



Optimal Placement of Soil Moisture Sensors in Irrigated Corn Fields (work in progress...)

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Soil Water Processes Lab

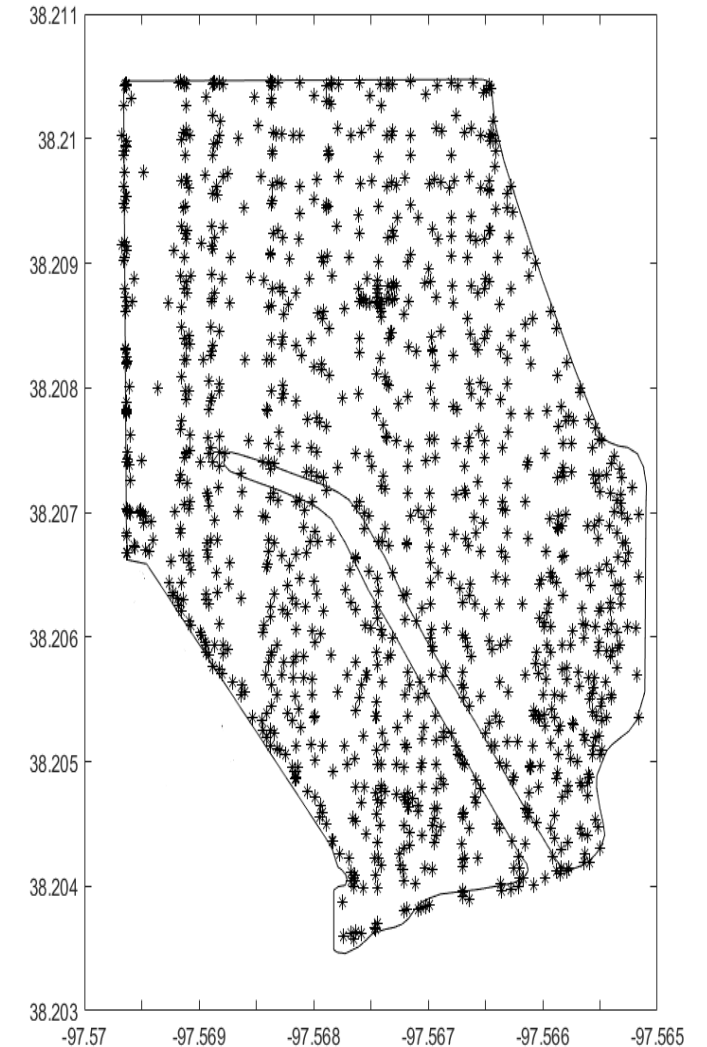
Department of Agronomy

Questions

- 1. How many soil moisture sensors are required to characterize a given field?**
- 2. Where do we place a limited number of soil moisture sensors?**
3. Accuracy of research-grade vs commercial sensors
4. How do we predict profile soil moisture from surface soil moisture sensors to improve irrigation scheduling.

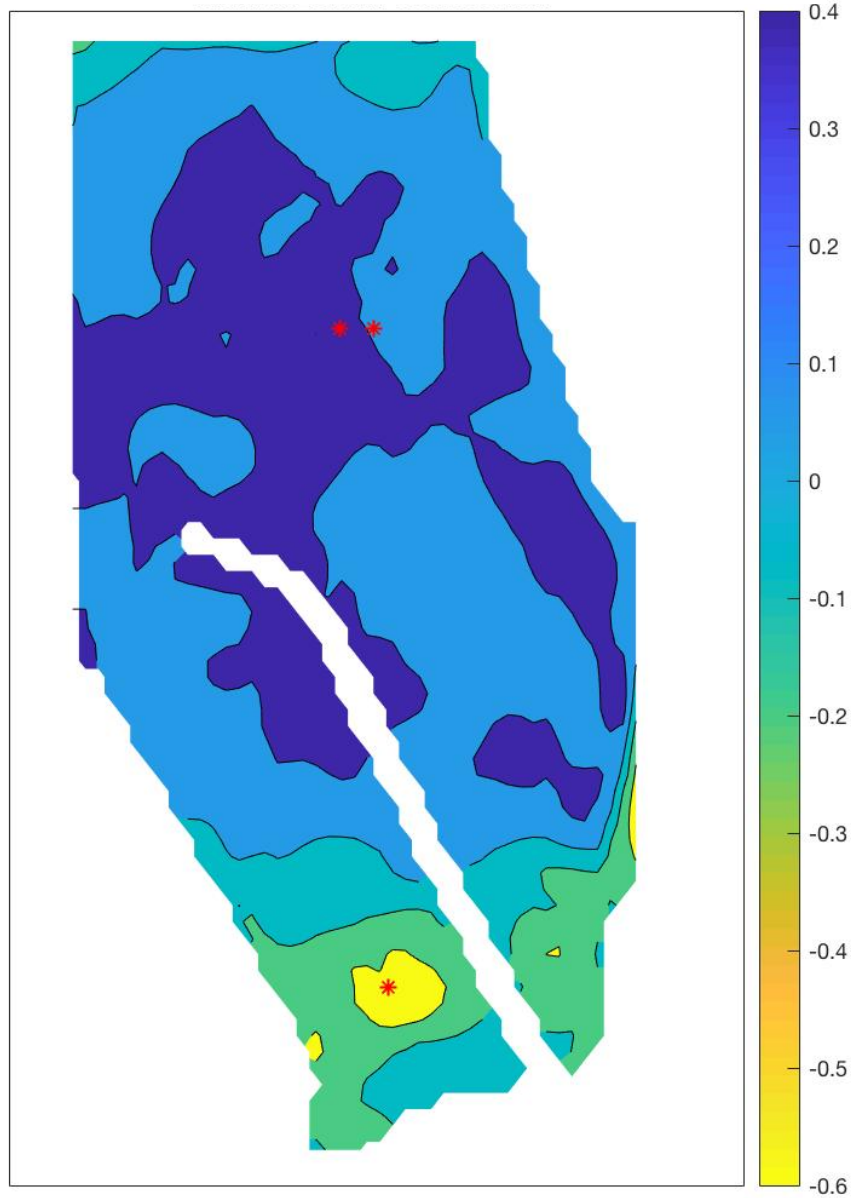
Field Work

- Total of 6 soil moisture surveys during the fallow period
- Hand-held sensor with 12-cm rods
- Collection of volumetric water content (%), along with geographic coordinates
- A total of 1200 soil moisture measurements

