FAAM

Basic Data Guide

VERSION 1.0

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1. Introduction

The Facility for Airborne Atmospheric Measurements (FAAM) provides data from the BAe146 aircraft core instrumentation to its users as a matter of routine for every science flight carried out. This document is a basic guide for those new to using FAAM data, and should provide a user with the basic understanding and further links to obtain and utilise the data successfully.

2. Access to Data

FAAM provides the aircraft and a centrally-maintained set of 'Core' measurements from instruments it maintains, as well as a few parameters measured by the aircraft avionics instruments. The vast majority of this instrumentation flies on every flight, but where a project has no interest in one or more 'Core' parameters then some instruments may not be fitted or operated. Examples may include certain cloud physics, chemistry or aerosol equipment. Tables 1(a) and (b), in this document's Appendix, contain the measurements that FAAM treats as Core.

FAAM additionally provides the aircraft platform for use by external research groups for their own instrumentation, on a project-by-project basis. Data from these instruments are regarded as Non-Core. Arrangements for the production and dissemination of Non-Core datasets are non-standard, and may involve non-routine processing procedures. Users requiring Non-Core data should contact the instrument owner for data, FAAM can supply contact details if necessary. From this point on, this document concentrates on the treatment of FAAM Core data.

2.1 The BADC Archive

The British Atmospheric Data Centre (BADC) holds FAAM Core data for every flight, within the Centre for Environmental Data Archival (CEDA). The data are held securely in a form that can be readily downloaded by all users. In order to obtain these data users must apply for access, which is a simple process. For the CEDA page that describes the FAAM datasets, access and other topics, visit
http://badc.nerc.ac.uk/data/faam/

3. Data and Metadata Provision

Data from any given research flight consist of several files in Network Common Data Format (NetCDF, see Section 4) containing processed data, typically at high and low data rates. In addition to the measurements there is also generally a ‘quality’ text file generated following a basic level of QA/QC, and a ‘flight summary’ text file which seeks to describe timings of aircraft manoeuvres to which the processed data relate. FAAM also creates a flight-log file (as a pdf), which contains a range of log sheets, mission briefs, a crew list, maps and forecasts and other supporting information provided to describe the purpose and conditions in which the flight was conducted.

3.1 Timescales

Under normal circumstances the initial data processing and QA will be carried out within 24 hours of a science flight, and processed NetCDF data files will be made available to users on the BADC at this point. Special provisions often have to be made when the aircraft is away from its home base because of the lower-quality internet connection or other factors. In many cases local processing will still be done immediately, and data shared locally with project participants before being archived at the BADC at a later point.

3.2 Revisions and Versions

FAAM data can be subject to revision after archival at the BADC for a number of reasons. The filename contains a revision field (eg r0, r1 etc) which indicates that further work has been done to improve the quality of data within the file, either by changing calibration constants or deleting/reinstating/flagging data.

The data-file name also contains a version field (v0, v1, etc), the use of which is less well understood. The intention here is to signify data which might be processed by some alternative method, where the raw data and calibration information remain the same but which are then processed using alternative code or a different algorithm.

3.3 Flagging

Typically, data parameters in Appendix 1 have accompanying data flags, listed as individual parameters in their own right. These flags indicate the instantaneous validity of the data, and may also indicate some special conditions such as calibrations or data states. They should be used in conjunction with the data. Flagging schemes are generally available in the metadata for each instrument, but a generic scheme is as follows:

Flag	Status
0	Data Good
1	Possible Minor Issue
2	Possible Major Issue
3	Data Bad

3.4 Metadata

Supporting information that helps a user apply FAAM data to their application is generally available, but not always held in the most rigorous or user-facing manner. It is also often not easy to find. Instrument manuals, operating procedures, calibration procedures and calibration results are some examples of supporting data that are more-or-less available.

Sources of metadata appropriate to FAAM instrumentation is held in a number of locations:

1) FAAM instrument webpages: the user may have to make some educated guesswork to link a NetCDF parameter name to an instrument webpage. Links have been added to the measurement tables in Appendix 1 where possible.
2) http://badc.nerc.ac.uk/browse/badc/faam/doc/FAAM_Instrument_Metadata
This list is not complete, and parameters are listed by their old Parameter Number.
3) Publications containing FAAM data
4) At FAAM!

