

Field Protocol for Methane Sampling

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1. Pre-trip Prep and Supply List

Be sure to have the following items prepared (highlighted items will be sent to you):

- Charged Laptop (check to make sure laptop is functioning properly)
- USB cord for Data Logger
- Intact chamber lids
- SF6 Vials (6 per plot)
- Evacuated vials (32 per plot)
- 60ml syringes
- 30ml syringes
- 22g Needles
- Ruler
- Data sheets & pens
- Clipboards
- Soil auger/tools for scraping soil
- Plastic Bags for soil samples/sharpiers
- Anemometer
- 5 gallon bucket/sand
- Shovel
- Gloves & Sunscreen
- Gas standards (2)-sent once
- Watch
- Cooler with frozen blue ice

2. Set up Anemometer

Make sure upwind direction is clear of obstructions (people, equipment, etc.), clipping tall grass if needed.

Anemometer should be as close to ground level as possible.

Start the anemometer recording by pushing the top button. Record anemometer start time on data sheet

3. Measure maximum vegetation height

At some study sites, the vegetation will grow to be too tall for placing the chamber lid onto the ring. At these sites, the vegetation should be clipped down to “simulate grazing,” bringing the vegetation height down enough to allow the lid to fit easily.

At all sites, the maximum height of vegetation in each ring should be measured prior to gas sampling, and prior to any clipping.

4. Conducting Gas Sampling

[Note: Each field worker will be sampling at 2 chamber sites simultaneously]

At each of the 6 sampling sites set out the following materials:

- 60mL syringe
- 30mL syringe
- Two needles
- Bag of four sample vials
- Bottle of SF₆
- Chamber lid (bowl is open to free air)

SF₆ Dilution

Apply needle to 60ml syringe and close syringe valve. Remove the needle cap.

Pierce SF₆ bottle, open valve

Pull 20-25mL of SF₆ (note: it may take a few seconds until the gas has flowed through the needle so do this slowly) close valve

Pull the needle and syringe from SF₆ bottle making sure the needle remains attached

Remove needle from syringe and replace to plastic packaging

Open valve and expel the SF₆ down to 15 ml, then dilute pulling in free air to 60 ml, close valve

Set aside SF₆ syringe (60mL) and needle

(Note: keep this needle separate from sampling needles because it is now contaminated with SF₆.)

At first chamber site:

Secure chamber lid on the plot ring (start time=0:00)

Orient plates on ground horizontally at ground level

SF₆ Injection

Insert SF₆ syringe onto chamber tube (all valves closed)

At time=0:30, open valves and inject entire syringe of SF₆

Pump 3 times (using all 60mL of syringe volume)

Close valves and remove syringe

Gas Sampling

Prepare to take gas sample

Apply 30mL syringe to chamber tube (both valves closed)

At time= 1:00, open both valves

Pull to 15mL, pump back to 0mL, and pull to 30mL

Close both valves

Remove 30mL syringe from chamber tube

Apply sample needle (not SF₆ needle) and open syringe valve

Quickly inject sample into first vial, close valve

(Note: If there is significant pressure in the vial; this indicates an un-evacuated vial. The sample should be quickly-retaken from the chamber and injected in to new evacuated vial.) Note this on the datasheet.

Replace needle to plastic packaging

(Note: this needle should be used for all of the air samples from this chamber. Also, the needles should be sent back to CSU in the same plastic baggie that holds the vials from that chamber.)

Record vial number on the data sheet.

At second chamber site:

At time=3:00, secure chamber lid and orient plates

At time=3:30, inject SF₆

At time=4:00, take first sample

Move back and forth between the two chamber sites as outlined on data sheet.

Measure height of chamber from the ground level to the top edge of the thick PVC ring that connects the metal chamber bowl and the PVC (see pictures). Measure the height at three points around the circumference of the chamber lid.

5. Fill gas standard vials

There are two blue cylinders of gas standards, one labeled “low” (containing N₂ gas) and the other “high” (containing 5ppm CH₄). Please fill 2 vials with the low standard and 2 with the high standard. Note the vial numbers on the datasheet.

To fill the standard vials, connect the 30ml sampling syringe to the standard bottle. Slowly open the standard bottle to fill the syringe with >15ml of standard air as a rinse. Expel this standard air and fill the syringe up to 30ml. Close the syringe valve and the standard tank valve. Apply the needle to the syringe and open the syringe valve so that the syringe air is at atmospheric pressure and filled to 30ml. Put the standard air into the vial in the same manner as you would for the chamber air samples.

6. Record Anemometer Data

When gas sampling has finished, record anemometer stop time, distance traveled (DIST/DAY), and maximum speed (MAXSPEED) on data sheet.