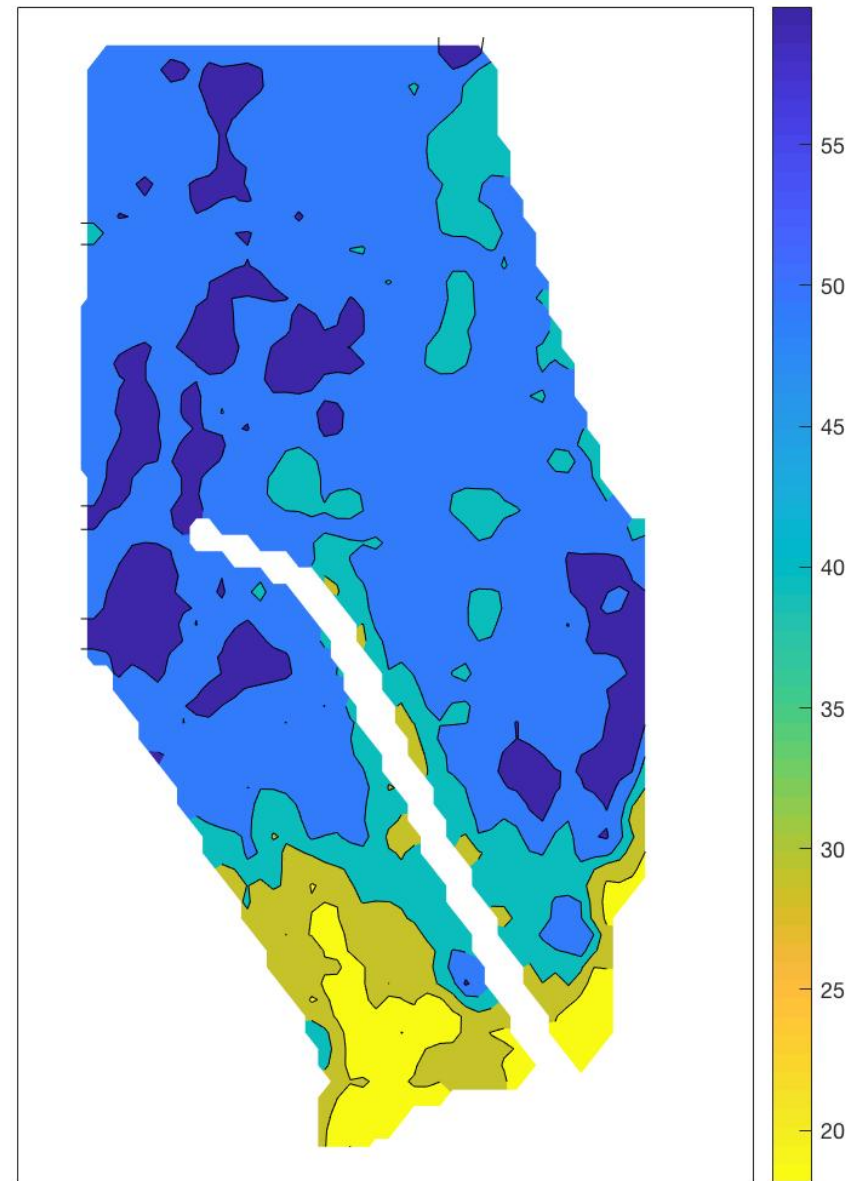




Normalized Soil Moisture

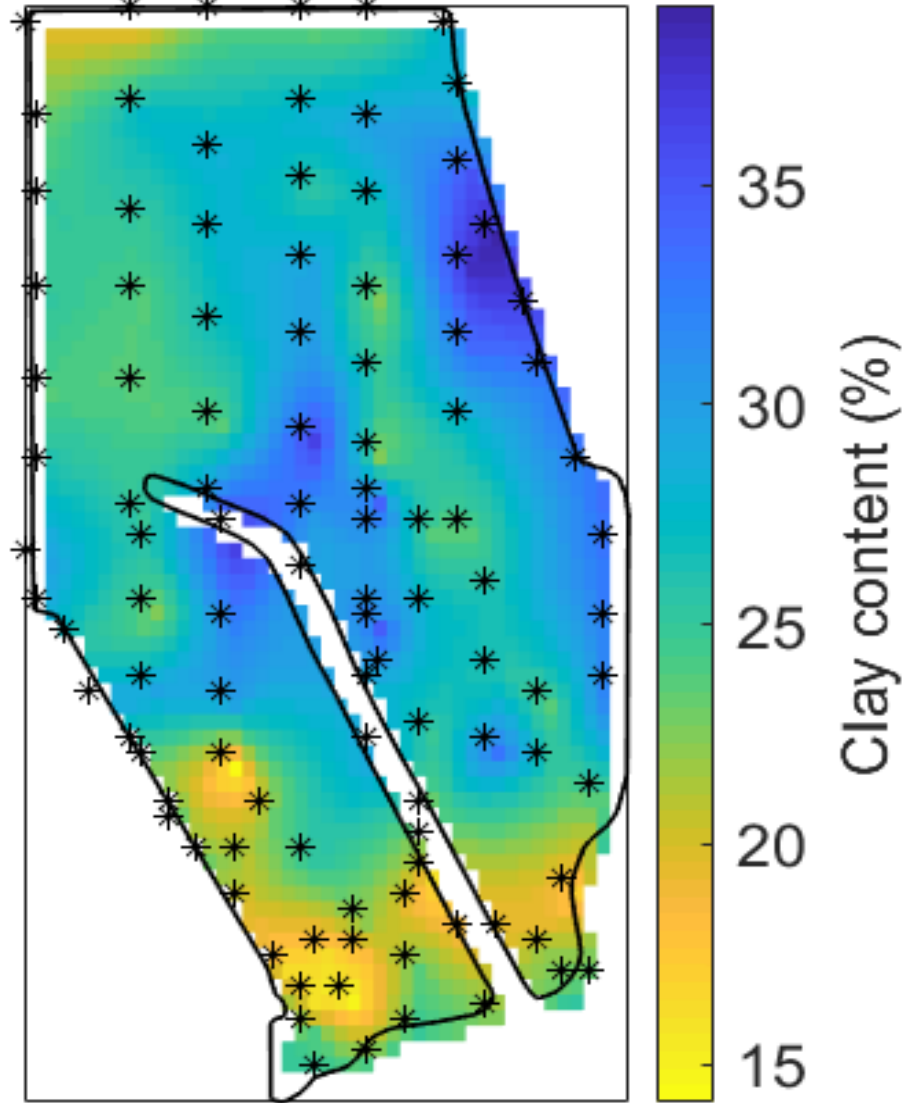


Electrical Conductivity (Dualem 1S)

