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Category	Instrument	Description, units	Variable name
Atmospheric State			
Air Temperature	Reverse-flow temperature sensor	Reference static air temperature, °C	trf
	Rosemount 102 temperature sensor	Secondary static air temperature, °C	trose
	Derived parameter	Potential temperature, K	thetad
Atmospheric Moisture – Water Vapor	EdgeTech Vigiliant model 137 chilled mirror hygrometer	Dewpoint temperature, °C	tdp
	Derived parameters	EdgeTech relative humidity, %	rh
		EdgeTech equivalent potential temperature, K	thetae
		LI-COR LI-7000 dewpoint temperature (cell B), °C	tdp70
		LI-COR LI-7000 relative humidity (derived using tdp70, trf, and ps_hads_a), %	rhli70
		Nevzorov hot wire cloud liquid water content, g/m^3	nevlwc
		Nevzorov hot wire total water content (ice + liquid), g/m^3	nevtwc
		LI-COR LI-7500 dewpoint temperature, °C	tdplicor75
Atmospheric Moisture – Condensed Water and Ice	*Derived parameters*	EdgeTech water vapor mixing ratio, g/kg	mr
		DMT LWC-301 hot wire cloud liquid water content, g/m^3	lwc301lwc
		Rosemount 871FA cloud liquid water content, g/m^3	rlwc
		DMT CDP Liquid Water Content – rebinned, g/m^3	cdplwc_NRB
		HVPS hydrometeor mass derived using m(D) relationships, g/cm^4	mass
		HVPS hydrometeor mass derived using Baker & Lawson method, g/cm^4	massBL

Atmospheric Pressure	Rosemount 1501 HADS static pressure sensor	Primary static air pressure (module A), hPa	ps_hads_a
		Static air pressure (module B), hPa	ps_hads_b
	Weston static pressure sensor	Static air pressure, hPa	ps_weston
	CPT 6140 static pressure sensor	Static air pressure, hPa	ps_CPT6140
	CPT 9000 static pressure sensor	Static air pressure, hPa	ps_CPT9000
	Diagnostic parameter	CPT 9000 sensor temperature, °C	temp_CPT9000
	Noseboom pitot	Static pressure correction calculation	dpa/dpb/dpr
Wind Components	Applanix AV 410 GPS/Inertial Measurement Unit *(see additional notes for Applanix parameters below under Aircraft State)*	u/v/w wind components (using AIAS), m/s	avuwind/avvwind/avwwind
		Wind direction/magnitude (using AIAS), deg; m/s	avwinddir/avwinddmag
		Longitudinal/lateral horizontal wind components, m/s	avux/avvy
Atmospheric Turbulence	MRI turbulence sensor	MRI Eddy dissipation rate ^1/3 u-component, MKS	turb
Photographic Imagery	Forward and downward cameras	Photo imagery at 1-Hz, imagery may be stitched to flight track in .kml files upon request	
Aircraft state			
Aircraft Position and Orientation	Applanix AV 410 GPS/Inertial Measurement Unit	Ground velocity in E-W/N-S/up components, m/s	avewvel/avnsvel/avzvel
		Ground speed, m/s	avgs
		Roll/pitch/heading, deg	avroll/avpitch/avthead
		Latitude/longitude, deg	avlat/avlon
		Orthometric/ellipsoid altitude, m	avzmsl/avzell
		Track angle, deg	avtrack
		Roll/pitch/yaw angle rate, rad/s	avrollr/avpitchr/avyawr
		Body-axis longitudinal/lateral/vertical acceleration component, m/s^2	avlonga/avlata/avnorma

