

RLFEX VAP: Status and Updates

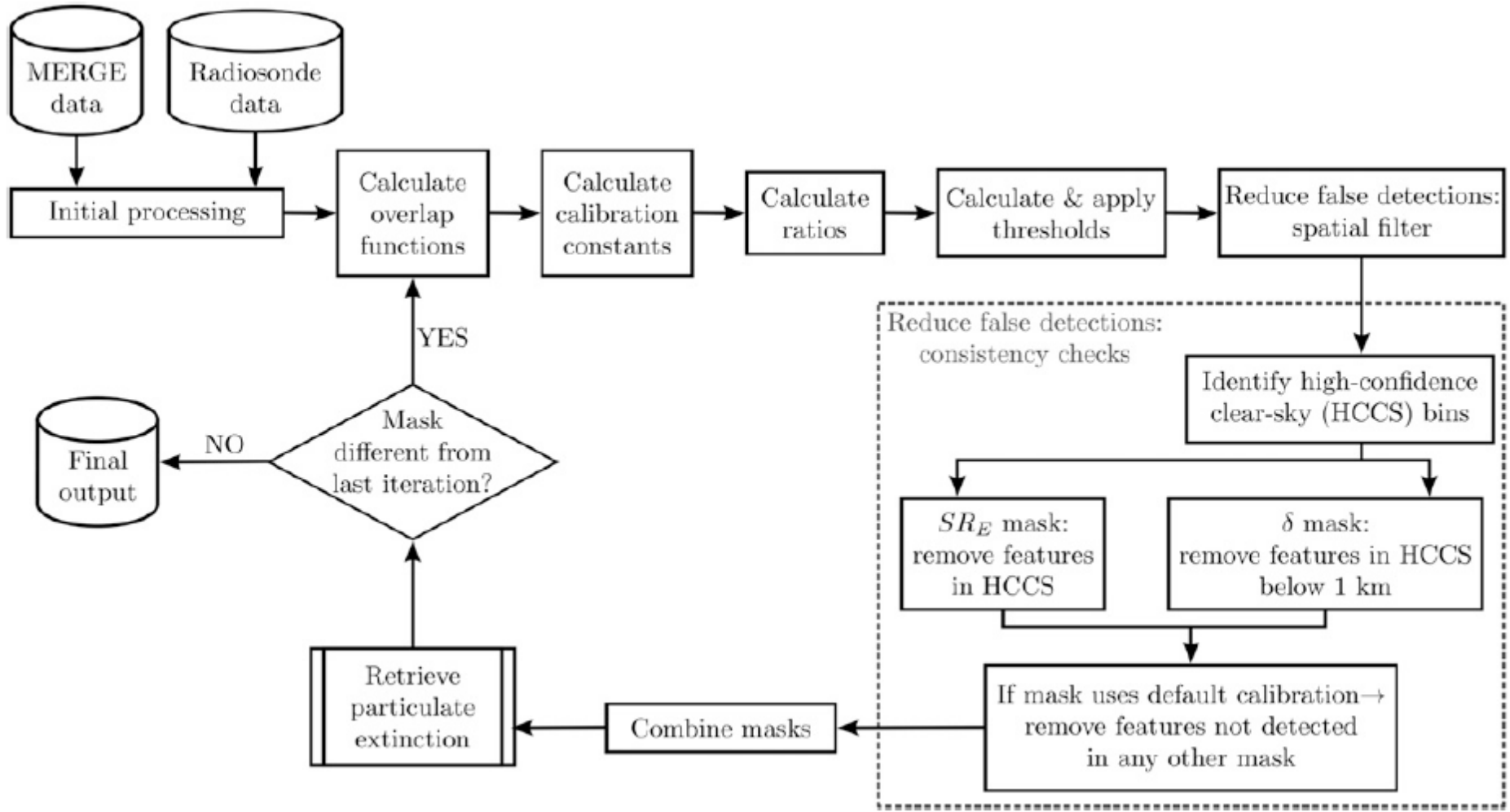
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Outline:

- **Introduction (RLFEX Flow diagram)**
- **RLFEX Outputs**
- **Progress made and tasks completed**
- **Next Steps**

Raman Lidar Feature detection and Extinction (RLFEX) VAP: Feature detection flow diagram



Four mask: DR, SR_E , SREN2 (High) and SREN2 (Low) mask

RLFEX VAP outputs:

enarlproffex1thorC1.c0 [40 fields]
Ratios (SR, DR, LR, detection confidence etc.)

enarlproffexext1thorC1.c0 [37 fields]
Particulate E and E-N backscatter, LR, etc.

enarlproffexcnt1thorC1.c0 [41 fields]
Background, counts, and SNR

enarlproffexaux1thorC1.c0 [65 fields]
Calibrations constants

Progress and tasks completed:

The configuration files are developed for RLFEX at ENA by following analysis:

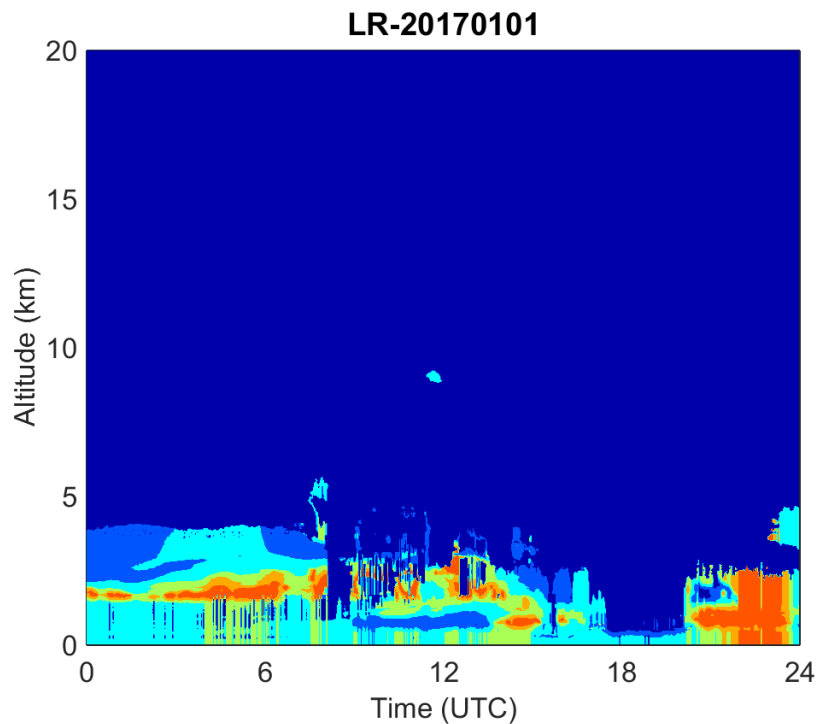
- (a) Surface sun-photometer
- (b) Surface size distribution
- (c) Liquid cloud droplet size from satellite analysis
- (d) Ice cloud droplet Size from satellite analysis
- (e) Raw RL data for misalignment angle for all clear sky days
- (f) Raw RL data for overlap functions for all clear sky days

Calibration stability of RL at ENA is being assessed, some results are presented in poster on Tuesday afternoon.

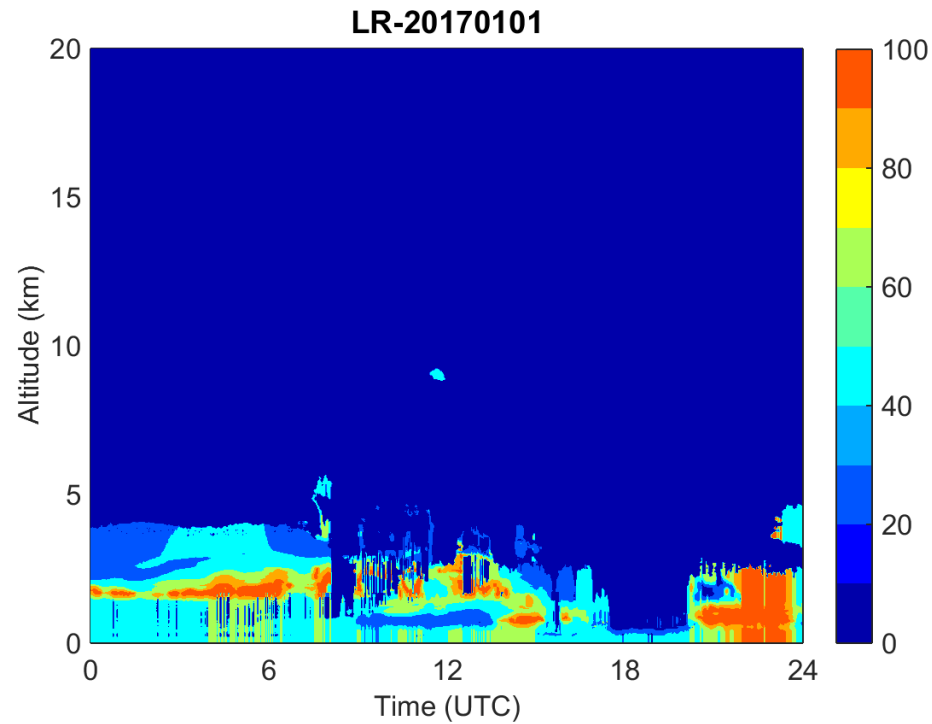
RLFEX: Comparison of original version with ADI

