OzFlux Variable Names and Definitions

Background

There are three distinct classes of variable names used in the OzFlux quality control and post-processing system. The classes are as follows:

1. The variable name used in the data logger program.
   The names used in the data logger program depend on the origin and version of the program being used. Programs supplied by Campbell Scientific use a different naming convention than the standard logger program supplied by OzFlux. Details of the naming convention used in the OzFlux standard program are given in the program documentation.

2. The variable name used in the netCDF file.
   The naming convention used for variables in the netCDF file follows the naming convention used in the OzFlux standard data logger program. The details of this convention are described later in this section. Note that each variable in the netCDF file also has a "long_name" attribute which gives a text description of the data contained in the variable.

3. The "standard_name" mapped to the netCDF variable name as required by the CF Metadata conventions.
   The netCDF files used by OzFlux implement the CF Metadata conventions. Each variable has an attribute called "standard_name" which comes from the CF controlled vocabulary. Those variables that do not have "standard_name" defined in the CF controlled vocabulary have this attribute set to "not defined".

This document provides information on:

1. General rules for naming variables used by OzFlux.
2. A listing of variables in alphabetical order
3. An alphabetical listing of variables at the L1 and L2 processing levels.
4. An alphabetical listing of variables at the L3 processing level.

General Rules for the OzFlux Variable Naming Scheme

The basic premise for the naming convention adopted by OzFlux is that the ecosystem world can be divided up into stores of quantities and transfers (or fluxes) between these stores. Based on this model, we use either "S" to indicate a store or an "F" to indicate a flux. In practice, many stores of quantities already have symbols which are widely used and for convenience, we use these common names rather than strictly adhere to the stores and fluxes description. For example, the store of heat in the atmosphere should be written "Sha" but we retain the commonly used "Ta" for air temperature.

Letters are appended to the initial "F" or "S" to indicate the quantity being transferred or stored, see the tables below.

The instrument taking the measurement is indicated by appending an abbreviation after the symbol for the quantity, see the table below. Instrument abbreviations are not used for the Kipp and Zonen 4 component radiometer (CNR1 or CNR4), for the soil heat flux plates (HFP3), for the soil temperature (TCAV) and for the soil moisture (CS616).

Symbol	Quantity
Fsd	Down-welling shortwave radiation
Fsu	Up-welling shortwave radiation
Fld	Down-welling longwave radiation
Flu	Up-welling longwave radiation
Fn	Net all-wave radiation
Fa	Available energy
Fh	Sensible heat flux
Fe	Latent heat flux
Fc	CO_2 flux
Fg	Ground heat flux
Fm	Momentum flux

Table 1: Basic symbols for fluxes.

Symbol	Quantity
Sws	Soil moisture, volumetric

Table 2: Basic symbols for stores

Symbol	Quantity
Ta	Air temperature
Tv	Virtual air temperature
Ts	Soil temperature

Table 3: Temperatures

Symbol	Quantity
Ah	Absolute humidity
e	Vapour pressure
q	Specific humidity

Table 4: Humidities

Symbol	Instrument
_CSAT	Campbell Scientific 3D sonic
_7500	Li-7500 open path gas analyser
_HMP	HMP45c T/RH sensor
_KZ	Kipp and Zonen
_NR	NRlite

Table 5: Abbreviations for instruments appended to the variable symbol.

Variable Listing by Alphabetical Order

The following tables give an alphabetical list of the variables in an L3 file from a standard OzFlux tower site. The left-most column is the variable name in the OzFlux netCDF file. The centre column is the CF Metadata Conventions standard name (standard_name) if this is defined for the variable (as at 31/12/2012). This column is blank if the standard name is not defined. The right most column is a description of the variable.

The tables of variable names and definitions are intended as a guide only that applies to a notional “standard” OzFlux site. Most OzFlux sites differ from the “standard” configuration, in which case there may be more, or less, variables than those given in the tables. In the case of more, the naming convention for extra variables can be deduced from the “standard” list given.

