Polly Config

The filename of polly config should be names as {polly version}_config.json. And it should be noted that the {polly version} is the lower case. Any wrong spelling can not be recognized correctly.

Overview

I will summarize all the configurations in the table below. But you should keep in mind there could be different settings for different polly, so you should create a new configuration file according to your demands.

keyword	Description	Example	Reference
flagCorrectFalseMShots	whether to correct the invalid shots stored in the netcdf files. (I don't know the reason yet, but it does exist in pollyxt_tropos for a period of time)	true	
flagFilterFalseMShots	whether to filter out the profiles with invalid shots. (Since I don't know whether it's trustable for these profiles, I will leave this keyword for future development.)	false	
flagForceMeasTime	whether to fix measurement time according to the mshots instead of using the original PC time	false	
flagDTCor	whether to implement deadtime correction	true	
flagWVCalibration	whether to implement water vapor calibration	true	
flagLCCalibration	whether to enable lidar calibration	true	
flagDepolCali	whether to enable lidar depolarization calibration	true	
flagUsePreviousDepolCali	whether to take previous lidar depolarization calibration results when no calibration is available	true	
flagUsePreviousWVconst	whether to take previous lidar water vapor calibration results when no water vapor calibration is available	true	
flagUsePreviousLC	whether to take previous lidar calibration constants when no lidar calibration is available	true	
flagUseSameRefH	whether to take the same reference height for aerosol retrievals at all available wavelength	false	
flagSigTempCor	whether to implement signal temperature correction	false	
tempCorFunc	temperature correction function for each channel	["1", "exp(-0.001*T)", "1"] (Unit: Kelvin)	
flagAutoscaleRCS	to control whether to configure the color-range for range corrected signal in an automatic way	true	
flagMolDepolCali	to control whether to use molecular depolarization calibration	false	H. Baars, Ph
MWRFolder	The folder of prw results from MWR. (This is only for LACROS)	"C:\Users\zhenping\Desktop\Picasso\test\read_IWV_from_MWR"	
dataFileFormat	regular expression to extract the data and time info from polly data file. (This is based on the syntax of matlab **regexp**)	"(?\d{4})(?\d{2})(?\d{2})\w*(?\d{2})(?\d{2})(?\d{2})\w*.nc"	