While FAAM explore better ways to make this kind of Metadata available, users should feel welcome to contact instrument team members directly for any help or information that they need. Contacts for instruments are given in tables 1(a) and (b) in the appendix, and contact details are available for all members of the team on the FAAM website. If in doubt contact the FAAM Instrument Manager.

4. NetCDF

As mentioned elsewhere in this document, FAAM's data are grouped together and published as a few files in NetCDF format. For those unfamiliar with NetCDF, it is a binary file standard developed and maintained by the Unidata program at the University Corporation for Atmospheric Research (UCAR) in the USA. Resources can be found here:
http://www.unidata.ucar.edu/software/netcdf/

In brief, the NetCDF format is self-describing, portable across different hardware and software platforms, permits efficient use of its data, can be easily appended and shared, and reliably archived.

The BADC briefly discusses NetCDF here, including providing some tools for viewing and manipulating the data:
http://badc.nerc.ac.uk/help/formats/netcdf/index.html

FAAM users typically use NetCDF tools in IDL, Igor or MatLab in order to analyse the FAAM data. Code for IGOR and some brief notes have been archived on the BADC here:
http://badc.nerc.ac.uk/browse/badc/faam/software/IGOR

A resource for Matlab analysis code is available here, at a website set up for the Greenland Flow Distortion experiment (GFDex)
http://www.uea.ac.uk/~e046/research/gfdex/data/code/code.htm

To simply view or extract data from a NetCDF file, one available tool, AEROS, is maintained by UCAR at:
https://www.eol.ucar.edu/software/aeros

FAAM is always interested in helping its user community. If readers of this document use other software tools for analysis of FAAM NetCDF data, or have developed useful code that could be employed by others then we invite you to make them available, either via the FAAM website or any other means. Please get in touch!

Appendix 1. Data Tables

FAAM core data is currently split between a 'core-cloud-phys' file, containing data from the cloud physics probes, and a 'core' file containing everything else. Tables 1(a) [core] and (b) [core-cloud-phys] detail the parameters contained within these files, and provide some context for new users. These notes only permit short descriptions of the measurements, for more information please visit the weblinks (where available) see the Metadata section or contact the FAAM instrument team member(s) directly.

In general the parameters in the following tables also have an accompanying _FLAG parameter, this serves to highlight the validity of these data at any given point.

Core Data NetCDF Measurements
NB GIN = GPS/ Inertial Navigation equipment, the science navigation equipment rather than the aircraft data.

Parameter Name	Parameter Description	Notes	FAAM Contact
ACLD_GIN	Acceleration along the aircraft vertical axis (GIN) (positive down)	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
ACLF_GIN	Acceleration along the aircraft longitudinal axis (GIN) (positive forward)	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
ACLS_GIN	Acceleration along the aircraft transverse axis (GIN) (positive starboard)	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
ALT_GIN	Altitude from POS AV 510 GPS-aided Inertial Navigation unit	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley

Parameter Name	Parameter Description	Notes	FAAM Contact
AOA	Angle of attack from the turbulence probe (positive, flow upwards wrt a/c axes)	Angle-of-attack is defined here as the vertical angle that the aircraft longitudinal axis makes with the vector representing the motion of the incident air. Subject to errors in icing conditions. http://www.faam.ac.uk/index.php/science-instruments/turbulence/117-turbulence-probe	Alan Woolley
AOSS	Angle of sideslip from the turbulence probe (positive, flow from left)	Angle-of-attack is defined here as the horizontal angle that the aircraft longitudinal axis makes with the vector representing the motion of the incident air. Subject to errors in icing conditions. http://www.faam.ac.uk/index.php/science-instruments/turbulence/117-turbulence-probe	Alan Woolley
BSC_BLUU	Uncorrected blue back scattering coefficient from TSI 3563 nephelometer.	Scattering signal with light blocked between 7 and 90° at 450 nm. Used to calculate forward scattering from the calculation TSC_BLUU-BSC_BLUU.	Jamie Trembath
BSC_GRNU	Uncorrected green back scattering coefficient from TSI 3563 nephelometer.	Scattering signal with light blocked between 7 and 90° at 550 nm. Used to calculate forward scattering from the calculation TSC_GRNU-BSC_GRNU.	Jamie Trembath
BSC_REDU	Uncorrected red back scattering coefficient from TSI 3563 nephelometer.	Scattering signal with light blocked between 7 and 90° at 700 nm. Used to calculate forward scattering from the calculation TSC_REDU-BSC_REDU.	Jamie Trembath
BTHEIM_C	Upwelling infrared brightness temperature from the Heimann radiometer.	Heimann Radiometer is a downward-looking 8-12 micron IR Camera. Corrected values use data from flight calibration using a black-body target at a known temperature. The brightness temperature result assumes a surface emissivity of 1.	Alan Woolley
BTHEIM_U	Uncorrected brightness temperature from the Heimann radiometer	Heimann Radiometer is a downward-looking 8-12 micron IR Camera. Corrected values, above, use data from flight calibration using a black-body target at a known temperature.	Alan Woolley
CAB_PRES	Cabin pressure		Alan Woolley

Parameter Name	Parameter Description	Notes	FAAM Contact
CAB_TEMP	Cabin temperature at the core consoles	Measuring cabin temperature is an inexact science, given the huge local variability within the cabin. Take this as a relative measurement.	Matt Gascoyne
CO_AERO	Mole fraction of Carbon Monoxide in air from the AERO AL5002 instrument	http://www.faam.ac.uk/index.php/science-instruments/chemistry/127-co-aerolaser (Pre-2011 instrument set-up, but many similarities)	Stéphane Bauguitte
GSPD_GIN	Groundspeed from POS AV 510 GPS-aided Inertial Navigation unit	Aircraft speed relative to the ground. http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
HDG_GIN	Heading from POSAV GPS-aided Inertial Navigation unit	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
HDGR_GIN	rate-of-change of GIN heading	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
HGT_RADR	Radar height from the aircraft radar altimeter.	This is the measured height of the lowest part of the aircraft above whatever terrain is beneath. This reads zero when the aircraft wheels are on the ground.	Alan Woolley
IAS_RVSM	Indicated air speed from the aircraft RVSM (air data) system.	Indicated Airspeed is that derived from the aircraft static/dynamic pressure measurements	Alan Woolley
LAT_GIN	Latitude from POS AV 510 GPS-aided Inertial Navigation unit	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
LON_GIN	Longitude from POS AV 510 GPS-aided Inertial Navigation unit	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
LWC_JW_U	Uncorrected liquid water content from the Johnson Williams instrument.	A bulk measurement of liquid water content in the air being flown through. 'Correction' involves simply removing baseline drift that occurs in some clouds or in changes in height or airspeed.	Alan Woolley

Parameter Name	Parameter Description	Notes	FAAM Contact
NEPH_HUM	Internal sample humidity of the nephelometer	Relative humidity of the nephelometer sample from 5 to 95% ± 5%.	Jamie Trembath
NEPH_PR	Internal sample pressure of the Nephelometer	Absolute pressure in the nephelometer measurement volume. Used with the temperature sensors to correct Rayleigh scattering coefficient of air in the measurement volume.	Jamie Trembath
NEPH_T	Internal sample temperature of the Nephelometer	Absolute temperature measured from the outlet temperature sensor. This sensor is closest to the operating temperature of the measurement volume. This value should be used for calculations requiring sample temperature and is used with the pressure sensor to correct Rayleigh scattering coefficient of air in the measurement volume.	Jamie Trembath
O3_TECO	Mole fraction of ozone in air from the TECO 49 instrument	http://www.faam.ac.uk/index.php/science-instruments/chemistry/64-instruments	Stéphane Bauguitte
P0_S10	Calibrated differential pressure between centre(P0) port and S10 static	Used as part of U_C, V_C and W_C derivation. http://www.faam.ac.uk/index.php/science-instruments/turbulence/117-turbulence-probe	Alan Woolley
P9_STAT	Static pressure from S9 fuselage ports	A science ‘static’ port, uncharacterised so use with caution.	Alan Woolley
PA_TURB	Calibrated differential pressure between turbulence probe vertical ports	Used as part of U_C, V_C, W_C and AOA derivation. http://www.faam.ac.uk/index.php/science-instruments/turbulence/117-turbulence-probe	Alan Woolley
PALT_RVS	Pressure altitude from the aircraft RVSM (air data) system	The altitude (in this case height above mean sea level) in the International Standard Atmosphere represented by the measured static pressure (PS_RVSM)	Alan Woolley