Variable	CF standard name	Definition
AGC_7500		Li-7500 automatic gain control
Ah	mass_concentration_of_water_vapor_in_air	Absolute humidity from HMP, merged with Li-7500 if required
Ah_7500_Av		Absolute humidity from Li-7500, average
Ah_7500_Sd		Absolute humidity from Li-7500, standard deviation
Ah_HMP_XXm		Absolute humidity from HMP at XXm, average
AhAh		Absolute humidity from Li-7500, variance
albedo	solar_albedo	Solar albedo
Cc		CO_2 concentration from Li-7500, merged with slow sensor if available
Cc_7500_Av		CO_2 concentration from Li-7500, average
Cc_7500_Sd		CO_2 concentration from Li-7500, standard deviation
CcCc		CO_2 concentration from Li-7500, variance
Cpm		Specific heat of moist air
C_ppm	mole_concentration_of_carbon_dioxide_in_air	CO_2 concentration in parts per million (ppm, umol/mol)
Cs		Specific heat capacity
Day		Day of the month
Ddd		Decimal day of the year (eg 1.5 is 12:00 1/1/2013)
Diag_7500		Li-7500 diagnostic value
Diag_CSAT		CSAT diagnostic value
e	water_vapor_partial_pressure_in_air	Vapour pressure
esat		Saturation vapour pressure

Variable	CF standard name	Definition
eta		Horizontal rotation angle from 2D coordinate rotation of CSAT data
Fa		Available energy using Fn,Fg
Fc	surface_upward_mole_flux_of_carbon_dioxide	CO_2 flux, rotated to natural wind coordinates, WPL corrected Fc
Fe	surface_upward_latent_heat_flux	Latent heat flux, rotated to natural wind coordinates, WPL corrected Fe
Fg_XXcm		Soil heat flux, raw values from individual sensors (suffix a, b, c etc) at depth below surface of XXcm
Fg		Soil heat flux corrected for storage
Fh	surface_upward_sensible_heat_flux	Sensible heat flux, rotated to natural wind coordinates, Fh rotated and converted from virtual heat flux
Fld	surface_downwelling_longwave_flux_in_air	Down-welling long wave radiation
Flu	surface_upwelling_longwave_flux_in_air	Up-welling long wave radiation
Fm		Momentum flux, rotated to natural wind coordinates
Fn	surface_net_allwave_radiation	Net all-wave radiation, merged from available sources eg CNR1 or CNR4 with NRlite
Fn_KZ		Net all-wave radiation from the Kipp and Zonen CNR1 or CNR4
Fn_NR		Net all-wave radiation from the Kipp and Zonen NRlite
Fre	surface_upward_mass_flux_of_carbon_dioxide_expressed_as_carbon_due_to_emission_from_natural_sources	
Fsd	surface_downwelling_shortwave_flux_in_air	Down-welling short wave radiation
Fsu	surface_upwelling_shortwave_flux_in_air	Up-welling short wave radiation
H_ppt		H_2O concentration in parts per thousand (ppt, mmol/mol)

Variable	CF standard name	Definition
Hdh		Decimal hour of the day eg 12.5 is 12:30 pm
Hour		Hour of the day
L		Monin-Obukhov length, corrected for frequency response using Massman
Lv		Latent heat of vapourisation
Minute		Minute of the hour
Month		Month of the year
ps	surface_air_pressure	Air pressure (Li-7500)
q	specific_humidity	Specific humidity
Precip		Precipitation, 30 minute total
RH	relative_humidity	Relative humidity
rhod		Density of dry air
rhom	air_density	Density of moist air
S		Soil heat flux storage in the layer above the heat flux plates
Second		Seconds into the current minute
SHD		Specific humidity deficit
Sws		Spatial average of shallowest volumetric soil moisture measurements
Sws_XXcm		Volumetric soil moisture, raw values from individual sensors (suffix a, b, c etc) at depth below surface of XXcm
Ta	air_temperature	Air temperature from the HMP at the same height as the sonic and IRGA, merged with air temperature from the sonic if required
Ta_CSAT		Air temperature calculated from virtual temperature measured by the sonic anemometer

