Proposed CF Standard Names
for RADAR and LIDAR data
in CfRadial NetCDF-CF format

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Introduction

In order for the CfRadial format to be formally recognized by the CF user community, the list of standard names for RADAR and LIDAR must be substantially augmented.

The names proposed in this document cover radar and lidar data. The CfRadial convention is suitable for any instrument that transmits pulses and receives echoes in return. Therefore sonar instruments could be included later.

Since there are a large number of proposed standard names, we separate them into several tables for clarity.

Table 1 - standard names for sensor geometry and coordinate variables

These names apply to the variables that describe the geometry of the scanning and sampling of the instrument, for orientation in space and distance from the instrument. They are essential for determining the sampling location in space.

Proposed standard name	Description	Units
unit_vector_component_x	The component of a unit vector, along the X coordinate axis.	unitless (0-1)
unit_vector_component_y	The component of a unit vector, along the Y coordinate axis.	unitless (0-1)
unit_vector_component_z	The component of a unit vector, along the Z coordinate axis.	unitless (0-1)
line_of_sight_distance_from_instrument	The distance, along the line of sight, from the instrument to the location of the observation.	m

Proposed standard name	Description	Units
platform_heading_angle	platform_heading_angle is the horizontal angle between the reference direction, which is often due north, and the longitudinal axis of the platform. The angle is measured clockwise positive, starting from the reference direction. If the reference is not north a comment attribute should be added to specify the reference details. See also standard names platform_azimuth_angle, platform_pitch_angle and platform_roll_angle. platform_heading_angle differs from platform_azimuth_angle, in that the former refers to the **orientation of the platform itself**, while the latter refers to the angle **from** an observation point **to** the platform.	degree
sensor_to_target_azimuth_angle	sensor_to_target_azimuth_angle is the horizontal angle between a reference direction, which is often due north, and the direction of observation from the sensor to the target. The angle is measured clockwise positive, starting from the reference direction. If the reference is not north a comment attribute should be added to specify the reference details. See also standard names sensor_azimuth_angle and direction_of_radial_vector_away_from_instrument. sensor_to_target_azimuth_angle differs from sensor_azimuth_angle in that the former is the angle **from** the sensor **to** the observation point, while the latter is the angle **from** an observation point **to** the sensor. Because of atmospheric path distortion (e.g. from refraction) these are not necessarily 180 degrees apart. The name direction_of_radial_vector_away_from_instrument is ambiguous in that it does not differentiate between the azimuth and elevation axes. direction_of_radial_vector_away_from_instrument could be used as a alias for sensor_to_target_azimuth_angle.	degree
sensor_to_target_elevation_angle	sensor_to_target_elevation_angle is the vertical angle between the direction from the sensor to the target and the horizontal plane at the sensor location. The angle is measured upward positive, starting from the horizontal plane. See also the standard name sensor_view_angle. A sensor_to_target_elevation_angle of -90.0 degrees is equivalent to a sensor_view_angle of 0.0 degrees.	degree
sensor_to_target_rotation_angle	sensor_to_target_rotation_angle is the angle between a reference plane, often the vertical plane, which contains the axis of rotation of the instrument, and the direction of observation from the sensor to the target. The angle is measured clockwise positive, starting from the reference plane. A comment attribute should be added to specify the reference plane details. sensor_to_target_rotation_angle is used in specialized cases, such as aircraft tail radars.	degree

Proposed standard name	Description	Units
sensor_to_target_tilt_angle	sensor_to_target_tilt_angle is the angle between the a reference plane that passes through the sensor location and is orthogonal to the plane of rotation, and the direction of observation from the sensor to the target. The angle is measured starting from the reference plane. A comment attribute should be added to specify the convention for the sign of the angle. sensor_to_target_tilt_angle is used in specialized situations, such as aircraft tail radars.	degree

Note on weather radar channels and the resulting variables

Modern weather radars can support either single-polarization or dual-polarization operation. Such radars can have up to 4 receive channels: horizontal copolar (Hc), vertical copolar (Vc), horizontal crosspolar (Hx) and vertical crosspolar (Vx).

Single polarization radars generally have just the Hc channel.

This terminology is receiver-centric:

- Hc indicates horizontal transmit and horizontal receive
- Vc indicates vertical transmit and vertical receive
- Hx indicates vertical transmit and horizontal receive
- Vx indicates horizontal transmit and vertical receive.