keyword	Description	Example	Reference
gdas1Site	gdas1 site for the current campaign. (You can find the info in gdas1-site-list.txt)	"warsaw"	
max_height_bin	the number of bins you want to extract for each profile. (Normally, the high altitude bins only contain noise. If you load too much bins, you will slow down the whole processing process)	2500	
first_range_gate_indx	the first bin for each channel. (It's highly suggested to tune this parameter to compensate the lag among different channels)	[261, 261, 261, 261, 261, 261, 261, 261, 262, 262, 262, 262]	
first_range_gate_height	The height for the first range bin. [m]. You need to take great care for this parameter, since it will create large bias for extinction coefficient with Raman method. Look for advice from hardware scientist if you are not certain about this	78.75 m **->(The unit is only for demonstration, don't set it in the config files)**	
dtCorMode	deadtime correction mode. (1: use the parameters saved in the netcdf files; 2: nonparalyzable correction with user define deadtime; 3: paralyzable correction with user defined parameters; 4: no deadtime correction)	1	
dt	parameters for deadtime correction. If "dtCorMode" is set to be '2', only the deadtime for each channel need to be set here with unit of ns. If "dtCorMode" is set to be '3', the correction parameters need to be set accordingly. You can take pollyxt_tropos_config.json as an example	[[0.0, 0.972992, 0.00353332, -7.90981e-006, 1.06451e-007, 1.42895e-009], [0, 1.0117, -0.0014, 0.0002, -0.0000, 0.0000], [0, 0.9674, 0.0023, 0.0000, 0.0000, 0.0000], [0, 0.9929, 0.0000, 0.0001, -0.0000, 0.0000], [0, 0.9843, 0.0022, 0.0001, -0.0000, 0.0000], [0, 0.9391, 0.0063, -0.0001, 0.0000, -0.0000], [0, 1.0035, 0.0003, 0.0001, -0.0000, 0.0000], [0, 1.0000, 0, 0, 0, 0], [0, 1.0000, 0.0029, 0.0000, 0.0000, 0.0000], [0, 1.0000, 0.0028, 0.0000, 0.0000, 0.0000], [0, 1.0000, 0.0028, 0.0000, 0.0000, 0.0000], [0, 1.0000, 0.0025, 0.0000, 0.0000, 0.0000], [0, 1, 0, 0, 0, 0]]	
bgCorRangeIndx	the bottom and top index of signal to calculate the background	[10, 240]	
mask_SNRmin	the SNR threshold to mask noisy bins	[1.6, 1, 1, 1, 1.5, 1, 1, 1.5, 1, 1, 1, 1]	
depol_cali_mode	depolarization calibration mode: 1: automatic searching based on depolarization calibration angle; 2: fixed calibration time according to input	1	
depol_cal_time_fixed_p_start	fixed timestamp for the start of depolarization calibration period at positive angle.	["05:30:00"] for the start time of depolarization calibration at 05:30:00 each day, or ["20130101 05:30:00"] for depolarization calibration at 2013-01-01 05:30:00	
depol_cal_time_fixed_p_end	fixed timestamp for the stop of depolarization calibration period at positive angle.	["05:35:30"]	
depol_cal_time_fixed_m_start	fixed timestamp for the start depolarization calibration period at negative angle.	["05:35:30"]	
depol_cal_time_fixed_m_end	fixed timestamp for the stop of depolarization calibration period at negative angle.	["05:40:00"]	
init_depAng	the initial angle of the polariser withou depo calibration [degree]	0	
maskDepCalAng	the mask for postive and negative calibration angle. 'none' means invalid profiles with different depol_cal_angle	["none", "none", "p", "p", "p", "p", "p", "p", "p", "p", "none", "none", "n", "n", "n", "n", "n", "n", "n", "n"]	
depol_cal_minbin_{wavelength}	the minimum bin used for depolarization calibration	40	

keyword	Description	Example	Reference
depol_cal_maxbin_{wavelength}	the maximum bin used for depolarization calibration	300	
depol_cal_SNRmin_{wavelength}	Threshold for the minimum SNR used in depol-calibration. There are four signal profiles used in the calibration, total channel at $\pm 45\circ$ and cross channel at $\pm 45\circ$. Therefore, an array of four element need to be configured. Namely, [total$+45\circ$, total$-45\circ$, cross$+45\circ$, cross$-45\circ$]		
[1, 1, 1, 1]			
depol_cal_sigMax_{wavelength}	The maximum signal strength could be used for depol-calibration to prevent signal pileup effects	[1500, 1500, 1500, 1500] (photon count)	
rel_std_dplus_{wavelength}	Threshold for maximum relative uncertainty of signal ratio at $+45\circ$ depol-calibration. If relative uncertainty exceed this value, it states there could be clouds or too weak signal for this calibration period.	0.2	
rel_std_dminus_{wavelength}	Threshold for maximum relative uncertainty of signal ratio at $-45\circ$ depol-calibration.	0.2	
depol_cal_segmentLen_{wavelength}	The small region for evaluating the uncertainty of depol calibration	40	
depol_cal_smoothWin_{wavelength}	The smoothing window for depol-calibration	8	
isFR	flag of far-range channel	[1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0]	
isNR	flag of near-range channel	[0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0]	
is532nm	flag of 532nm channel	[0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0]	
is355nm	flag of 355nm channel	[1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0]	
is1064nm	flag of 1064nm channel	[0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0]	
isTot	flag of total channel	[1, 0, 0, 0, 1, 0, 0, 1, 1, 0, 1, 0, 0]	
isCross	flag of cross polarized channel	[0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0]	
is387nm	flag of 387nm channel	[0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0]	
is407nm	flag of 407nm channel	[0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0]	
is607nm	flag of 607nm channel	[0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0]	
channelTag	label of each channel	["FR-total-355 nm", "FR-cross-355 nm", "FR-387 nm", "FR-407 nm", "FR-total-532 nm", "FR-cross-532 nm", "FR-607 nm", "FR-total-1064 nm", "NR-total-532 nm", "NR-607 nm", "NR-total-355 nm", "NR-387 nm", "unknown"]	
minPC_fog	The minimum photon count for non-fog profile. The detected photon count between 40th and 120th bin (above the first bin) for each 30s profile will be accumulated for the fog profile screening.	60	Baars H. et a
TR	Transmission ratio for different channel.	[0.898, 1086, 1, 1, 1.45, 778.8, 1, 1, 1, 1, 1, 1, 1]	Ronny, AMT
overlapCalMode	1:estimate the overlap function based on the near-range signal. 2: calculate the overlap function with Raman method (U. Wandinger, et al, Applied Optics, 2002)	1	

