

D3R Data Processing for the OLYMPEX Campaign

Filename Convention

The data files are netCDF4 files with extension “.nc”. There is one scan per file. The data filenames are formatted as follows:

<campaign>_d3r_<freq>_<date>_<time>_<scanindex>.nc

<campaign> is “olympex”

<freq> is “ku” or “ka”

<date> is in YYYYMMDD format (UTC time)

<time> is in HHmmSS format (UTC time)

<scanindex> is the scan number within a volume.

An example filename is “olympex_d3r_ku_20151206_000124_06.nc”.

The quick-look images are PNG format. The image name follows a similar convention as the netCDF files but provides some additional information in the filename.

<netCDF filename >_<scantype>_<fixed angle>_<Pol/PRT Mode>_<moment>.png

<netCDF filename > is the name of the netCDF that the image is generated from (without extension)

<scantype> is “ppi” or “rhi”

<fixed angle> is the fixed angle of the scan (so azimuth for an RHI and elevation for a PPI)

<Pol/PRT Mode> the first number is the polarization mode, the second is the PRT mode. (See the notes at the end of the NETCDF definition below.)

<moment> is the radar moment plotted (all are reflectivity or “zdb”)

olympex_d3r_ku_20151206_000124_06_rhi_236az_41_zdb.png

Data Processing Description

The D3R OLYMPEX data, published in July 2016, was post-processed from IQ data recorded during the field campaign. The moment processor v02.16 and netCDF version v01.08 were used. A detailed list of all the fields is at the end of this document.

All range gates are 150 meters. The first range gate is at 0 km and is the short transmit pulse.

D3R uses two frequency diverse pulses: a “short” and “medium” pulse. The short pulse is use for the first 23 range gates (up to 3.3 km). The medium pulse is used for the remaining data.

Ground clutter is NOT enabled and will be present in the results. If ground clutter filtering is required, please request this from the instrument PI.

Noise power for the two pulses is estimated using a passive radiometric noise channel on a pulse-by-pulse basis. This noise estimate is independent for H and V.

All power-based moments are noise corrected (i.e., Z, Zdr, RHO_{hv}, LDR, etc.).

RawPower_* is the received power without any noise subtraction or manipulation. SignalPower_* is the power used to estimate reflectivity (without compensation for range or the radar constant).

Observations determined to be second-trip-only (for staggered PRT only) are removed.

TX power integration over multiple rays (using the max of 5.0 degrees in az/el or 50 rays)

ZDR bias corrected done daily for SIM and ALT modes. Zdr bias expected to be accurate within 0.2 dB.

Reflectivity is consistent with radar calibration for all other field campaigns. Calibration expected to be within 1 dB.

“LDRvh” is H-pol transmit LDR. Similarly, “LDRhv” is the V-pol transmit LDR.

0 dB SNR threshold used for censoring data. The H and V SNR may be used. For ALT mode, the cross-pol SNR is used. The H-Pol SNR is provided in “Signal+Clutter_toNoise_H”. For ALT mode, the cross-pol SNR is “SNRvh” and “SNRhv”.

D3R v01.08 NetCDF Definition

The NETCDF variables have dimension "Length" by the number of rays.

Variables

Variable Name	Length	Data Type	Units
"Azimuth"	1	double	"Degrees"
"Elevation"	1	double	"Degrees"
"Azimuth_Ray_Start"	1	double	"Degrees"
"Azimuth_Ray_End"	1	double	"Degrees"
"Elevation_Ray_Start"	1	double	"Degrees"
"Elevation_Ray_End"	1	double	"Degrees"
"GateWidth"	1	int	"Millimeters"
"StartRange"	1	double	"Millimeters"
"StartGate"	1	int	"Unitless"
"Time"	1	int	"Seconds"
"TxFrequency_Short"	1	double	"Hertz"
"TxFrequency_Medium"	1	double	"Hertz"
"TxLength_Short"	1	double	"Seconds"
"TxLength_Medium"	1	double	"Seconds"
"TxPowerH_Short"	1	double	"dBm"
"TxPowerH_Medium"	1	double	"dBm"
"TxPowerV_Short"	1	double	"dBm"
"TxPowerV_Medium"	1	double	"dBm"
"NoiseSourcePowerH_Short"	1	double	"dBu"
"NoiseSourcePowerV_Short"	1	double	"dBu"
"StartGate_Short"	1	int	"Unitless"
"StartGate_Medium"	1	int	"Unitless"
"GcfState"	1	int	"Unitless"
"PolarizationMode"	1	int	"Unitless"
"PRTMode"	1	int	"Unitless"
"Reflectivity"	# Gates	float	"dBZ"
"ReflectivityV"	# Gates	float	"dBZ"
"ReflectivityHV"	# Gates	float	"dBZ"
"Velocity"	# Gates	float	"MetersPerSecond"
"SpectralWidth"	# Gates	float	"MetersPerSecond"
"DifferentialReflectivity"	# Gates	float	"dB"
"DifferentialPhase"	# Gates	float	"Degrees"
"CopolarCorrelation"	# Gates	float	"Unitless"
"NormalizedCoherentPower"	# Gates	float	"Unitless"
"SignalPower_H"	# Gates	float	"dBu"
"SignalPower_V"	# Gates	float	"dBu"

"SignalPower_HV"	# Gates	float	"dBu"
"RawPower_H"	# Gates	float	"dBu"
"RawPower_V"	# Gates	float	"dBu"
"RawPower_HV"	# Gates	float	"dBu"
"Signal+Clutter_toNoise_H"	# Gates	float	"dB"
"ClutterPowerH"	# Gates	float	"dBu"
"ClutterPowerV"	# Gates	float	"dBu"
Alternate Transmission Mode Only (ALT only) Variables			
"LDRvh"	# Gates	float	"dB"
"LDRhv"	# Gates	float	"dB"
"SNRvh"	# Gates	float	"dB"
"SNRhv"	# Gates	float	"dB"

Attributes

Attribute Name	Description
"NetCDFRevision"	NETCDF revision
"GMAPTDRevision"	GMAPTD moment code revision
"ConfigRevision"	GMAPTD Config file revision
"CampaignName"	Campaign Name
"RadarName"	Radar Name
"Latitude"	Latitude in degrees
"Longitude"	Longitude in degrees
"Altitude"	Altitude in meters
"NumGates"	Number of Range Gates
"PulsePerRay"	Pulses in a ray
"ScanId"	Always 0
"ScanType"	1=Fixed, 2=PPI, 3=RHI
"Time"	Epoch time (seconds)
"SweepNumber"	Sweep Number within a volume
"Modified"	Optional, QC bias correction details

Notes

"PolarizationMode" states

- 0: Passive (no transmitter fired)
- 1: H Only
- 2: V Only
- 3: Alternate
- 4: Simultaneous
- 99: Error

"PRTMode" states

- 0: Uniform PRT
- 1: Staggered 2/3 PRT

"GcfState" states (ground clutter filtering)

- 0: Off - No ground clutter filter used
- 1: On - GMAPTD ground clutter filtering enabled