	H transmit	**V Transmit**
H receive	Hc = H co polar	Hx = H cross polar
V receive	Vx = V cross polar	Vc = V co polar

We can compute quantities from signals for a single channel, or for a combination of two channels.

The following table shows the possible channel combinations. For some quantities the result is order dependent:

	Hc	**Vc**	**Hx**	**Vx**
Hc	HcHc	HcVc	HcHx	HcVx
Vc	VcHc	VcVc	VcHx	VcVx
Hx	HxHx	HxVc	HxHx	HxVx
Vx	VxHc	VxVc	VxHx	VxVx

Table 2 - standard names for radar moments variables

To date, the only radar moments fields included in the CF standard names are for radar reflectivity (*equivalent_reflectivity_factor*) and radial velocity (*radial_velocity_of_scatterers_away_from_instrument*).

We propose to rename reflectivity to *radar_equivalent_reflectivity_factor*, with an alias to support the existing name (*equivalent_reflectivity_factor*).

Proposed standard name	Description	Units
radar_equivalent_reflectivity_factor (with alias for backward compatibility: equivalent_reflectivity_factor – this is the existing CF standard name)	"Equivalent reflectivity factor" is the radar reflectivity factor that is calculated from the measured radar backscatter return power assuming the target is composed of liquid water droplets whose diameter is less than one tenth of the radar wavelength, i.e., treating the droplets as Rayleigh scatterers. The actual radar reflectivity factor would depend on the size distribution and composition of the particles within the target volume and these are often unknown. The quantity is corrected for range, radar wavelength and other operating characteristics such as transmit power and pulse length.	dBZ
radar_equivalent_reflectivity_factor_h	This is the radar_equivalent_reflectivity_factor, for the copolar horizontal receive signal.	dBZ
radar_equivalent_reflectivity_factor_v	This is the radar_equivalent_reflectivity_factor, for the copolar vertical receive signal.	dBZ
radar_linear_equivalent_reflectivity_factor	radar_equivalent_reflectivity_factor, in linear units	$mm^6\ m^{-3}$
radar_linear_equivalent_reflectivity_factor_h	radar_equivalent_reflectivity_factor_h, in linear units	$mm^6\ m^{-3}$
radar_linear_equivalent_reflectivity_factor_v	radar_equivalent_reflectivity_factor_v, in linear units	$mm^6\ m^{-3}$
radial_velocity_of_scatterers_away _from_instrument (already in CF)	A velocity is a vector quantity. "Radial velocity away from instrument" means the component of the velocity of the scatterers along the line of sight of the instrument where positive implies movement away from the instrument (i.e. outward). The "instrument" (examples are radar and lidar) is the device used to make the observation, and the "scatterers" are what causes the transmitted signal to be returned to the instrument (examples are aerosols, hydrometeors and refractive index irregularities), of whatever kind the instrument detects.	$m\ s^{-1}$
radial_velocity_of_scatterers_away _from_instrument_h	Radial velocity for the copolar horizontal receive signal.	$m\ s^{-1}$
radial_velocity_of_scatterers_away _from_instrument_v	Radial velocity for the copolar vertical receive signal.	$m\ s^{-1}$
radar_doppler_spectrum_width	A measure of the dispersion of radial velocity within the radar measurement volume. This is analogous to the standard deviation of the distribution of velocities for all particles in the measurement volume.	$m\ s^{-1}$