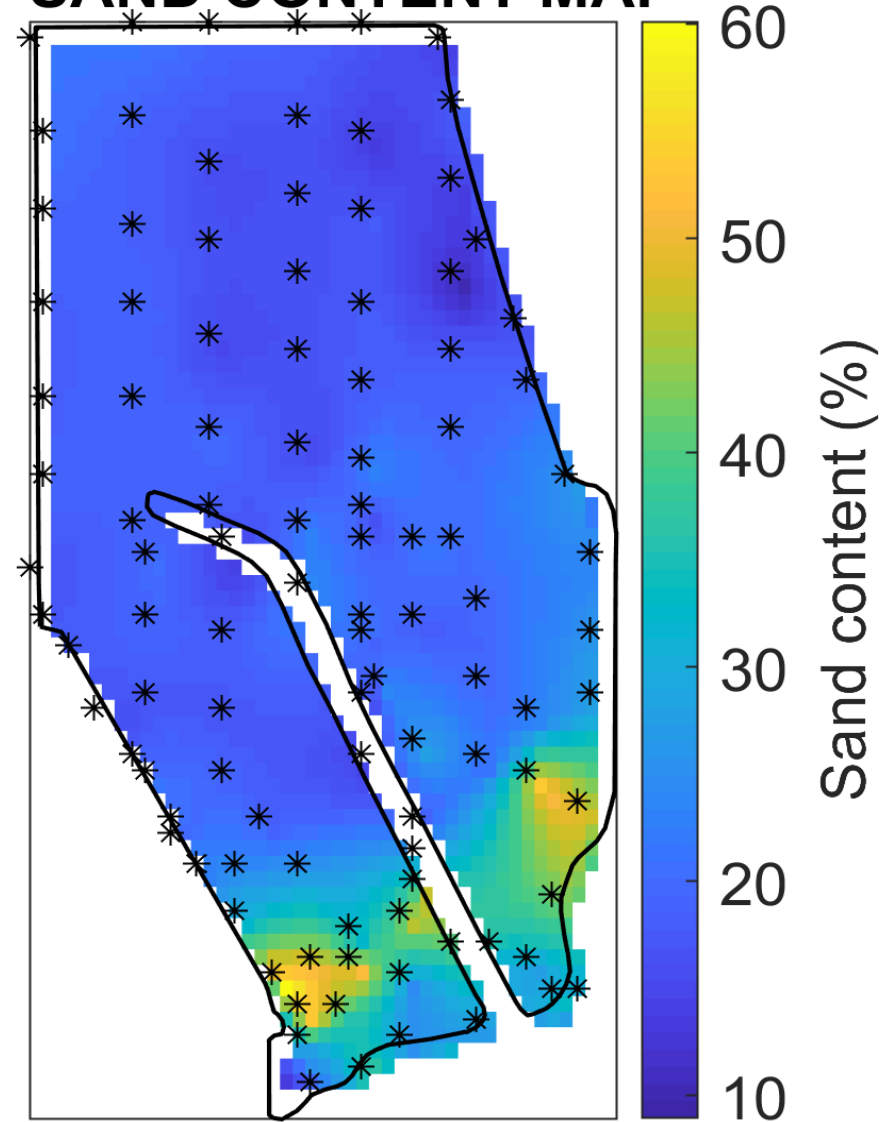


Soil texture

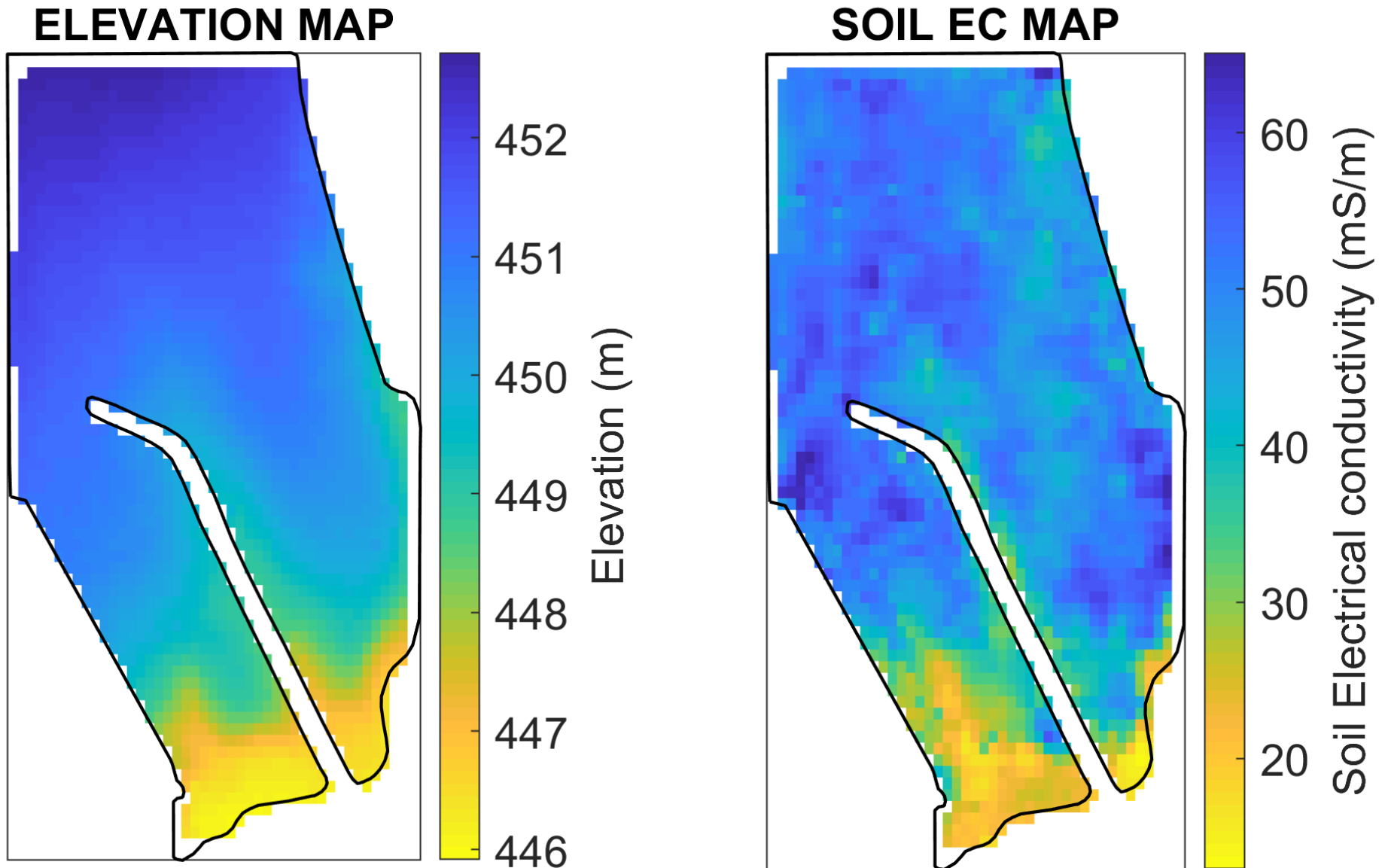
CLAY CONTENT MAP



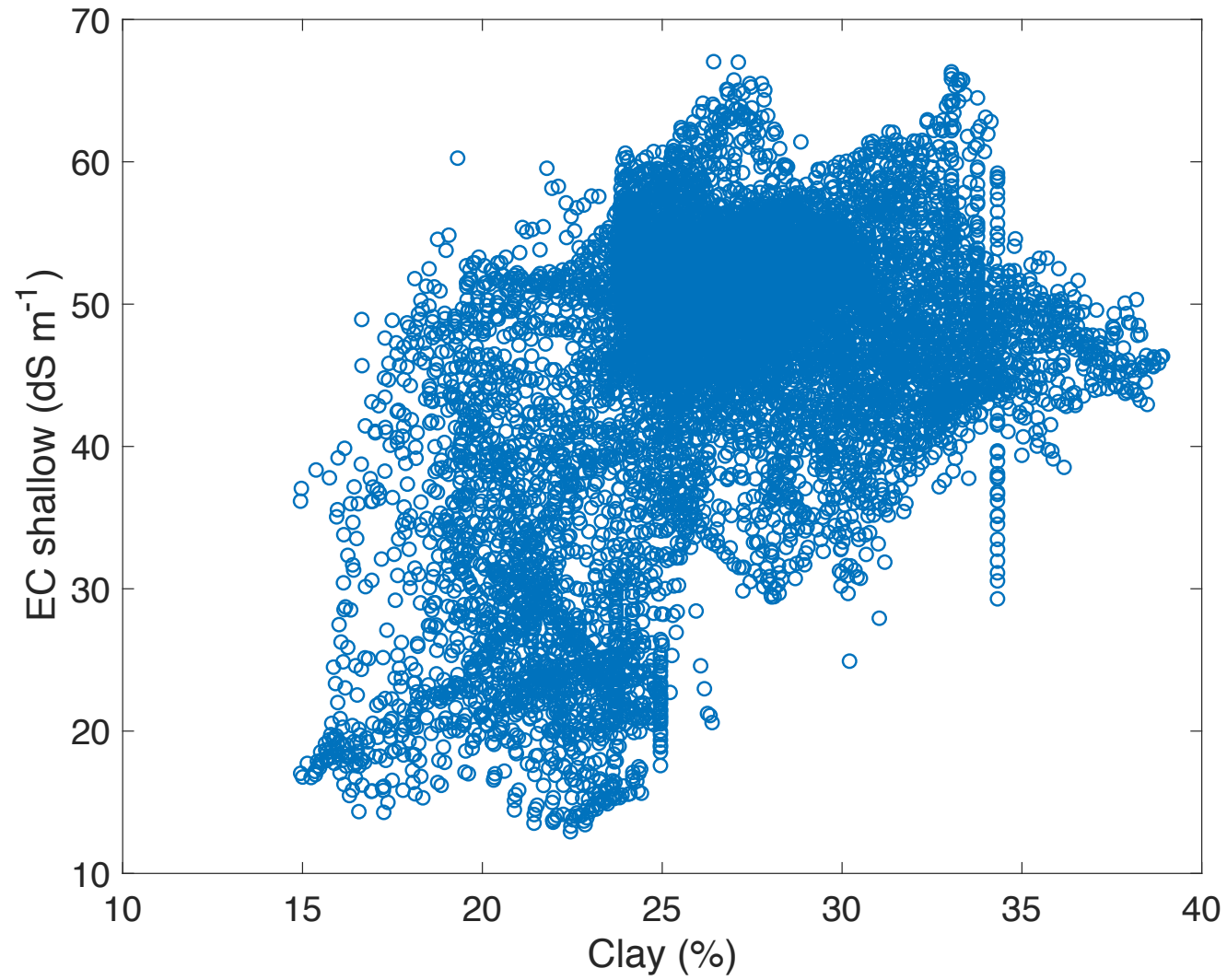
SAND CONTENT MAP



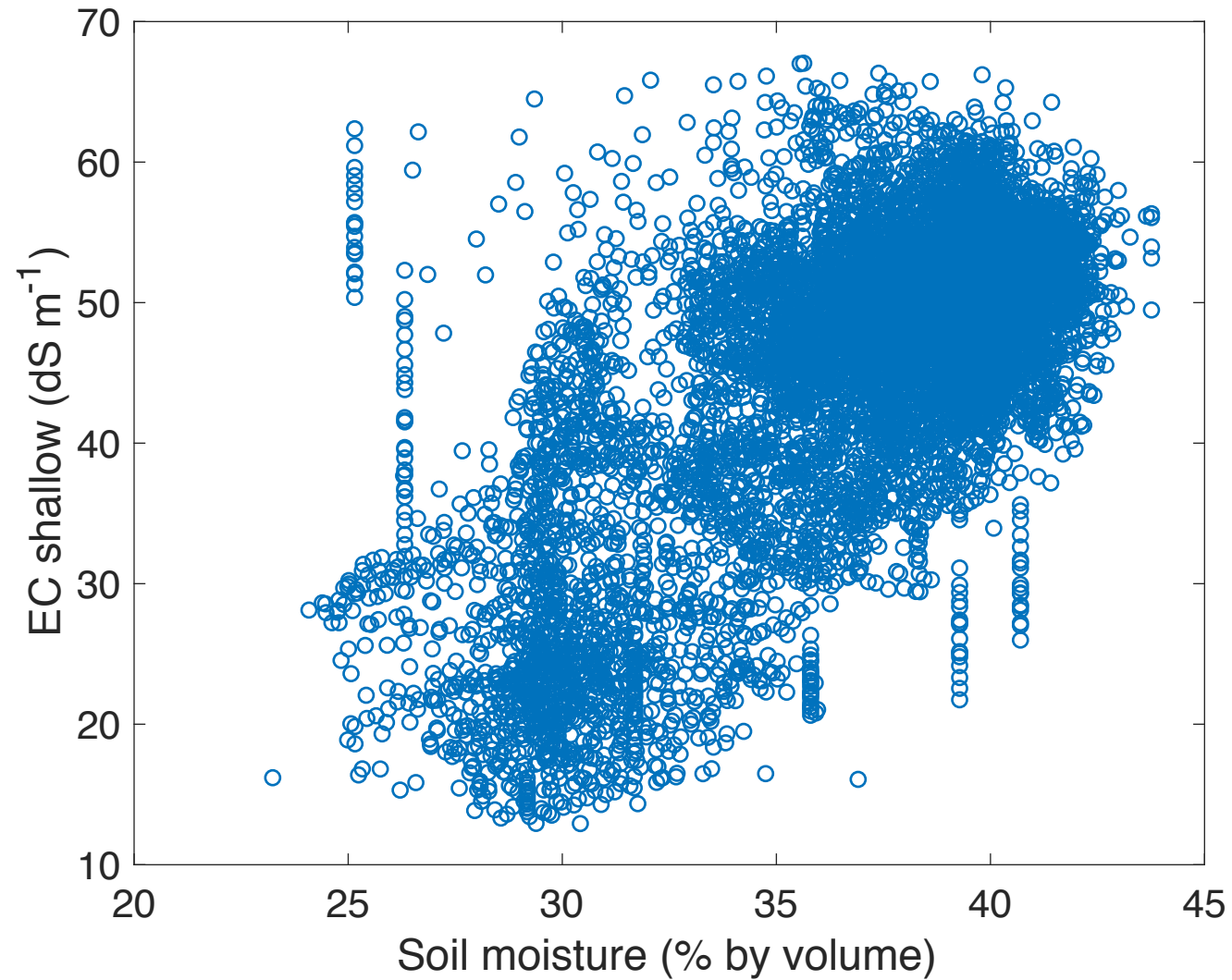
