Title: Seasonal relationships between soil respiration and water-extractable carbon as influenced by soil temperature and moisture in forest soils of the Andrews Experimental Forest, 1992-1993

Abstract:

The overall objective of this study is to model trace gas emissions from forest soils of the H. J. Andrews Experimental Forest. This is to be accomplished by studying trace gas emissions and related variable at a set of 20 permanent plots at the HJA.

Keywords: Carbon; Carbon storage; Long-Term Ecological Research (LTER); Microclimate; Micrometeorology; Soil chemistry; Soil respiration; Inorganic nutrients; Organic matter; Long-Term Ecological Research (LTER); Meteorology; Soil chemistry; Microclimate; Soil respiration; Respiration; Carbon cycling; Inorganic nutrients; Carbon;

Date data commenced: 1992-07-12
Date data terminated: 1993-07-07

Principal Investigator: Robert P. Griffiths

List of Entities:

1. Soil Characteristics and Microbial Variables - Full set
2. Soil Characteristics and Microbial Variables - Routine set
3. Field Respiration
4. Air and Soil Temperature
5. Site Location and Description

<table>
<thead>
<tr>
<th>Attribute List:</th>
<th>STCODE</th>
<th>N</th>
<th>N</th>
<th>char(10)</th>
<th>enum</th>
</tr>
</thead>
<tbody>
<tr>
<td>FORMAT</td>
<td>N</td>
<td>N</td>
<td>numeric(1,0)</td>
<td>range</td>
<td>1.0000</td>
</tr>
<tr>
<td>SITE</td>
<td>Y</td>
<td>N</td>
<td>char(5)</td>
<td>enum</td>
<td></td>
</tr>
<tr>
<td>DATE</td>
<td>Y</td>
<td>N</td>
<td>datetime</td>
<td>range</td>
<td>7/13/1992</td>
</tr>
<tr>
<td>SAMPLOCA</td>
<td>Y</td>
<td>N</td>
<td>char(2)</td>
<td>freetext</td>
<td></td>
</tr>
<tr>
<td>PH</td>
<td>N</td>
<td>Y</td>
<td>numeric(5,2)</td>
<td>range</td>
<td>3.6000</td>
</tr>
<tr>
<td>P_MOIST</td>
<td>N</td>
<td>Y</td>
<td>numeric(5,1)</td>
<td>range</td>
<td>17.6000</td>
</tr>
<tr>
<td>F_DRY_WT</td>
<td>N</td>
<td>Y</td>
<td>numeric(5,3)</td>
<td>range</td>
<td>0.3330</td>
</tr>
<tr>
<td>SOM</td>
<td>N</td>
<td>Y</td>
<td>numeric(5,1)</td>
<td>range</td>
<td>7.4000</td>
</tr>
<tr>
<td>EXTR_AMM</td>
<td>N</td>
<td>Y</td>
<td>numeric(6,3)</td>
<td>range</td>
<td>0.0000</td>
</tr>
<tr>
<td>MIN_N</td>
<td>N</td>
<td>Y</td>
<td>numeric(6,2)</td>
<td>range</td>
<td>2.5000</td>
</tr>
<tr>
<td>DOC_SOIL</td>
<td>N</td>
<td>Y</td>
<td>numeric(6,1)</td>
<td>range</td>
<td>0.3000</td>
</tr>
<tr>
<td>LAB_RESP</td>
<td>N</td>
<td>Y</td>
<td>numeric(6,3)</td>
<td>range</td>
<td>0.0030</td>
</tr>
<tr>
<td>N2OCONS</td>
<td>N</td>
<td>Y</td>
<td>numeric(6,3)</td>
<td>range</td>
<td>-0.4380</td>
</tr>
<tr>
<td>METHCONS</td>
<td>N</td>
<td>Y</td>
<td>numeric(5,2)</td>
<td>range</td>
<td>-0.0600</td>
</tr>
<tr>
<td>DENITPOT</td>
<td>N</td>
<td>Y</td>
<td>numeric(6,3)</td>
<td>range</td>
<td>0.0300</td>
</tr>
<tr>
<td>Attribute</td>
<td>Field Type</td>
<td>Description</td>
<td>Range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>------------</td>
<td>----------------------</td>
<td>---------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>METHPROD</td>
<td>numeric(5,2)</td>
<td>range 0.1200 5.0500</td>
<td>nmol/g*hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLD_RESP</td>
<td>numeric(5,2)</td>
<td>range 0.0900 3.3500</td>
<td>g/m2*day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIT_RESP</td>
<td>numeric(5,2)</td>
<td>range 0.0000 2.1800</td>
<td>g/m2*day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIT_RESP_P</td>
<td>numeric(6,2)</td>
<td>range 0.0000 140.0600</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BULKDENS</td>
<td>numeric(5,2)</td>
<td>range 0.0800 1.0200</td>
<td>g/cm3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MASS_LIT</td>
<td>numeric(5,2)</td>
<td>range 0.6600 25.8000</td>
<td>kg/m2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIRTEMP</td>
<td>numeric(5,1)</td>
<td>range 5.5000 31.0000</td>
<td>deg c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOILTEMP</td>
<td>numeric(5,1)</td>
<td>range 8.5000 19.5000</td>
<td>deg c</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Soil Characteristics and Microbial Variables - Routine set

