DORSY

AC-TC processor

LATMOS
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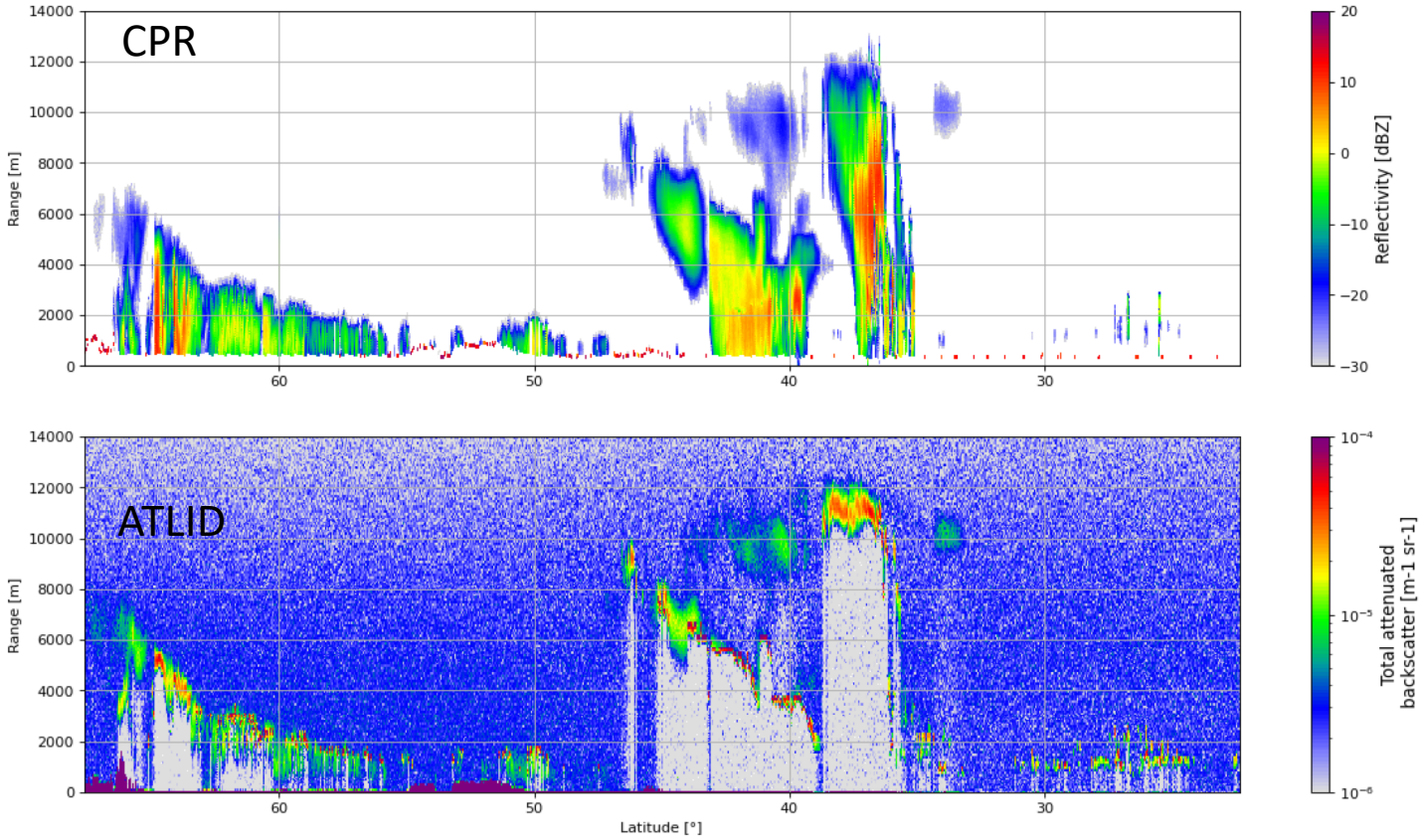
HALIFAX scene simulation



Capitalise on the experience of CloudSat/CALIPSO data for many years

AC-TC processor: merging information of LIDAR and RADAR CLASSIFICATIONS

lidar and **radar** probe different parts of particle size regimes: **radar can penetrate thick ice clouds while lidar detects very thin ice clouds and liquid clouds.**