Parameter Name	Parameter Description	Notes	FAAM Contact
PB_TURB	Calibrated differential pressure between turbulence probe horizontal ports	Used as part of U_C, V_C, W_C and AOSS derivation. http://www.faam.ac.uk/index.php/science-instruments/turbulence/117-turbulence-probe	Alan Woolley
PITR_GIN	rate-of-change of GIN pitch angle	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
PS_RVSM	Static pressure from the aircraft RVSM (air data) system	Air pressure measured at an exterior port on the aircraft fuselage that is generally representative of atmospheric pressure.	Alan Woolley
PSAP_LIN	Uncorrected absorption coefficient at 565nm, linear, from PSAP.	Linear output, measured using the integrating plate technique, where a change in optical transmission of a filter by deposition of particulate mater is related to the optical absorption coefficicent using Beer's law. Measures between 0 and $5e^{-5}$ m^{-1}. For basic corrections see Bond 1999.	Jamie Trembath
PSAP_LOG	Uncorrected absorption coefficient at 565nm, log, from PSAP.	Log of the above scalar. Due to the analogue output being limited to 5V a log output allows for high concentration data, that would have saturated the linear scale, to be recorded. Output range between $5e^{-7}$ and $5e^{-2}$ m^{-1}.	Jamie Trembath
PSP_TURB	Pitot-static pressure from centre-port measurements corrrected for AoA and AoSS	Used as part of U_C, V_C and W_C derivation.	Alan Woolley
PTCH_GIN	Pitch angle from POSAV GPS-aided Inertial Nav. unit (positive for nose up)	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
Q_RVSM	Pitot-static pressure inverted from RVSM (air data) system indicated airspeed	The dynamic pressure induced by the aircraft's motion through the air.	Alan Woolley

Parameter Name	Parameter Description	Notes	FAAM Contact
RED_DN_C	Corrected downward short wave irradiance, red dome	Measured using Eppley Pyranometer instruments on top of the aircraft, fitted with red domes, with corrections for pitch and other non-idealities. http://www.faam.ac.uk/index.php/science-instruments/remote-sensing/100-broadband-radiometers	Alan Woolley
RED_UP_C	Corrected upward short wave irradiance, red dome	Measured using Eppley Pyranometer instruments beneath the aircraft, fitted with red domes, with corrections for pitch and other non-idealities. http://www.faam.ac.uk/index.php/science-instruments/remote-sensing/100-broadband-radiometers	Alan Woolley
ROLL_GIN	Roll angle from POSAV GPS-aided Inertial Nav. unit (positive for left wing up)	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
ROLR_GIN	rate-of-change of GIN roll angle	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
SOL_AZIM	Solar azimuth derived from aircraft position and time.		Alan Woolley
SOL_ZEN	Solar zenith derived from aircraft position and time.		Alan Woolley
SW_DN_C	Corrected downward short wave irradiance, clear dome	Measured using Eppley Pyranometer instruments on top of the aircraft, with corrections for pitch and other non-idealities. http://www.faam.ac.uk/index.php/science-instruments/remote-sensing/100-broadband-radiometers	Alan Woolley
SW_UP_C	Corrected upward short wave irradiance, clear dome	Measured using Eppley Pyranometer instruments beneath the aircraft, with corrections for pitch and other non-idealities. http://www.faam.ac.uk/index.php/science-instruments/remote-sensing/100-broadband-radiometers	Alan Woolley