Proposed standard name	Description	Units
radar_doppler_spectrum_width_h	radar_doppler_spectrum_width for the copolar horizontal receive signal.	m s^{-1}
radar_doppler_spectrum_width_v	radar_doppler_spectrum_width for the copolar vertical receive signal.	m s^{-1}
radar_differential_reflectivity_hv	The ratio of the copolar horizontal reflectivity to the copolar vertical reflectivity. Commonly referred to as ZDR.	dB
radar_linear_depolarization_ratio	The ratio of the received power from one polarization to the received power from the orthogonal polarization, for a pulse transmitted in the orthogonal polarization. Commonly referred to as LDR.	dB
radar_linear_depolarization_ratio_h	radar_linear_depolarization_ratio for horizontal transmit. That is, the ratio of the vertical received power to the horizontal received power, for horizontal transmit.	dB
radar_linear_depolarization_ratio_v	radar_linear_depolarization_ratio for vertical transmit. That is, the ratio of the horizontal received power to the vertical received power, for vertical transmit.	dB
radar_differential_phase_hv	The horizontal copolar received phase minus the vertical copolar received phase. Commonly referred to as PHIDP.	degree
radar_specific_differential_phase_hv	The rate of change of radar_differential_phase_hv with distance (i.e. range from the instrument). Commonly referred to as KDP.	degree km^{-1}
radar_differential_phase_copolar_h_crosspolar_v	The horizontal copolar received phase minus the vertical crosspolar received phase.	degree
radar_differential_phase_copolar_v_crosspolar_h	The vertical copolar received phase minus the horizontal crosspolar received phase.	degree
radar_correlation_coefficient_hv	The complex correlation coefficient between the copolar horizontal received signal and the copolar vertical received signal.	unitless (0-1)
radar_correlation_coefficient_copolar_h_crosspolar_v	The complex correlation coefficient between the copolar horizontal received signal and the crosspolar vertical received signal, for horizontal transmit.	unitless (0-1)
radar_correlation_coefficient_copolar_v_crosspolar_h	The complex correlation coefficient between the copolar vertical received signal and the crosspolar horizontal received signal, for vertical transmit.	unitless (0-1)
radar_received_signal_power	Received power, unspecified channel.	dBm
radar_received_signal_power_copolar_h	radar_received_signal_power for copolar horizontal receive, for horizontal transmit.	dBm
radar_received_signal_power_copolar_v	radar_received_signal_power for copolar vertical receive, from vertical transmit.	dBm
radar_received_signal_power_crosspolar_h	radar_received_signal_power for crosspolar horizontal receive, for vertical transmit.	dBm
radar_received_signal_power_crosspolar_v	radar_received_signal_power for crosspolar vertical receive, for horizontal transmit.	dBm

Proposed standard name	Description	Units
radar_signal_to_noise_ratio	The ratio of the signal power to the system noise. The signal power is computed as the total measured power minus the noise power.	dB
radar_signal_to_noise_ratio_copolar_h	radar_signal_to_noise_ratio for copolar horizontal receive, for horizontal transmit.	dB
radar_signal_to_noise_ratio_copolar_v	radar_signal_to_noise_ratio for copolar vertical receive, for vertical transmit.	dB
radar_signal_to_noise_ratio_crosspolar_h	radar_signal_to_noise_ratio for crosspolar horizontal receive, for vertical transmit.	dB
radar_signal_to_noise_ratio_crosspolar_v	radar_signal_to_noise_ratio for crosspolar vertical receive, for horizontal transmit.	dB
radar_normalized_coherent_power	The lag1 power of the received signal, divided by the lag0 power of the received signal.	unitless (0-1)
radar_normalized_coherent_power_copolar_h	radar_normalized_coherent_power for copolar horizontal receive, for horizontal transmit.	unitless (0-1)
radar_normalized_coherent_power_copolar_v	radar_normalized_coherent_power for copolar vertical receive, for vertical transmit.	unitless (0-1)
radar_estimated_precipitation_rate	Precipitation rate based estimated by radar.	mm/hr
radar_scatterer_classification	Dominant scatterer type in a radar return for a sample volume.	unitless (0-255)

Table 3 - standard names for radar covariance quantities

This section lists the proposed standard names for radar covariance variables.

These are the fundamental quantities from which many of the radar moments are computed.

Lag0 covariances for a single channel (e.g. horizontal copolar to horizontal copolar) are real.

All other covariances are complex. These are stored as (complex, phase) pairs.

Proposed standard name	Description	Units
Lag-0 covariances of single channel (real) Used for power-based moments		
radar_lag0_covariance_of_copolar_h _and copolar_h	Lag-0 covariance for the horizontal copolar signal. This is the received horizontal copolar power.	dBm
radar_lag0_covariance_of_copolar_v _and_copolar_v	Lag-0 covariance for the vertical copolar signal. This is the received vertical copolar power.	dBm
radar_lag0_covariance_of_crosspolar_h _and_crosspolar_h	Lag-0 covariance for the horizontal crosspolar signal. This is the received horizontal crosspolar power.	dBm
radar_lag0_covariance_of_crosspolar_v _and_crosspolar_v	Lag-0 covariance for the vertical crosspolar signal. This is the received vertical crosspolar power.	dBm

