The Role of Runoff and Erosion on Soil Carbon Stocks: From Soilscapes to Landscapes

CUAHSI Short Course Overview

This CUAHSI Instrumentation Training course is designed to inform its participants about the state-of-the-art instrumentation and measurements that are available for quantifying carbon dynamics in Intensively Managed Landscapes (IMLs) from the soil profile scale to the landscape scale. This course will examine the key processes that define carbon budget in IMLs, which include erosion, litter incorporation into the soil profile, microbial activity/ respiration, and stabilization in aggregates.

To capture the effects of runoff and erosion on soil organic carbon stocks, we will measure enrichment ratios using a mobile unit of rainfall simulators to break apart the soil aggregates and mobilize the sediment. We will also use Visible Near InfraRed Spectroscopy to quantify the carbon concentrations in the soil. Radio Frequency IDs will be used to track the movement of litter across the soil surface and its incorporation into the soil matrix. Respiration and microbial activity will be monitored using a soil gas analyzer with in-situ chambers and elemental soil analysis, plus an infrared camera can measure changes in associated heat fluxes. Finally, we will quantify aggregate stability using the rainfall simulators to measure the strength of the soil.

Additionally the students will be exposed to small fixed-wing and quadrotor style unmanned aerial vehicles (UAVs) equipped with sensor payloads currently being used in the IML-CZO. Other UAV-based sensors, such as thermal imaging for characterizing vegetation, and emerging robotics technologies, including unmanned ground and surface vehicles will be demonstrated for hydrologic and environmental data collection.

This course is being offered in conjunction with the Joint Conference and Workshop on Organic Matter Flux and Stabilization in the Critical Zone hosted by the US-China EcoPartnership for Environmental Sustainability.

CUAHSI Short Course Instructors

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Course prerequisites

- Applied Hydrology
- Environmental Physics of Soil, water, and watersheds
- Soil organic matter
- Experimental hydrology/hydraulics & analytical methods

Other information

Maximum Number of Participants

20-25

The "Ideal" student

Graduate students and early career scientists with backgrounds in hydropedology, soil erosion, soil biogeochemistry, ecology, field methods, modeling, sensor technology, and/or analytical methods.

CUAHSI Short Course Schedule

October 20-21, 2015
Purdue University, West Lafayette, IN

CUAHSI Short Course Begins

18:00 - 20:00	*Welcome mixer / registration at TBD*

Day 1: Tuesday, October 20, 2015

Carbon Dynamics Research in the Soilscape and the Landscape

08:00	CUAHSI Short Course Begins
08:00 - 08:30	Participant introductions & Course overview
08:30 - 09:15	Introduction to key physical & biogeochemical processes affecting SOC redistribution in IMLs Physicochemical, measurable SOC pools The concept of the Enrichment Ratio (ER) to study SOC redistribution
09:15 - 09:30	Showcase the infield instruments via slides & operational video ER instrument, RFID tags, Soil gas chamber, Aggregate Collection Device, VNIR, Drones and Infrared
09:30 - 10:00	Planning a field campaign for SOC studies: Practical issues and deployment strategies “Dos and Don’ts”
10:00 - 10:20	Travel to Purdue University ACRE site
10:30 - 11:00	Walk through of the experimental set up, the preparatory tasks needed before, during, and after the experiment
11:00 - 14:00	Experimental run – We will have two multi-frequency simulators set up on either side of the hill (one in corn and one in bean).

	Test two intensities I=30 mm/hr & I=60 mm/hr
12:00 - 13:00	Lunch will be provided during the experiments (in “true field-work fashion”)
14:00 - 14:30	Sample storage and site clean up Methods to avoid sample destruction and cross contamination
14:30 - 15:00	Travel back to Purdue
15:00 - 15:20	Introduction to sample analysis and associated instrument Use proxy samples from the sites to demo the process. Number of subsamples needed about 25-40. Sample preparation techniques
15:20 - 16:00	Elemental analysis – the four “Ps” **P**rinciples **P**rep. of Samples **P**otential pitfalls **P**resentation of results
16:00 - 16:20	FTIR- the four “Ps” **P**rinciples **P**rep. of Samples **P**otential pitfalls **P**resentation of results
16:30 - 17:15	Data analysis and interpretation
17:15 - 18:00	Discussion of field experience

Day 2: Wednesday, October 21, 2015

Carbon Dynamics Research in the Soilscape and the Landscape

08:00 - 08:30	Overview of carbon dynamics mechanisms Litter incorporation Respiration Aggregate Stability
08:30 - 08:45	Travel to Purdue University ACRE site

08:45 - 09:45	Litter Incorporation using RFIDs
09:45 - 10:45	Respiration and microbial activity using a soil gas analyzer
10:45 - 12:30	Aggregate Stability tests
12:30 - 13:30	Lunch & final discussions

Unmanned aerial vehicles in IMLs

13:30 - 14:30	Current technology for remote monitoring with drones
14:30 - 15:30	Infield and in-stream applications to capture georeferenced imagery that can be used to assemble high-resolution scenes for topographic analysis
15:30 - 16:00	Travel back to Purdue
16:00 - 17:00	Learn how to use software that can construct a 3D topographic model based on the images for standard hydraulic flow analysis in a geographic information system (GIS)
17:00 - 18:00	Practice with the software
18:00 - 18:30	Final discussions