Soil respiration measurement using Micro-Oxymax Respirometer

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Basal respiration

I. Soil preparation
   a. Pre-incubate several hours to warm up at incubation temperature (RT)[1]
   b. Weight wet soil 50g dry weight based on moisture content measurement into numbered (matching to channel number) Duran bottles.
   c. After all bottles are weighed, finish assembling with water bottle and sample bottles making sure O-rings and metal plates connects are intact.

II. Setting up the Micro Oxymax Respirometer
   a. Refill drierite in drying columns
      i. Dry used drierite (pink) in drying oven, take dried drierite from the oven if there is drierite in the oven (color should be little bit bluish or at least purple).
   b. Calibration (`Tools-Calibration`)
      i. Offsetting gases other than O_2 (bottle 1 – lime soda column)
      ii. Offsetting O_2 (bottle 2 – calibration gas cylinder[2])
      iii. Gaining O_2 (bottle 1)
      iv. Gaining gases other than O_2 (bottle 2[3])
   c. Setup the experiment (`Experiment-Setup`)
      i. `Setup` tab
         1. **Channels** – End channel – # channels to use
         2. Mark 'O2 Consumption Positive'
         3. **Timing** – Sample Interval(Hours) – 2.5hours or 'auto'
         4. **Data Units** – Normalization Unit – g
      ii. `Chamber Setup` tab
         1. Type 'Normalization Units' and 'Channel Label' while leakage test
         2. 'Volume' and 'Leakage' will be determined by tests
   d. Leakage check & volume measurement (`Tools-Utilities`)
      i. Click on `Leakage` button for testing (pp. 76 for source of leakage)
      ii. Click on `Volume` button for measuring headspace volume
   e. Start the incubation by clicking `Run`

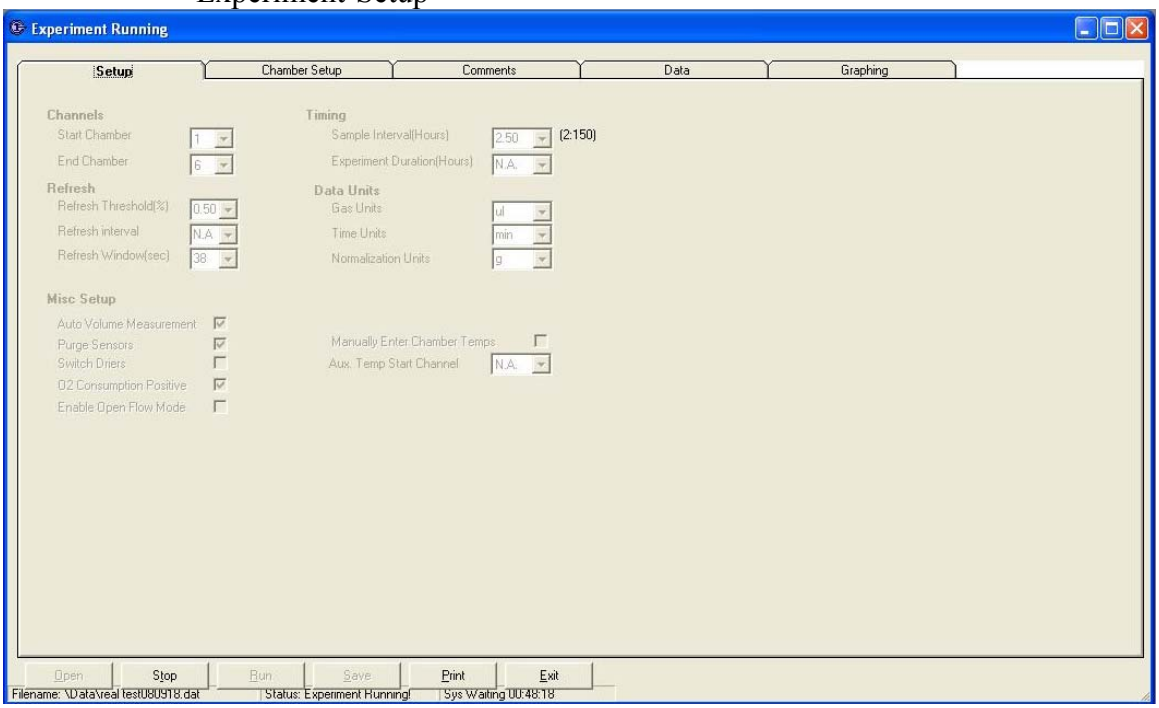
[1] Pre-incubation is needed for restoration of metabolic equilibrium of the population after storing at 4C (12hr) and re-wetting (24hr).
[2] Open the cylinder first, open regulator knob until hearing hissing sound, then adjust pressure to 5psi.
[3] Current composition (H_2S 179.8ppm, H_2 1801ppm, CO_2 0.906%, CO 0.9015%, CH_4 0.9054%) – balanced by N_2 (cylinder # SG9147282, reference # 83-124147696-1). It should be modified in System Properties at Sensors tab (pp. 70)