Variable	CF standard name	Definition
Ta_HMP_XXm		Air temperature from the HMP at XXm
theta		Vertical rotation angle from 2D coordinate rotation of CSAT data
Ts_XXcm		Soil temperature, raw values from individual sensors (suffix a, b, c etc) at depth below surface of XXcm
Tv_CSAT		Virtual air temperature from sonic anemometer
u		Longitudinal component of wind-speed in natural wind coordinates
ustar		Friction velocity, rotated to natural wind coordinates
uw		Momentum flux X component, corrected to natural wind coordinates
Ux		Wind speed from sonic anemometer, longitudinal component
UxA		Covariance of Ux (CSAT) and H_2O (Li-7500)
UxC		Covariance of Ux (CSAT) and CO_2 (Li-7500)
UxT		Covariance of Ux (CSAT) and T (CSAT)
UxUx		Longitudinal wind speed (CSAT coordinates), variance
UxUy		Covariance of Ux and Uy (CSAT coordinates)
UxUz		Covariance of Ux and Uz (CSAT coordinates)
Uy		Wind speed from sonic anemometer, lateral component
UyA		Covariance of Uy (CSAT) and H_2O (Li-7500)
UyC		Covariance of Uy (CSAT) and CO_2 (Li-7500)
UyT		Covariance of Uy (CSAT) and T (CSAT)
UyUy		Lateral wind speed component (CSAT coordinates), variance

Variable	CF standard name	Definition
UyUz		Covariance of Uy (CSAT) and Uz (CSAT)
Uz		Wind speed from sonic anemometer, vertical component
UzA		Covariance of Uz (CSAT) and H_2O (Li-7500)
UzC		Covariance of Uz (CSAT) and CO_2 (Li-7500)
UzT		Covariance of Uz (CSAT) and T (CSAT)
UzUz		Vertical wind speed (CSAT coordinates), variance
v		Lateral component of wind-speed in natural wind coordinates
Vbat		Battery voltage at logger
VPD	water_vapor_saturation_deficit_in_air	Vapour pressure deficit
vw		Momentum flux Y component, corrected to natural wind coordinates
w		Vertical component of wind-speed in natural wind coordinates
wA		Kinematic vapour flux, rotated to natural wind coordinates, frequency response corrected, and density flux corrected (wpl)
wC		Kinematic CO2 flux, rotated to natural wind coordinates
Wd	wind_from_direction	Wind direction, merged from CSAT and any other available wind direction measurements, corrected to bearing from true north
Wd_CSAT		Wind direction from CSAT, bearing from longitudinal axis
Ws	wind_speed	Wind speed, merged from CSAT and any other available wind speed measurements
Ws_CSAT		Wind speed from CSAT
wT		Kinematic heat flux, rotated to natural wind coordinates
xlDateTime		Date/time in Excel format
Year		Year

Table 6: Variable names, CF Conventions standard name and description for L3 files.

Variable Listing by Processing Level

L1 and L2

The following tables list the variables used in the OzFlux netCDF files at the L1 and L2 processing levels, in alphabetical order.

Variable	CF standard name	Definition
AGC_7500		Li-7500 automatic gain control
Ah_7500_Av		Absolute humidity from Li-7500, average
Ah_7500_Sd		Absolute humidity from Li-7500, standard deviation
Ah_HMP_XXm		Absolute humidity from HMP at XXm, average
AhAh		Absolute humidity from Li-7500, variance
Cc_7500_Av		CO_2 concentration from Li-7500, average
Cc_7500_Sd		CO_2 concentration from Li-7500, standard deviation
CcCc		CO_2 concentration from Li-7500, variance
Day		Day of the month
Ddd		Decimal day of the year (eg 1.5 is 12:00 1/1/2013)
Diag_7500		Li-7500 diagnostic value
Diag_CSAT		CSAT diagnostic value
Fg_XXcm		Soil heat flux, raw values from individual sensors (suffix a, b, c etc) at depth below surface of XXcm
Fld	surface_downwelling_longwave_flux_in_air	Down-welling long wave radiation
Flu	surface_upwelling_longwave_flux_in_air	Up-welling long wave radiation
Fn_KZ		Net all-wave radiation from the Kipp and Zonen CNR1 or CNR4
Fn_NR		Net all-wave radiation from the Kipp and Zonen NRlite
Fsd	surface_downwelling_shortwave_flux_in_air	Down-welling short wave radiation
Fsu	surface_upwelling_shortwave_flux_in_air	Up-welling short wave radiation
Hdh		Decimal hour of the day eg 12.5 is 12:30 pm
Hour		Hour of the day