		East/north position, km	avxdist/avydist
	Initial diagnostic parameters (real-time Applanix output)	Vertical/horizontal dilution of precision, factor	avvdop/avhdop
		North/east/down position RMS, m	avnposrms/avepposrms/avdposrms
		North/east/down velocity RMS, m/s	avnvelrms/avevelrms/avdvelrms
		Roll/pitch/heading angle RMS, deg	avrollrms/avpitchrms/avtheadrms
	Post-processed measurements and diagnostic parameters	Flight data are typically post-processed to incorporate high-precision satellite data available several days subsequent to each flight. With the exception of removing the real-time dilution of precision, the parameters above are replaced with a higher-accuracy with the parameter names beginning with capitalized 'AV', for example *AVlat* rather than the original *avlat*.	
		Attack angle (corrected), deg	alpha
		Sideslip angle (corrected), deg	beta
Altitude (AGL)	Stewart Warner APN159 radar altimeter	Altitude above ground, m	ralt3
	Diagnostic parameter		ralt3qc
Airspeed		Reference indicated airspeed, m/s	aias
	Co-pilot pitot	Secondary indicated airspeed, m/s	bias
		True airspeed, m/s	tas
		Reference true airspeed, m/s	TASX
Engine Torque			torque
Cabin Air Pressure	Cabin air pressure sensor	Ambient cabin air pressure, hPa	cabinp
Timekeeping Parameters		Seconds since start of project year	time
		UTC time in HHMMSS	TIME
		Date in YYYYMMDD	DATE
		Hours from midnight (UTC)	HOUR
		Minutes from beginning of HOUR	MINUTE
		Seconds from beginning of MINUTE	SECONDS

Cloud Physics			
Bulk Properties – Ice and Liquid Mass Content	DMT LWC-301 hot wire probe	Derived cloud liquid water content, g/m^3	lwc301lwc
	Diagnostic parameters	Sensor power, W	lwc301power
		Liquid water content, g/m^3	lwc301ave
		Liquid water content, g/m^3	lwc301cal
	Nevorov hot-wire TWC-LWC probe - *derived parameters*	Liquid water content, g/m^3	nevlwc
		Total water content (ice + liquid), g/m^3	nevtwc
	Rosemount 871FA icing sensor	Icing sensor cycles	rid_cycles
	Derived parameters	Rosemount 871FA cloud liquid water content, g/m^3	rlwc
		DMT CDP Liquid Water Content – rebinned, g/m^3	cdplwc_NRB
Hydrometeor Spectra and Properties	*Note: HVPS, 2DS, CIP, and 2DP have separate data systems, raw and processed files are available. Processed CIP and 2DP output is also available in the primary processed flight data files.*		
	SPEC High-Volume Precipitation Spectrometer (HVPS)	*Hydrometeor particle imagery (150 µm resolution) and size distribution – primary measurement for large hydrometeors*	
	Processed output	Hydrometeor number concentration, #/cm^3	n
		Number count for partial images with no correction	count
		Hydrometeor size distribution using maximum particle diameter, #/cm^4	conc_minR
		Area ratio per size bin, #/cm^4	area
		Hydrometeor size distribution using area-equivalent diameter, #/cm^4	conc_AreaR
		Total projected area (extinction), mm^2/cm^4	total_area
		Hydrometeor mass derived using m(D) relationships, g/cm^4	mass
		Hydrometeor size distribution with respect to habit, #/cm^4	habitsd
		Effective hydrometeor radius, mm	re
		Hydrometeor mass derived using Baker & Lawson method, g/cm^4	massBL
		Mass-weighted terminal hydrometeor velocity, m/s	vt
		Precipitation rate, mm/hr	Prec_rate
		Mass distribution with respect to habit, g/cm^4	habitmsd

		Hydrometeor area derived using A-D relationships, mm^2/cm^4	Calcd_area
	Diagnostic and timekeeping parameters	time, HHMMSS	Time
		Size bin minimum size, mm	bin_min
		Size bin maximum size, mm	bin_max
		Size bin midpoint size, mm	bin_mid
		Size bin width, mm	bin_dD
		Area ratio, %	ar
		Rejection ratio, %	Reject_ratio
		Mean area ratio	mean_area_ratio
		Mean hydrometeor perimeter	mean_perimeter
	SPEC Two-Dimensional Stereo particle imager (2DS)	*Hydrometeor particle imagery (10 µm resolution) and size distribution; measurements available from two orthogonal orientations, horizontal (H) and vertical (V)*	
	Processed output	Hydrometeor number concentration, $\#/cm^3$	n
		Number count for partial images with no correction	count
		Hydrometeor size distribution using maximum particle diameter, $\#/cm^4$	conc_minR
		Area ratio per size bin, $\#/cm^4$	area
		Hydrometeor size distribution using area-equivalent diameter, $\#/cm^4$	conc_AreaR
		Total projected area (extinction), mm^2/cm^4	total_area
		Hydrometeor mass derived using m(D) relationships, g/cm^4	mass
		Hydrometeor size distribution with respect to habit, $\#/cm^4$	habitsd
		Effective hydrometeor radius, mm	re
		Hydrometeor mass derived using Baker & Lawson method, g/cm^4	massBL
		Mass-weighted terminal hydrometeor velocity, m/s	vt
		Precipitation rate, mm/hr	Prec_rate
		Mass distribution with respect to habit, g/cm^4	habitmsd
		Hydrometeor area derived using A-D relationships, mm^2/cm^4	Calcd_area