Original runs from Thorson et al 2015

ADI



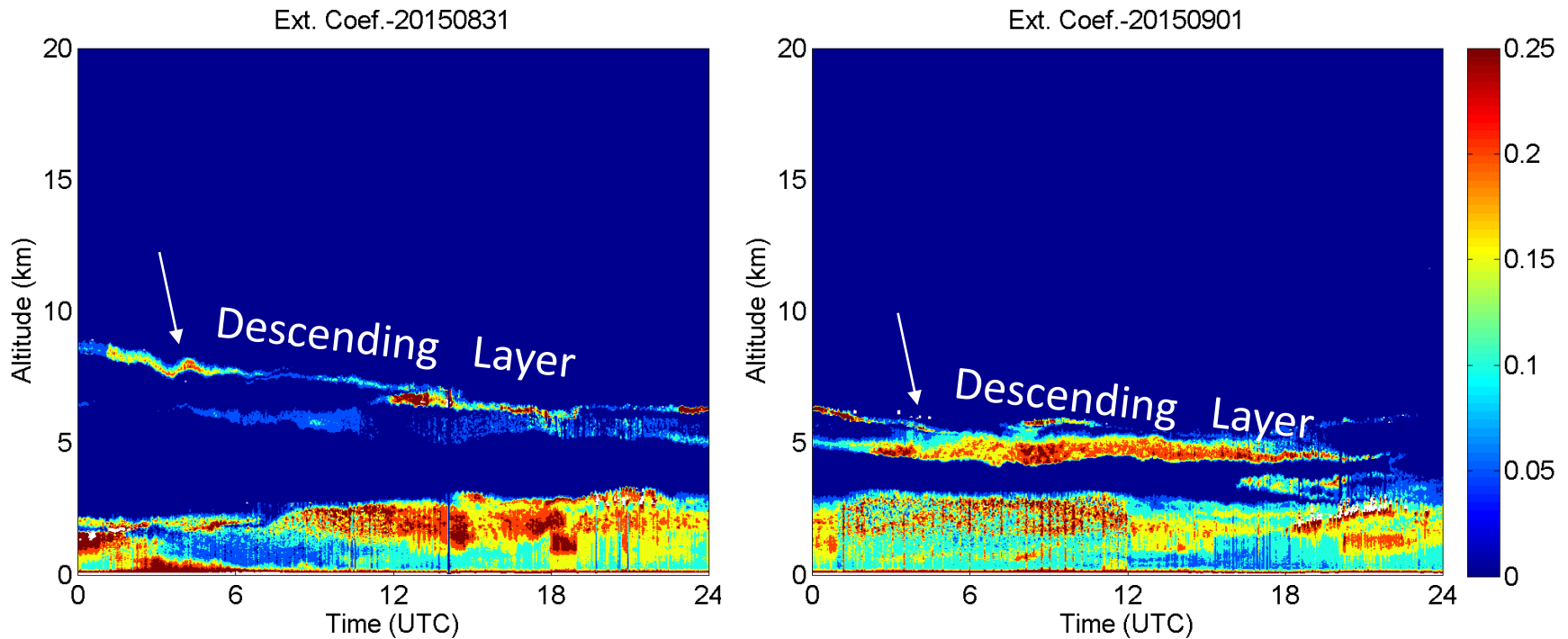
Original_RLFex



ADI_RLFex

RLFEX Installation, Testing, and Implementation:

(RLFex from THORSEN et al., 2015A, 2015B)



**Aerosol/cloud layer descending from Free Troposphere
is observed by SGP RL system**

Estimate misalignment angle in the RL system

Estimating the gain parameter (η) and misalignment angle (ϕ):

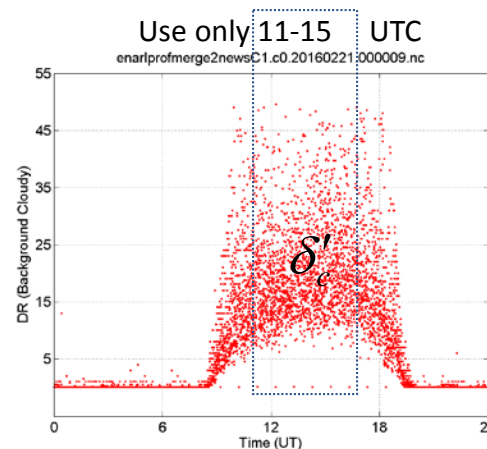
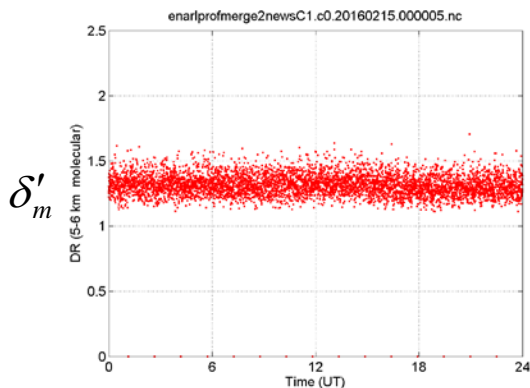
$$\eta = \frac{\delta'_c}{\delta'_m} = \frac{22}{1.33} = 16.54 \quad (\text{Avg gain parameter is 23.41 instead of 22 (see page 7)})$$

$$f_m = \frac{1 - \delta_m}{1 + \delta_m} = \frac{1 - 0.004}{1 + 0.004} = 0.992 \quad (\text{Here } \delta_m = 0.004 \text{ is true molecular DR})$$

$$\gamma = \frac{\eta - 1}{f_m(\eta + 1)} = \frac{16.54 - 1}{0.992(16.54 + 1)} = 0.9268$$

Misalignment angle, $\phi = 0.5 \cos^{-1} \gamma = 11.02 \text{ deg}$ (if we use gain parameter as 23.41 the misalignment angle is 12.9 degree)

Here the value of δ'_c is weight or gain parameter in file: rlprof_fex.para_weight