Variable	CF standard name	Definition
Minute		Minute of the hour
Month		Month of the year
ps	surface_air_pressure	Air pressure (Li-7500)
Precip		Precipitation, 30 minute total
Second		Seconds into the current minute
Sws_XXcm		Volumetric soil moisture, raw values from individual sensors (suffix a, b, c etc) at depth below surface of XXcm
Ta_HMP_XXm		Air temperature from the HMP at XXm
Tpanel		Panel temperature at logger
Ts_XXcm		Soil temperature, raw values from individual sensors (suffix a, b, c etc) at depth below surface of XXcm
Tv_CSAT		Virtual air temperature from sonic anemometer
Ux		Wind speed from sonic anemometer, longitudinal component
UxA		Covariance of Ux (CSAT) and H_2O (Li-7500)
UxC		Covariance of Ux (CSAT) and CO_2 (Li-7500)
UxT		Covariance of Ux (CSAT) and T (CSAT)
UxUx		Longitudinal wind speed (CSAT coordinates), variance
UxUy		Covariance of Ux and Uy (CSAT coordinates)
UxUz		Covariance of Ux and Uz (CSAT coordinates)
Uy		Wind speed from sonic anemometer, lateral component
UyA		Covariance of Uy (CSAT) and H_2O (Li-7500)
UyC		Covariance of Uy (CSAT) and CO_2 (Li-7500)
UyT		Covariance of Uy (CSAT) and T (CSAT)

Variable	CF standard name	Definition
UyUy		Lateral wind speed component (CSAT coordinates), variance
UyUz		Covariance of Uy (CSAT) and Uz (CSAT)
Uz		Wind speed from sonic anemometer, vertical component
UzA		Covariance of Uz (CSAT) and H_2O (Li-7500)
UzC		Covariance of Uz (CSAT) and CO_2 (Li-7500)
UzT		Covariance of Uz (CSAT) and T (CSAT)
UzUz		Vertical wind speed (CSAT coordinates), variance
Vbat		Battery voltage at logger
Wd_CSAT		Wind direction from CSAT, bearing from longitudinal axis
Ws_CSAT		Wind speed from CSAT
xlDateTime		Date/time in Excel format
Year		Year

Table 7: Variable names, CF Conventions standard name and description for L1 and L2 files.

L3

The following tables list the variables used in the OzFlux netCDF files at the L3 processing level, in alphabetical order.

Variable	CF standard name	Definition
Ah		Absolute humidity from HMP, merged with Li-7500 if required
albedo	solar_albedo	Solar albedo
Cc		CO_2 concentration from Li-7500, merged with slow sensor if available
Cpm		Specific heat of moist air
C_ppm		CO_2 concentration in parts per million (ppm, umol/mol)
Cs		Specific heat capacity
e	water_vapor_partial_pressure_in_air	Vapour pressure
esat		Saturation vapour pressure
eta		Horizontal rotation angle from 2D coordinate rotation of CSAT data
Fa		Available energy using Fn,Fg
Fc		CO_2 flux, rotated to natural wind coordinates, WPL corrected Fc
Fe	surface_upward_latent_heat_flux	Latent heat flux, rotated to natural wind coordinates, WPL corrected Fe
Fg		Soil heat flux corrected for storage
Fh	surface_upward_sensible_heat_flux	Sensible heat flux, rotated to natural wind coordinates, Fh rotated and converted from virtual heat flux
Fld	surface_downwelling_longwave_flux_in_air	Down-welling long wave radiation
Flu	surface_upwelling_longwave_flux_in_air	Up-welling long wave radiation
Fm		Momentum flux, rotated to natural wind coordinates
Fn	surface_net_allwave_radiation	Net all-wave radiation, merged from available sources eg CNR1 or CNR4 with NRlite
Fsd	surface_downwelling_shortwave_flux_in_air	Down-welling short wave radiation
Fsu	surface_upwelling_shortwave_flux_in_air	Up-welling short wave radiation