**Attribute List:**
- **STCODE**: char(10), enum
- **FORMAT**: numeric(1,0), range 2.0000 2.0000, number
- **SITE**: char(5), enum
- **DATE**: datetime, range 7/7/1992 12:00:00 AM to 12/23/1993 12:00:00 AM
- **SAMPLE**: char(2), freetext
- **P_MOIST**: numeric(5,1), range 3.5000 408.8000, %
- **F_DRY_WT**: numeric(5,3), range 0.3150 0.9660, number
- **SOM**: numeric(5,1), range 0.0000 89.4000, %
- **DOC_SOIL**: numeric(6,1), range -3.0000 4053.0000, ug/g
- **LAB_RESP**: numeric(6,3), range -0.2600 4.5560, umol/g*hr
- **AIRTEMP**: numeric(5,1), range -0.7000 31.8000, deg c
- **SOILTEMP**: numeric(5,1), range -0.2000 19.8000, deg c

### Field Respiration

**Attribute List:**
- **STCODE**: char(10), enum
- **FORMAT**: numeric(1,0), range 3.0000 3.0000, number
- **SITE**: char(5), enum
- **RESPDATETIME**: datetime, range 7/13/1992 11:20:00 AM to 12/23/1993 12:00:00 AM
- **SAMPLE**: char(2), freetext
- **TREATMNT**: char(1), enum
- **NET_RESP**: numeric(5,2), range -0.9700 18.4400, g/m2*day

### Air and Soil Temperature

**Attribute List:**
5. Site Location and Description

Attribute List:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STCODE</td>
<td>char(10)</td>
<td>enum</td>
</tr>
<tr>
<td>FORMAT</td>
<td>numeric(1,0)</td>
<td>range 5.0000 5.0000 number</td>
</tr>
<tr>
<td>SITE</td>
<td>char(5)</td>
<td>enum</td>
</tr>
<tr>
<td>SITE</td>
<td>char(10)</td>
<td>freetext</td>
</tr>
<tr>
<td>ASPECT</td>
<td>char(10)</td>
<td>enum</td>
</tr>
<tr>
<td>MAP_ELEV</td>
<td>numeric(4,0)</td>
<td>range 473.0000 1433.0000 m</td>
</tr>
<tr>
<td>LONGITUDE</td>
<td>numeric(13,6)</td>
<td>range 44.2000 44.2800 deg lat-lon</td>
</tr>
<tr>
<td>VEG</td>
<td>char(10)</td>
<td>enum</td>
</tr>
<tr>
<td>STANDAGE</td>
<td>char(10)</td>
<td>enum</td>
</tr>
<tr>
<td>COMMENTS</td>
<td>varchar(60)</td>
<td>freetext</td>
</tr>
</tbody>
</table>

Attributes Definitions:

AIRMAX
Maximum air temperature during field respiration

AIRMIN
Minimum air temperature during field respiration

AIRTEMP
Mean of air temperatures taken at the start and end of field respiration

ASPECT
Aspect description

BULKDENS
Bulk density of soil

COMMENTS
Site description and comments

CONTROL
Control site for given site code - if any

DATE
Date samples collected (yyyymmdd)

DENITPOT
Denitrification potential

DOC_SOIL
Dissolved organic carbon extracted from soils (as C)

EXTR_AMM
Concentration of ammonium n extracted with 2m KCl

F_DRY_WT
Wt fraction dry/wet wt soil

FLD_RESP
Forest floor respiration (g CO2)

