

Stony soil moisture dynamics and impacts for meso-scale soil moisture sensors

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Stony (Rocky) Soils

- **Coarse fragments (> 2 mm)**

Shape and size ¹	Noun	Adjective
Spherical, cubelike, or equiaxial:		
2-75 mm diameter	Pebbles	Gravelly
2-5 mm diameter	Fine	Fine gravelly
5-20 mm diameter	Medium	Medium gravelly
20-75 mm diameter	Coarse	Coarse gravelly
75-250 mm diameter	Cobbles	Cobbly
250-600 mm diameter	Stones	Stony
>600 mm diameter	Boulders	Bouldery
Flat:		
2-150 mm long	Channers	Channery
150-380 mm long	Flagstones	Flaggy
380-600 mm long	Stones	Stony
>600 mm long	Boulders	Bouldery
1. The roundness of the fragments may be indicated as angular (strongly developed faces with sharp edges), irregular (prominent flat faces with incipient rounding or corners), subrounded (detectable flat faces with well-rounded corners), and rounded (flat faces absent or nearly absent with all corners).		

Stony (Rocky) Soils

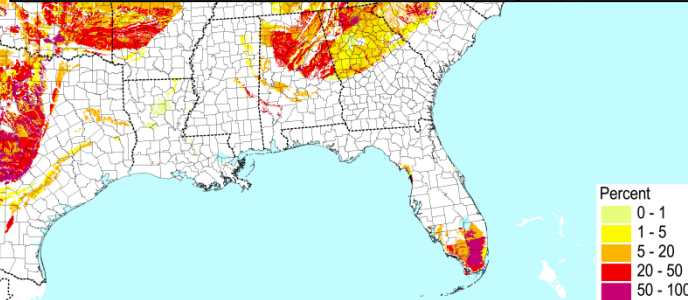
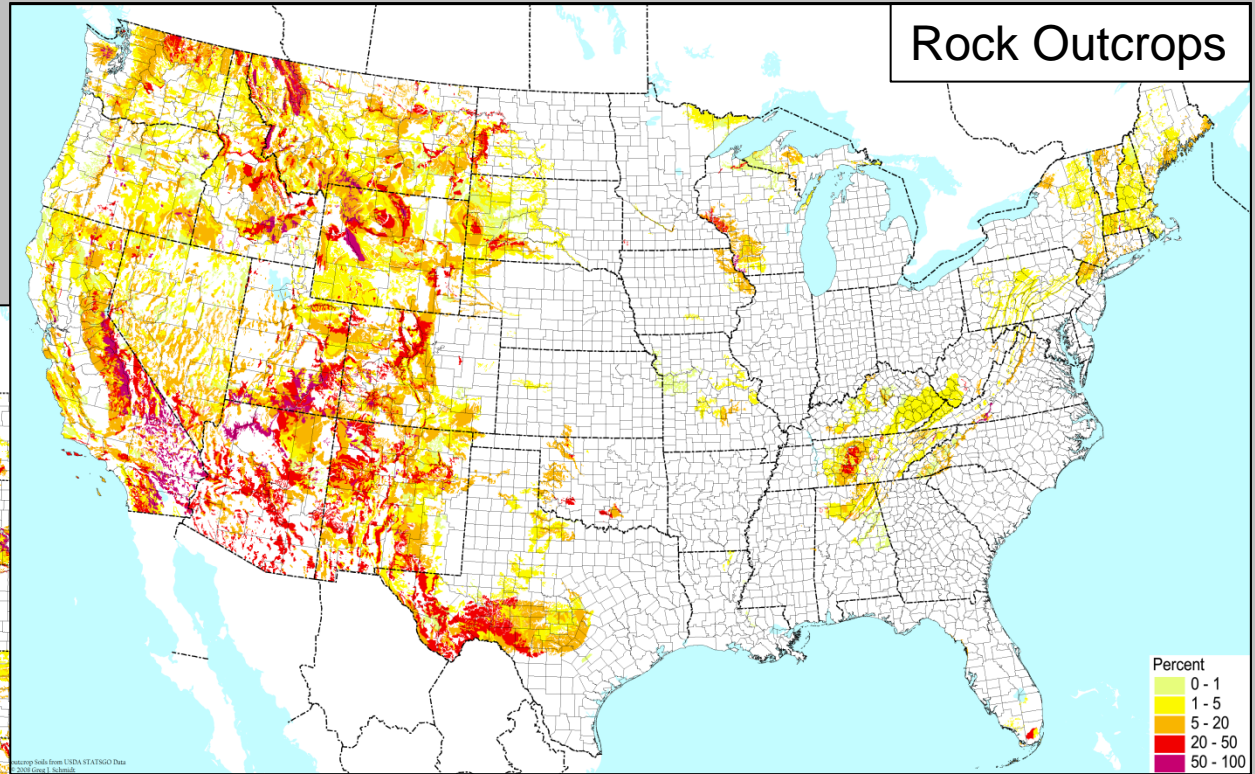
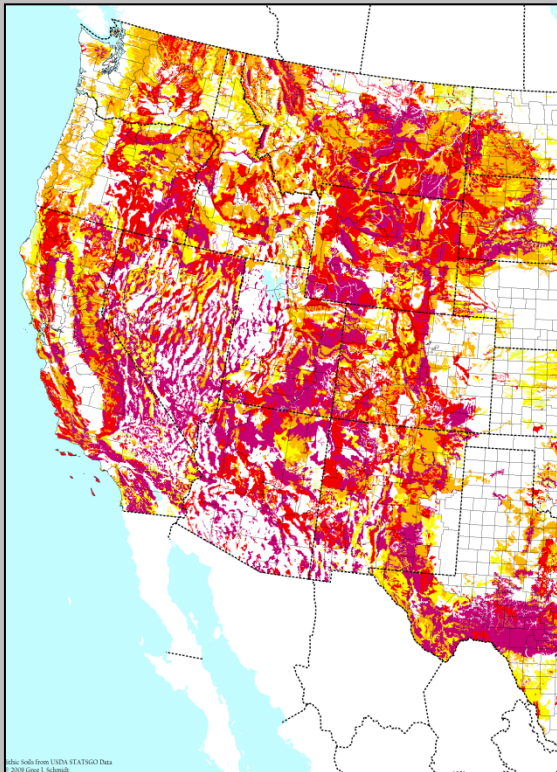
- Coarse fragments (> 2 mm)