Elevation and bulk electrical conductivity



EC vs Clay



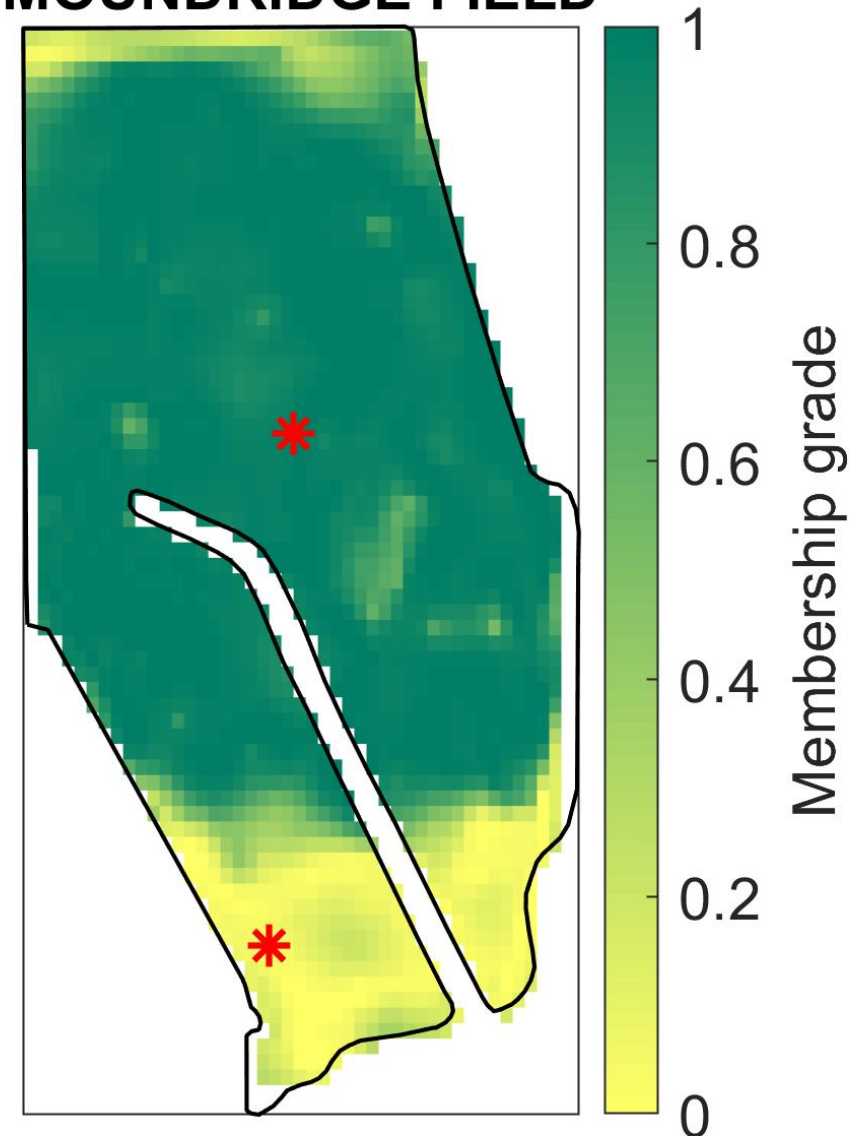
EC vs Soil moisture



Optimal location

- ✓ Highest membership grade within each soil moisture zone
- ✓ Weighted by the most centralized pixel in each zone