keyword	Description	Example	Reference
overlapCorMode	0: no overlap correction; 1:overlap correction with using the default overlap function; 2: overlap correction with using the calculated overlap function; 3: overlap correction with gluing near-range and far-range signal	1	
overlapSmoothBins	vertical window (bins) for smoothing the noisy overlap function	8	
saturate_thresh	the threshold for signal saturation	100 [MHz]	
heightFullOverlap	height for the base of full overlap	[500, 500, 500, 500, 500, 500, 500, 500, 150, 150, 150, 150, 150]	polly_overvi
minSNR_4_sigNorm	The minimum SNR requirement for the signal used for signal normalization both for near- and far- range signal.	[10]	
cloudScreenMode	1: using signal gradient; 2: using Zhao's algorithm	1	
maxSigSlope4FilterCloud	The slope threshold for cloud screening. The screening is based on the slope of the Range Corrected Signal(photon count * m^2). In theory, this should be done with the attenuated backscatter. Since the lidar constant is unknown and cloud-screen is highly important for retrieving aerosol profiles, this is the only applicable way to my knowledge. Attention should be paid for the threshold setting, because it's dependent on the the order of ND filter. But it's not very sensitive because cloud scattering signal is much more stronger than that from aerosols. You can keep this value if there is no dramatic changes of ND filter(more than 1)	3e6	
maxSigSlope4FilterCloud_NR	The slope threshold for cloud screening with using NR signal	0.5e6	
intNProfiles	Accumulated profiles for retrieving.	120	
minIntNProfiles	minimum integral profiles for aerosol retrieving	90	
meteorDataSource	the data source for meteorological data. If the current data does not exist. It will turn to standard atmosphere model.	"gdas1"	
radiosondeSitenum	The site number for the nearest radiosonde launching site. (You can search the number in radiosonde-station-list.txt)	14430	
maxDecomHeight{wavelength}		8000	
maxDecomThickness{wavelength}		700	
decomSmoothWin{wavelength}	The smoothing window for molecular corrected signal used in Douglas-Peucker decomposition algorithm.	20	Pollynet_Prc
minRefThickness{wavelength}	The minimum thickness for the reference height. There is thickness test in the RayleighFit function which will ensure the minimum thickness of the reference height	500 [m]	Pollynet_Prc