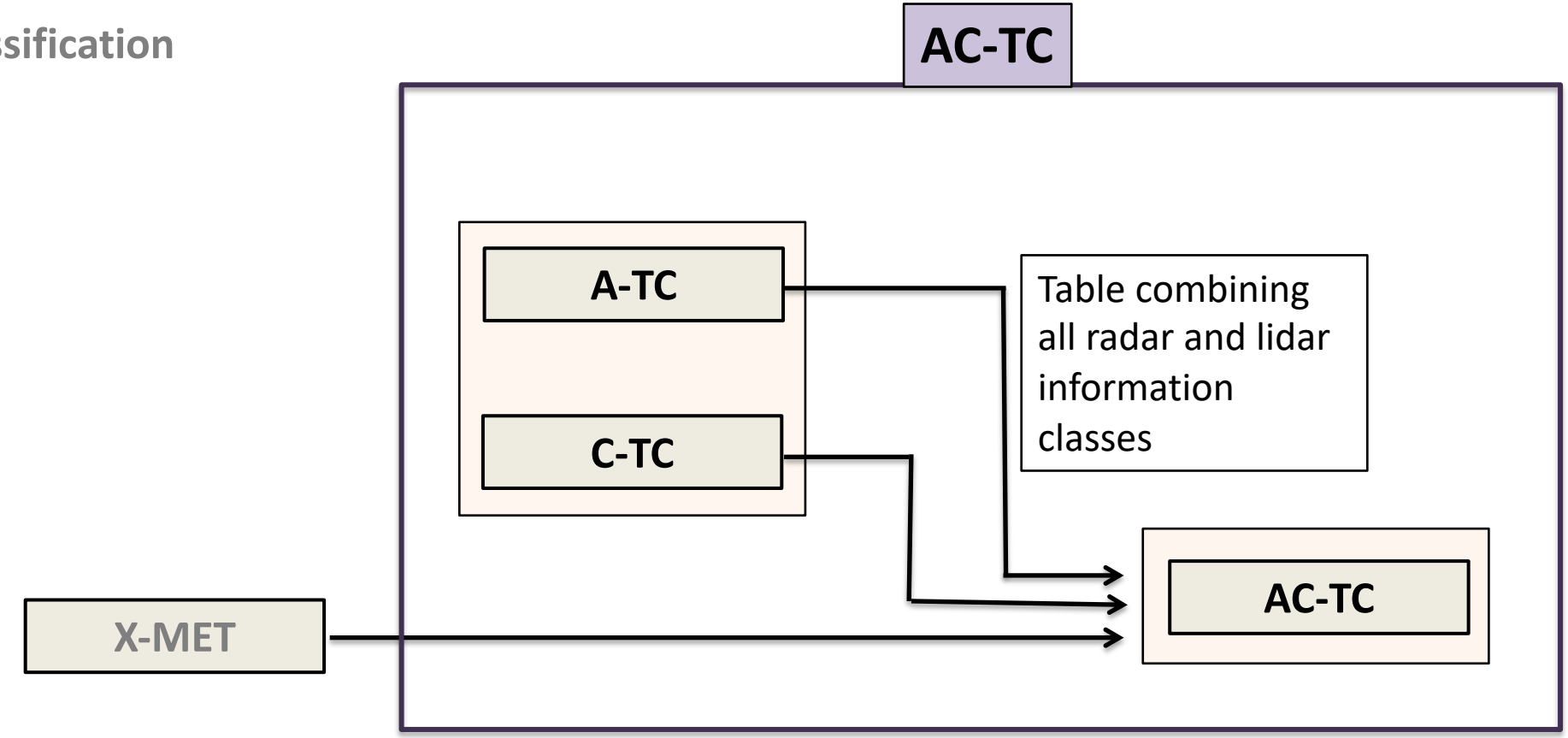
Two independent information (microwave and optical) in the overlap region: Combination of the two signals allows us to further when classify the different targets.

1. **lidar backscatter** contains **information** about **hydrometeor nature: strong backscatter** regions composed either of **warm liquid water**, **supercooled water**, **ice in high concentration** or a **mix of them**.
2. **radar** brings much more **information** on **deep ice cloud** and the **precipitation part of the cloud** (**solid** or **liquid**).
3. **radar is taking over lidar** on **rain**, **drizzle** and **snow events**.

AC-TC PROCESSOR AND DATA PRODUCT

A-TC : ATL Target Classification

C-TC : CPR Target Classification



ATL Target Classification

A-TC VALUES	CLASSES
-3	Missing data
-2	Surface or sub-surface
-1	Attenuated region
0	Clear
1	(Warm) liquid cloud
2	Supercooled liquid cloud
3	Ice cloud
10	Dust
11	Sea salt
12	Continental pollution
13	Smoke
14	Dusty smoke
15	Dusty mix
20	STS – PSC type I
21	NAT – PSC type II
22	Stratospheric ice
25	Ash
26	Sulfate
27	Smoke

CPR Target Classification

Value C-TC	Description
-1	Missing data
0	Ground
1	Clear sky
2	No drizzle liquid cloud
3	Lightly drizzling liquid clouds
4	Heavy drizzle and warm rain
5	Cold rain (rain from melting ice)
6	Melting snow
7	Rimed snow
8	Snow
9	Ice cloud
10	Stratospheric cloud (ice)
11	Insects (or artefacts)
12	Signal likely extinguished, rain likely present
13	Signal likely extinguished, mixed-phase likely present
14	Signal extinguished, rain likely present
15	Signal extinguished, mixed-phase likely present
16	Removed ground clutter, possible rain in clutter
17	Removed ground clutter, possible snow in clutter
18	Removed ground clutter, possible cloud in clutter
19	Removed ground clutter, cloud/precipitation unlikely present in this layer
20	Uncertain (don't know)