Parameter Name	Parameter Description	Notes	FAAM Contact
TAS	True airspeed (dry-air) from turbulence probe	Used as part of U_C, V_C and W_C derivation.	Alan Woolley
TAS_RVSM	True air speed from the aircraft RVSM (air data) system and deiced temperature.	True Airspeed is the actual speed of the aircraft relative to the airmass in which it is flying.	Alan Woolley
TAT_DI_R	True air temperature from the Rosemount deiced temperature sensor.	The true or static air temperature, measured by a system that employs deicing heat to keep the inlet free of frost/ice (the effect of which is corrected). http://www.faam.ac.uk/index.php/science-instruments/temperature/102-rosemount-total-air-temperature	Alan Woolley
TAT_ND_R	True air temperature from the Rosemount non-deiced temperature sensor.	The true or static air temperature, measured by a system that does not employ deicing heat to keep the inlet free of frost/ice (sometimes becomes iced-up, but generally less prone to calibration drift than deiced sensor). http://www.faam.ac.uk/index.php/science-instruments/temperature/102-rosemount-total-air-temperature	Alan Woolley
TDEW_C_U	Uncertainty estimate for Buck CR2 Mirror Temperature	A dynamically-calculated uncertainty estimate for the quality of the TDEW_CR2 data. http://www.faam.ac.uk/index.php/science-instruments/humidity/112-cr2	Alan Woolley
TDEW_CR2	Mirror Temperature measured by the Buck CR2 Hygrometer	A relatively slow but absolute chilled-mirror technique. http://www.faam.ac.uk/index.php/science-instruments/humidity/112-cr2	Alan Woolley
TDEW_GE	Dew point from the General Eastern instrument.	A relatively slow but absolute chilled-mirror technique, data are reported as mirror temperature. Assume that this is frostpoint at or below 273.15K. http://www.faam.ac.uk/index.php/science-instruments/humidity/111-general-eastern	Alan Woolley

Parameter Name	Parameter Description	Notes	FAAM Contact
Time	Time of measurement (seconds since midnight on start date)	UTC time obtained by reference to GPS system	Matt Gascoyne
TRCK_GIN	Aircraft track angle POSAV GPS-aided Inertial Navigation unit	Track differs from heading because of the effect of wind. http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
TSC_BLUU	Uncorrected blue total scattering coefficient from TSI 3563 nephelometer.	Total scattering collected between 7 and 170° at 450 nm.	Jamie Trembath
TSC_GRNU	Uncorrected green total scattering coefficient from TSI 3563 nephelometer.	Total scattering collected between 7 and 170° at 550 nm.	Jamie Trembath
TSC_REDU	Uncorrected red total scattering coefficient from TSI 3563 nephelometer.	Total scattering collected between 7 and 170° at 700 nm.	Jamie Trembath
TWC_DET	Raw data from the TWC probe Lyman alpha detector	TWC = Total Water Content	Duncan MacLeod
TWC_EVAP	Total water specific humidity from the TWC evaporator instrument	Uses a comparison technique with TDEW_GE to allow the TWC detector to produce absolute measurements of humidity	Duncan MacLeod
TWC_TDEW	Dew-point derived from TWC probe specific humidity (valid in cloud-free air)	Uses a comparison technique with TDEW_GE to allow the TWC detector to produce absolute measurements of humidity	Duncan MacLeod

Parameter Name	Parameter Description	Notes	FAAM Contact
TWC_TSAM	Sample temperature in Kelvin from the TWC evaporator probe		Duncan MacLeod
U_C	Eastward wind component from turbulence probe and GIN	Derived from a combination of the aircraft airspeed and groundspeed vectors with air incidence angle measurements. Subject to errors in icing conditions	Alan Woolley
U_NOTURB	Eastward wind component derived from aircraft instruments and GIN	Derived from a combination of the aircraft airspeed and groundspeed vectors, produces a bulk wind vector measurement of slightly lower quality than U_C regardless of icing conditions http://www.faam.ac.uk/index.php/science-instruments/turbulence/446-aircraft-horizontal-wind	Alan Woolley
V_C	Northward wind component from turbulence probe and GIN	Derived from a combination of the aircraft airspeed and groundspeed vectors with air incidence angle measurements. Subject to errors in icing conditions	Alan Woolley
V_NOTURB	Northward wind component derived from aircraft instruments and GIN	Derived from a combination of the aircraft airspeed and groundspeed vectors, produces a bulk wind vector measurement of slightly lower quality than V_C regardless of icing conditions http://www.faam.ac.uk/index.php/science-instruments/turbulence/446-aircraft-horizontal-wind	Alan Woolley
VELD_GIN	Aircraft velocity down from POS AV 510 GPS-aided Inertial Navigation unit	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
VELE_GIN	Aircraft velocity east from POS AV 510 GPS-aided Inertial Navigation unit	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley

Parameter Name	Parameter Description	Notes	FAAM Contact
VELN_GIN	Aircraft velocity north from POS AV 510 GPS-aided Inertial Navigation unit	http://www.faam.ac.uk/index.php/science-instruments/primary-systems/103-gin	Alan Woolley
VMR_C_U	Uncertainty estimate for water vapour volume mixing ratio measured by the Buck CR2	A dynamically-calculated uncertainty estimate for the quality of the VMR_CR2 data. http://www.faam.ac.uk/index.php/science-instruments/humidity/112-cr2	Alan Woolley
VMR_CR2	Water vapour volume mixing ratio measured by the Buck CR2	A relatively slow but absolute chilled-mirror technique, data are reported as mirror temperature. Software attempts to identify the mirror state based on earlier data. http://www.faam.ac.uk/index.php/science-instruments/humidity/112-cr2	Alan Woolley
W_C	Vertical wind component from turbulence probe and GIN	Derived from a combination of the aircraft airspeed and groundspeed vectors with air incidence angle measurements. Subject to errors in icing conditions	Alan Woolley

Cloud Physics NetCDF Parameters

Parameter Name	Parameter Description	Notes	FAAM Contact
Time	Seconds since midnight on start date		
2DTSPM	Time UTC seconds past midnight for 2D-C and 2D-P	NB: 2D-P is no longer used and is an invalid reference.	Graeme Nott and Angela Dean
2DC_CONC	Particle concentration from the 2DC	The sum of particle concentrations for each channel.	Graeme Nott and Angela Dean
2DC_CONC_FLAG	Flag for particle concentration from the 2DC	Indicates if 2DC concentration data (includes zero concentration) is available. 3 = no data. 0 = data.	Graeme Nott and Angela Dean
2DC_IWC	Water content from 2DC assuming ice	Ice water content, calculated using the sum of particle concentrations for each channel, the centre of each bin, and various constant coefficients.	Graeme Nott and Angela Dean
2DC_IWC_FLAG	Flag for Ice water content from 2DC	Indicates if 2DC ice water content data (includes zero content) is available for this channel. 3 = no data. 0 = data.	Graeme Nott and Angela Dean
2DC_LWC	Water content from 2DC assuming liquid	Liquid water content, calculated using the sum of particle concentrations for each channel, the centre of each bin, and various constant coefficients.	Graeme Nott and Angela Dean
2DC_LWC_FLAG	Flag for Liquid water content from 2DC	Indicates if 2DC liquid water content data (includes zero content) is available for this channel. 3 = no data. 0 = data.	Graeme Nott and Angela Dean
2DC_CH[00 to 31] ;	2DC Concentration in size channel [0 to 31]	Particle concentration for each channel, calculated using particle counts per channel, the depth of field, aircraft True Air Speed, width of the sample area and the elapsed time (between particles).	Graeme Nott and Angela Dean
2DC_CH[00 to 31]_FLAG	Flag for 2DC Concentration in size channel [0 to 31]	Indicates if 2DC concentration data (includes zero concentration) is available for this channel.	Graeme Nott and Angela Dean