Class	Percentage	Distance in meters between stones			Name
		0.25 m ¹	0.6 m	1.2 m	
1	0.01 - 0.1	At least 8	At least 20	At least 37	Stony or bouldery
2	0.1 - 3.0	1 - 8	3 - 20	6 - 37	Very stony or very bouldery
3	3.0 - 15	0.5 - 1	1 - 3	2 - 6	Extremely stony or extremely bouldery
4	15 - 50	0.3 - 0.5	0.5 - 1	1 - 2	Rubbly
5	50 - 90	< 0.3	< 0.5	<1	Very rubbly

1. 0.38 m if flat

Stony (Rocky) Soils

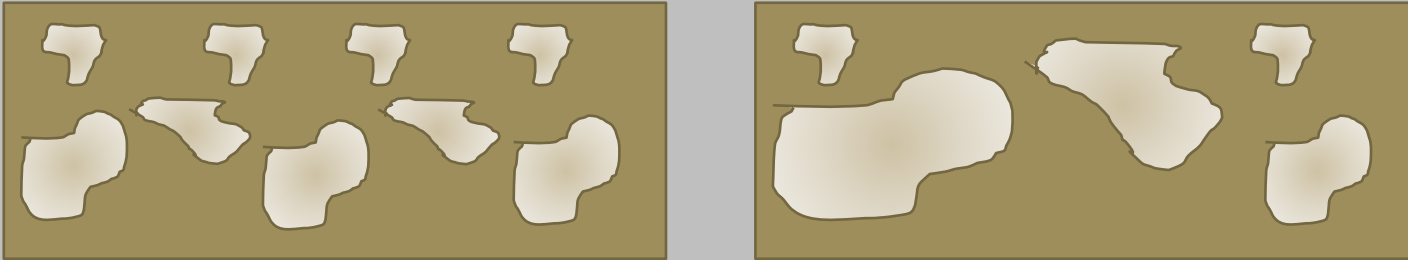
- Map from NRCS
 - None exists!



