

## AmeriFlux Standardized Level 2 Data Files

May 2014

Recognizing the need and convenience for some users to be able to easily obtain data files containing long-term records from AmeriFlux sites in a common, standardized format, the AmeriFlux data activity within the Carbon Dioxide Information Analysis Center (CDIAC) at Oak Ridge National Laboratory produces the standard files presented here. These files contain data provided by individual site investigators for individual years that have been checked and reformatted by CDIAC. These Level 2 (L2) files contain the same data available from the CDIAC AmeriFlux Site and Data Exploration System (<http://ameriflux.ornl.gov>).

When using these files PLEASE adhere to the AmeriFlux fair-use data policy listed on each data file as part of the standard header record. If you have questions about the content, use, or citation of these data, please contact Tom Boden ([bodenta@ornl.gov](mailto:bodenta@ornl.gov)) or Bai Yang ([yangb@ornl.gov](mailto:yangb@ornl.gov)).

For some sites (e.g., Vaira Ranch, California) both gap-filled files and files with periods of missing data are furnished. Separate directories are provided for gap-filled (/gap\_filled) and non gap-filled (/with\_gaps) records. The basic file naming convention is “AMF\_CCFID\_yyyy\_L2\_XX\_V###.csv” or “AMF\_CCFID\_yyyy\_L2\_XX\_V###.nc”. AMF denotes the files are from the AmeriFlux network. CC is a two-character country code (e.g., US for the United States, CA for Canada). FID is a unique, three-character site identifier assigned to all flux sites worldwide (e.g., Dk3 is assigned to the Duke Forest loblolly pine site). A complete list of the AmeriFlux sites and their country code-site identifiers are provided at <http://ameriflux.lbl.gov/AmeriFluxSites/Pages/Site-Map.aspx>. yyyy is the sampling year A.D. or C.E. (e.g., 1998). L2 reflects the AmeriFlux product level (i.e., Level 2). XX identifies whether the file contains records with gaps (WG) or offers gap-filled (GF) records. V### denotes the release version for this particular site (e.g., V007 represents the seventh release of a new set of L2 files for site FID). The L2 files are provided as ASCII text files with each variable separated by commas i.e., comma-separated value or .csv files) or in NetCDF format (.nc files). Every csv file contains a 17-line header record followed by data records. The basic content of the header record and the order of the variables presented in the data records are identical for each file, regardless of whether the files are gap-filled or not. Missing values or values set to missing by CDIAC during their QA/QC checks are denoted by -9999. Parameters not reported by the site investigator are denoted by -6999.

### ***Content and Format of Header Records***

Line 1	Sitename
Line 2	Location including latitude and longitude coordinates (decimal degrees, N & E hemispheres have positive values, S & W hemispheres have negative values) and elevation (masl)
Line 3	Principal investigator name
Line 4	Ecosystem type according to IGBP classifications

Line 5	File creation date
Lines 6-13	AmeriFlux fair-use data policy
Lines 14-16	File origin and background
Line 17	E-mail contact for questions
Line 18	Listing of the variables and order for each data record
Line 19	Units for each variable listed in line 15
Line 20	Summary record that identifies the percentage of non-missing values for each column

### ***Content and Format of Data Records***

<b><u>Variable Name</u></b>	<b><u>Description and Units</u></b>
YEAR	Years A.D. or C.E., values range from 1991 to 2014.
GAP	Indicator used to identify whether CO <sub>2</sub> flux estimates (FC) are furnished for a particular record; 0 denotes an FC measurement is present and -1 denotes no FC measurement is present. Summary files (sitename.html) are also provided in each subdirectory to aid users in determining the availability of data for specific sites and variables.
DTIME	Local standard time of day; each half-hour equals 0.02083. Some AmeriFlux sites report data on a one-hour reporting interval.
DOY	Julian day.
HRMIN	Local standard time of day expressed in a three or four-digit HHMM format (e.g., 2:30 AM = 230; 2:30 PM = 1430).
UST	Friction velocity, calculated as the square root of kinematic momentum flux and expressed in m/s.
TA	Air temperature, expressed in degrees Celsius, measured just above the canopy and close to the height of the eddy covariance system.
WD	Wind direction, expressed in degrees clockwise from the North.
WS	Wind speed, expressed in m/s, measured above the canopy.
NEE	Net ecosystem exchange, including subcanopy CO <sub>2</sub> storage, expressed in $\mu\text{mol}/\text{m}^2/\text{s}$ . Subcanopy storage includes the entire column from the ground to the height of the eddy covariance system and for some sites advection contributions too.