FORMAT
Entity number

LAB_RESP
CO2 released from soils incubated at 15 deg. C

LATITUDE
Site latitude decimal degrees

LIT_RESP
Litter respiration (g CO2)

LIT_RESP_P
Percent litter respiration

LONGITUDE
Site longitude decimal degrees

MAP_ELEV
Site elevation from gis map

MASS_LIT
Mass of litter on a square meter basis

METHCONS
Methane consumption rates from soils

METHPROD
Methane production

MIN_N
Concentration ammonium n after incubation at 40 deg. C for 7 days

N2OCONS
Nitrous oxide consumed by soils
NET_RESP
    Net respiration rate (as C)

P_MOIST
    Percent moisture (wet-dry/dry)x100

PH
    pH

RESPDATETIME
    Date and time respiration started

SAMPLE
    Sample location number along transect at each site

SAMPLOCA
    Location along transect where sample is taken

SITE
    Permanent trace gas sites

SOILTEMP
    Mean of soil temperatures taken at the start and end of field respiration

SOM
    Percent soil organic matter in mineral soil (by combustion at 550 C)

STANDAGE
    Standage description, OG=old-growth, CC=clearcut, or age in years

STCODE
    Database code

TREATMNT
    Treatment code: N=no treatment P=mineral soil respiration eliminated by plastic sheet between mineral soil and litter

VEG
    Primary tree vegetation

Enumerated Domains:

Enumerated Domain for Attribute: SITE
10C Mid-elevation (south slope)
11C Riparian area
1C 1v control + high hot dry mc
1V High hot dry microclimate (mc)
2C North facing
2V North facing clear cut (mid-elevation)
2VC Control for 2v and 3v
3C Valley site near stream (no slope)
3V 15 year old doug-fir stand
4C  Cool-wet high elevation (north slope) control for 6v.
4V  35 year old doug-fir stand
4VC Control for 4v
5C  Site similar to 3c but higher
5V  Big-leaf maple site
5VC Control for 5v
6C  High-moisture site (north facing)
6V  Sitka alder veg. site
7C  Moisture mid-elevation (north facing veg. site)
8C  High dry hot site (south facing ridge top)
9C  Low elevation (north slope) cool moisture

Enumerated Domain for Attribute: STCODE
SP004  FSDB Database Study Code

Enumerated Domain for Attribute: SITE
10C  Mid-elevation (south slope)
11C  Riparian area
1C  1v control + high hot dry mc
1V  High hot dry microclimate (mc)
2C  North facing
2V  North facing clear cut (mid-elevation)
2VC Control for 2v and 3v
3C  Valley site near stream (no slope)
3V  15 year old doug-fir stand
4C  Cool-wet high elevation (north slope) control for 6v.
4V  35 year old doug-fir stand
4VC Control for 4v
5C  Site similar to 3c but higher
5V  Big-leaf maple site
5VC Control for 5v
6C  High-moisture site (north facing)
6V  Sitka alder veg. site
7C  Moisture mid-elevation (north facing veg. site)
8C  High dry hot site (south facing ridge top)
9C  Low elevation (north slope) cool moisture
**Enumerated Domain for Attribute: STCODE**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP004</td>
<td>FSDB Database Study Code</td>
</tr>
</tbody>
</table>

**Enumerated Domain for Attribute: SITE**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10C</td>
<td>Mid-elevation (south slope)</td>
</tr>
<tr>
<td>11C</td>
<td>Riparian area</td>
</tr>
<tr>
<td>1C</td>
<td>1v control + high hot dry mc</td>
</tr>
<tr>
<td>1V</td>
<td>High hot dry microclimate (mc)</td>
</tr>
<tr>
<td>2C</td>
<td>North facing</td>
</tr>
<tr>
<td>2V</td>
<td>North facing clear cut (mid-elevation)</td>
</tr>
<tr>
<td>2VC</td>
<td>Control for 2v and 3v</td>
</tr>
<tr>
<td>3C</td>
<td>Valley site near stream (no slope)</td>
</tr>
<tr>
<td>3V</td>
<td>15 year old doug-fir stand</td>
</tr>
<tr>
<td>4C</td>
<td>Cool-wet high elevation (north slope) control for 6v.</td>
</tr>
<tr>
<td>4V</td>
<td>35 year old doug-fir stand</td>
</tr>
<tr>
<td>4VC</td>
<td>Control for 4v</td>
</tr>
<tr>
<td>5C</td>
<td>Site similar to 3c but higher</td>
</tr>
<tr>
<td>5V</td>
<td>Big-leaf maple site</td>
</tr>
<tr>
<td>5VC</td>
<td>Control for 5v</td>
</tr>
<tr>
<td>6C</td>
<td>High-moisture site (north facing)</td>
</tr>
<tr>
<td>6V</td>
<td>Sitka alder veg. site</td>
</tr>
<tr>
<td>7C</td>
<td>Moisture mid-elevation (north facing veg. site)</td>
</tr>
<tr>
<td>8C</td>
<td>High dry hot site (south facing ridge top)</td>
</tr>
<tr>
<td>9C</td>
<td>Low elevation (north slope) cool moisture</td>
</tr>
</tbody>
</table>