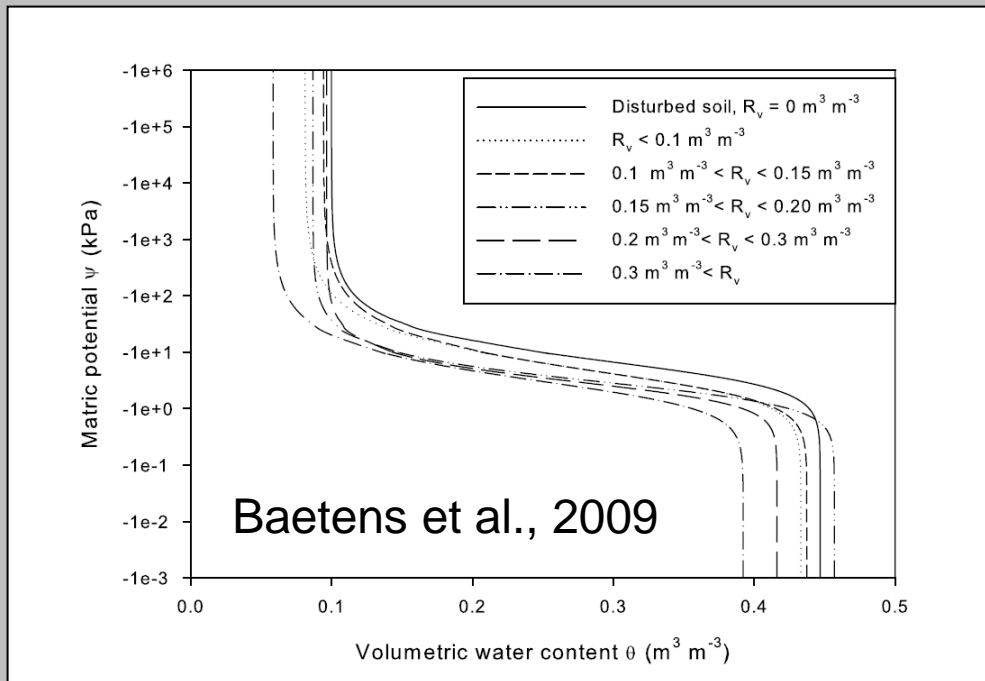
The Biota of North
America Program

Moisture dynamics in stony soils

- Loss in active volume of soil (not always true)

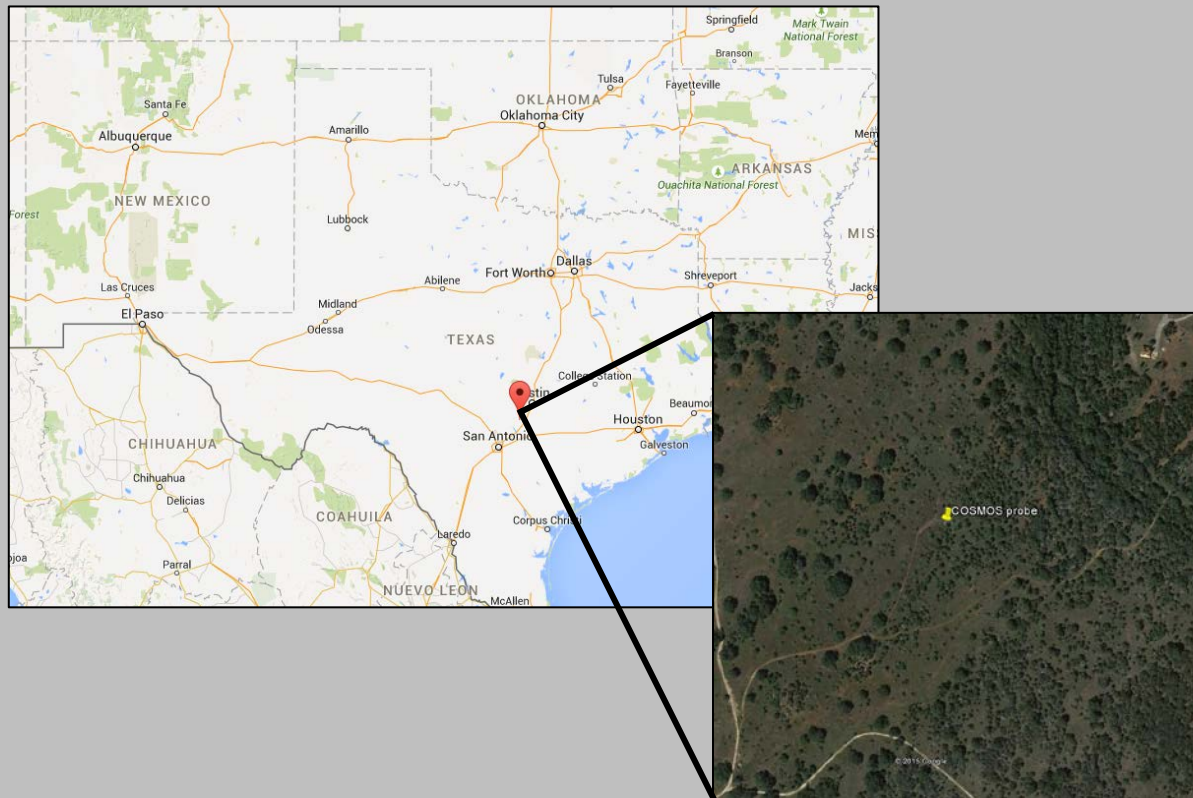


- Effects on moisture release curve



Freeman Ranch

- Stony (rocky) soil
 - Gravelly clay loam (23-30% clay in surface horizons)
- 91 cm (35.8 inches) annual rainfall
- Juniper and mesquite encroachment