FC	CO <sub>2</sub> flux or the rate of vertical transfer of CO <sub>2</sub> , not corrected for storage or advection, as calculated from measurements above the canopy expressed in $\mu\text{mol}/\text{m}^2/\text{s}$ . Positive values denote upward fluxes (i.e., source to the atmosphere) and negative values denote downward fluxes (i.e., terrestrial sink). Corrections, such as WPL and frequency corrections (or others deemed appropriate by the site investigators), have been applied.
SFC	CO <sub>2</sub> storage flux in the canopy air layer expressed in $\mu\text{mol}/\text{m}^2/\text{s}$ . The canopy air layer includes the column from the ground to the height of the eddy covariance system. Positive values indicate CO <sub>2</sub> has accumulated in the column. Negative values indicate CO <sub>2</sub> has been depleted from the column.
H	Sensible heat flux or the rate of vertical transfer of heat, not corrected for storage, measured above the canopy and expressed in $\text{W}/\text{m}^2$ . Positive values denote upward fluxes (i.e., away from the ground) and negative values denote downward fluxes (i.e., toward the ground).
SH	Sensible heat storage in the canopy air space (occasionally at some sites also includes heat storage in biomass and soil) above the soil heat plate expressed in $\text{W}/\text{m}^2$ . Positive values indicate air temperature is increasing with time in the control volume. Negative values indicate air temperature is decreasing. Users should be aware AmeriFlux sites differ in the three elements included in the SH estimates for individual sites.
LE	Latent heat flux, not corrected for storage, measured above the canopy and expressed in $\text{W}/\text{m}^2$ . Positive values denote upward fluxes (i.e., away from the ground) and negative values denote downward fluxes (i.e., toward the ground).
SLE	Latent heat storage in the canopy air layer expressed in $\text{W}/\text{m}^2$ . Positive values indicate water vapor has accumulated in the canopy air layer. Negative values indicate water vapor has been depleted from the canopy air layer.
FG	Soil heat flux expressed in $\text{W}/\text{m}^2$ . Positive values denote downward heat fluxes (i.e., from top soil layer/air into the deeper soil layers) and negative values denote upward heat fluxes (i.e., from deep soil layer into the top soil layer/air).
TS1	Soil temperature expressed in degrees C.
TSdepth1	Measurement depth for TS1, expressed in cm.

TS2	Soil temperature expressed in degrees C.
TS2depth2	Measurement depth for TS2, expressed in cm.
PREC	Total rainfall or wintertime precipitation within the measurement period expressed in mm.
RH	Relative humidity of air, expressed as a percentage, measured just above the canopy.
PRESS	Barometric pressure expressed in kPa.
CO2	CO2 concentration expressed in $\mu\text{mol/mol}$ .
VPD	Vapor pressure deficit, as the difference between the saturation water vapor pressure and the measured water vapor pressure, expressed in kPa. VPD is calculated from relative humidity (RH) and air temperature (TA) or from water vapor concentration (H2O), TA, and barometric pressure (PRESS).
SWC1	Soil water content, based on time-domain measurement methods sensitive to dielectric permittivity, at depth 1 expressed as a percentage.
SWC2	Soil water content, based on time-domain measurement methods sensitive to dielectric permittivity, at depth 2 expressed as a percentage.
	Measurement depths and column depths in cm for SWC1 and SWC2 are provided in a table at the bottom of this document.
Rn	Net radiation expressed in $\text{W/m}^2$ . Positive values denote downwards.
PAR	Incoming photosynthetically active radiation (i.e., radiation in the 0.4 to 0.7 micrometer waveband), measured above the canopy, and expressed in $\mu\text{mol/m}^2/\text{s}$ .
Rg	Incoming global solar radiation (shortwave radiation, 0.15 to 4.0 micrometer waveband) including both direct radiation and diffuse radiation, measured above the canopy, and expressed in $\text{W/m}^2$ .
Rgdif	Incoming diffuse global solar radiation including reflected and scattered radiation from all portions of the sky, measured above the canopy, and expressed in $\text{W/m}^2$ .

