# CF Standard Names for RADAR and LIDAR data in CfRadial

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## Introduction

In order to have the CfRadial format formally recognized by the CF user community, we need to agree upon a list of standard names for RADAR and LIDAR. Thus far, only reflectivity and radial velocity are in the approved list of CF standard names.

## Links

The CF conventions page is:

http://cfconventions.org/latest.html

The guidelines for standard names are provided here:

http://cfconventions.org/Data/cf-standard-names/docs/guidelines.html

The CF FAQ is here:
http://cfconventions.org/faq.html

## Table 1 - standard names for radar/lidar/sonar sensor geometry

| 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) |

| | | |
|---|---|---|
| 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.<br><br>If the reference is not north a comment attribute should be added to specify the reference details.<br><br>See also platform_pitch_angle and platform_roll_angle.<br><br>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.<br><br>The angle is measured clockwise positive, starting from the reference direction.<br><br>If the reference is not north a comment attribute should be added to specify the reference details.<br><br>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 path distortion (e.g. from refraction) they are not necessarily 180 degrees apart. | 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.<br><br>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.<br><br>A comment attribute should be added to specify the reference plane details.<br><br>sensor_to_target_rotation_angle is used in specialized cases, such as aircraft tail radars. | degree |

| | | |
|---|---|---|
| sensor_to_target_tilt_angle | sensor_to_target_tilt_angle is the angle between the direction from the sensor to the target and a reference plane at the sensor location and orthogonal to the plane of rotation. The angle is measured starting from the reference plane.<br><br>A comment attribute should be added to specify the sign of the angle quantity.<br><br>sensor_to_target_tilt_angle is used in specialized situations, such as aircraft tail radars. | degree |

# Table 2 - standard names for radar moments variables

Note:

- copolar horizontal means transmit H, receive H
- copolar vertical means transmit V, receive V
- crosspolar horizontal means transmit V, receive H
- crosspolar vertical means transmit H, receive V

| Proposed standard name | Description | Units |
|---|---|---|
| radar_equivalent_reflectivity_factor<br>(requested alias for backward compatibility:<br>equivalent_reflectivity_factor –<br>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 copolar vertical receive signal. | dBZ |
| radar_linear_equivalent_reflectivity_factor | radar_equivalent_reflectivity_factor,<br>in linear units | $mm^6 m^{-3}$ |
| radar_linear_equivalent_reflectivity_factor_h | radar_equivalent_reflectivity_factor_h,<br>in linear units | $mm^6 m^{-3}$ |
| radar_linear_equivalent_reflectivity_factor_v | radar_equivalent_reflectivity_factor_v,<br>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. | $m\ s^{-1}$ |
| radar_doppler_spectrum_width_h | radar_doppler_spectrum_width for the copolar horizontal receive channel. | $m\ s^{-1}$ |
| radar_doppler_spectrum_width_v | radar_doppler_spectrum_width for the copolar vertical receive channel. | $m\ s^{-1}$ |
| 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 a horizontal transmit pulse. | 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 a vertical transmit pulse. | 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, from a horizontal polarization transmit pulse. | dBm |
| radar_received_signal_power_copolar_v | radar_received_signal_power for copolar vertical receive, from a vertical polarization transmit pulse. | dBm |
| radar_received_signal_power_crosspolar_h | radar_received_signal_power for crosspolar horizontal receive, from a vertical polarization transmit pulse. | dBm |
| radar_received_signal_power_crosspolar_v | radar_received_signal_power for crosspolar vertical receive, from a horizontal polarization transmit pulse. | dBm |
| 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, from a horizontal polarization transmit pulse. | dB |
| radar_signal_to_noise_ratio_copolar_v | radar_signal_to_noise_ratio for copolar vertical receive, from a vertical polarization transmit pulse. | dB |
| radar_signal_to_noise_ratio_crosspolar_h | radar_signal_to_noise_ratio for crosspolar horizontal receive, from a vertical polarization transmit pulse. | dB |
| radar_signal_to_noise_ratio_crosspolar_v | radar_signal_to_noise_ratio for crosspolar vertical receive, from a horizontal polarization transmit pulse. | 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, from a horizontal polarization transmit pulse. | unitless (0-1) |
| radar_normalized_coherent_power_copolar_v | radar_normalized_coherent_power for copolar vertical receive, from a vertical polarization transmit pulse. | 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 powers (real)** | | |
| 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 |
| **Lag-0 covariances (complex) stored as (power, 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_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) |
| **Lag-1 covariances (complex) stored as (power, phase)** | | |
| radar_lag1_covariance_of_copolar_h _and_copolar_h | Lag-1 covariance for 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 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 to vertical copolar 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 to horizontal copolar 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 to vertical crosspolar 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 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 signal. 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_copolar_v _and_crosspolar_h | Lag-1 covariance for vertical copolar to horizontal crosspolar 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 signal. This is a complex quantity, stored as (power, phase). | (dBm, degree) |
| | | |
| **Lag-2 covariances (complex), stored as (power, phase)** | | |
| 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)** | | |
| 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)** | | |
| 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) |
| 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)** | | |
| 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** | | |
| 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_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_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_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)** | | |
| 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_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_long_to_short_prt_lag1_covariance_of _copolar_h_to_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_to_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) |
| radar_short_to_long_prt_lag1_covariance_of _copolar_h_to_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_to_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

A modern weather radar can typically have up to 4 receive channels: horizontal copolar (Hc), vertical copolar (Vc), horizontal crosspolar (Hx) and vertical crosspolar (Vx). This terminology is receiver-centric: Hx indicates vertical transmit and horizontal receive, and Vx indicates horizontal transmit and vertical receive.

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.

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

There is redundant information in the items in this table. The above-diagonal terms are conjugate-symmetric with the corresponding below-diagonal terms. We include the names for all possible combinations to provide flexibility in how researchers choose to compute and store the spectra.

| Standard name | Description | Units |
|---|---|---|
| | | |
| **Power spectrum for a single channel (diagonal terms in table above)** | | |
| 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 |
| 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 (complex FFT of time series)** | | |
| 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 in table above) | | |
|---|---|---|
| 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) |
| 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+) |