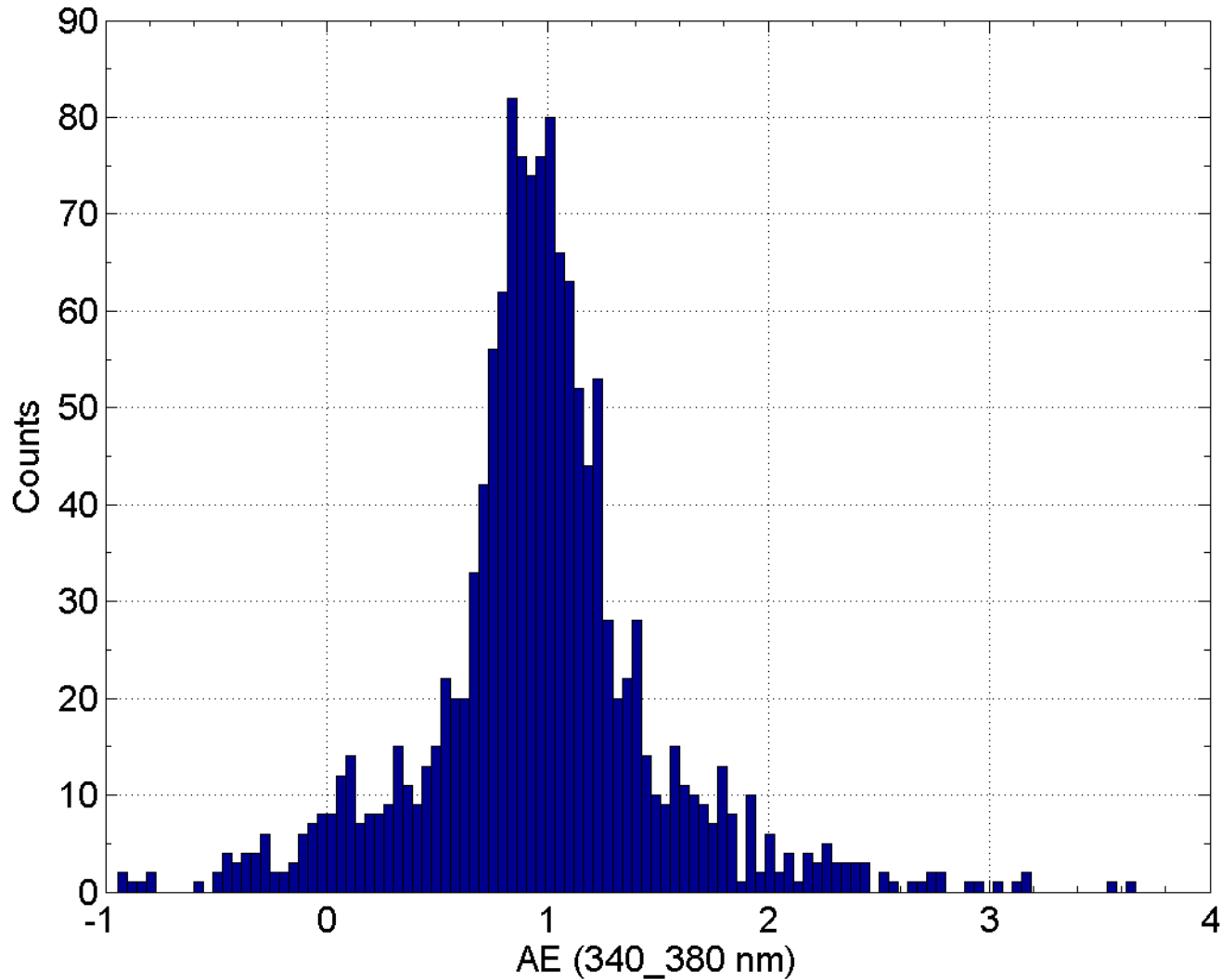
Year	Month	Date/Day	Back_Dep_cld	Back_Dep_cld_std	Mis_alng_angle
2.0150000e+03	1.0000000e+01	1.9000000e+01	1.7907722e+01	9.8823786e+00	1.4847228e+01
2.0150000e+03	1.0000000e+01	2.0000000e+01	1.8141123e+01	9.5274305e+00	1.4750317e+01
2.0150000e+03	1.0000000e+01	2.1000000e+01	1.7264595e+01	1.0079642e+01	1.5123691e+01
2.0160000e+03	1.0000000e+00	2.9000000e+01	2.1667728e+01	1.4551685e+01	1.3470840e+01
2.0160000e+03	1.0000000e+00	3.0000000e+01	2.0341776e+01	1.4011430e+01	1.3915138e+01
2.0160000e+03	2.0000000e+00	2.1000000e+01	2.2027885e+01	1.4316901e+01	1.3356719e+01
2.0160000e+03	2.0000000e+00	2.4000000e+01	2.3221272e+01	1.4521122e+01	1.2996603e+01
2.0160000e+03	2.0000000e+00	2.8000000e+01	2.2612396e+01	1.4984768e+01	1.3176992e+01
2.0160000e+03	2.0000000e+00	2.9000000e+01	2.5761469e+01	1.5789341e+01	1.2310268e+01
2.0160000e+03	3.0000000e+00	1.0000000e+00	2.5593752e+01	1.7629797e+01	1.2352603e+01
2.0160000e+03	3.0000000e+00	2.0000000e+00	2.5174669e+01	1.6747890e+01	1.2460104e+01
2.0160000e+03	3.0000000e+00	3.0000000e+00	2.5824047e+01	1.7819597e+01	1.2294579e+01
2.0160000e+03	3.0000000e+00	4.0000000e+00	2.6147705e+01	1.7597914e+01	1.2214251e+01
2.0160000e+03	3.0000000e+00	7.0000000e+00	2.6525681e+01	1.6712387e+01	1.2122196e+01
2.0160000e+03	3.0000000e+00	8.0000000e+00	2.7842058e+01	1.9635029e+01	1.1815501e+01
2.0160000e+03	4.0000000e+00	9.0000000e+00	2.3024609e+01	1.0645952e+01	1.3054132e+01
2.0170000e+03	3.0000000e+00	1.7000000e+01	2.8875349e+01	1.8390839e+01	1.1588713e+01

