

DATA META FILE 2005

This file describes the instrumentation, field setup, and quality control procedures associated with the climate and flux data collected for 2005 at the University of Minnesota, Rosemount Research Experiment Station (UMORE Park) located near St. Paul Minnesota.

Metafile Created: 7/17/07

Climate Data Files First Posting: **August 22, 2007**

Flux Raw Data Files First Posting: **August 22, 2007**

Investigators

Please direct all questions, comments, or errors related to these data to:

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Site Location and Description

Rosemount Research and Outreach Center (RROC), Upper Midwest, St. Paul, Minnesota
2 Flux stations in corn-soybean Rotation

Site G21 Conventional Management of Corn-Soybean Rotation

Note that 2005 was a corn year.

Site G19 Modified Management of Corn-Soybean Rotation (Strip Tillage and Cover Cropping)

Note that 2005 was a corn year.

RROC Station Coordinates

Latitude 44° 42' Longitude 93° 05'

Met Tower G21: 44° 42' 51.50931" 93° 05' 23.43557" 259.7385 m

Met Tower G19: 44° 43' 18.16391" 93° 05' 21.62062" 259.7393 m

Last Ameriflux Site Visits: August 2006, August 2004

Key Reference Papers

- Baker, J.M., Ochsner, T.E., Venterea, R.T., and Griffis, T.J. 2006. Tillage and Soil Carbon Sequestration – What Do We Really Know?, *Agriculture, Ecosystems, and Environment*, 118: 1-5
- Baker, J.M. and Griffis T.J. 2005. Examining strategies to improve the carbon balance of corn/soybean agriculture using eddy covariance and mass balance techniques. *Agricultural and Forest Meteorology*, 128 (3-4), 163-177.
- Griffis, T.J., Sargent S.D., Baker J.M., Lee X., Tanner B.D., Greene J., Swiatek E., and Billmark K. 2007. Direct measurement of biosphere-atmosphere Isotopic CO₂ exchange using the eddy covariance technique. In prep.
- Griffis, T.J., Zhang J., Baker, J.M., Kljun, N., and Billmark, K. 2007. Determining carbon isotope signature from micrometeorological measurements: Implications for studying biosphere-atmosphere exchange processes. *Boundary-Layer Meteorology*, 123 (2): 201-218, doi: 10.1007/s10546-006-9143-8
- Griffis, T.J., Baker, J.M., and Zhang, J. 2005. Seasonal dynamics of isotopic CO₂ exchange in a C3/C4 managed ecosystem. *Agricultural and Forest Meteorology*, 132, 1-19.
- Griffis, T.J. Lee, X., Baker J.M., King J.Y., and Sargent S.D. 2005. Feasibility of quantifying ecosystem-atmosphere C¹⁸O¹⁶O fluxes and discrimination mechanisms using laser spectroscopy, *Agricultural and Forest Meteorology*, 135, 44-60.
- Zhang, J., Griffis T.J., and Baker J.M. 2006. Using continuous stable isotope measurements to partition net ecosystem CO₂ exchange. *Plant Cell and Environment*, doi:10.1111/j.1365-3040.2005.01425.x.

Climate Variables and Data Structure

There are currently 11 variables contained within a [17520 x 11] comma delineated array. This array represents our best measure/quality control of the climate variables to date and is subject to revision. See dates above for recent updates concerning the data file and metadata.

The following data are provided without headers for field sites **G21** and **G19**:

<u>Column</u>	<u>Variable</u>	<u>Units</u>	<u>Instrument</u>	<u>*Notes</u>
1	Year	-	-	-
2	DOY	-	-	-
3	DDOY	-	-	-
4	Time (hour/minute)	-	-	-
5	Solar radiation (K↓)	W/m ²	Eppley PSP	3.7 m
6	Net radiation (Rn)	W/m ²	Kipp&Zonen Components	3.7 m
7	Ground heat flux (Qg)	W/m ²	Huskeflux HFP01SC	
8	Air temperature (Ta)	°C	Vaesala HMP35C	3.0 m
9	Soil temperature (Ts)	°C		
10	Relative humidity (%)	-	Vaisala HMP35C	3.0 m
11	Precipitation	mm	weighing Geonor T200B	

Instrumentation and Calculations

*All heights provided above are relative to the ground surface

Soil heat flux is measured at a soil depth of 10 cm and corrected using the calorimetric method with thermocouples position above (but offset from) the HFP01SC self calibrating heat flux plates.

Net radiation is a composite variable consisting of the best component fluxes (upward and downward facing pyranometers and pyregeometers, Eppley Laboratory Inc.) and all-wave measurements (Kipp&Zonen NRLite).

Soil Temperature is an average of thermocouples integrated over a depth of 10 cm.

Data Files Recently Posted (August 22, 2007)

g21climatedata2005.txt (comma delimited)

g19climatedata2005.txt (comma delimited)

Eddy Covariance Flux Measurements (Year 2005)

Basic System Information

All eddy covariance data collection and calculations were performed on a CR5000 Campbell Scientific Data Logger. All signals were acquired at 10 Hz and half-hourly fluxes calculated and stored internally. Post processing of these data is done at the University of Minnesota using custom Matlab software.

The eddy covariance system consists of a 2-dimensional sonic-anemometer-thermometer (CSAT3, Campbell Scientific Inc.) and an open-path infrared gas analyzer (LI-7500, Licor). CO₂ profiles are obtained using a Trace Gas Analyzer (TGA100, Campbell Scientific Inc.).

Basic Post-Processing

1. Raw covariances are determined from 30 minute block averaging
2. Two-dimensional coordinate rotation is applied following Boldocchi et al., (1988)
3. Webb-Pearman-Leuning (WPL) & Schotanus simultaneous solution
4. Co-spectral corrections following analytical model of Massmann (2000)
5. Filter1: Fluxes are flagged using a friction velocity threshold of 0.1 ms^{-1}
6. Filter2: Fluxes are flagged for relative humidity values exceeding 98%

Please Note: These Eddy Flux Files are considered “RAW” and have not been filtered using final assessment of the co-spectra/stationarity/statistical properties. Final filtered and gap-filled Eddy Flux Files will be posted in the near future.

Flux Variables and Data Structure

There are currently 11 variables contained within a [17520 x 12] comma delimited array. This array represents flux variables that have been screened using Filter 1 and Filter 2 above. They are subject to revision. See dates above for recent updates concerning the flux data file and metadata.

<u>Column</u>	<u>Variable</u>	<u>Units</u>
1	DDOY	-
2	net ecosystem CO ₂ exchange	$\mu\text{mol m}^{-2} \text{s}^{-1}$
3	latent heat flux	W m^{-2}
4	sensible heat flux	W m^{-2}
5	friction velocity	m s^{-1}
6	wind speed	m s^{-1}
7	dry air density	g m^{-3}
8	sat vap pressure	kPa
9	vapor pressure	kPa
10	specific humidity	g/kg
11	air pressure	kPa

Data Files Recently Posted (August 22, 2007)

g21fluxdata2005.txt (comma delimited)

g19fluxdata2005.txt (comma delimited)

Biomass DATA

Leaf area index was measured with an AccuPAR handheld sensor (AccuPAR, Model PAR-80, Decagon Devices Inc., Pullman, WA, USA).

The leaf area indexes are currently stored as 8 variables within a comma delimited array. The variables include: Year, DOY, Time, Field ID, Crop Type, LAI, Latitude, Longitude

Biomass Files Poasted (August 22, 2007)

G21_LAI2005.txt

G19_LAI2005.txt