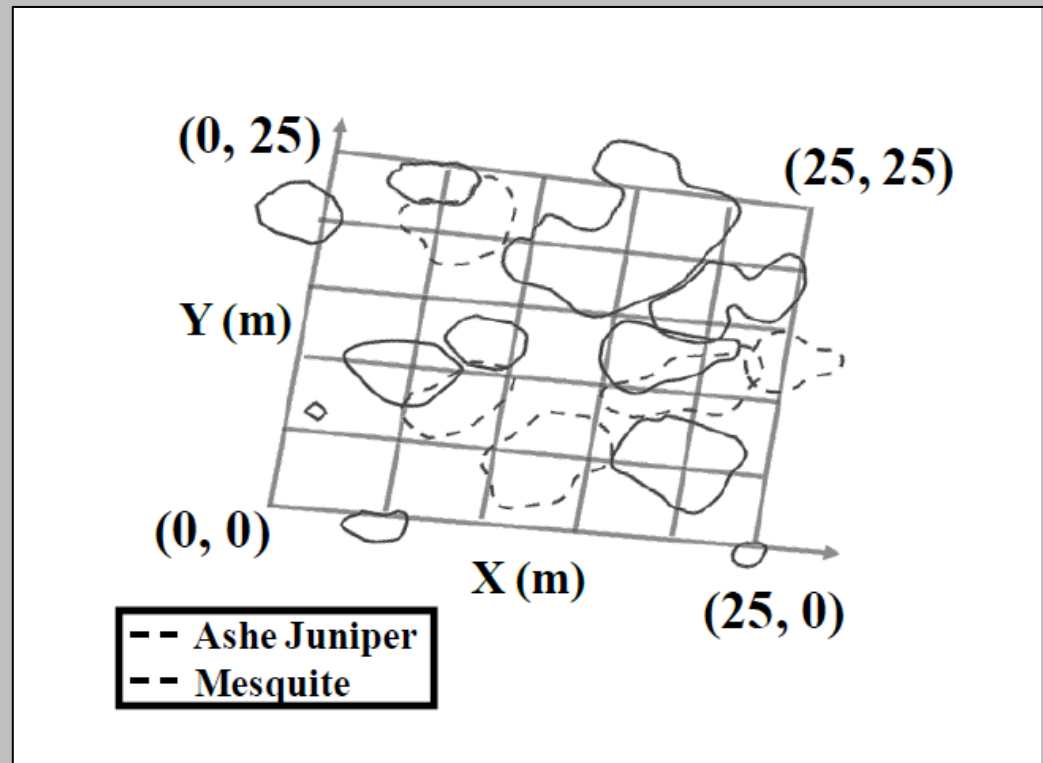
Previous work: Motivation

- Changes in water balance due to woody encroachment



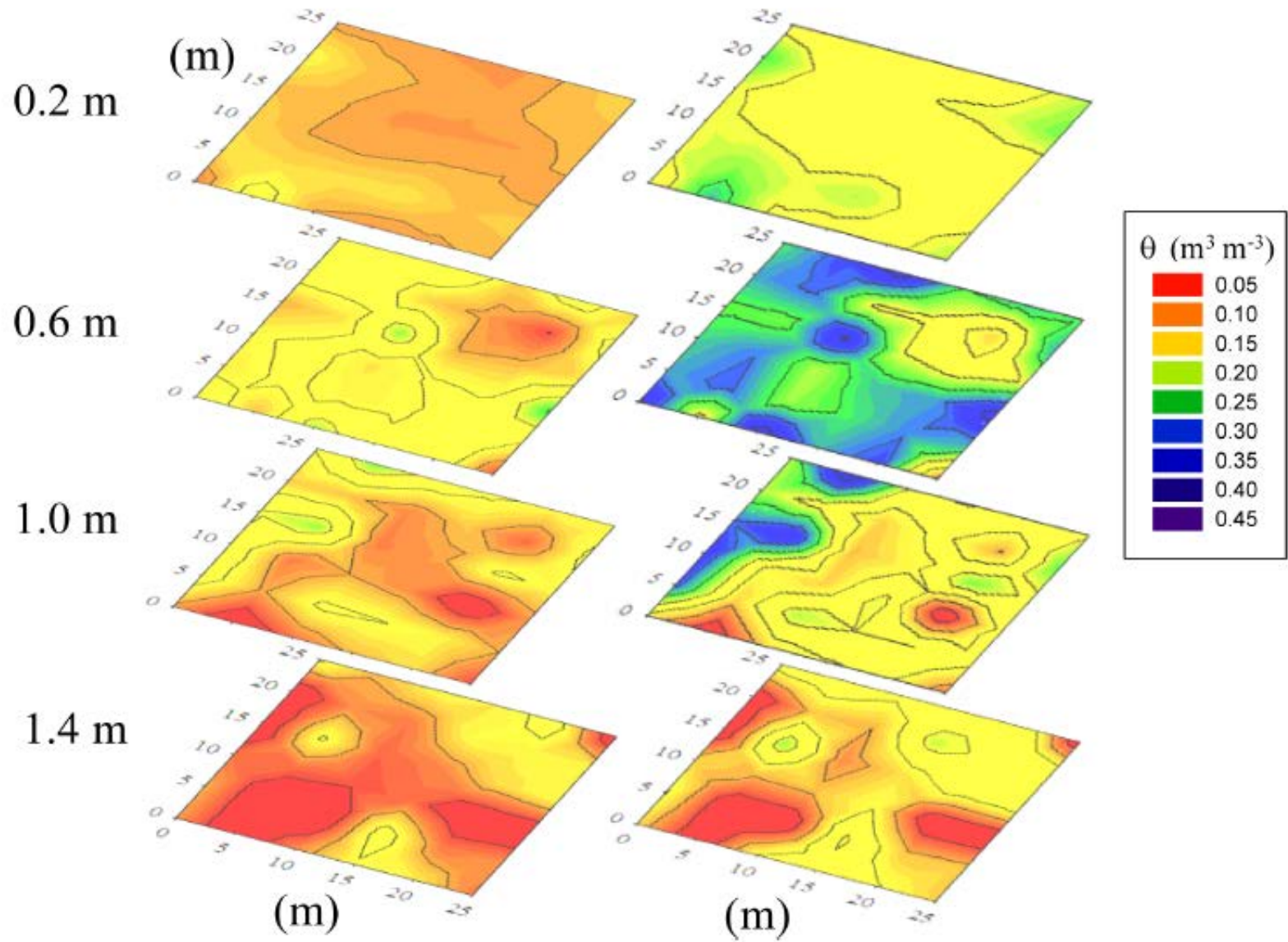
Previous work