Average misalignment angle: 12.99 ± 1.08 degree

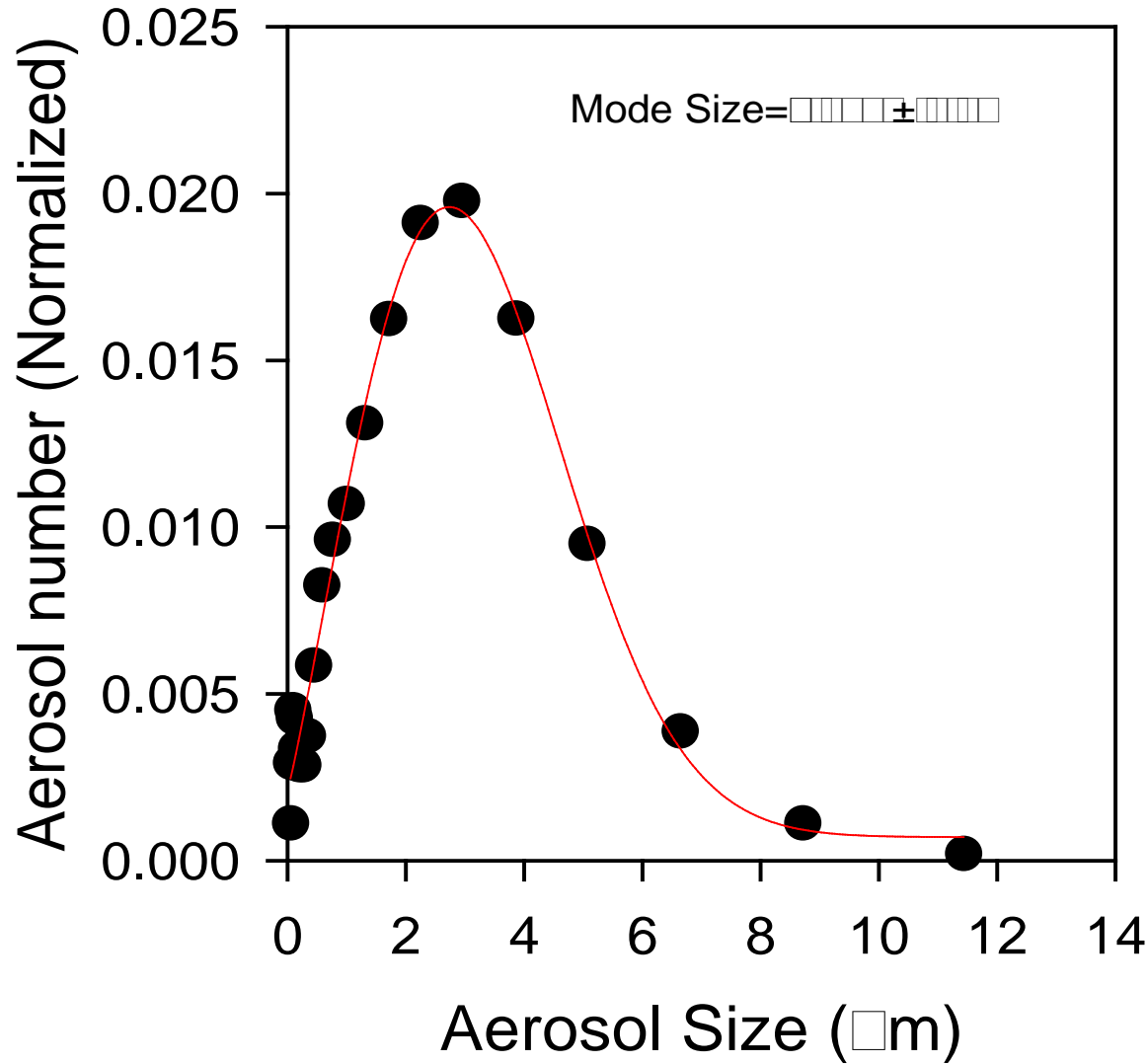
Average gain parameter: 23.41

Analysis of AERONET AOD data at 340 and 380 nm

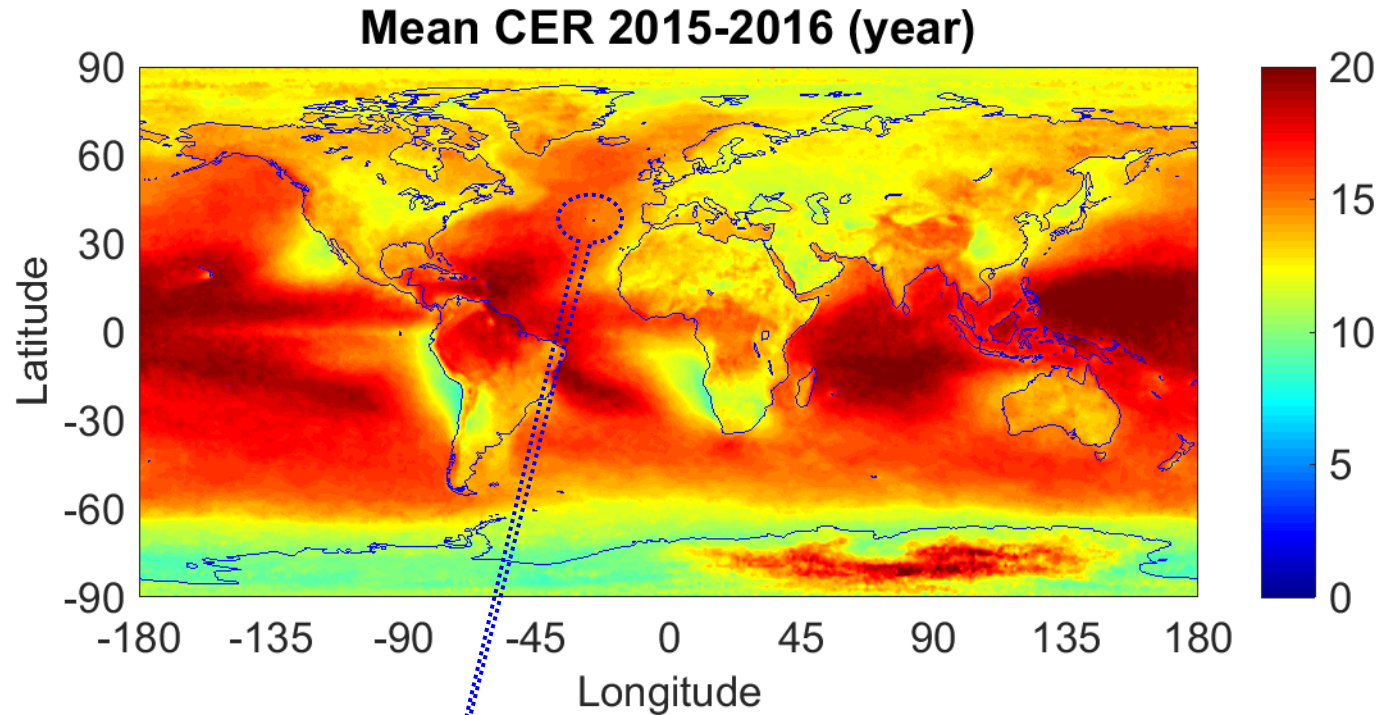