Parameter Name	Parameter Description	Notes	FAAM Contact
PCAS2CH	PCASP (SPP200) Channel Number	List of all channel numbers.	Graeme Nott
PCAS2TSPM	Time UTC seconds past midnight for PCASP2 (SPP200)	Time derived from raw PADS data file as a non-integer number of seconds from midnight. May be >86400. Core data are taken from the nearest whole second for processing.	Graeme Nott
PCAS2CON	Droplet concentration from PCASP2 (SPP200) channels 2 to 30 included	Total droplet concentration summed over size channels 2-30 (cm^{-3}). -9999 indicates invalid or missing data.	Graeme Nott
PCAS2_FL	Volumetric sample flow rate through PCASP2 (SPP200)	Volumetric sample flow calculated using core ambient data (cm^3/s). -9999 indicates invalid or missing data.	Graeme Nott
PCAS2_FLAG	Flag for droplet concentration from PCASP2 (SPP200) channels 2 to 30 included	Data quality flag 0-3. 0, adequate. 1, Sheath:sample flow ratio too low. 2, Unknown. 3, Invalid.	Graeme Nott
PCAS2_[01 to 30]	PCASP2 (SPP200) conc in size channel [1 to 30]	Droplet concentration in single size channel (cm^-3). -9999 indicates invalid or missing data.	Graeme Nott
PCAS2_[01 to 30]_err	Percentage error in PCASP2 (SPP200) conc in size channel [1 to 30]	Relative uncertainty in droplet concentration in single size channel (%). Calculation method unknown. -9999 indicates invalid or missing data.	Graeme Nott
PCAS2_D_L_NOM	Nominal uncalibrated channel diameter lower limits as given in the instrument manual	Unused	Graeme Nott
PCAS2_D_L_CAL	Calibrated channel diameter lower limits	Unused	Graeme Nott
PCAS2_D_U_CAL	Calibrated channel diameter upper limits	Unused	Graeme Nott

Parameter Name	Parameter Description	Notes	FAAM Contact
PCAS2_D_L_ERR	Error in calibrated channel diameter lower limits	Unused	Graeme Nott
PCAS2_D_U_ERR	Error in calibrated channel diameter upper limits	Unused	Graeme Nott
PCAS2_D_L_RI	Refractive index of the aerosol used to calibrate channel diameter lower limits	Unused	Graeme Nott
PCAS2_D_U_RI	Refractive index of the aerosol used to calibrate channel diameter upper limits	Unused	Graeme Nott
PCAS2_D_L_COMP	Composition of the aerosol used to calibrate channel diameter lower limits	Unused	Graeme Nott
PCAS2_D_U_COMP	Composition of the aerosol used to calibrate channel diameter upper limits	Unused	Graeme Nott
CDP_TSPM	Time UTC seconds past midnight for CDP		Angela Dean.
CDPCH	CDP Channel Number	Channel identifier. This will always be 1 to 30 for the FAAM CDP.	Angela Dean.
CDP_CONC	Total droplet concentration from CDP channels 1 to 30 included	Particle concentration calculated using sum of individual channel concentrations. Also: http://www.faam.ac.uk/index.php/science-instruments/cloud-physics/108-cdp for CDP info, and the CP_flightlog on the BADC for flight specific notes on instrument performance.	Angela Dean.

Parameter Name	Parameter Description	Notes	FAAM Contact
CDP_[01 to 30]	Droplet concentration in CDP size channel [1 to 30]	Particle concentration for each channel, calculated using channel count, the CDP sample area, and the aircraft True Air Speed. Also: http://www.faam.ac.uk/index.php/science-instruments/cloud-physics/108-cdp for CDP info, and the CP_flightlog on the BADC for flight specific notes on instrument performance.	Angela Dean.
CDP_D_L_NOM	Nominal uncalibrated channel diameter lower limits as given in the instrument manual	Unused.	Angela Dean.
CDP_D_U_NOM	Nominal un-calibrated channel diameter upper limits as given in the instrument manual	Nominal 3 to 50 microns, over the 30 channels.	Angela Dean.
CDP_D_L_CAL	Calibrated channel diameter lower limits	Unused. For calibration data, see contact.	Angela Dean.
CDP_D_U_CAL	Calibrated channel diameter upper limits	Unused. For calibration data, see contact.	Angela Dean.
CDP_D_L_ERR	Error in calibrated channel diameter lower limits	Unused. For calibration data, see contact.	Angela Dean.
CDP_D_U_ERR	Error in calibrated channel diameter upper limits	Unused. For calibration data, see contact.	Angela Dean.
CDP_FLAG	Flag for droplet concentration from CDP channels 2 to 30 included	Indicates if CDP concentration data (includes zero concentration) is available. 3 = no data. 0 = data.	Angela Dean.