Variable	CF standard name	Definition
H_ppt		H_2O concentration in parts per thousand (ppt, mmol/mol)
L		Monin-Obukhov length, corrected for frequency response using Massman
Lv		Latent heat of vapourisation
ps	surface_air_pressure	Air pressure (Li-7500)
q	specific_humidity	Specific humidity
Precip		Precipitation, 30 minute total
rhod		Density of dry air
rhom	air_density	Density of moist air
S		Soil heat flux storage in the layer above the heat flux plates
SHD		Specific humidity deficit
Sws		Spatial average of shallowest volumetric soil moisture measurements
Ta	air_temperature	Air temperature from the HMP at the same height as the sonic and IRGA, merged with air temperature from the sonic if required
theta		Vertical rotation angle from 2D coordinate rotation of CSAT data
Ts		Spatial average of soil temperature measurements
u		Longitudinal component of wind-speed in natural wind coordinates
ustar		Friction velocity, rotated to natural wind coordinates
uw		Momentum flux X component, corrected to natural wind coordinates

Variable	CF standard name	Definition
v		Lateral component of wind-speed in natural wind coordinates
VPD	water_vapor_saturation_deficit_in_air	Vapour pressure deficit
vw		Momentum flux Y component, corrected to natural wind coordinates
w		Vertical component of wind-speed in natural wind coordinates
wA		Kinematic vapour flux, rotated to natural wind coordinates, frequency response corrected, and density flux corrected (wpl)
wC		Kinematic CO2 flux, rotated to natural wind coordinates
Wd	wind_from_direction	Wind direction, merged from CSAT and any other available wind direction measurements, corrected to bearing from true north
Ws	wind_speed	Wind speed, merged from CSAT and any other available wind speed measurements
wT		Kinematic heat flux, rotated to natural wind coordinates

Table 8: Variable names, CF Conventions standard name and description for L3 files.

OzFlux Metadata (netCDF attributes)

Background

Metadata for data from OzFlux towers sites is available in several locations:

1. On the OzFlux web site under Monitoring sites (http://ozflux.org.au/monitoringsites/index.html)
2. Stored in the netCDF files.
3. On the OzFlux data portal (http://ozflux.its.monash.edu.au/ecosystem/home).
4. On institution specific web pages for each site where these exist.

This section will only deal with the metadata stored in the netCDF files available from the OzFlux Data Portal.

Metadata is stored in the netCDF files available from the data portal in two ways:

1. Global attributes – these give information on the contents of the file.
2. Variable attributes – these give information on each variable in the netCDF file.

The term “attributes” will be used in place of “metadata” for the rest of this section.

Global Attributes

The following table (Table 9) lists the global attributes currently used in the OzFlux netCDF files. The global attributes listed in the table are specified in the L1 control file. In addition to these, several global attributes are written to the netCDF file during QC and post-processing. These additional global attributes are given in the second table (Table 10).

