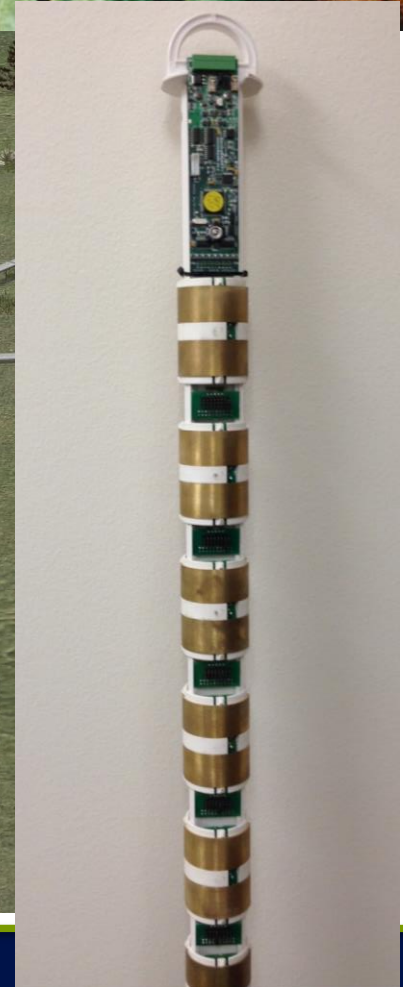
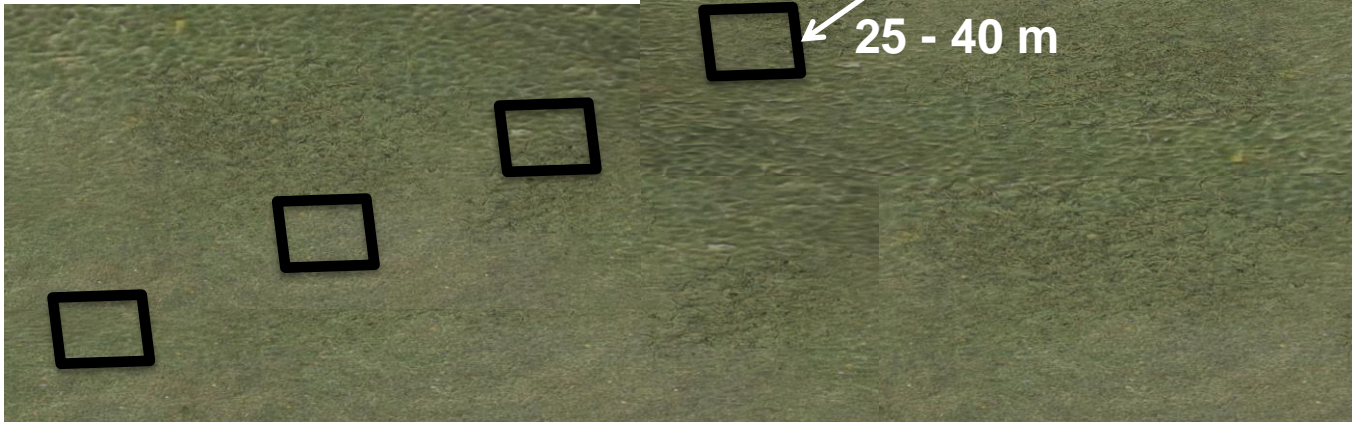
- | | | | | |
|------------------------|-----------------------------------|---------------------|--------------------------------------|----------------------|
| 1 Northeast | 5 Great Lakes | 9 Northern Plains | 13 Southern Rockies/Colorado Plateau | 17 Pacific Southwest |
| 2 Mid Atlantic | 6 Prairie Peninsula | 10 Central Plains | 14 Desert Southwest | 18 Tundra |
| 3 Southeast | 7 Appalachians/Cumberland Plateau | 11 Southern Plains | 15 Great Basin | 19 Taiga |
| 4 Atlantic Neotropical | 8 Ozarks Complex | 12 Northern Rockies | 16 Pacific Northwest | 20 Pacific Tropical |

Site layout

5 soil plots per site

Soil moisture profile:

- Sentek TriSCAN sensors
- 8 sensor per profile
 - Uppermost sensor measures 1-11 cm depth
- Up to 2 m deep
- 1-min & 30-min averages with uncertainty