Mean, Std = 0.97, 0.58



Analysis of size distribution data from AERONET AERONET ENA



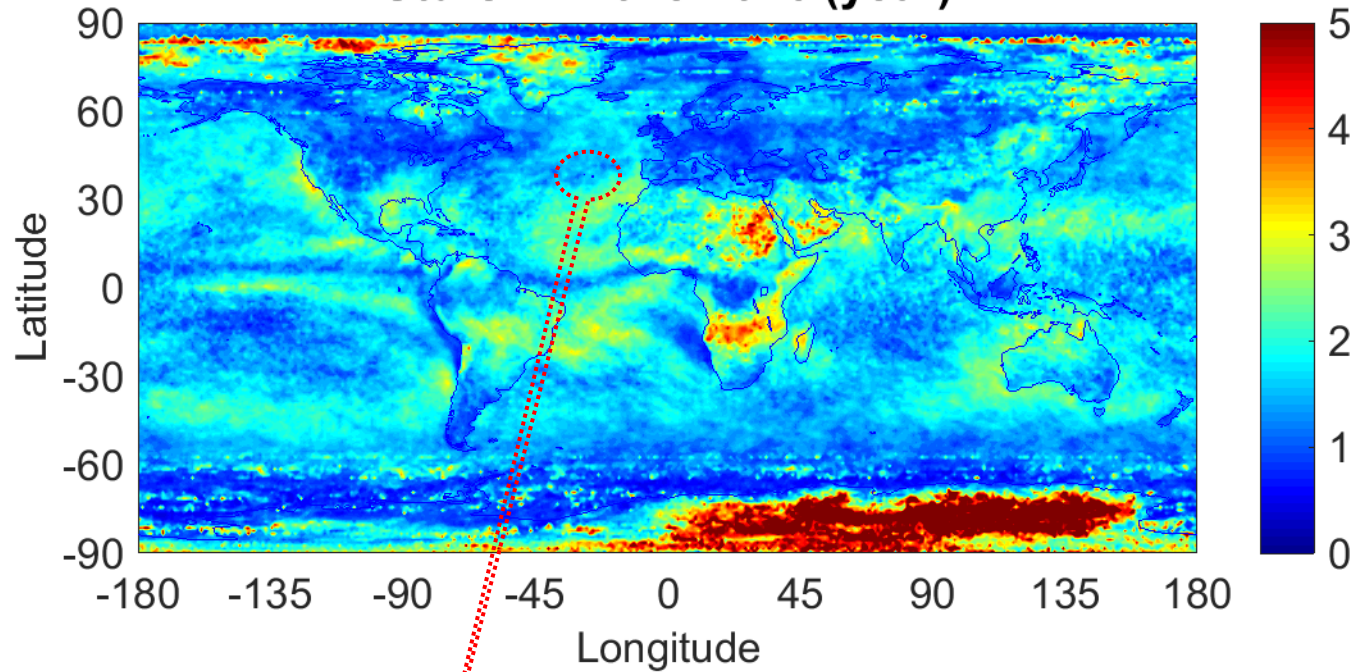
Analysis of liquid cloud droplet size from satellite data