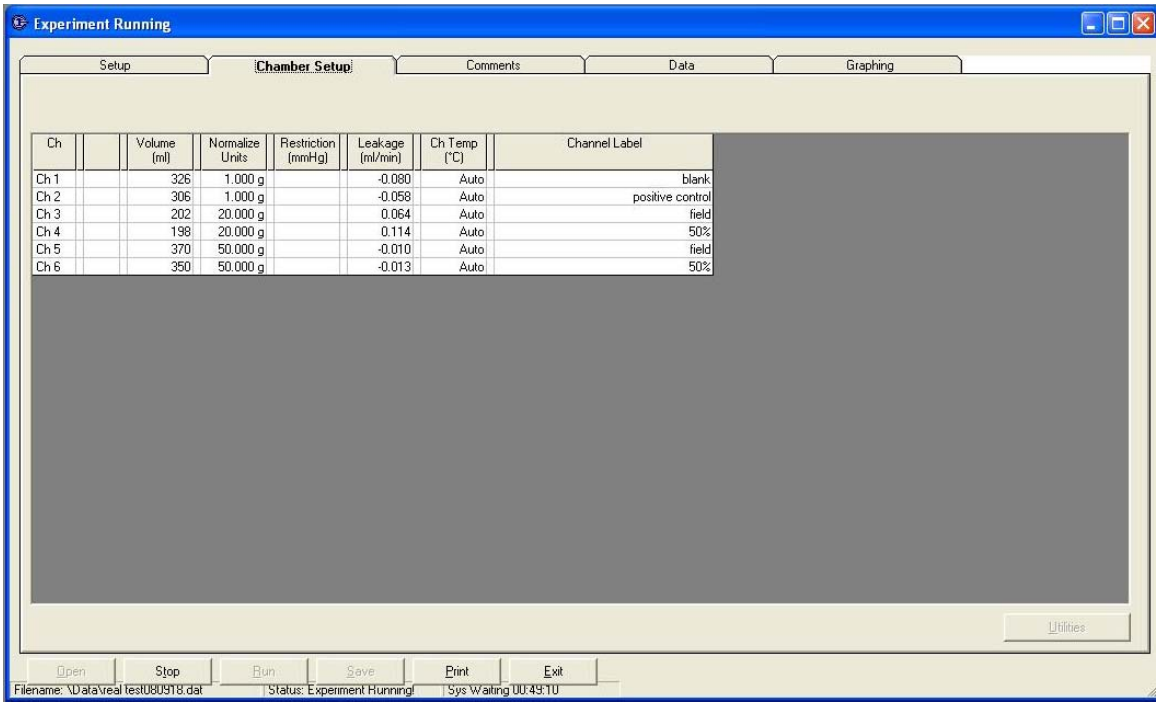
III. Incubation condition & measurement
   a. 23C (or RT), 2 ½ hour interval[4] for 120 hours[5]
   b. Humidifying bottles (50ml with GL32 cap) for each sample to maintain moisture level in gas after going through drier (Figure 1)
   c. Collect final results (accumulation) and graph in both rate (μl O_2 g^{-1} soil h^{-1}) and accumulation (μl O_2 g^{-1} soil) for further inference

IV. After incubation
   a. Finish incubation by clicking `Stop`.
   b. Disconnect Duran bottles, empty soil, wash, oven-dry and cap with aluminum foil for long term storage; otherwise, re-use them for next incubation.
   c. Leave water bottles connected for immediate next incubation; otherwise cover with the original orange caps

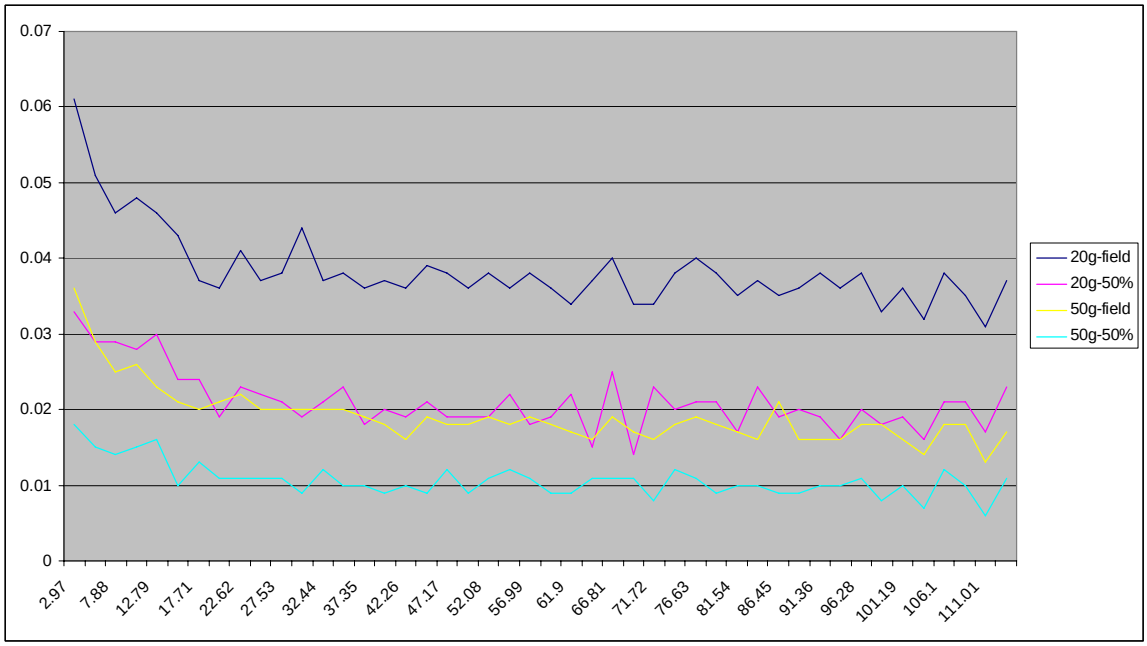
[4] Or shortest intervals possible. (# channel + 1) * 6 min
[5] 72 hours by Chuck, 150 hours by Hollender *et al* 2003