MOUNDRIDGE FIELD



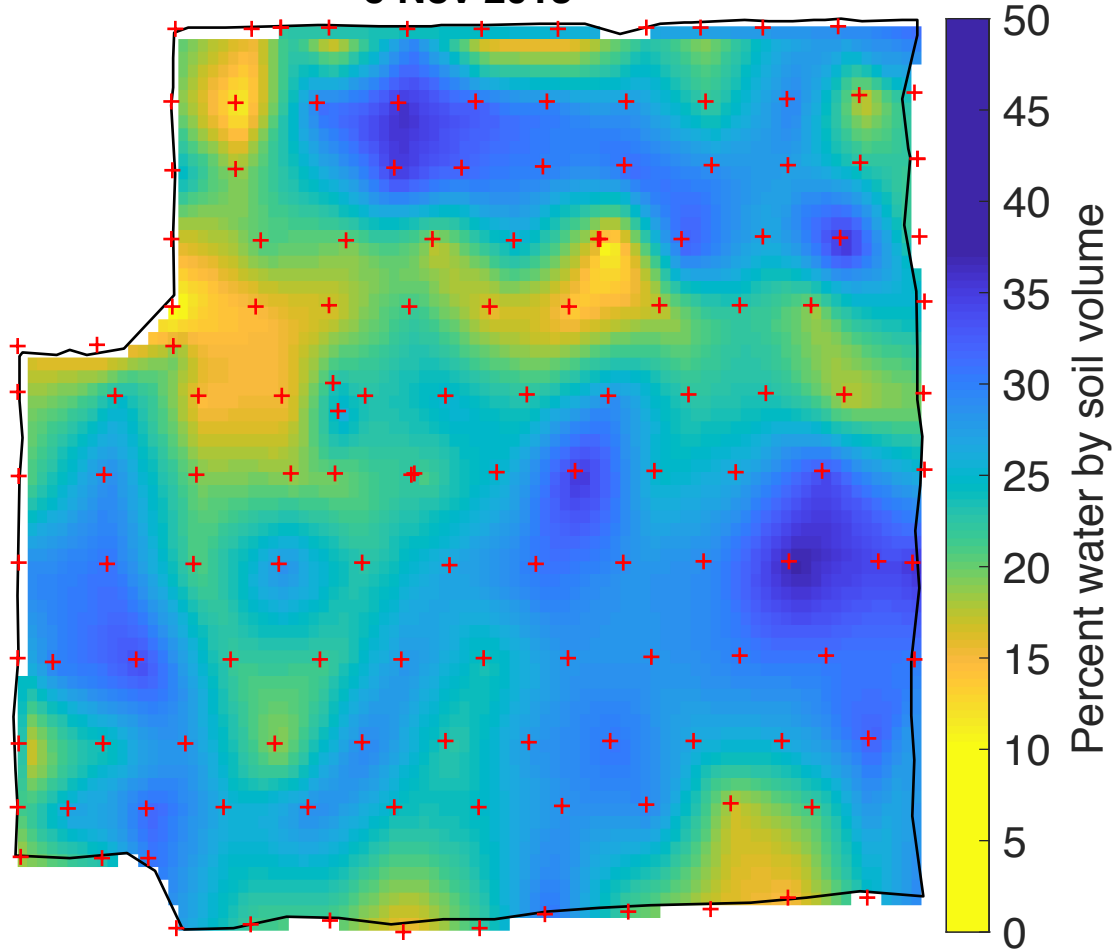
* Soil moisture sensors location

Yield Across Soil Moisture-Based Zones

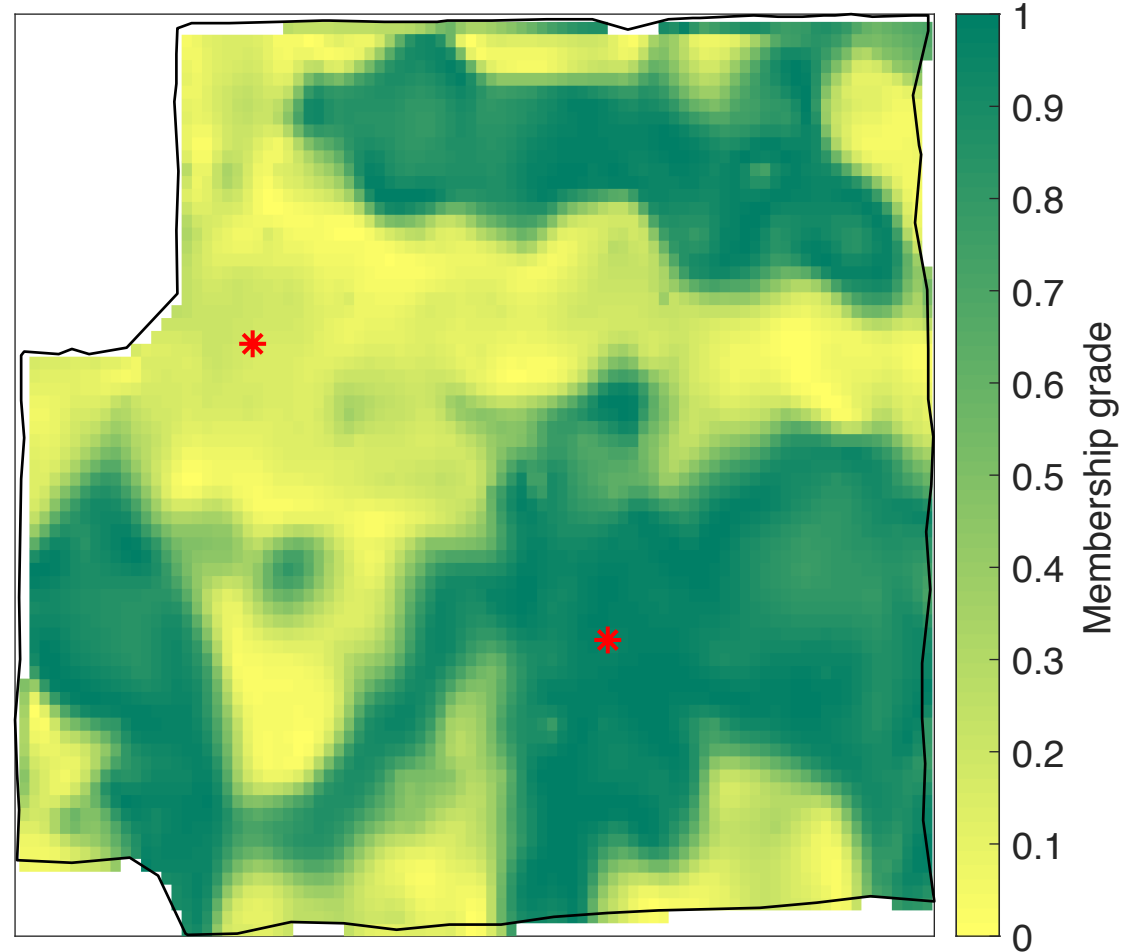




5 Nov 2018

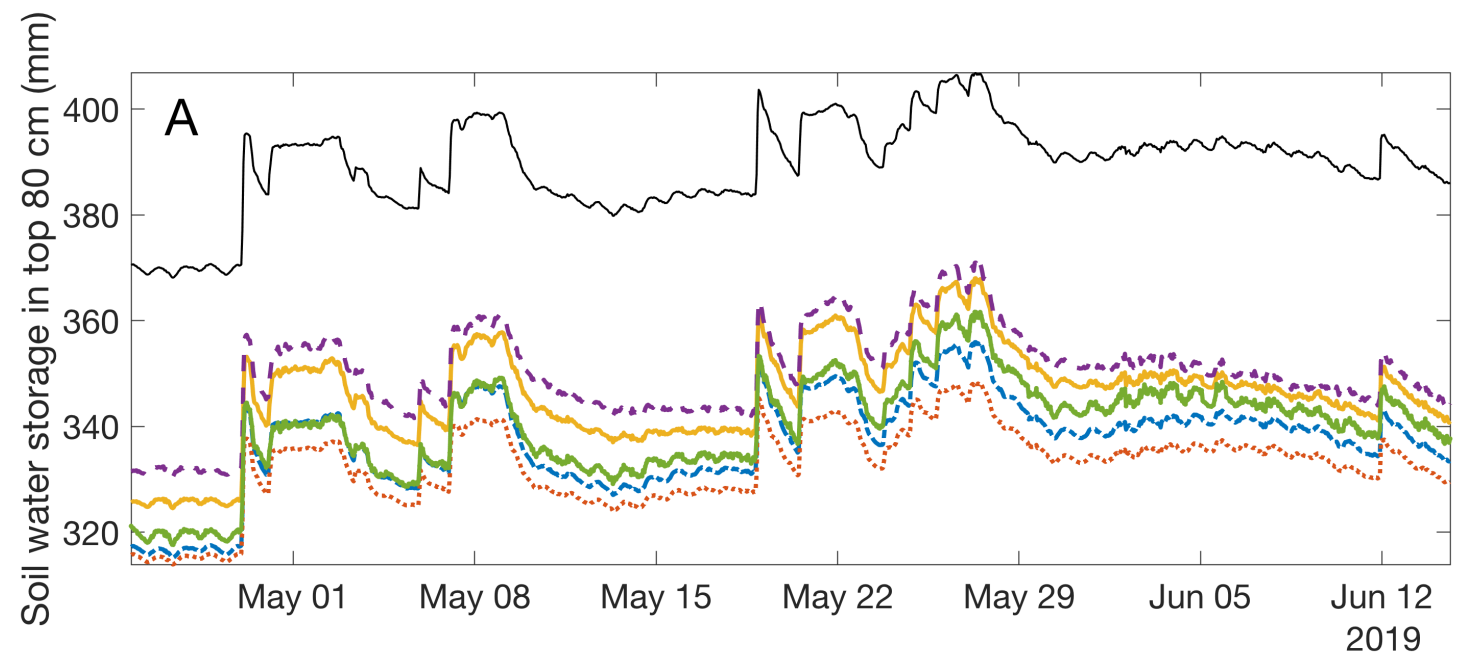


HUTCHINSON FIELD

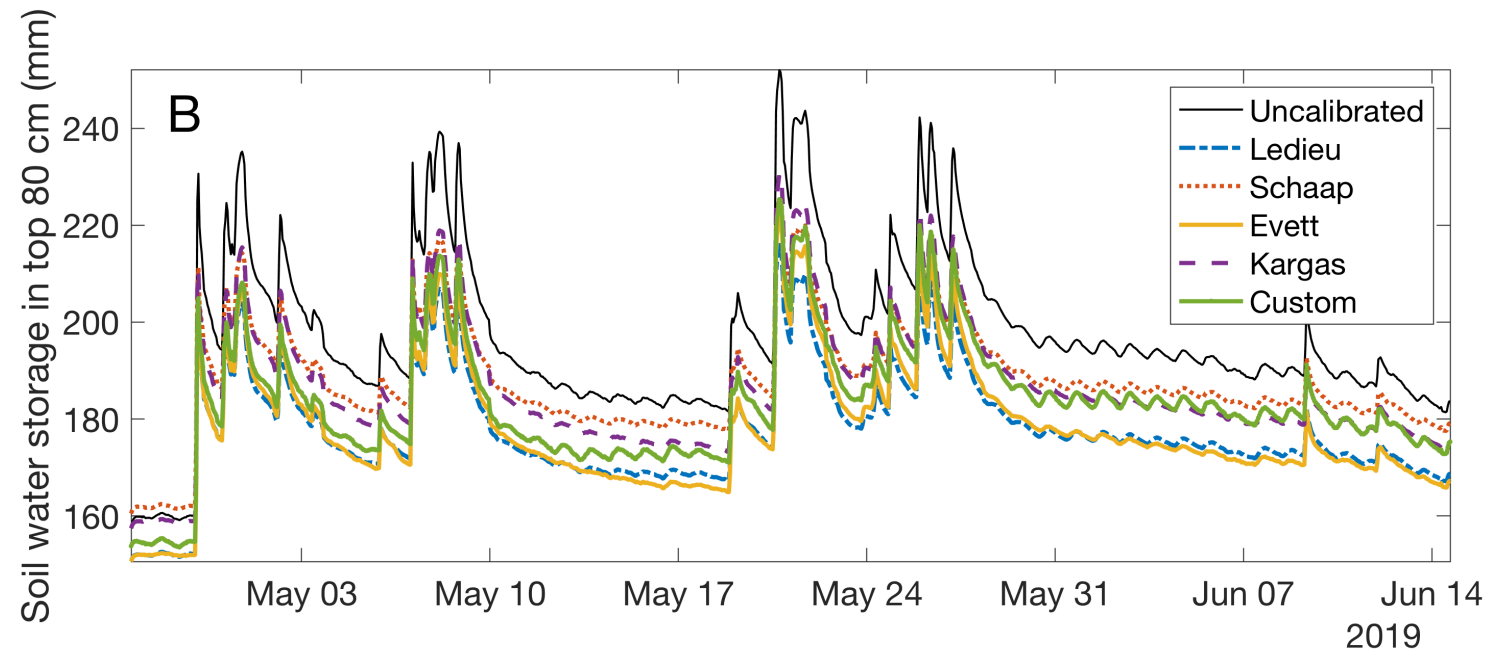