keyword	Description	Example	Reference
minRefDeltaExt{wavelength}	The maximum slope difference between measured signal and molecule signal. This threshold is used in RayleighFit slope test which will examine whether $slope_{molecular signal}\in[slope_{measured signal} - k\sigma_{slope_{measured signal}}, slope_{measured signal} + k\sigma_{slope_{measured signal}}]$	2	Pollynet_Prc
minRefSNR{wavelength}	The minimum SNR for the accumulated signal at the tested reference height.	5	Pollynet_Prc
LR{wavelength}	Default lidar ratio for Klett retrieving method	50 Sr	
refBeta{wavelength}	Reference value for Klett and Raman method	2e-8	
smoothWin_klett_{wavelength}	smoothing window for klett method	21	
maxIterConstrainFernald	The maximum iterations for searching the best Lidar Ratio with Constrained-AOD fernald method	20 Sr	
minLRConstrainFernald	The minimum lidar ratio used for Constrained-AOD fernald method	1 Sr	
maxLRConstrainFernald	The maximum lidar ratio used for Constrained-AOD fernald method	150 Sr	
minDeltaAOD	The minimum AOD deviation that is required for Constrained-AOD fernald method	0.01	
minRamanRefSNR387	The minimum SNR for the signal at the reference height. If SNR at the reference height is smaller than this value, raman method will not implemented.	40	
minRamanRefSNR607	The minimum SNR for the signal at the reference height. If SNR at the reference height is smaller than this value, raman method will not implemented.	20	
angstrexp	Default angstroem exponent for Raman method	0.9	
smoothWin_raman_{wavelength}	smoothing window for raman method	61	
LCMeanWindow	The window for calculating the Lidar Constant	50	
LCMeanMinIndx	The minimum bin used for lidar constant calculation	70	
LCMeanMaxIndx	The maximum bin used for lidar constant calculation	1000	
LCCalibrationStatus	The tag for lidar calibration status, which will displayed in the output figures	["none", "Klett", "Raman", "Defaults"	
quasi_smooth_h	temporal smoothing window for quasi retrieving method. For consistency, this parameter should be set for each channel	[1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]	
quasi_smooth_t	spatial smoothing window for quasi retrieving method. For consistency, this parameter should be set for each channel	[1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]	
IWV_instrument	the data source of IWV. ('mwr' or 'aeronet')	"AERONET"	

keyword	Description	Example	Reference
maxIWVTLag	The minumum lag required for water vapor calibration between IWV data and lidar water vapor measurement.	0.1666 (day)	
tTwilight	span of the twilight	0.0347 (day)	
hWVCaliBase	The minimum height used for calculating the IWV from lidar measurement.	120	
minHWVCaliTop	The minimum top height required for calculating the IWV from lidar measurement.	2000	
clear_thres_par_beta_1064	The threshold for discriminating clear atmosphere based on particle backscatter at 1064nm	1e-8 m^{-1}	Baars H. et a
turbid_thres_par_beta_1064	The threshold for discriminating turbid atmosphere based on particle backscatter at 1064nm	2e-7 m^{-1}	Baars H. et a
turbid_thres_par_beta_532	The threshold for discriminating turbid atmosphere based on particle backscatter at 532nm	2e-7 m^{-1}	Baars H. et a
droplet_thres_par_depol	The threshold for discriminating cloud droplets based on particle depolarization ratio at 532nm	0.05	Baars H. et a
spheroid_thres_par_depol	The threshold for discriminating spheriod paricles based on particle depolarization ratio at 532nm	0.07	Baars H. et a
unspheroid_thres_par_depol	The threshold for discriminating unspheriod paricles based on particle depolarization ratio at 532nm	0.2	Baars H. et a
ice_thres_par_depol	The threshold for discriminating ice crystals based on particle depolarization ratio at 532nm	0.35	Baars H. et a
ice_thres_vol_depol	The threshold for discriminating ice crystals based on volume depolarization ratio at 532nm	0.3	Baars H. et a
large_thres_ang	The threshold for discriminating large particles based on angstroem exponent	0.75	Baars H. et a
small_thres_ang	The threshold for discriminating small particles based on angstroem exponent	0.5	Baars H. et a
cloud_thres_par_beta_1064	The threshold for discriminating cloud layers based on quasi particle backscatter at 1064nm	2e-5 m^{-1}	Baars H. et a
min_atten_par_beta_1064	The minimum attenuation factor could be expected at the first 250m penatration depth	10	Baars H. et a
search_cloud_above	The parameter is used in cloud top detection. The cloud top will be searched between the first bin with quasi particle backscatter at 1064nm larger than cloud_thres_par_beta_1064 and +search_height_above	300 m	Baars H. et a
search_cloud_below	The parameter is used in cloud base detection. The cloud base will be searched between the first bin with quasi particle backscatter at 1064nm larger than cloud_thres_par_beta_1064 and -search_height_below	100 m	Baars H. et a
overlap{wavelength}Color	the color settings for the line of overlap	[0, 255, 64]	