Global Attribute	Description
contact	Email address of the person responsible for processing the data.
canopy_height	Height of the canopy over which the tower has been installed.
comment	Space for any comments regarding the data in the file.
conventions	The attribute naming convention eg “CF-1.6” for version 1.6 of the CF conventions.
data_url	The URL where the data file can be obtained, usually a collection on the OzFlux Data Portal.
doi	The Digital Object Identifier (DOI) for this data set, not currently implemented.
end_datetime	The last date/time value in the file (optional, if not present this value will be determined automatically)
history	The history of the QC/post-processing system used, usually the version number of OzFluxQC (recommended by CF Conventions)
institution	The institution of the site PI or the data contact person (recommended by CF Conventions)
latitude	The latitude of the site in decimal degrees, negative values for the Southern Hemisphere.
license_type	The license covering the data in the file (eg TERN-BY-SA-NC).
license_url	The URL of the license eg http://www.tern.org.au/datalicence/TERN-BY-SA-NC/1.0
longitude	The longitude of the site in decimal degrees, positive east of the Greenwich meridian.
metadata_url	The URL of the entry for the site on the OzFlux/Monitoring sites web page eg http://ozflux.org.au/monitoringsites/howardsprings/index.html
ozflux_url	The URL for the OzFlux web site eg http://ozflux.org.au/
references	Published or web-based references that describe the data or the methods used to produce it (recommended by CF Conventions).
site_name	The site name (can contain spaces) eg “Howard Springs”.
site_pi	The Principle Investigator for the site eg “Lindsay Hutley”.
soil_type	The soil type eg “red kandasol”
source	The source of the data eg “23m flux tower” (recommended by CF Conventions).
start_datetime	The first date/time value in the file (optional, if not present this value will be determined automatically)
title	A description of what is in the data set (recommended by CF Conventions).

time_step	The time step between records in minutes eg “30” for 30 minutes, “60” for 1 hour
tower_height	The height of the tower eg “30m”
vegetation	The type of vegetation at the site eg “woody savanna”.

Table 9: Global attributes defined in the L1 control file.

Global Attribute	Description
xl_fullname	The name of the L1 Excel spreadsheet, including path, from which the data came.
xl_datemode	The date mode for the L1 Excel spreadsheet eg “0” for Windows, “1” for Mac.
xl_moddatetime	The modification date and time for the L1 Excel spreadsheet.

Table 10: Global attributes defined during conversion of the L1 Excel spreadsheet to the L1 netCDF file.

Global Attribute	Description
featureType	The feature type for the netCDF file eg “timeseries” (required by the CF conventions).
nc_rundatetime	The date and time at which the netCDF file was created.
nc_nrecs	The number of records in the netCDF file (the length of the “time” dimension).
nc_level	The level of processing for the data in the netCDF file eg “L1”, “L2”, “L3” or “L4”.

Table 11: Global attributes defined during writing of netCDF files.

Variable Attributes

All variables in the OzFlux netCDF files are assigned a standard set of variable attributes based on recommendations from the netCDF Users Guide and the CF Metadata Conventions. The standard set of attributes are given in the L1 control file and are assigned to the variables at the time the L1 Excel spreadsheet is converted to an L1 netCDF file.

In addition to the standard variable attributes, several variable attributes are added to the list for each variable during the quality control and post-processing. These attributes contain information on the quality control or post-processing options used to produce the data in the netCDF file.

The variable attributes are described below.

Variable Attribute	Description
ancillary_variables	A list of other variables that depend on this variable, currently only the variable QC flag is given.
height	The height of the measurement eg “23m”.
instrument	The type of instrument used to collect the data.
long_name	A text description of the measurement.
serial_number	The serial number for the instrument used to measure the data.
standard_name	The CF Metadata Conventions standard name. If a standard_name is not defined for this measurement, this attribute is set to "not defined".
units	The units of the measurement.

Table 12: Variable attributes defined in the L1 control file.

Variable Attribute	Description
rangecheck_lower	The lower limit of the the range check, 12 values, one for each month of the calendar year, specified in the L2 control file and written as a variable attribute during L2 processing.
rangecheck_upper	The upper limit of the the range check, 12 values, one for each month of the calendar year, specified in the L2 control file and written as a variable attribute during L2 processing.
valid_range	The valid range for the variable (required by the CF Conventions). Any values outside valid_range are treated as missing data by generic netCDF utilities. valid_range is calculated from RangeCheck_Lower and RangeCheck_Upper.
diurnalcheck_numsd	The number of standard deviations either side of the mean used in the diurnal check.