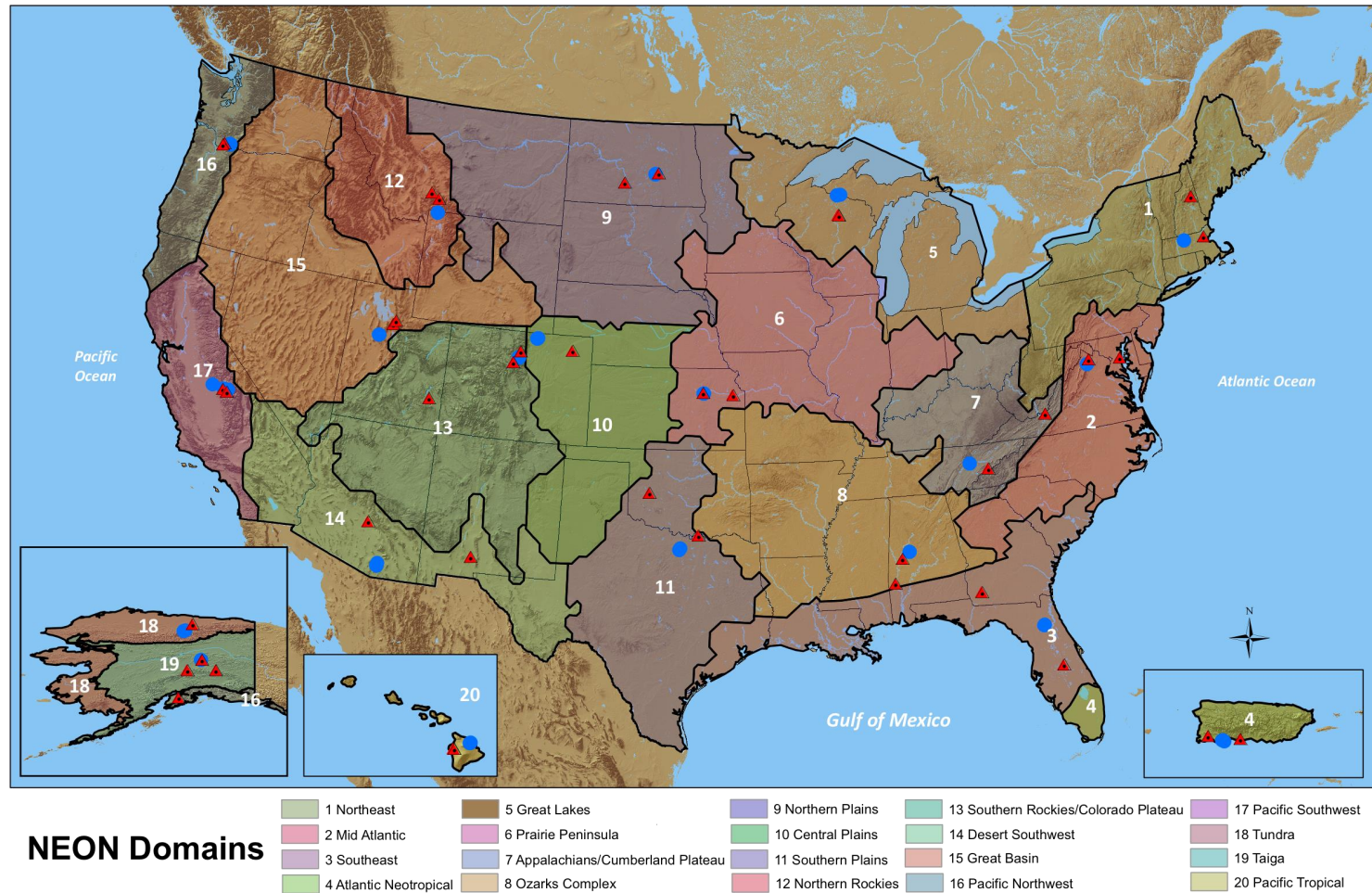


Schedule for soil moisture measurements

2014: 17 sites

2015: 22 sites

2016: 21 sites

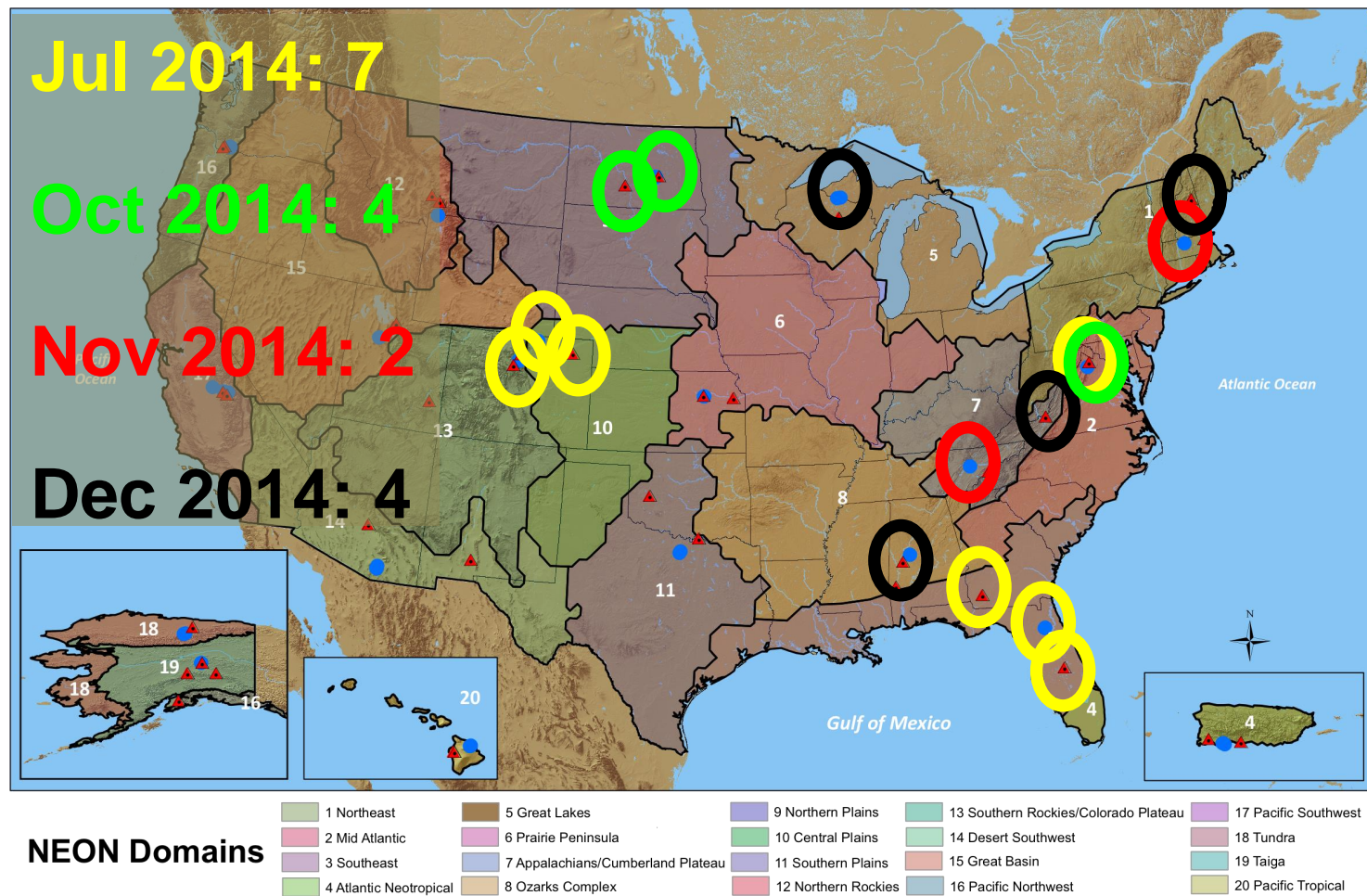