	Diagnostic and timekeeping parameters	time, HHMMSS	Time
		Size bin minimum size, mm	bin_min
		Size bin maximum size, mm	bin_max
		Size bin midpoint size, mm	bin_mid
		Size bin width, mm	bin_dD
		Area ratio, %	ar
		Rejection ratio, %	Reject_ratio
		Mean area ratio	mean_area_ratio
		Mean hydrometeor perimeter	mean_perimeter
	DMT Two-Dimensional Greyscale Cloud Imaging Probe (CIP)	*Hydrometeor particle imagery (25 µm resolution) and size distribution; measurements available at three levels of greyscale sensitivity; parameter names are appended with _IBR if the instrument was installed in the inboard right wing-tip canister and _OBR if in the outboard canister*	
	Base processed parameters	Shadow OR, #/L	twodcip
		Number of particles	npart_cip
		Number of particles in cell (IX, no sample volume correction)	ACIP0
		Number of particles in cell (IX, no sample volume correction)	ACIP0
		Number of particles in cell (IY, all-in, no sample volume correction)	ACIP1
		Number of particles in cell (max(IX,IY), IY all-in, no sample volume correction)	ACIP2
	Derived parameters	Particle concentration [IX, sample volume correction IX/(64+IX)], #/L	CONC0_cip
		Particle concentration [IY, all-in, sample volume correction IY/(62-IY)], #/L	CONC1_cip
		Mass concentration [IX, sample volume correction IX/(64+IX)], g/m^3	mass0_cip
		Mass concentration [IY, all-in, sample volume correction IY/(62-IY)], g/m^3	mass1_cip
		Concentration per cell [IX, sample volume correction IX/(64+IX)], #/L	CCIP0

		Concentration per cell [IX, sample volume correction IX/(64+IX)], #/L	CCIPsz0
		Concentration per cell [IY, all-in, sample volume correction IY/(62-IY)], #/L	CCIP1
		Concentration per cell [IY, all-in, sample volume correction IY/(62-IY)], #/L	CCIP1sz1
		Concentration per cell [max(IX,IY), IY all-in, sample volume correction IY/(62-IY)], #/L	CCIP2
		Number per cell [max(IX,IY), IY all-in, sample volume correction IY/(62-IY)]	ACIPsz2
		Concentration per cell [max(IX,IY), IY all-in, sample volume correction IY/(62-IY)], #/L	CCIPsz2
	Diagnostic parameter	Particle arrival times, log10(s)	CIParrt
	PMS Two-Dimensional Precipitation particle imager (2DP)	*Hydrometeor particle imagery (200 µm resolution) and size distribution – secondary measurement for large hydrometeors; parameter names are appended with _IBL if the instrument was installed in the inboard right wing-tip canister and _OBL if in the outboard canister*	
	Base processed parameters	Shadow OR, #/L	twodp
		Number of particles	npart_2dp
		Number of particles per cell (IX, no sample volume correction)	A2DP0
		Number of particles per cell (IY (all-in), no sample volume correction)	A2DP1
		Number of particles per cell (max(IX,IY), no sample volume correction)	A2DP2
	Derived parameters	Particle concentration [IX, sample volume correction IX/(32+IX)], #/L	CONC0_2dp
		Particle concentration [IY, all-in, sample volume correction IY/(30-IY)], #/L	CONC1_2dp
		Mass concentration [IX, sample volume correction IX/(32+IX)], g/m^3	mass0_2dp
		Mass concentration [max(IX,IY), all-in, sample volume correction IY/(30-IY)], g/m^3	mass2_2dp