- Water budget
 - Neutron moisture meter measurements
 - 5-m grid



4 Aug. 2009

28 Oct. 2009

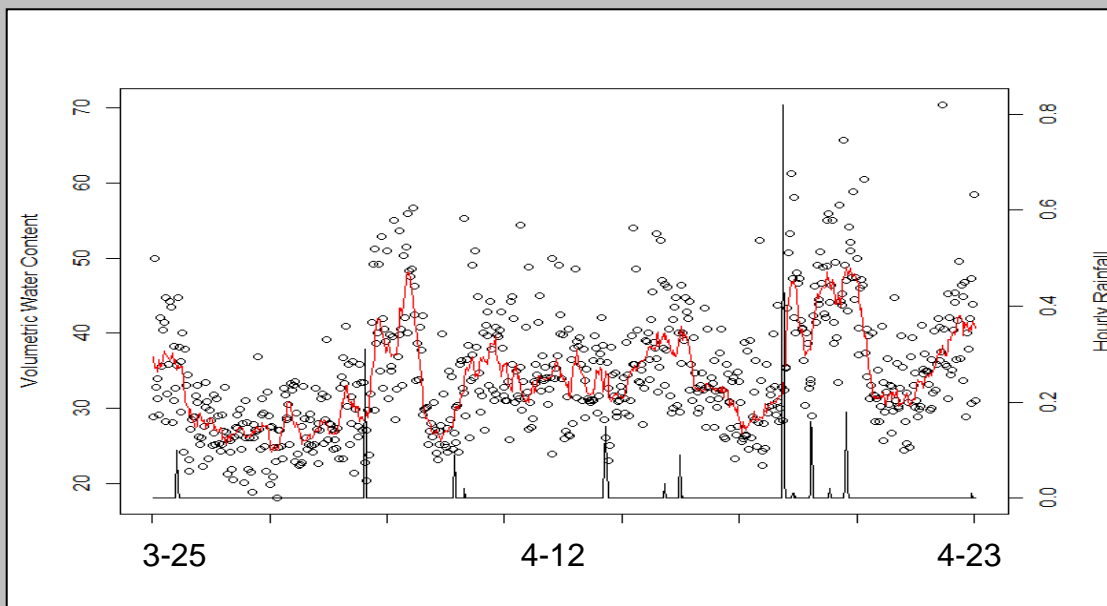
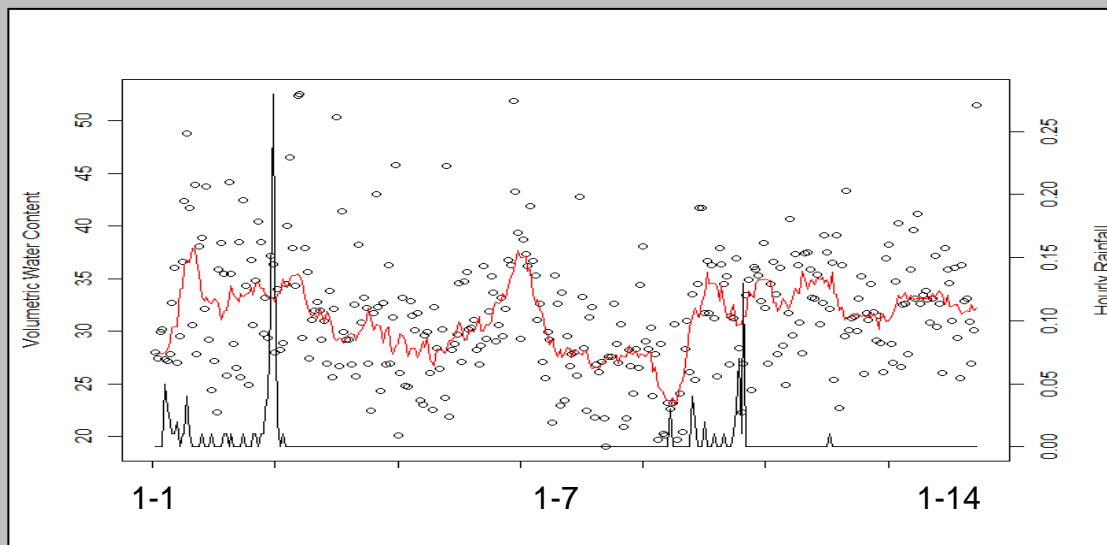