Over Graciosa Island (ENA) 15.0 μm

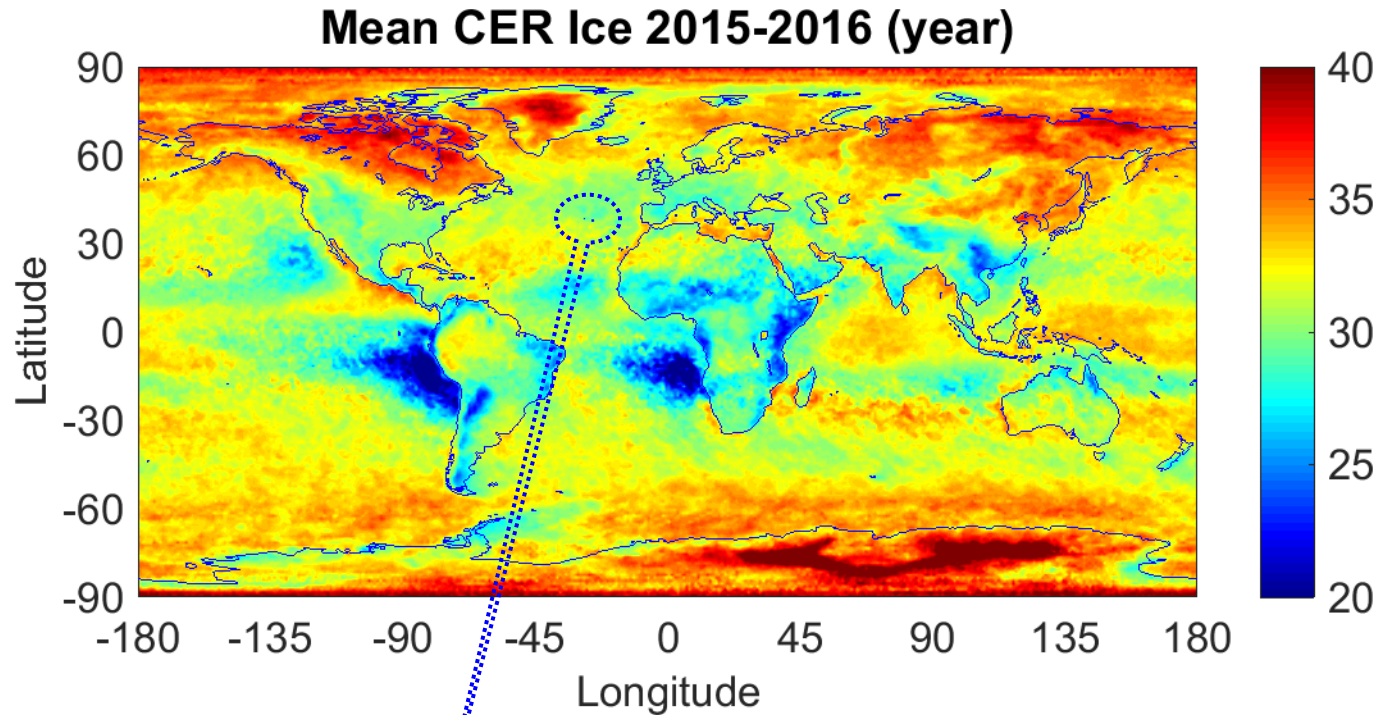
Liquid CER

Std CER 2015-2016 (year)



Over Graciosa Island (ENA) 1.6 μm

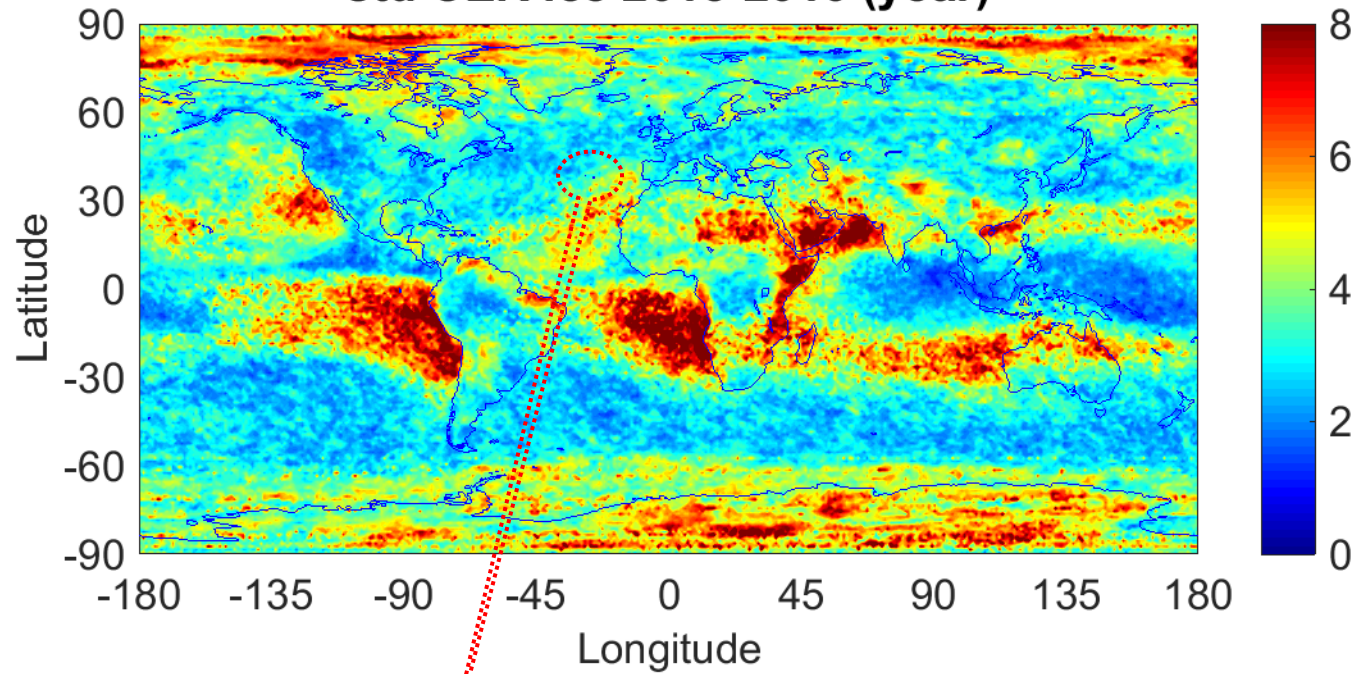
Analysis of ice crystal size from satellite data



