DATA META FILE 2009
This file describes the instrumentation, field setup, and quality control procedures associated with the climate and flux data collected for 2009 at the University of Minnesota, Rosemount Research Experiment Station (UMORE Park) located near St. Paul Minnesota.

Metafile Created: **February 12, 2013**
Metafile Updated: **February 14, 2013**
Climate Data Files First Posting: **January 20, 2013**
Flux Data Files First Posting: **January 19, 2013**
Raw Data 17 variables posted: **February 14, 2013**

Investigators
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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 2009 was a corn year.
Site G19 Modified Management of Corn-Soybean Rotation (Strip Tillage and Cover Cropping)
Note that 2009 was a soybean 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 2009 (G19), August 2006 (G21), August 2004 (G21)

Relevant Reference Papers (complete list at www.biometeorology.umn.edu)

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 ecosystematmosphere 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 9 variables contained within a [17520 x 9] 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**:
Column Variable Units Instrument *Notes

1 DDOY, decimal day of year
2 Solar radiation (K↓) W/m2 Eppley PSP 3.7 m
3 Net radiation (Rn) W/m2 Kipp&Zonen Components 3.7 m
4 Ground heat flux (Qg1) W/m2 Huskeflux HFP01SC
5 Ground heat flux (Qg2) W/m2 Huskeflux HFP01SC
6 Ground heat flux (Qg3) W/m2 Huskeflux HFP01SC
7 Air temperature (Ta) °C Vaisala HMP35C 3.0 m
8 Soil temperature (Ts) °C at 2.5 cm
9 Relative humidity (%) - Vaisala HMP35C 3.0 m

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 allwave measurements (Kipp&Zonen NRLite).
Soil Temperature is an average of thermocouples integrated over a depth of 10 cm.

Data Files Recently Posted (January 20, 2013)
g21climatedata2009.txt (comma delimited)

Eddy Covariance Flux Measurements (Year 2009)
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)

Please Note: These Eddy Flux Files are considered "RAW" and have not been filtered using final assessment of the co-spectra/stationarity/statistical properties.

Flux Variables and Data Structure
There are currently 11 variables contained within a [17520 x 11] comma delimited array.
These data are subject to revision. See dates above for recent updates concerning the
flux data file and metadata.

Column Variable Units

1 DDOY -
2 net ecosystem CO2 exchange μmol m-2 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/g
11 air pressure kPa

Data Files Recently Posted (January 19, 2013)
g21fluxdata2009.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 Posted (Pending)
G21_LAI2009.txt

Raw Data File Posted February 14, 2013
G21_rawdata2009.txt
This file contains 17 variables. No screening or gap filling applied
Flux data include WPL terms
Flux data have NOT been corrected for frequency response, sensor separation, block averaging, etc.

1. DOY
2. friction velocity (m/s)
3. momentum flux (kg/m/s2)
4. latent heat flux (W/m2)
5. sensible heat flux (W/m2)
6. NEE (micromol/m2/s)
7. Kd (W/m2)
8. Ku (W/m2)
9. Ld (W/m2)
10. Lu (W/m2)
11. Rn (W/m2)
12. Qg1 (W/m2)
13. Qg2 (W/m2)
14. Qg3 (W/m2)
15. Tair (oC)
16. Tsoil (oC)
17. relative humidity (%)