7. Conducting Soil Sampling

Remove soil residue from soil auger (does not need to be spotless)

Chose 3 random sampling points on each side of the plot, at least 1m away from the sample rings

Take soil sample (making sure that the soil agar stays vertical)

Start by combing any vegetation out of the way

Auger down until the bottom of marker is at the soil level (~12 cm)

Wipe off excess soil from outside of the soil agar

Empty corer into labeled bag

Remove air and seal bag

Place soil samples in cooler with ice. Protect soils from overheating in the field using enough ice to cool the samples rapidly.

Fill holes with sand

Bag Labeling

Site Name- Sample # Date

8. Obtaining Data from Data Logger onto Laptop

Set-up and Connections

Open data logger, power on laptop and connect using USB cord in polyurethane case to portal labeled "COMM PORT". Open icon on desktop "ECH2O Utility." Under "Connect Via:" choose "Direct on COM3 Decagon UCA" on the drop down list. Hit "Connect." Make sure that all 5 ports are set to "5TE Moisture/Temp/EC." The measurement interval should be "60 minutes." If any changes are made, be sure to click "Apply" at the bottom of the window.

Check that all connections are working by clicking "Scan," all 5 ports should have a valid input of reasonable values. If an invalid input appears check to make sure the connection to the data logger is secure. Try unplugging and plugging back in the probe cords to the data logger. Record any problems with the data logger on data sheet. Once all connections are valid, close the scan window.

Downloading data

To download data from the Logger click "Data" from the top tool bar. Choose "Download All Data." Save the file with an appropriate name. Record the name of the file on the data sheet. Send information via portable USB Drive or in email back to CSU.

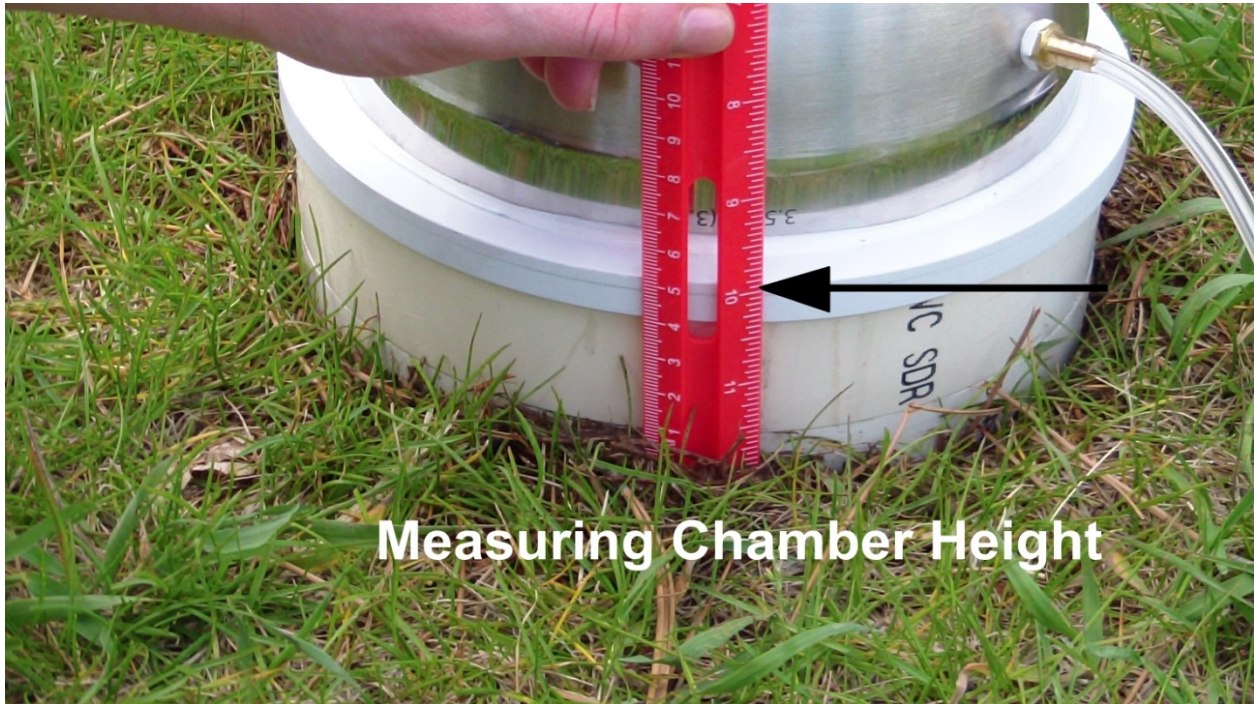
Hit the power button to put the laptop in hibernate mode.

9. Send Soil and Gas Samples Back

Crease data sheet and place in bag with designated sample vials.

Place capped, used sampling needle in the same bag that holds the vials from the chamber.

As a constraint, we ask that soils be shipped by 2nd day air (in coolers, on ice) and that they not spend time in transit over the weekend (cooking in some warehouse). With that in mind, we prefer that if you sample late in the week that you hold the samples in your facilities in a refrigerator and ship them Monday or at your earliest convenience.



Appropriate Soil Level Inside Ring



Max Vegetation Height