COSMOS Surface Soil Moisture Sensors

- Surface soil moisture sensor
- 600-m diameter



COSMOS Observations



Big Questions:

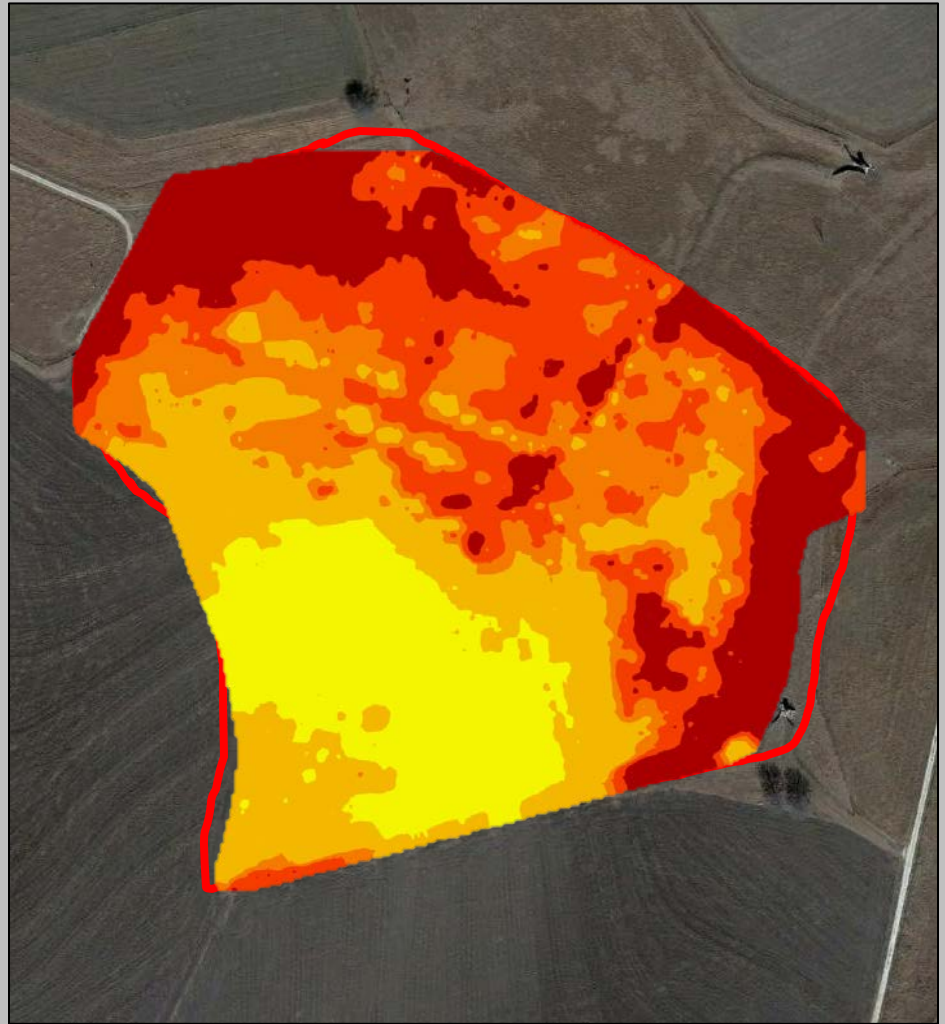
- How does precipitation affect COSMOS probes?
- Sample site selections and scaling
- Can we map coarse fragments?
 - Are coarse fragments tied to vegetation, and if so, can we use vegetation instead?