Table 13: Variable attributes added to the netCDF file during processing.

OzFlux QC Flag Defintions

The OzFlux quality control (QC) system uses flags to indicate the quality of each data point. There is a QC flag for each variable for every time step. The value of the QC flag indicates the data quality and why it may have been rejected or what type of processing has been used.

The QC flag definitions are given in the table below.

Flag	Definition
0	Data has passed all QC checks
1	Data missing from L1 Excel spreadsheet
2	Failed range check
3	Failed CSAT check, Diag_CSAT flag!=0 (do_CSATcheck)
4	Failed 7500 check, Diag_7500 flag!=0 plus dependencies on AGC_7500, Ah_7500_Sd, Cc_7500_Sd, AhAh, CcCc (do_7500check)
5	Failed diurnal check
6	Date/time range excluded
7	Hour range excluded
8	Value of -9999 found with QC flag value of 0
9	Fre set to missing when (Fsd>threshold) or (ustar<threshold)
10	Linear correction or linear drift correction applied to data
11	Dependent data rejected during 2D coordinate rotation
12	Data rejected due to dependencies when calculating Massman frequency corrections (MassmanStandard)
13	Fh rejected during conversion of Fhv to Fh (FhvtoFh)
14	Fc rejected during WPL correction due to dependencies (Fc_WPLcov) Fe rejected during WPL correction due to dependencies (Fe_WPL) Fe rejected during WPL correction due to dependencies (Fe_WPLcov)
15	Ta calculated from CSAT Tv rejected due to dependencies (TaFromTv)
16	Data rejected at L3 due to failed range check (do_qcchecks)
17	Data rejected at L3 due to failed diurnal check (do_qcchecks)
18	Ustar below threshold (FilterUstar)
19	Data rejected during coordination of gaps in flux series

Table 14: Definition of QC flag values from 0 to 19.

Flag	Definition
20	GapFilling: Driver gap filled using alternate data CONFLICT: same code used by ReplaceRotatedCovariance
21	Missing rotated covariance replaced with non-rotated value CONFLICT: same code used in gfalternate_main
22	Soil moisture set to default value in CorrectFgForStorage
23	
24	
25	
26	
27	
28	
29	
30	GapFilling: Flux Gap Filled by ANN (SOLO)
31	GapFilling: Flux Gap not Filled by ANN
32	
33	
34	
35	Data replaced by alternate value when difference between data and alternate value exceeds threshold (ReplaceWhenDiffExceedsRange)
36	
37	
38	Data rejected at L4 due to failed range check (do_qcchecks)
39	Data rejected at L4 due to failed diurnal check (do_qcchecks)
40	Gap filled from climatology
41	No value available from GapFillUsingClimatology
42	
43	
44	
45	
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47	
48	
49	

Table 15: Definition of QC flag values from 20 to 49.

Flag	Definition
50	Gap filled by interpolation
51	Fsd below threshold when calculating albedo
52	Hour outside range 1000 to 1400 when calculating albedo
53	
54	
55	
56	
57	
58	
59	
60	Flux data generated by GapFillFluxFromDayRatio
61	Stomatal resistance less than 0 (get_stomatalresistance)
62	Fe less than threshold when calculating stomatal resistance (get_stomatalresistance)
63	Fsd less than threshold when calculating stomatal resistance (get_stomatalresistance)
64	Wind speed = 0 when calculating stomatal resistance (get_stomatalresistance)
65	
66	
67	
68	
69	
70	Partitioning Night: Re computed from exponential temperature response curves
71	
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73	
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78	
79	

Table 16: Definition of QC flag values from 50 to 79.

Flag	Reason
80	Partitioning Day: GPP/Re computed from light-response curves, GPP = Re - Fc
81	Partitioning Day: GPP night mask
82	Partitioning Day: Fc > Re, GPP = 0, Re = Fc
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84	
85	
86	
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Table 17: Definition of QC flag values from 80 to 100.