Proposed standard name	Description	Units
Lag-0 covariances of 2 channels (complex) stored as (power, phase) Used for correlation moments, differential phase		
radar_lag0_covariance_of_copolar_h_and_copolar_v	Lag-0 covariance of the horizontal copolar signal to the vertical copolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag0_covariance_of_copolar_h_and_crosspolar_h	Lag-0 covariance of the horizontal copolar signal to the horizontal crosspolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag0_covariance_of_copolar_h_and_crosspolar_v	Lag-0 covariance of the horizontal copolar signal to the vertical crosspolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag0_covariance_of_copolar_v_and_crosspolar_h	Lag-0 covariance of the vertical copolar signal to the horizontal crosspolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag0_covariance_of_copolar_v_and_crosspolar_v	Lag-0 covariance of the vertical copolar signal to the vertical crosspolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag0_covariance_of_crosspolar_h_and_crosspolar_v	Lag-0 covariance of the horizontal crosspolar signal to the vertical crosspolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
Lag-1 covariances of 2 channels (complex) stored as (power, phase) Used for velocity, spectrum width, correlations		
radar_lag1_covariance_of_copolar_h_and_copolar_h	Lag-1 covariance for horizontal copolar to horizontal copolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_copolar_h_and_copolar_v	Lag-1 covariance for horizontal copolar to vertical copolar signals. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_copolar_h_and_crosspolar_h	Lag-1 covariance for horizontal copolar to horizontal crosspolar signals. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_copolar_h_and_crosspolar_v	Lag-1 covariance for horizontal copolar to vertical crosspolar signals. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_copolar_v_and_copolar_h	Lag-1 covariance for vertical copolar to horizontal copolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_copolar_v_and_copolar_v	Lag-1 covariance for vertical copolar to vertical copolar signals. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_copolar_v_and_crosspolar_h	Lag-1 covariance for vertical copolar to horizontal crosspolar signals. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_copolar_v_and_crosspolar_v	Lag-1 covariance for vertical copolar to vertical crosspolar signals. This is a complex quantity, stored as (power, phase).	(dBm, degree)

Proposed standard name	Description	Units
radar_lag1_covariance_of_crosspolar_h _and_copolar_h	Lag-1 covariance for horizontal crosspolar to horizontal copolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_ crosspolar_h _and_copolar_v	Lag-1 covariance for horizontal crosspolar to vertical copolar signals. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_ crosspolar_h _and_crosspolar_h	Lag-1 covariance for horizontal crosspolar to horizontal crosspolar signals. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_ crosspolar_h _and_crosspolar_v	Lag-1 covariance for horizontal crosspolar to vertical crosspolar signals. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_crosspolar_v _and_copolar_h	Lag-1 covariance for vertical crosspolar to horizontal copolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_ crosspolar_v _and_copolar_v	Lag-1 covariance for vertical crosspolar to vertical copolar signals. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_ crosspolar_v _and_crosspolar_h	Lag-1 covariance for vertical crosspolar to horizontal crosspolar signals. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag1_covariance_of_ crosspolar_v _and_crosspolar_v	Lag-1 covariance for vertical crosspolar to vertical crosspolar signals. This is a complex quantity, stored as (power, phase).	(dBm, degree)
Lag-2 covariances (complex), stored as (power, phase) Used for spectrum width		
radar_lag2_covariance_of_copolar_h _and_copolar_h	Lag-2 covariance for horizontal copolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag2_covariance_of_copolar_v _and_copolar_v	Lag-2 covariance for vertical copolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
Lag-3 covariances (complex), stored as (power, phase) Used for spectrum width		
radar_lag3_covariance_of_copolar_h _and_copolar_h	Lag-3 covariance for horizontal copolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag3_covariance_of_copolar_v _and_copolar_v	Lag-3 covariance for vertical copolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
Lag-4 covariances (complex), stored as (power, phase) Used for spectrum width		
radar_lag4_covariance_of_copolar_h _and_copolar_h	Lag-4 covariance for horizontal copolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)