**Enumerated Domain for Attribute: TREATMNT**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Total respiration from soil and litter: no treatment</td>
</tr>
<tr>
<td>P</td>
<td>Respiration from litter only</td>
</tr>
</tbody>
</table>

**Enumerated Domain for Attribute: SITE**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10C</td>
<td>Mid-elevation (south slope)</td>
</tr>
<tr>
<td>11C</td>
<td>Riparian area</td>
</tr>
<tr>
<td>1C</td>
<td>1v control + high hot dry mc</td>
</tr>
<tr>
<td>1V</td>
<td>High hot dry microclimate (mc)</td>
</tr>
<tr>
<td>2C</td>
<td>North facing</td>
</tr>
</tbody>
</table>
2V  North facing clear cut (mid-elevation)
2VC  Control for 2v and 3v
3C  Valley site near stream (no slope)
3V  15 year old doug-fir stand
4C  Cool-wet high elevation (north slope) control for 6v.
4V  35 year old doug-fir stand
4VC  Control for 4v
5C  Site similar to 3c but higher
5V  Big-leaf maple site
5VC  Control for 5v
6C  High-moisture site (north facing)
6V  Sitka alder veg. site
7C  Moisture mid-elevation (north facing veg. site)
8C  High dry hot site (south facing ridge top)
9C  Low elevation (north slope) cool moisture

Enumerated Domain for Attribute: STCODE
SP004  FSDB Database Study Code

Enumerated Domain for Attribute: ASPECT
High flat  High flat
North  North
North-flat  North-flat
South  South
South-flat  South-flat

Enumerated Domain for Attribute: SITE
10C  Mid-elevation (south slope)
11C  Riparian area
1C  1v control + high hot dry mc
1V  High hot dry microclimate (mc)
2C  North facing
2V  North facing clear cut (mid-elevation)
2VC  Control for 2v and 3v
3C  Valley site near stream (no slope)
3V  15 year old doug-fir stand
4C  Cool-wet high elevation (north slope) control for 6v.
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4V</td>
<td>35 year old doug-fir stand</td>
</tr>
<tr>
<td>4VC</td>
<td>Control for 4v</td>
</tr>
<tr>
<td>5C</td>
<td>Site similar to 3c but higher</td>
</tr>
<tr>
<td>5V</td>
<td>Big-leaf maple site</td>
</tr>
<tr>
<td>5VC</td>
<td>Control for 5v</td>
</tr>
<tr>
<td>6C</td>
<td>High-moisture site (north facing)</td>
</tr>
<tr>
<td>6V</td>
<td>Sitka alder veg. site</td>
</tr>
<tr>
<td>7C</td>
<td>Moisture mid-elevation (north facing veg. site)</td>
</tr>
<tr>
<td>8C</td>
<td>High dry hot site (south facing ridge top)</td>
</tr>
<tr>
<td>9C</td>
<td>Low elevation (north slope) cool moisture</td>
</tr>
</tbody>
</table>

Enumerated Domain for Attribute: **STANDAGE**
- **YS** young stand
- **MS** mature stand
- **OG** old growth
- **CC** Clearcut

Enumerated Domain for Attribute: **STCODE**
- **SP004** FSDB Database Study Code

Enumerated Domain for Attribute: **VEG**
- **BL maple** Broad-leaf maple
- **Clearcut** Clearcut
- **Douglas-fir** Douglas-fir
- **Noble fir** Noble fir
- **Sitka alder** Sitka alder