PARout	Reflected photosynthetically active radiation expressed in $\mu\text{mol}/\text{m}^2/\text{s}$ .
RgOut	Outgoing global solar radiation (shortwave radiation, 0.15 to 4.0 micrometer waveband), measured above the canopy, expressed in $\text{W}/\text{m}^2$ .
Rgl	Incoming longwave radiation (i.e., radiation in the 4 to 100 micrometer waveband), measured above the canopy, expressed in $\text{W}/\text{m}^2$ .
RglOut	Outgoing longwave radiation, measured above the canopy, expressed in $\text{W}/\text{m}^2$ .
H2O	Water vapor concentration above the canopy expressed in $\text{mmol}/\text{mol}$ .
RE	Total ecosystem respiration expressed in $\mu\text{mol}/\text{m}^2/\text{s}$ .
GPP	Gross primary production, including total ecosystem respiration (RE) and net ecosystem exchange (NEE), expressed in $\mu\text{mol}/\text{m}^2/\text{s}$ . GPP is calculated as $\text{GPP} = \text{RE} - \text{NEE}$
CO2top	If more than one concentration is reported by the site investigator the measurement closest to the surface is presented above as CO2 and the measurement from the highest sampling point is reported here as CO2top in $\mu\text{mol}/\text{mol}$ .
CO2height	Indicates the height of the CO2top measurement expressed in meters.
APAR	The amount of photosynthetically active radiation (PAR) assimilated by the canopy and understory as determined by the difference between above-canopy PAR measurements and ground-level PAR measurements. APAR values are expressed in $\mu\text{mol}/\text{m}^2/\text{s}$ .
PARdif	Incoming diffuse photosynthetically active radiation (i.e., radiation in the 0.4 to 0.7 micrometer waveband), measured above the canopy, and expressed in $\mu\text{mol}/\text{m}^2/\text{s}$ . Diffuse PAR includes reflected and scattered radiation in the 0.4 to 0.7 micrometer wavebands from all portions of the sky.

APARpct	The percentage of incoming photosynthetically active radiation (PAR) assimilated by the canopy and understory. APARpct values are expressed as percentages.
ZL	Atmospheric stability parameter calculated from $Z/L$ where $Z$ is the measurement height and $L$ is the Monin-Obukhov length. $ZL$ is unitless.

**Measurement heights, expressed in meters, for the eddy-covariance systems.**

<b>Site name</b>	<b>Measurement height (m)</b>
Aiken	25.0
Anaktuvuk River moderate burn site	2.7
Anaktuvuk River severe burn site	2.72
Anaktuvuk River unburned site	2.5
ARM SGP site	4.28
ARM burn site	3.45
ARM control site	4.05
ARM switchgrass #1	2.84
ARM switchgrass #2	2.95
Atqasuk	2.0
Audubon Grasslands	4.0
Austin Cary	32.0
Barrow	4.18
Bartlett Experimental Forest	24.0
Black Hills	24.0
Blodgett Forest	8.5, 10.5, and 12.5*
Bondville	8.0 and 10.0*
Bondville companion site	10.0
Brookings	4.0
Brooks Field 10	4.0 (2007, corn), 2.25 (2008 soybean), 5.2 (2011, corn)*
Brooks Field 11	2.4 (2007, soybean), 4.5 (2008, corn), 2.5 (2011, soybean)*
Canaan Valley	4.0
Cedar Bridge	17.0
Chestnut Ridge	38.0 and 43.0
Corral Pocket	1.85
Cottonwood	5.0
Delta Junction 1920 control site	9.5
Delta Junction 1987 burn site	10.0
Delta Junction 1999 burn site	7.8
Diablo	2.1
Donaldson	15.0, 18.0, 21, 24.4*
Duke Forest loblolly pine	20.2
Duke Forest open field	2.8
Duke Forest hardwoods	39.8
Fermi agricultural site	4.05
Fermi prairie site	3.76
Flagstaff unmanaged forest site	23.0