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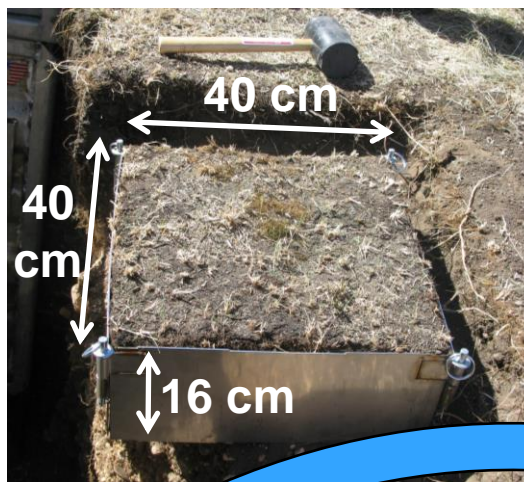
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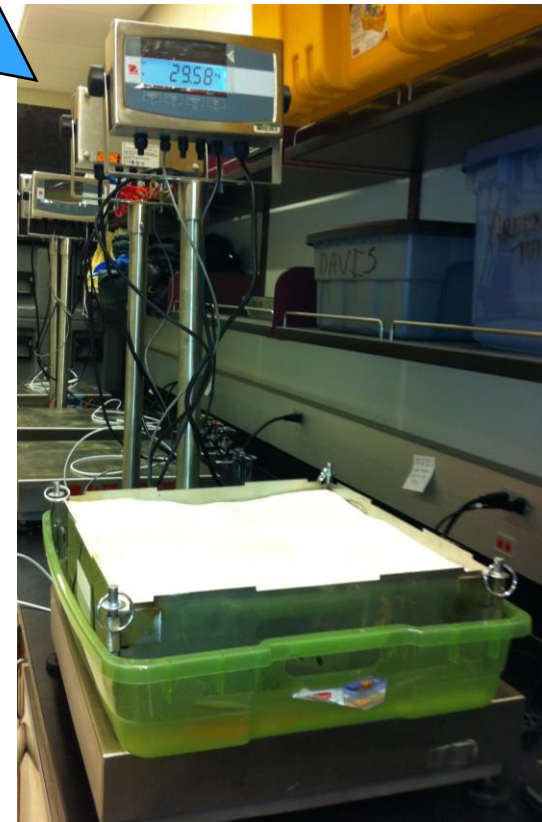
Calibration