Proposed standard name	Description	Units
radar_lag4_covariance_of_copolar_v _and_copolar_v	Lag-4 covariance for vertical copolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
Lag-5 covariances (complex), stored as (power, phase) Used for spectrum width		
radar_lag5_covariance_of_copolar_h _and_copolar_h	Lag-5 covariance for horizontal copolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_lag5_covariance_of_copolar_v _and_copolar_v	Lag-5 covariance for vertical copolar signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
Lag-0 powers for staggered PRT Used for staggered PRT moments		
radar_long_prt_lag0_covariance_of_copolar_h _and_copolar_h	Lag-0 covariance for the horizontal copolar signal for long PRT. This is a real quantity, power.	dBm
radar_long_prt_lag0_covariance_of_copolar_v _and_copolar_v	Lag-0 covariance for vertical copolar signal for long PRT. This is a real quantity, power.	dBm
radar_long_prt_lag0_covariance_of_crosspolar_h _and_crosspolar_h	Lag-0 covariance for horizontal crosspolar signal for long PRT. This is a real quantity, power..	dBm
radar_long_prt_lag0_covariance_of_crosspolar_v _and_crosspolar_v	Lag-0 covariance for vertical crosspolar signal for long PRT. This is a real quantity, power.	dBm
radar_short_prt_lag0_covariance_of_copolar_h _and_copolar_h	Lag-0 covariance for horizontal copolar signal for short PRT. This is a real quantity, power.	dBm
radar_short_prt_lag0_covariance_of_copolar_v _and_copolar_v	Lag-0 covariance for vertical copolar signal for short PRT. This is a real quantity, power.	dBm
radar_short_prt_lag0_covariance_of_crosspolar_h _and_crosspolar_h	Lag-0 covariance for horizontal crosspolar signal for short PRT. This is a real quantity, power.	dBm
radar_short_prt_lag0_covariance_of_crosspolar_v _and_crosspolar_v	Lag-0 covariance for vertical crosspolar signal for short PRT. This is a real quantity, power.	dBm
Lag-1 covariances (complex) for staggered PRT, stored as (power, phase) Used for staggered PRT moments		
radar_long_prt_lag1_covariance_of_copolar_h _and_copolar_h	Lag-1 covariance for horizontal copolar signal for long PRT. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_long_prt_lag1_covariance_of_copolar_v _and_copolar_v	Lag-1 covariance for vertical copolar signal for long PRT. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_long_to_short_prt_lag1_covariance_of _copolar_h_and_copolar_h	Lag-1 covariance for horizontal copolar signal for long-to-short PRT. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_long_to_short_prt_lag1_covariance_of _copolar_v_and_copolar_v	Lag-1 covariance for vertical copolar signal for long-to-short PRT. This is a complex quantity, stored as (power, phase).	(dBm, degree)

Proposed standard name	Description	Units
radar_short_prt_lag1_covariance_of_copolar_h and_copolar_h	Lag-1 covariance for horizontal copolar signal for short PRT. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_short_prt_lag1_covariance_of_copolar_v and_copolar_v	Lag-1 covariance for vertical copolar signal for short PRT. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_short_to_long_prt_lag1_covariance_of _copolar_h_and_copolar_h	Lag-1 covariance for horizontal copolar signal for short-to-long PRT. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_short_to_long_prt_lag1_covariance_of _copolar_v_and_copolar_v	Lag-1 covariance for vertical copolar signal for short-to-long PRT. This is a complex quantity, stored as (power, phase).	(dBm, degree)

Table 4 - standard names for radar spectrum variables

We can compute the spectrum for a single channel, or a cross spectrum between two channels.

The following table shows the possible combinations for cross-spectra. These can be computed as the FFT of the first channel multiplied by the conjugate of the FFT of the second channel.

The on-diagonal terms are real – they are the power spectrum for that channel.

The off-diagonal terms are complex.

	Hc*	**Vc***	**Hx***	**Vx***
Hc	HcHc*	HcVc*	HcHx*	HcVx*
Vc	VcHc*	VcVc*	VcHx*	VcVx*
Hx	HxHx*	HxVc*	HxHx*	HxVx*
Vx	VxHc*	VxVc*	VxHx*	VxVx*

Standard name	Description	Units
Power spectrum for a single channel (diagonal terms)		
radar_power_spectrum_of_copolar_h	Power spectrum for the copolar horizontal signal. This is a real value, representing the power only. The phase is discarded.	dBm
radar_power_spectrum_of_copolar_v	Power spectrum for the copolar vertical signal. This is a real value, representing the power only. The phase is discarded.	dBm
radar_power_spectrum_of_crosspolar_h	Power spectrum for the crosspolar horizontal signal. This is a real value, representing the power only. The phase is discarded.	dBm