Flagstaff managed forest site	23.0
Flagstaff wildfire site	2.5, 3.0, and 4.0*
Florida Everglades Shark River Slough long hydroperiod marsh site	3.3
Florida Everglades Shark River Slough mangrove forest site	27.0
Florida Everglades Taylor Slough short hydroperiod marsh	3.3
Fort Dix	17.0
Fort Peck	3.5
Freeman Ranch Mesquite	7.97
Freeman Ranch Woodland	14.0
GLEES	22.5
Goodwin Creek	4.0
Great Mountain	30.4
Happy Valley	2.5
Harvard Forest	29.0
Harvard Forest hemlock site	27.0
Heritage Land Conservancy	9.0
Howland east tower harvest site	29.0
Howland main	29.0
Howland west tower site	29.0
Imnavait Creek heath tundra	3.18
Imnavait Creek tussock tundra	2.82
Imnavait Creek wet sedge tundra	2.18
Ivotuk	3.8
Kansas Field Station	3.0
Kendall Grasslands	6.4 (2006- ), 3.2 (2004-2005)
Kennedy Space Center pine site	18.0
Kennedy Space Center scrub oak site	3.5 and 4.1
Konza Prairie	3.0
KUOM turfgrass field	1.35
La Paz	13.0
La Selva	
LBA Tapajos/Santarem logged forest	64.0
LBA Tapajos/Santarem primary forest	57.8
Lindcove Orange Orchard	9.18
Little Prospect Hill	
Little Washita	3.0
Lost Creek	10.2
Lucky Hills shrubland	6.5 (2008 -), 3.1 (pre-2008)*
Marys River fir site	38.3
Mead Irrigated	3.0, 6.2 (growing season)*

Mead Irrigated/Rotation	3.0, 6.2 (growing season)*
Mead Rainfed	3.0, 6.2 (growing season)*
Metolius Eyerly burn site	10.0
Metolius first young ponderosa pine site	12.0
Metolius intermediate ponderosa pine site	33.0
Metolius old ponderosa pine site	47.0
Metolius second young ponderosa pine site	12.0
Metolius young ponderosa pine burn site	12.0
Missouri Ozark	30.0
Mize	4.2, 6.4, 9.4, 12.4, and 18.5*
Morgan Monroe State Forest	46.0
Nebraska Sandhills dry valley	3.85
Niwot Ridge	21.5
North Carolina clearcut site	6.0 and 11.6
North Carolina loblolly pine site	22.5
Northern Michigan jack pine site	
Ohio Oak Openings	32.0 and 33.5
Olentangy River Wetland Research Park	9.6
Park Falls	30, 122, 396**
Ponca	4.5
Rayonier	14.0
Rosemount G19	3.0
Rosemount G21	3.0
Santa Rita creosote site	3.75
Santa Rita mesquite site	7.82
Sevilleta Desert Grassland	3.0
Sevilleta Desert Shrubland	2.5
Sherman Island	
Shidler	4.5
Silas Little	19.0
Sioux Falls portable	7.0
Sky Oaks old chaparral site	4.5
Sky Oaks young chaparral site	4.5
Sky Oaks new chaparral site	4.5
Sylvania Wilderness	36.0
Tablelands juniper savanna site	8.0
Tonzi Ranch	23.0
Twitchell Island	2.59 (FC), 3.0 (FCH4)
UCI 1850 burn site	24.0
UCI 1930 burn site	20.0
UCI 1964 burn site	10.0
UCI 1964 wet burn site	10.0
UCI 1981 burn site	9.0
UCI 1989 burn site	6.0

UCI 1998 burn site	6.0
UCI 2003 burn site	6.0
UMBS	46.0
UMBS Disturbance	32.0
UPad	2.0
Vaira Ranch	2.0
Valles Caldera Mixed Conifer	21.65
Valles Caldera Ponderosa Pine	18.5
Walker Branch	36.9
Walnut River	2.1
Willow Creek	29.6
Wind River	70.0
Wisconsin Clearcut Red Pine	6.0
Wisconsin Clearcut Young Hardwoods	3.0
Wisconsin Intermediate Hardwoods	9.0
Wisconsin Intermediate Red Pine	9.0
Wisconsin Mature Hardwoods	26.0
Wisconsin Mature Red Pine	23.0
Wisconsin Mixed Young Jack Pine	6.0
Wisconsin Pine Barrens	3.0
Wisconsin Young Jack Pine	9.0
Wisconsin Young Red Pine	6.0

\* Heights vary from year to year due to canopy growth, crop rotation, or crop growth.

\*\* FC and other fluxes (H and LE) are a collection from different heights on the WLEF tall tower because of preferred atmospheric stability or footprint.

**Measurement depths and integration depths, expressed in cm, for SWC1 and SWC2.** NA denotes cases where only one soil moisture value was reported by the principal investigator.