Big Questions:

- How does precipitation affect COSMOS probes?
- Sample site selections and scaling
- **Can we map coarse fragments?**
 - Are coarse fragments tied to vegetation, and if so, can we use vegetation instead?

Methods

- Soil cores
 - Expensive
 - Time-consuming
- Soil sensors
 - Remote vs. proximal
 - Surfing vs. diving
 - Contact vs. non-contact

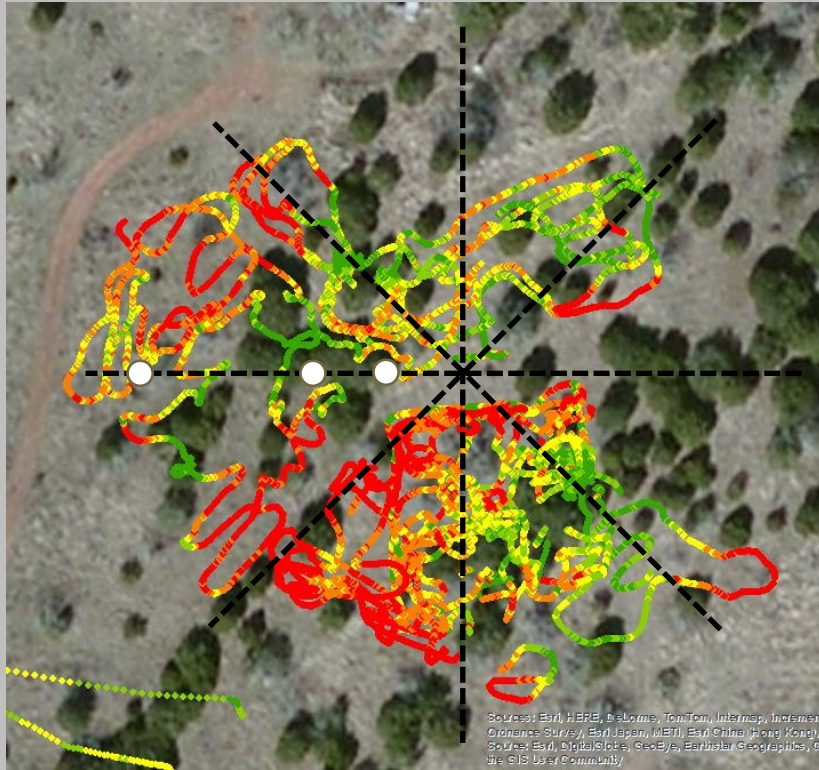


Soil Sensors

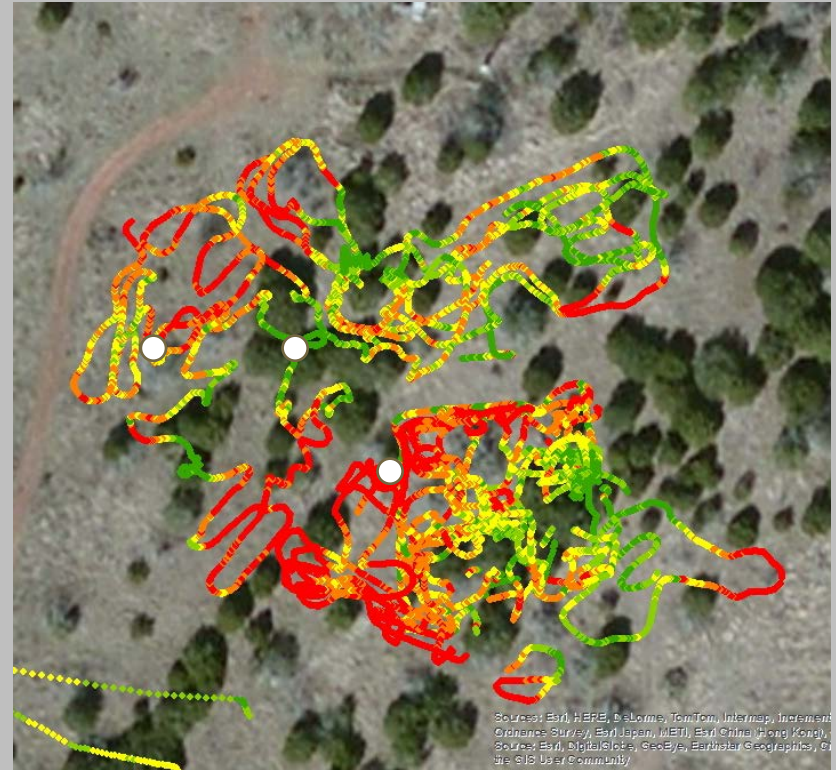
- Proximal sensors
 - EM (electromagnetic induction)
- ERT (electrical resistivity tomography)
- Passive gamma-ray spectrometry
- Vis-NIR penetrometer