		Particle concentration per cell [IX, sample volume correction IX/(32+IX)], #/L	C2DP0
		Particle concentration per cell [IX, sample volume correction IX/(32+IX)], #/L	C2DPsz0
		Particle concentration per cell [IY (all-in), sample volume correction IY/(30-IY)], #/L	C2DP1
		Particle concentration per cell [IY (all-in), sample volume correction IY/(30-IY)], #/L	C2DPsz1
		Particle concentration per cell [max(IX,IY), IY all-in, sample volume correction IY/(30-IY)], #/L	C2DP2
		Particle number per cell [max(IX,IY), IY all-in, sample volume correction IY/(30-IY)]	A2DPsz2
		Particle concentration per cell [max(IX,IY), IY all-in, sample volume correction IY/(30-IY)], #/L	C2DPsz2
	Diagnostic parameter	Particle arrival time, log10(s)	T2DParrt
	DMT Cloud Droplet Probe (CDP)	DMT CDP number - rebinned (per cell)	ACDP_NRB
		DMT CDP concentration - rebinned (per cell), #/cm^3	CCDP_NRB
		DMT CDP Total number - rebinned	cdpacc_NRB
		DMT CDP Total concentration – rebinned, #/cm^3	cdpconb_NRB
	Derived parameters	DMT CDP Liquid Water Content – rebinned, g/m^3	cdplwc_NRB
		DMT CDP Mean Diameter – rebinned, µm	cdpdbar_NRB
Air Chemistry			
	LI-COR LI-7000 closed-path CO2/H2O Gas Analyzer	Mole fraction of CO2 (cell B), µmol/mol	co2mlb70
		Mass mixing ratio of water vapor in dry air (cell B), g/kg	h2omrb70
	Derived parameters	Dewpoint temperature (cell B), °C	tdp70
		Relative humidity derived using tdp70, trf, and ps_hads_a, %	rhli70
	Diagnostic parameter	Flow rate, volts	flow70
	LI-COR LI-7500 open-path CO2/H2O Gas Analyzer	CO2 absorptivity, unitless	co2abs75
		H2O absorptivity, unitless	h2oabs75
		Raw CO2 absorptivity, unitless	co2absraw75
		Raw H2O absorptivity, unitless	h2oabsraw75

		Mole concentration of CO2 in air, mmol/m^3	co2ndens75
		Mass concentration of CO2 in air, mg/m^3	co2mdens75
		Mole fraction of CO2 in air, µmol/mol	co2ml75
		Mole concentration of H2O in air, mmol/m^3	h2ondens75
		Mass concentration of H2O in air, mg/m^3	h2omdens75
		Mole fraction of H2O in air, µmol/mol	h2oml75
	Derived parameters	H2O mixing ratio, g/kg	h2omx75
		H2O specific humidity, g/kg	h2oms75
		Dewpoint temperature, °C	tdplicor75
		CO2 mixing ratio, µg/g	co2mx75
		CO2 specific humidity, µg/g	co2ms75
	Picarro gas analyzer *(separate data system)**		CH4
			CH4_dry
			H2O
Aerosols			
	DMT Passive Cavity Aerosol Spectrometer Probe (PCASP-100X; two available)	*Aerosol Hydrometeor size distribution (0.1 – 3.0 µm diameter), total concentration; parameter names are appended with _IBR if the instrument was installed in the inboard right wing-tip canister and _OBR if in the outboard canister*	
		Particle count per size bin	AS200
		Particle concentration per size bin, #/cm^3	CS200
		Total particle count	TCNTP
		Total particle number concentration, #/ cm^3	CONCP
	Derived parameters	Mean particle diameter, µm	DBARP
		Particle surface area concentration, $\mu m^2/cm^3$	PSFCP
		Particle volume concentration, $\mu m^3/cm^3$	PVOLP
		Particle size dispersion, unitless	DISPP
	Diagnostic parameters	Sample flow rate, cm^3/s	PFLW
		Sample volume, cm^3/s	PFLWC
		Sheath flow rate, cm^3/s	PFLWS
	TSI 3010 Condensation Particle Counter (CPC)	Cloud nuclei concentration (>15 nm), #/cm^3	

	TSI 3025 Condensation Particle Counter (CPC)	Cloud nuclei concentration (>5 nm), #/cm^3	
	TSI 3563 Nephelometer*	Ultrafine nuclei concentration (>5 nm), #/cm^3	
	UWYO CCNC-100A cloud concentration nuclei sampler*	Light scattering extinction coefficient at 450, 550, and 700 nm; 50 nm bandwidth on each wavelength	