Over Graciosa Island (ENA) 30.1 μm

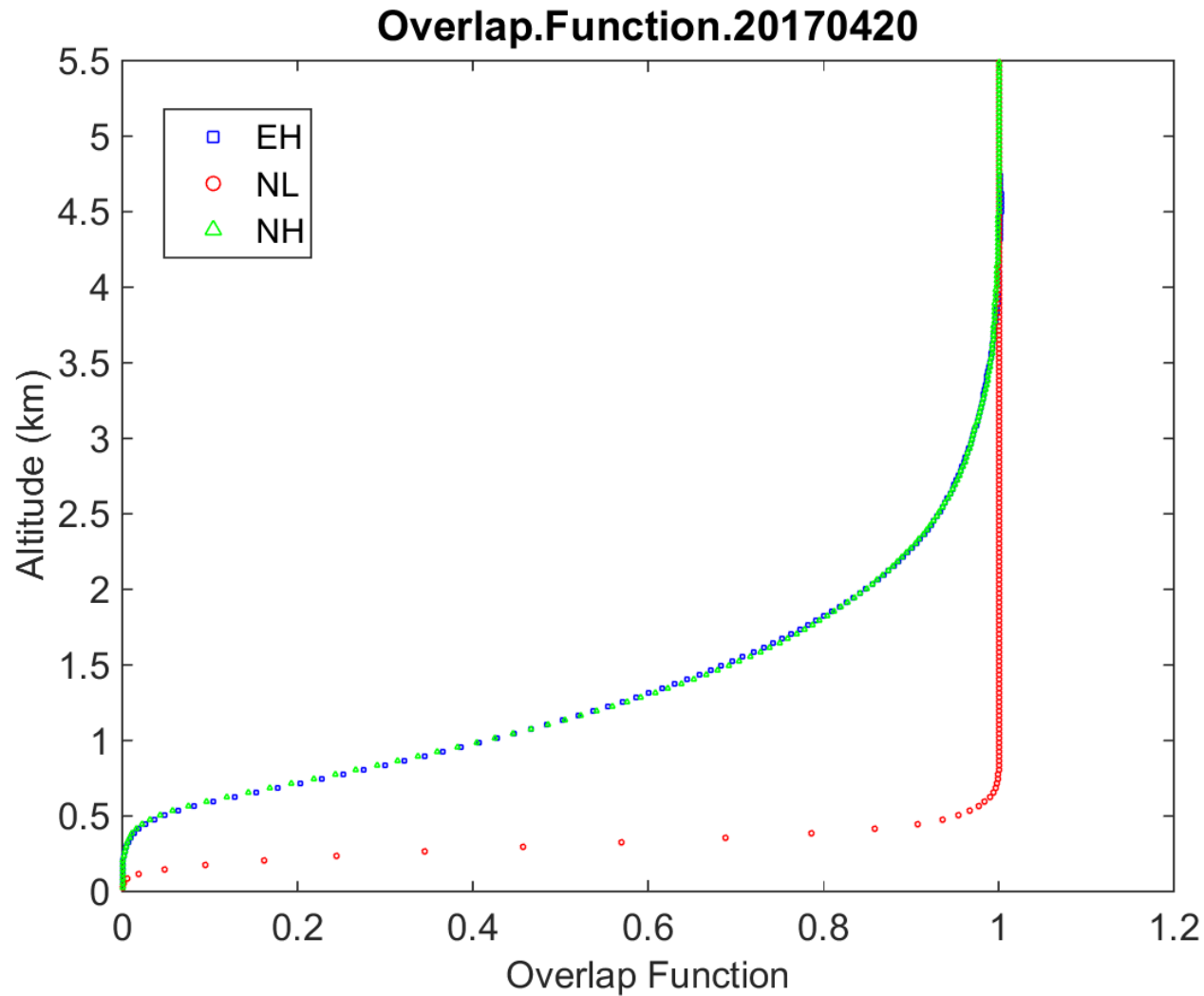
Ice CER

std CER Ice 2015-2016 (year)



Over Graciosa Island (ENA) 3.6 μm

Estimating the Overlap Functions (OFs)



Operational Status of RL/RLFEX

RLFEX at SGP: ~1150 days of data (since Jan 06, 2015)

Current Status: operational

RLFEX at ENA: ~1000 days of data (since Sep 04, 2015)

Current Status: operational

RL at OLI: ~350 days of data (since Nov 15, 2014)

Current Status: operational

Next tasks

Complete the RLFEX VAP handbook

Start on RL configuration files for Oliktok Point

Get first estimate of RL calibration stability at SGP

Thank you!