keyword	Description	Example	Reference
xLim_Profi_Bsc	x-range of the profile of aerosol backscatter	[-0.1, 10] Mm^{-1}sr^{-1}	
xLim_Profi_NR_Bsc	x-range of the profile of aerosol backscatter retrieved with near-range signal	[-0.1, 10] Mm^{-1}sr^{-1}	
xLim_Profi_Ext	x-range of the profile of aerosol extinction coefficient	[-1, 300] Mm^{-1}	
xLim_Profi_NR_Ext	x-range of the profile of aerosol extinction coefficient retrieved with near-range signal	[-1, 300] Mm^{-1}	
xLim_Profi_WV_RH	x-range (**z-range**) of the profile (**time-height plot**) of water vapor mixing ratio	[0, 10] g*kg^{-1}	
xLim_Profi_RCS	x-range of the profile of range corrected signal	[0.3, 10] (*1e6 a.u.)	
xLim_Profi_LR	x-range of the profile of lidar ratio	[0, 120] sr	
yLim_LC_{wavelength}	y-range of the profile of lidar constant at certain wavelength	[0, 1e14]	
yLim_LC_ratio_{wavelength1}_{wavelength2}	y-range of the scatter plot of the lidar constant ratio at two given wavelength	[0, 1]	
yLim_WVConst	y-range of the profile of water vapor calibration constant	[0, 20]	Guangyao D
yLim_FR_RCS	y-range of the profile of range corrected signal (**time-height plot of signal saturation bits**) from far-range channels	[0, 20000] m	
yLim_NR_RCS	y-range of the profile of range corrected signal (**time-height plot of signal saturation bits**) from near-range channels	[0, 3000] m	
yLim_att_beta	y-range of the time-height plot of far-field attenuated backscatter	[0, 15000] [m]	
yLim_att_beta_NR	y-range of the time-height plot of near-field attenuated backscatter	[0, 3000] [m]	
yLim_Quasi_Params	y-range of aerosol optical products retrieved by quasi-retrieving method	[0, 12000] m	Baars H. et a
yLim_WV_RH	y-range of the profile of water vapor mixing ratio (relative humidity)	[0, 7000] m	
yLim_Profi_Ext	y-range of the profile of extinction coefficient	[0, 5000] m	
yLim_Profi_LR	y-range of the profile of lidar ratio	[0, 5000] m	
yLim_Profi_DR	y-range of the profile of volume/particle depolarization ratio	[0, 20000] m	
yLim_Profi_Bsc	y-range of the profile of aerosol backscatter	[0, 20000] m	
yLim_Profi_WV_RH	y-range of the profile of water vapor mixing ratio (relative humidity)	[0, 7000] m	
yLim_depolConst_{wavelength}	y-range of the profile of depolarization calibration constant at certain wavelength	[0, 0.2]	
zLim_att_beta_{wavelength}	z-range of the time-height plot of attenuated backscatter	[0, 15] Mm^{-1}sr^{-1}	
zLim_quasi_beta_{wavelength}	z-range of the time-height plot of quasi aerosol backscatter coefficient	[0, 8] Mm^{-1}sr^{-1}	Baars H. et a
zLim_quasi_Par_DR_532	z-range of the time-height plot of quasi particle depolarization ratio	[0, 0.4]	