Silty Clay Loam



Sandy Loam





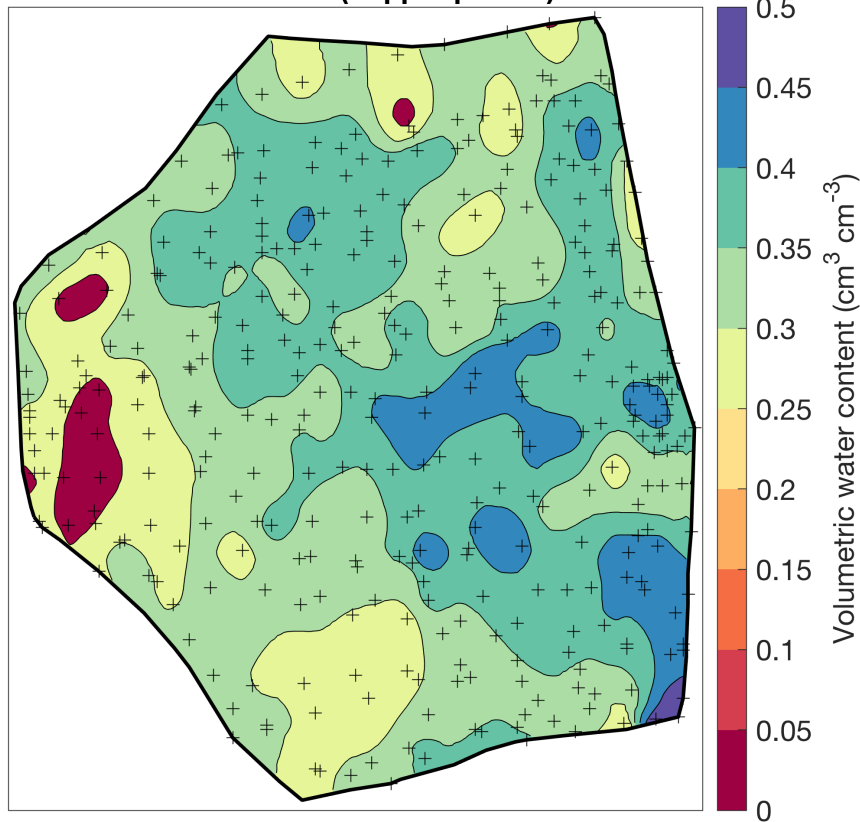
Calibration of soil moisture sensors

- Develop a database of improved calibrations for different sensors.
- Make calibration parameters available to crop consultants and manufacturers.

