

## CPL OPTICAL PROPERTIES (OP) HDF FILE

Definitions of Global Attributes:

<i>Parameter Name</i>	<i>Units</i>	<i>Data Type</i>	<i>Dim . 1</i>	<i>Dim . 2</i>	<i>Min Value</i>	<i>Max Value</i>	<i>Description</i>
Date	n/a	string	1		n/a	n/a	Date for this flight
Project	n/a	string	1		n/a	n/a	Field project name
NumRecs	n/a	Long integer	1		1	36000	Number of horizontal records (profiles)
NumBins	n/a	Long integer	1		900	900	Number of vertical lidar bins in the optical profiles
Frame_Top	km	Float	1		20.0	23.0	Top height of CPL reference frame (first bin)
Bin_Width	m	Float	1		29.0	31.0	Vertical resolution of the lidar
NumWave	n/a	Long integer	1		3	3	Number of wavelengths in lidar output -- Wavelength (wl) index: 0=355,1=532,2=1064nm
Hori_Res	sec	Long integer	1		1	5	Horizontal Resolution of the lidar profiles (typically 1 sec or 200 m)
PGR	fraction	Float	1		0.0	2.0	Polarization gain ratio - 1064nm parallel/perpendicular detector relative calibration used
NumChans	n/a	Short integer	1		4	10	Total number of lidar channels, including annulus channels if avail, whereas nchan= 4 always
MaxLay	n/a	Long integer	1		4	10	Maximum number of layers allowed per profile
Start_JDay	utc	Float	1		0.0	366.0	Decimal julian day for the start time of the flight
End_JDay	utc	Float	1		0.0	366.0	Decimal julian day for the end time of the flight

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Definitions of Science Data Sets:

<i>Parameter Name</i>	<i>Units</i>	<i>Data Type</i>	<i>Dim. 1</i>	<i>Dim. 2</i>	<i>Dim. 3</i>	<i>Min Value</i>	<i>Max Value</i>	<i>Description</i>
Dec_JDay	utc	Double	Num Recs			0.0	367.0	Decimal day of year to 5 decimal places (second) for current profile
Latitude	degrees	Float	Num Recs			-90.0	90.0	Latitude of profile, decimal degrees, S= '-'
Longitude	degrees	Float	Num Recs			-180.	180.	Longitude of profile, decimal degrees, W= '-'
Gnd_Hgt	km	Float	Num Recs			-999.	20.0	Height of earth's surface detected by lidar, missing= -999.0
Bin_Alt	km	Float	Num Bins			-20.0	25.0	Altitude in km for each vertical bin
Depol_Ratio	n/a	Float	Num Bins	Num Recs		0.0	1.0	Final depolarization ratio profile for 1064nm, valid only inside layers
Depol_Ratio_Err	n/a	Float	Num Bins	Num Recs		0.0	1.0	1064 nm Depolarization ratio standard deviation profile
NumLayers	n/a	Long integer	Num Recs			0	10	Number of layers detected in current profile
Layer_Type	n/a	Short integer	10	Num Recs		0	4	Layer type: 0=missing, 1=PBL, 2=elevated aerosol, 3=cloud, 4= indeterminate
Layer_Top_Alt	km	Float	10	Num Recs		-999.	22.0	Heights of all layer tops above mean sea level in profile
Layer_Bot_Alt	km	Float	10	Num Recs		-999.	22.0	Heights of all layer bottoms above mean sea level in profile
Layer_OD	n/a	Float	10	Num Wave	Num Recs	-9.9	4.0	Final layer optical depth estimate per layer per wavelength, -8.8=layer not processed, -9.9=invalid
Layer_OD_Err	n/a	Float	10	Num Wave	Num Recs	-9.9	4.0	Final layer optical depth from error profile per layer per wavelength, -8.8=layer not processed, -9.9=invalid

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Definitions of Science Data Sets (Page 2):

<i>Parameter Name</i>	<i>Units</i>	<i>Data Type</i>	<i>Dim. 1</i>	<i>Dim. 2</i>	<i>Dim. 3</i>	<i>Min Value</i>	<i>Max Value</i>	<i>Description</i>
Extinction	1/km	Float	Num Bins	Num Wave	Num Recs	-9900	100.0	Extinction profile per wavelength, 0.0=not processed (no layer), -9900=invalid
Extinction_Err	1/km	Float	Num Bins	Num Wave	Num Recs	-9900	100.0	Extinction profile from error profile per wavelength, 0.0=not processed (no layer), -9900=invalid
Lidar_Ratio	Ster-radians	Float	10	Num Wave	Num Recs	-9.9	130.0.	Extinction-to-backscatter ratio used per layer per wavelength, -8.8=layer not processed, -9.9=invalid
Lidar_Ratio_Err	Ster-radians	Float	10	Num Wave	Num Recs	-9.9.	130.0	Lidar ratio from error profile per layer per wavelength, -8.8=layer not processed, -9.9=invalid
Direct_OD	n/a	Float	10	Num Wave	Num Recs	-9.9	4.0	Optical depth estimate from transmission loss only per layer per wavelength, not final od of layer, -8.8=layer not processed, -9.9=invalid
Inver_Type	n/a	Short integer	10	Num Wave	Num Recs	-1	1	Type of lidar inversion used, -1=missing, 0=backward, 1=forward
LRatio_Source*	n/a	Short integer	10	Num Wave	Num Recs	0	9	Source of lidar ratio calculation per layer per wavelength (see explanation below table)*
Plane_Alt	km	Float	Num Recs			-999.	20.0	Height of the aircraft above mean sea level, missing= -999.0
Plane_Pitch	degrees	Float	Num Recs			-180.	180.	Aircraft pitch, decimal degrees, down= ‘-‘
Plane_Roll	degrees	Float	Num Recs			-180.	180.	Aircraft roll, decimal degrees, left turn= ‘-‘
Mol_Ext_Prof	1/km	Float	Num Bins	Num Wave		0	10 <sup>-3</sup>	Rayleigh extinction profile of first record, currently used for whole flight

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Definitions of Science Data Sets (Page 3):

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T_Loss_Stats	n/a	Short integer	10	Num Wave	Num Recs	0	7	Layer transmission loss technique statistics, 0=passed test, 1=no ground return after this final layer, 2=no lower layer or ground return, 3=clear zone below layer too small, 4=clear zone SNR below minimum, 5=transmission <sup>2</sup> of bin below minimum, 6=transmission <sup>2</sup> of layer <= 0.0, 7=1064nm S ratio used 532 optical depth

### \*Source of Lidar ratio calculation per layer per wavelength:

#### Aerosols:

0=pre-defined default wavelength-dependent equations based on general geographic location and rh

1=educated guess based on recent aerosol history at location (PBL)

2=calculated from available column AOD at location and time

3=pre-calculated from AERONET, CPL, etc. for location and time

4=retrieved directly using technique calculating layer transmission loss

5=future use

6=lowered by a maximum of 5.0sr in order to process down to layer bottom (excludes 4)

7&8=future use

9=missing

#### Clouds:

0=water phase determination based on met temperature profile only, used wavelength dependent equation based on mean layer temperature

1= same as 0 except phase determination based on depolarization ratio and temperature

2=future use

3=1064nm S ratio calculated from 532nm optical depth using transmission loss technique

4=retrieved directly using technique calculating layer transmission loss

5=calculated setting layer bottom transmission to reflect extinguished signal

6=lowered by a maximum of 5.0sr in order to process down to layer bottom (excludes 3,4,5)

7&8=future use

9=missing