Standard name	Description	Units
radar_power_spectrum_of_crosspolar_v	Power spectrum for the crosspolar vertical signal. This is a real value, representing the power only. The phase is discarded.	dBm
Complex spectrum for a single channel (diagonal terms, complex FFT)		
radar_complex_spectrum_of_copolar_h	Complex spectrum for the copolar horizontal signal. This is a complex value, stored as (power, phase).	(dBm, degree)
radar_complex_spectrum_of_copolar_v	Complex spectrum for the copolar vertical signal. This is a complex value, stored as (power, phase).	(dBm, degree)
radar_complex_spectrum_of_crosspolar_h	Complex spectrum for the crosspolar horizontal signal. This is a complex value, stored as (power, phase).	(dBm, degree)
radar_complex_spectrum_of_crosspolar_v	Complex spectrum for the crosspolar vertical signal. This is a complex value, stored as (power, phase).	(dBm, degree)
Cross spectra of 2 channels (off-diagonal terms, complex FFT)		
radar_cross_spectrum_of_copolar_h_and_copolar_v	Cross spectrum of copolar horizontal signal to copolar vertical signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_cross_spectrum_of_copolar_h_and_crosspolar_h	Cross spectrum of copolar horizontal signal to crosspolar horizontal signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_cross_spectrum_of_copolar_h_and_crosspolar_v	Cross spectrum of copolar horizontal signal to crosspolar vertical signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_cross_spectrum_of_copolar_v_and_copolar_h	Cross spectrum of copolar vertical signal to copolar horizontal signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_cross_spectrum_of_copolar_v_and_crosspolar_h	Cross spectrum of copolar vertical signal to crosspolar horizontal signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_cross_spectrum_of_copolar_v_and_crosspolar_v	Cross spectrum of copolar vertical signal to crosspolar vertical signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_cross_spectrum_of_crosspolar_h_and_copolar_h	Cross spectrum of crosspolar horizontal signal to copolar horizontal signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_cross_spectrum_of_crosspolar_h_and_copolar_v	Cross spectrum of crosspolar horizontal signal to copolar vertical signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_cross_spectrum_of_crosspolar_h_and_crosspolar_v	Cross spectrum of crosspolar horizontal signal to crosspolar vertical signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)

Standard name	Description	Units
radar_cross_spectrum_of_crosspolar_v_and_copolar_h	Cross spectrum of crosspolar vertical signal to copolar horizontal signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_cross_spectrum_of_crosspolar_v_and_copolar_v	Cross spectrum of crosspolar vertical signal to copolar vertical signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)
radar_cross_spectrum_of_crosspolar_v_and_crosspolar_h	Cross spectrum of crosspolar vertical signal to crosspolar horizontal signal. This is a complex quantity, stored as (power, phase).	(dBm, degree)

Table 5 - standard names for Lidar measured quantities

Standard name	Description	Units
lidar_copolar_combined_backscatter_photon_count	Lidar backscatter photon count from both gas molecules and particles (aerosols plus cloud particles), in the co-polarization (transmit) channel. Backscatter implies a scattering angle of 180 degrees.	unitless (0+)
lidar_crosspolar_combined_backscatter_photon_count	Lidar backscatter photon count from both gas molecules and particles (aerosols plus cloud particles), in the cross-polarization channel. Backscatter implies a scattering angle of 180 degrees.	unitless (0+)
lidar_colopar_molecular_backscatter_photon_count	Lidar backscatter photon count from gas molecules only, in the co-polarization (transmit) channel. Backscatter implies a scattering angle of 180 degrees.	unitless (0+)
lidar_volume_depolarization_ratio	Ratio of the combined crosspolar signal to the combined copolar signal.	unitless (0-1)
lidar_particle_depolarization_ratio	Depolarization ratio caused by particles (aerosols and cloud particles). This is the volume depolarization ratio with the effect of molecular depolarization removed.	unitless (0-1)
lidar_backscatter_ratio	Ratio of the sum of the combined copolar and crosspolar backscatter signals to the molecular backscatter signal.	unitless (1+)
lidar_backscatter_coefficient	Probability of 180 degree scattering per unit length per unit solid angle. This is a calibrated value that quantifies the level of backscatter from a sample volume.	$m^{-1}sr^{-1}$
lidar_extinction_coefficient	Rate of power extinction per unit distance. This can also be considered the probability of photon scattering and absorption per unit path length. *(Theory of Lidar, © Springer International Publishing Switzerland 2015)*	m^{-1}
lidar_optical_depth	The aerosol optical depth or optical thickness (τ) is defined as the integrated extinction coefficient over a vertical column of unit cross section. Extinction coefficient is the fractional depletion of radiance per unit path length. (*https://www.researchgate.net*)	unitless (0+)