Experiment-Setup





Ch		Volume (ml)	Normalize Units	Restriction (mmHg)	Leakage (ml/min)	Ch Temp (°C)	Channel Label
Ch 1		326	1.000 g		-0.080	Auto	blank
Ch 2		306	1.000 g		-0.058	Auto	positive control
Ch 3		202	20.000 g		0.064	Auto	field
Ch 4		198	20.000 g		0.114	Auto	50%
Ch 5		370	50.000 g		-0.010	Auto	field
Ch 6		350	50.000 g		-0.013	Auto	50%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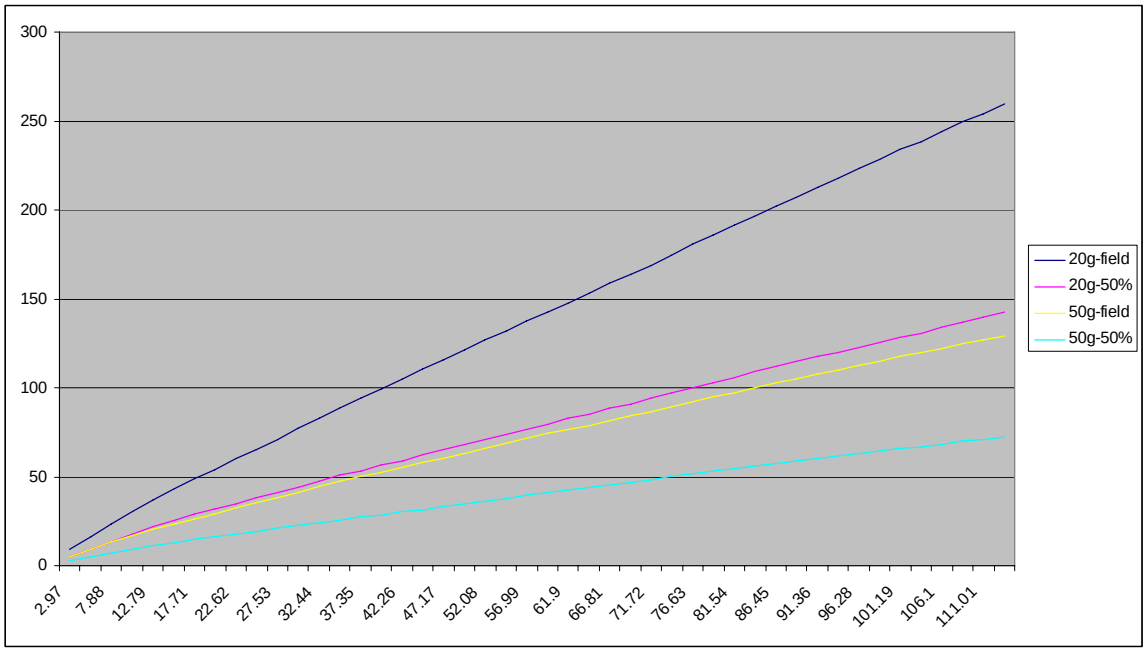
0.06
0.05
0.04
0.03
0.02
0.01
0
2.97
7.88
12.79
17.71
22.62
27.53
32.44
37.35
42.26
47.17
52.08
56.99
61.9
66.81
71.72
76.63
81.54
86.45
91.36
96.28
101.19
106.1
111.01
20g-field
20g-50%
50g-field
50g-50%


300
250
200
150
100
50
0
2.97
7.88
12.79
17.71
22.62
27.53
32.44
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42.26
47.17
52.08
56.99
61.9
66.81
71.72
76.63
81.54
86.45
91.36
96.28
101.19
106.1
111.01
20g-field
20g-50%
50g-field
50g-50%