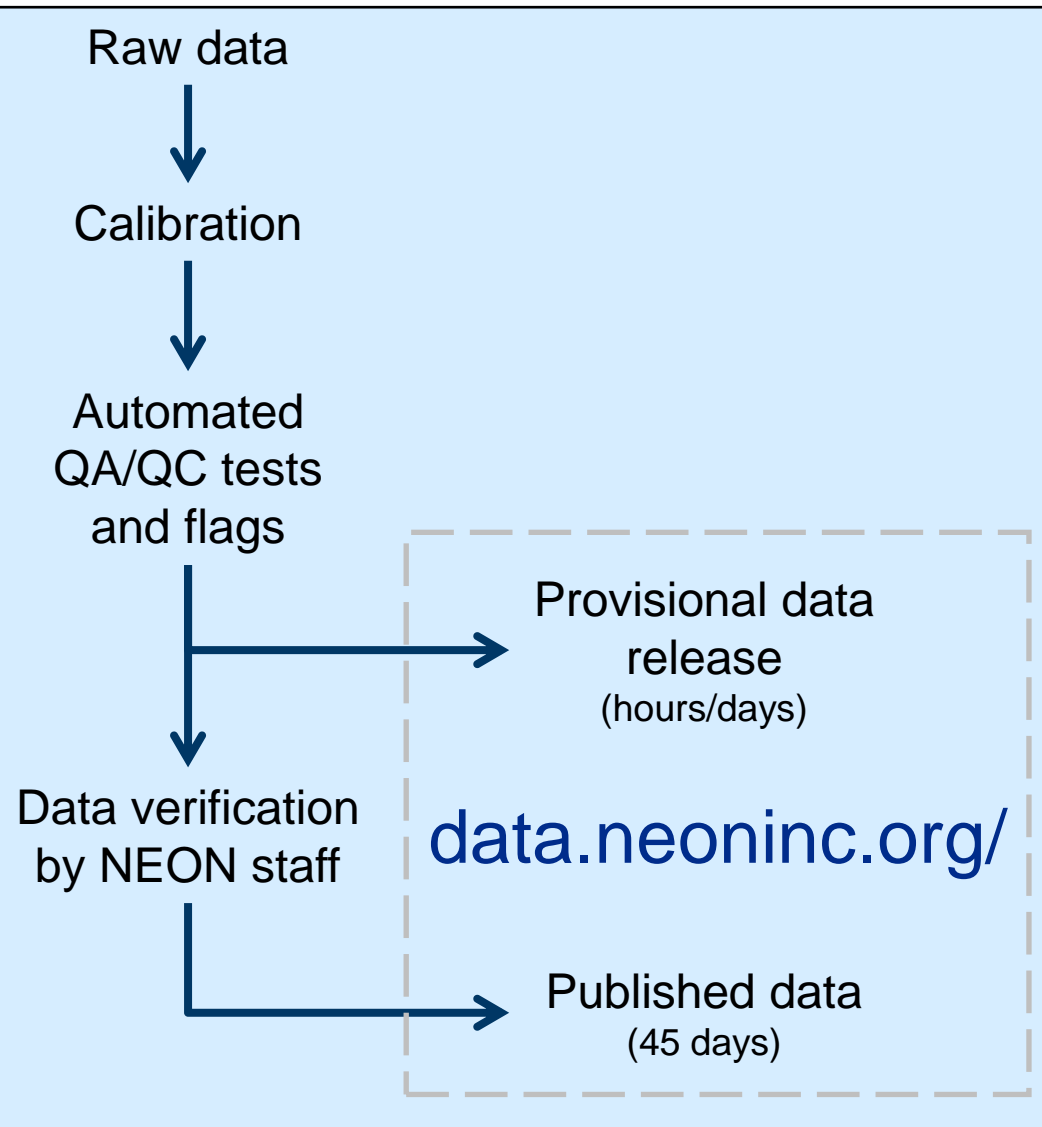
1 soil pit per site

1 intact soil block collected from each horizon

Water added and allowed to dry down. Soil moisture measured gravimetrically and using sensor.



Data flow and QA/QC



Automated QA/QC

Temperature test

Plausibility tests

- Range
- Step
- Null
- ...

Consistency test

- Compares a measurement with measurements above and/or below it

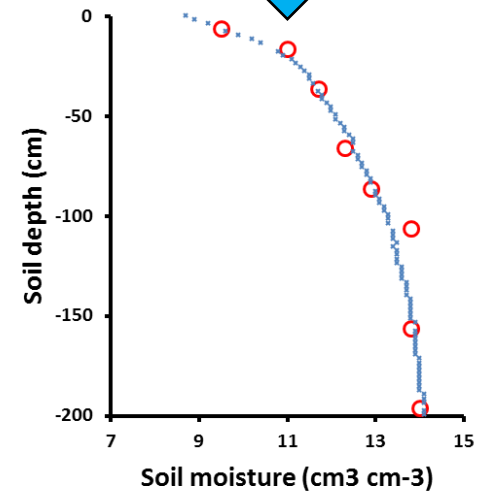
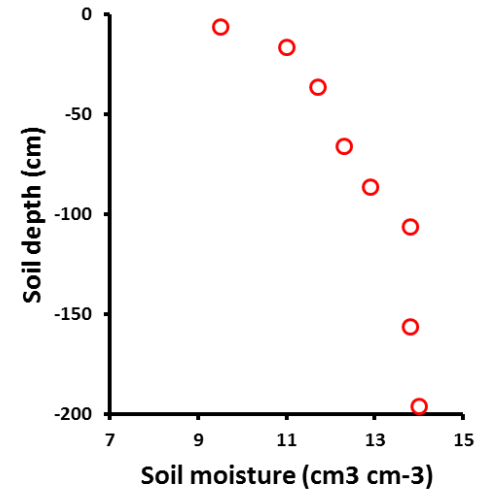
Representing 0-5 cm soil moisture

Level 1 data product:

- Assume sensor at 6 cm depth represents 0-5 cm moisture
 - Integrates over 1-11 cm

Level 2 data product (~1 year):

- Modeled/interpolated soil moisture profiles from 0-200 cm



Up-scaling to SMAP scale

Short-term:

- Data from the 5 soil moisture profiles at each site can be averaged
 - 8 pairs of sites <36 km apart

Longer term (~2-3 years)

- Modeled soil moisture across ~10,000 km² at each site (Andy Fox, NEON)
 - 100 m spatial resolution
 - 30 minute temporal resolution

Other relevant measurements

- Precipitation
- Throughfall
- Snow depth
- Soil temperature profiles
- Net ecosystem C exchange (eddy covariance)
- >500 data products



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National Ecological Observatory Network

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