<b>Site name</b>	<b>SWC1</b>	<b>SWC2</b>
Anaktuvuk River moderate burn site	2.5	NA
Anaktuvuk River severe burn site	2.5	NA
Anaktuvuk River unburned site	2.5	NA
ARM SGP site	10 (5 before 4/13/2005)	20 (25 before 4/13/2005)
ARM burn site	10	30
ARM control site	10	30
ARM switchgrass #1	10	30
ARM switchgrass #2	10	30
Audubon Grasslands	10	20
Bartlett Experimental Forest	0-10	NA
Black Hills	10	30
Blodgett Forest	10	20 (30 during 1997)
Bondville	10 (5 before 1/1/2006)	20
Bondville companion site	10	20
Brookings	10	20
Brooks Field 10	5	NA
Brooks Field 11	5	NA
Canaan Valley	5 (10 before 1/1/2007)	10 (20 before 1/1/2007)
Chestnut Ridge	5	10
Corral Pocket	5	10
Cottonwood	5	10
Delta Junction 1920 control site	2	4
Delta Junction 1987 burn site	2	11
Delta Junction 1999 burn site	2	4
Diablo	30	NA
Duke Forest pine	0-30	NA
Duke Forest open field	10	25
Duke Forest hardwoods	10	25
Fermi agricultural site	2.5	10
Fermi prairie site	2.5	10
Freeman Ranch Mesquite	5	NA
Flagstaff unmanaged forest site	2	10
Flagstaff managed forest site	2	10
Flagstaff wildfire site	2	10
Florida Everglades Shark River Slough long hydroperiod marsh site	0-15	NA

Florida Everglades Taylor Slough short hydroperiod marsh	0-15	NA
Fort Peck	5 (2006-2008) 10 (2003-2008)	20
Freeman Ranch Mesquite	2	NA
Freeman Ranch Woodland	10	20
GLEES	5	10
Goodwin Creek	10	20
Great Mountain	5	10
Heritage Land Conservancy	2.5	5
Imnavait Creek heath tundra	2.5	NA
Imnavait Creek tussock tundra	2.5	NA
Imnavait Creek wet sedge tundra	2.5	NA
Kansas Field Station	2.5	NA
Kendall Grasslands	5	15
Kennedy Space Center pine site	15	NA
Kennedy Space Center scrub oak site	0-15	NA
Konza Prairie	2.5	NA
KUOM turfgrass field	10	NA
LBA Tapajos/Santarem logged forest	10	20
LBA Tapajos/Santarem primary forest	surface	20
La Paz	5	10
Lindcove Orange Orchard	5	20
Little Washita	10	NA
Lucky Hills shrubland	5	15
Marys River fir site	10	20
Mead Irrigated	10	25
Mead Irrigated/Rotation	10	25
Mead Rainfed	10	25
Metolius Eyerly burn site	0-30	NA
Metolius first young ponderosa pine site	0-30	NA
Metolius intermediate ponderosa pine site	0-30	NA
Metolius old ponderosa pine site	0-30	NA
Metolius second young ponderosa pine site	0-30	NA
Metolius young ponderosa pine burn site	0-30	NA
Missouri Ozark	10	100
Morgan Monroe State Forest	0-30	NA
Nebraska Sandhills dry valley	10	25
Niwot Ridge	5 (0-15 through 2004)	NA
North Carolina clearcut site	0-30	NA
North Carolina loblolly pine site	0-30	NA

Ohio Oak Openings	0-30	NA
Park Falls	surface	NA
Ponca	0-15	15-30
Santa Rita creosote site	2.5	12.5
Santa Rita mesquite site	2.5-5	5-10
Sevilleta Desert Grassland	2.5	NA
Sevilleta Desert Shrubland	2.5	NA
Sherman Island	10	20
Shidler	0-15	15-30
Silas Little	0-30	NA
Sioux Falls portable	5	10
Sky Oaks old chaparral site	5	10
Sky Oaks young chaparral site	5	10
Sky Oaks new chaparral site	5	10
Sylvania Wilderness	5	10
Tablelands juniper savanna site	2.5	5
Tonzi Ranch	surface	20
Twitchell Island	surface	NA
UCI 1850 burn site	32	NA
UCI 1930 burn site	18	28
UCI 1964 burn site	5	10
UCI 1964 wet burn site	25	35
UCI 1981 burn site	9	NA
UCI 1989 burn site	14	NA
UCI 1998 burn site	11	90
UMBS	0-30	NA
UMBS Disturbance	0-30	5
Vaira Ranch	surface	10
Valles Caldera Mixed Conifer	2.5	5
Valles Caldera Ponderosa Pine	5	NA
Walker Branch	5	10
Walnut River	2.5	NA
Willow Creek	5	10
Wind River	0-30 (30 from 1998- 2006)	50 (since 2007)