Wet Soil Moisture Conditions

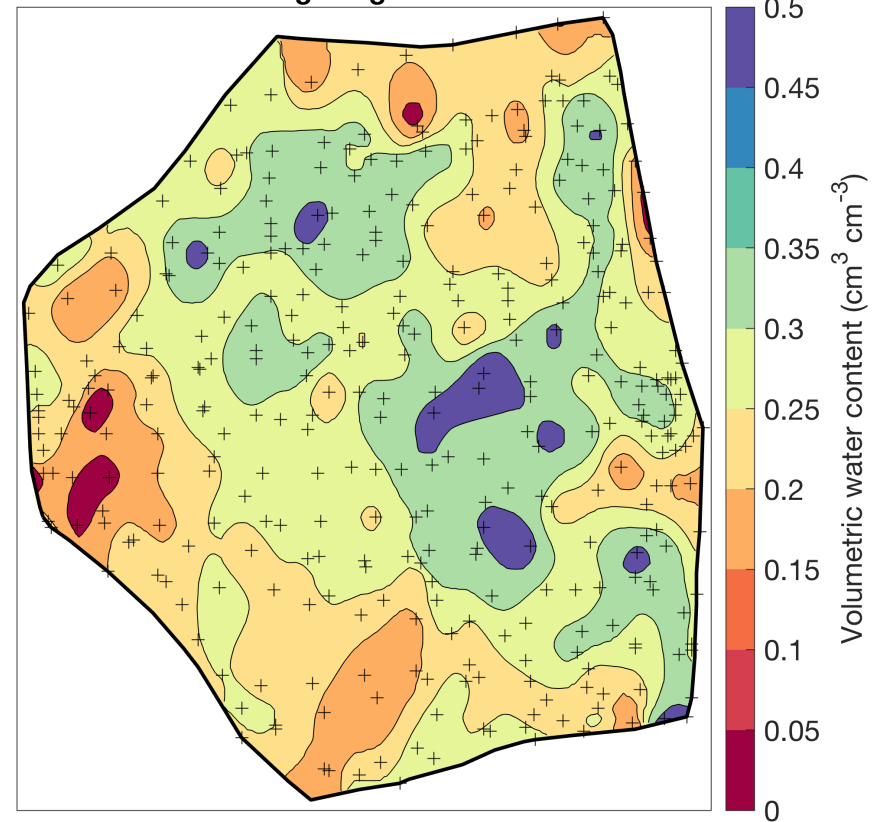
Uncalibrated

Uncalibrated (Topp equation)



Calibrated

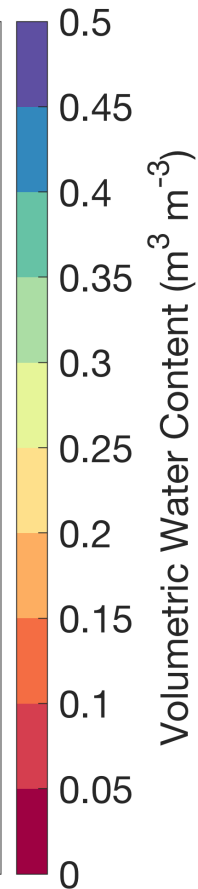
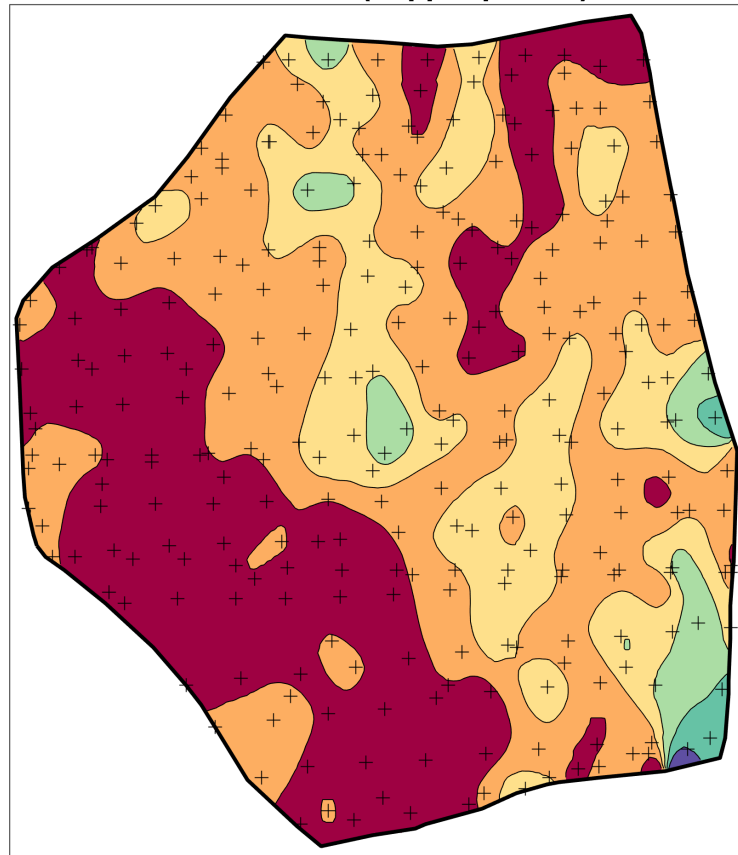
Calibrated using Kargas and Soulis 2019



Dry Soil Moisture Conditions

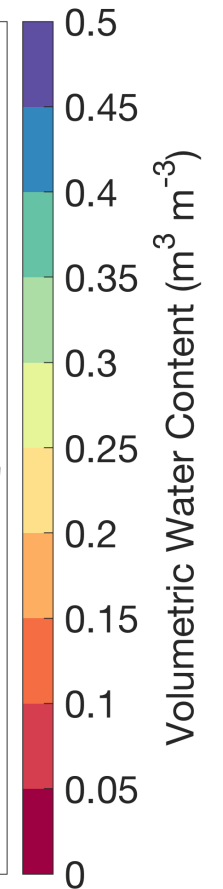
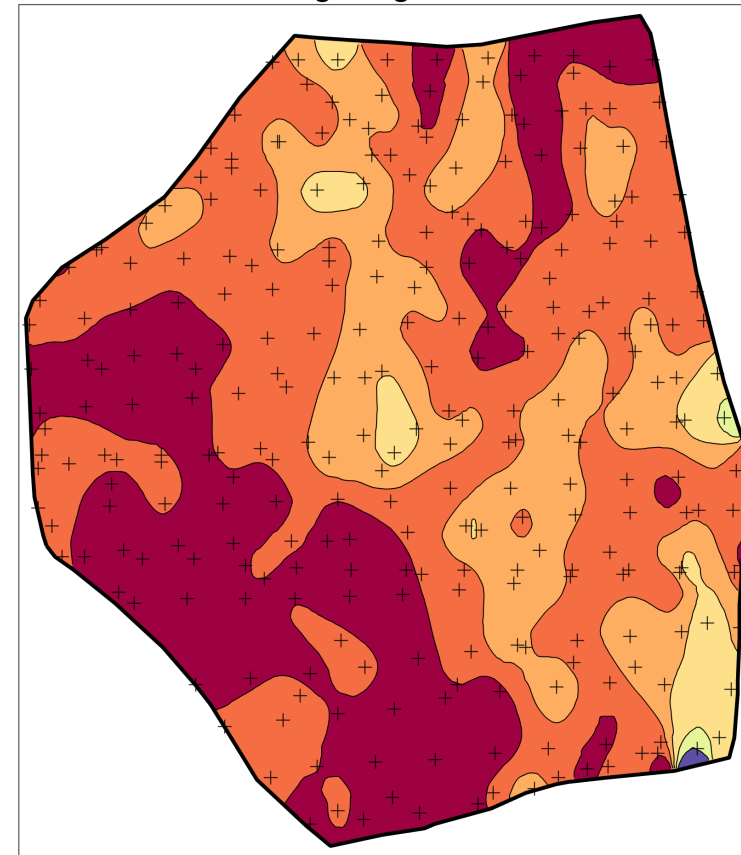
Uncalibrated