keyword	Description	Example	Reference
zLim_FR_RCS_{wavelength}	z-range of the time-height plot of range corrected signal from far-range channels	[1e-2, 30] (1e6 a.u.)	
zLim_NR_RCS_{wavelength}	z-range of the time-height plot of range corrected signal from near-range channels	[1e-2, 5] (1e6 a.u.)	
zLim_VolDepol_{wavelength}	z-range of volume depolarization ratio	[0, 0.3]	
colormap_basic	basic colormap (`chiljet`, `eleni`, `CALIPSO`, `labview`): • range corrected signal • volume depolarization ratio • attenuated backscatter • quasi particle backscatter • quasi angstroem exponent • quasi particle depolarization ratio	`chiljet`	https://githu
PI	project investigator	"Holger Baars"	
PI_affiliation	affiliation of PI	"Holger Baars"	
PI_affiliation_acronym	acronym of the affiliation of the PI	"TROPOS"	
PI_address	address of the PI	"Permoserstraße 15, 04103 Leipzig, Germany"	
PI_phone	phone number of the PI	""	
PI_email	email of the PI	"baars@tropos.de"	
Data_Originator	data originator	"Zhenping Yin"	
Data_Originator_affiliation	affiliation of the data originator	"Leibniz Institute for Tropospheric Research, Leipzig"	
Data_Originator_affiliation_acronym	acronym of the data originator	"TROPOS"	
Data_Originator_address	address of the data originator	"Permoserstraße 15, 04103 Leipzig, Germany"	
Data_Originator_phone	phone number of the data originator	""	
Data_Originator_email	email of the data originator	"zhenping@tropos.de"	
comment	comment on the data	"test measurements"	
calibrationDB	database for saving calibration results	"polly_calibration.db"	
logbookFile	path to the logbook file. Only the logfile generated by the pollylog program was accepted.	"/home/zhenping/logbook.csv"	
radiosondeFolder	directory of the radiosonde file. The radiosonde file should be in standardized format, which has been defined in '../doc/meteorological_file_settings.pptx'	"/home/picasso/data/radiosonde"	
imgFormat	image format	'png'	
partnerLabel	partner label to be displayed in the figures	"UMA"	
prodSaveList	control the output of nc files. If the product was specified in the product save list (prodSaveList), it will then be saved.	["overlap", "aerProfFR", "aerProfNR", "aerProfOC", "aerAttBetaFR", "aerAttBetaOC", "WVMR_RH", "volDepol", "quasiV1", "quasiV2", "TC", "TCV2"]	

Rayleigh fit configurations

There are two steps for Rayleigh fit algorithm implemented in Picasso:

1. Signal de-composition by Douglas-Peucker algorithm
2. Rayleigh fit on each signal segments (de-composed by step **1**)

To obtain required reference height in terms of reference height width and SNR, there are 7 configs applied:

1. decomSmoothWin{wavelength}
2. maxDecomHeight{wavelength}
3. maxDecomThickness{wavelength}

4. minDecomLogDist{wavelength}
5. minRefThickness{wavelength}
6. minRefSNR{wavelength}
7. minRefDeltaExt{wavelength}

The first 4 parameters are associated with signal de-composition. Before the signal de-composition, range-corrected signal is first divided by Rayleigh signal to correct signal attenuation by molecules and then is smoothed to remove signal spikes caused by signal noise. The smoothing window width is controlled by `decomSmoothWin`. The larger the smoothing window width, the more likely suitable reference height can be found. But it should be noted that signal smoothing would remove weak signal features and make them de-composed wrongly. Therefore, one may need to tune this parameter to get more reliable reference height.

During the signal de-composition, the signal was decomposed according to the required maximum distance of all points to the line determined by start/end point of each signal segment. It would ensure that every signal segment is close to a line with maximum deviation less than maximum distance, configured by `maxDecomLogDist`. The smaller the maximum distance, the narrower the signal segments. Besides, `maxDecomHeight` and `maxDecomThickness` control the top boundary of signal de-composition and maximum length of signal segments, which would determine the top boundary of Rayleigh fit and final width of reference height.

After the signal de-composition, the signal segments are fed into Rayleigh fit algorithm. The Rayleigh fit criteria are applied for each signal segment to choose suitable reference height. The criteria includes:

1. minimum reference height width (controlled by `minRefThickness`)
2. near- and far-range test
3. White-noise test
4. SNR test (controlled by `minRefSNR`)
5. Slope test (Pure Rayleigh test controlled by `minRefDeltaExt`)

`minRefThickness` is the parameter to control the width of reference height. It should be at least larger than 500 m to fulfill criterion **3** of requirement for minimum SNR. `minRefDeltaExt` is a key parameter to control the similarity between lidar signal and Rayleigh signal (Details can be found in [Picasso_Rayleigh_fit_algorithm.pptx]). Usually, this should be fixed to 1.