Sampling site selection

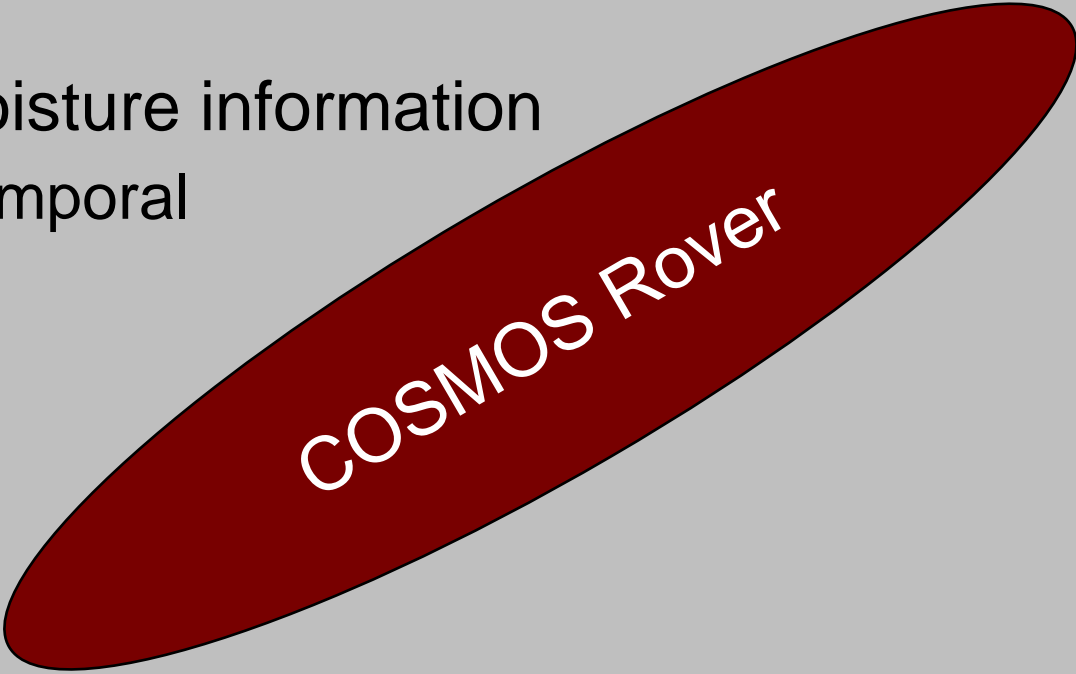


VS.



Long-term projects

- Soil moisture dynamics of stony soils
 - Other methods to map coarse fragments
- Integrating soil science into land surface modeling
- Scaling soil moisture information
 - Spatial and temporal



COSMOS Rover

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PhD Assistantship - Meso-scale Soil Moisture

LeAnn Hague



A PhD graduate research assistantship is available beginning Fall Semester 2015, or Spring Semester 2016, with the Department of Soil and Crop Sciences at Texas A&M University in the area of meso-scale soil moisture. The project will focus on creating rapid calibration procedures for an innovative surface soil moisture sensor to answer questions of spatial and temporal soil moisture dynamics. Applicants should hold a BS or MS in Soil Science or a related field. Preference will be given to applicants seeking to enroll in a PhD program or to those seeking to enroll in an MS program who have a desire to pursue a doctoral degree. Experience with instrumentation, computer programming, and analytical skills are preferred but not required. Expected outcomes include publication of research in a peer-reviewed journal, presentation of research at local and national meetings, field and laboratory experience, and mentoring undergraduate and graduate students. This graduate research assistantship is supported by the College of Agriculture and Life Sciences and US citizenship is required. Inquiries regarding this GRA should be directed to Dr. Haly Neely, hneely@ag.tamu.edu, Ph: 979-458-2747.

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Posted:
May 11, 2015

Location:
College Station, Texas



NOTES:

Thank you!