Uncalibrated (Topp equation)

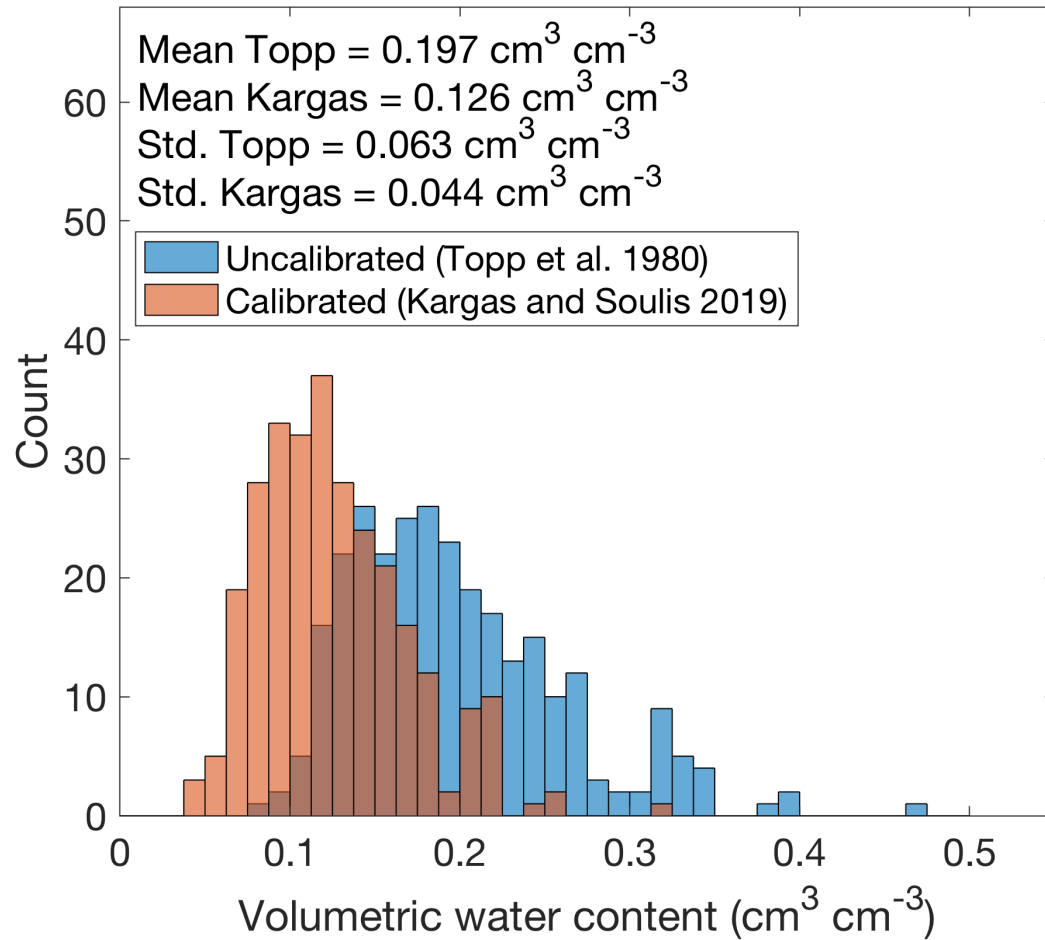


Calibrated

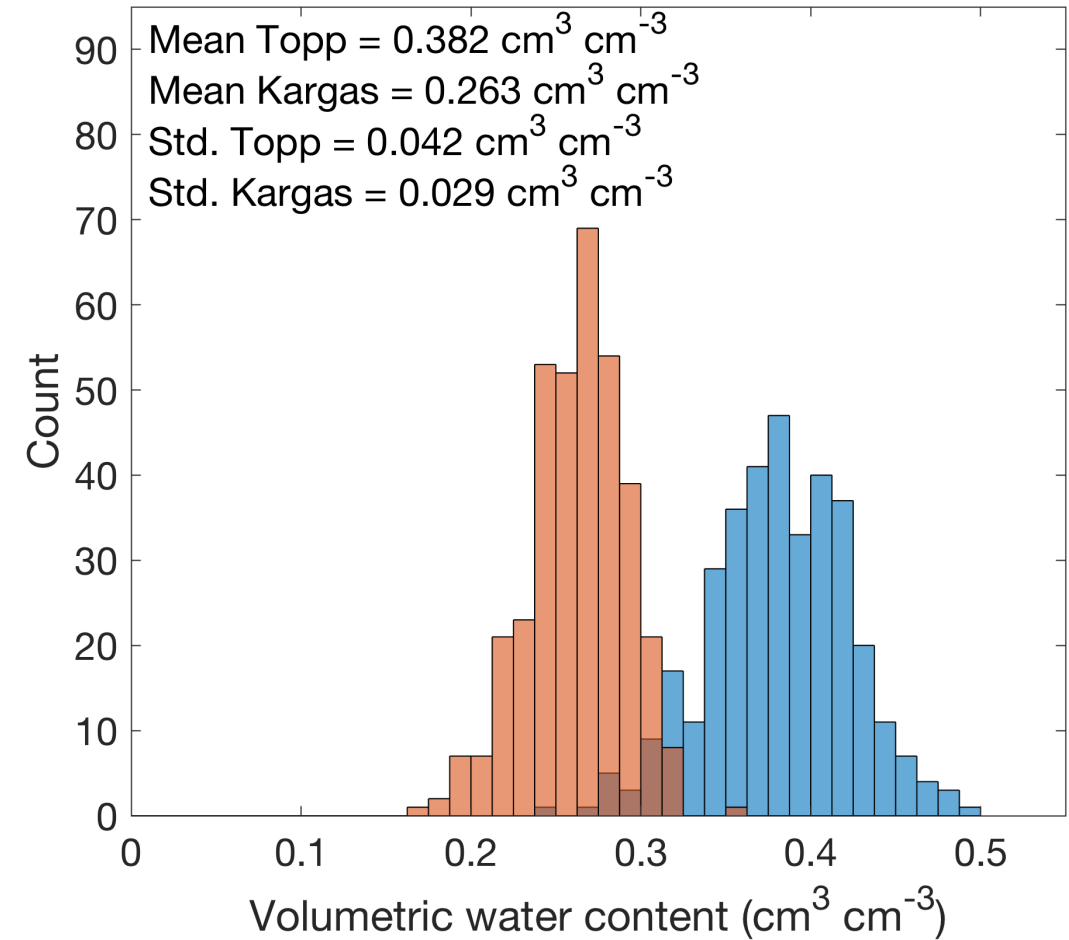
Calibrated using Kargas and Soulis 2019



Dry Soil Moisture Conditions



Wet Soil Moisture Conditions



Future work

- Publish calibration parameters to help consultants and manufacturers.
- Check irrigation efficiency
- Detailed spatial management requires accurate spatial patterns of soil properties.
- Compare soil water storage from research-grade and calibrated sensors with other sensors in Moundridge field.