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AC-TC Classification

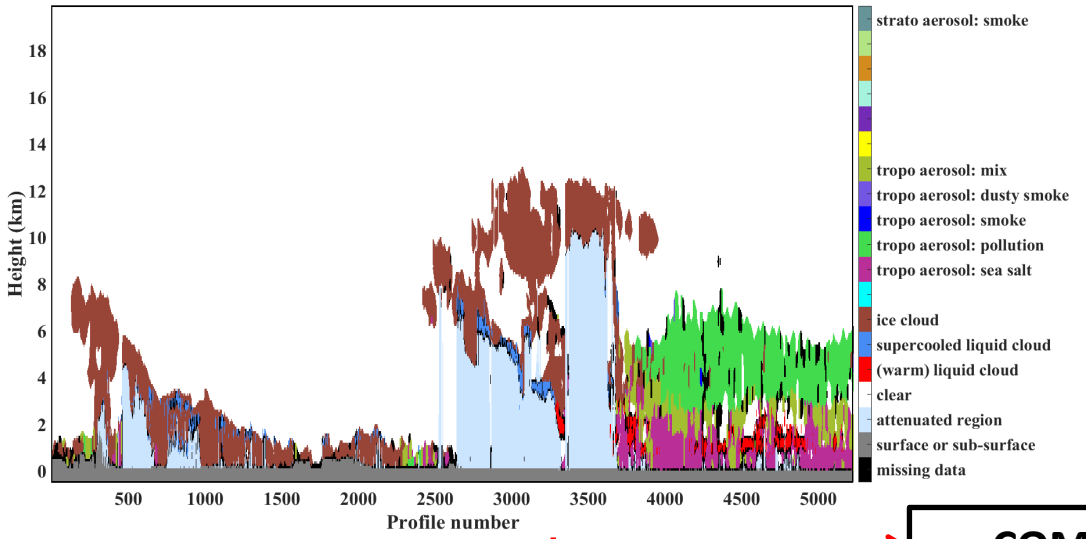
AC Classes	Associated numbers
unknown (missing data)	-1
ground	0
clear sky	1
possible rain (ground clutter, radar likely or extinguished)	2
possible snow in ground clutter	3
possible cloud in ground clutter	4
possible mixed-phase (radar likely or extinguished)	5
No rain or ice but can't tell if liquid	6
liquid	7
drizzling liquid cloud	8
warm rain	9
rain from melting (cold rain)	10
melting snow	11
snow but don't know if liquid too	12
snow (no liquid)	13
rimed snow but don't know if liquid too	14
rimed snow and supercooled liquid	15
snow and supercooled liquid	16
supercooled	17
ice cloud don't know if liquid too	18
ice and supercooled liquid	19
ice cloud (no liquid)	20
Stratospheric ice	21
STS - PSC type I	22
NAT - PSC type II	23
insects	24
tropospheric aerosol type	25-30
stratospheric aerosol type	31-33

C-TC \ A-TC	-3 Missing data	-2 Ground	-1 attenuated region	0 clear sky	1 liquid cloud	2 supercooled water	3 ice cloud	10-15 Aerosol and type	20 STS	21 NAT	22 Stratospheric ice	25-27 Aerosol and type
-1 Missing data	-1 Unknown	0 Ground	-1 Unknown	1 clear sky	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	22 STS	23 NAT	21 Stratospheric ice	31-33 Aerosol - Types
0 Ground	0 ground	0 Ground	0 Ground	1 clear sky	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	0 Ground	0 Ground	0 Ground	31-33 Aerosol - Types
1 clear sky	1 clear sky	0 Ground	6 no rain no ice can't tell if liquid	1 clear sky	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	22 STS	23 NAT	21 Stratospheric ice	31-33 Aerosol - Types
2 liquid cloud (no drizzle)	7 Liquid	0 Ground	7 Liquid	24 insects	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	22 STS	23 NAT	21 Stratospheric ice	31-33 Aerosol - Types
3 lightly drizzling liquid clouds	8 drizzling liquid cloud	0 Ground	8 drizzling liquid cloud	24 insects	8 drizzling liquid cloud	19 ice and supercooled	20 ice cloud	25-30 Aerosol - Types	22 STS	23 NAT	21 Stratospheric ice	31-33 Aerosol - Types
4 heavy drizzle and warm rain	9 warm rain	0 Ground	9 warm rain	24 insects	8 drizzling liquid cloud	19 ice and supercooled	20 ice cloud	25-30 Aerosol - Types	22 STS	23 NAT	21 Stratospheric ice	31-33 Aerosol - Types
5 cold rain (from melting ice)	10 rain from melting	0 Ground	10 rain from melting	24 insects	8 drizzling liquid cloud	19 ice and supercooled	20 ice cloud	10 rain from melting	22 STS	23 NAT	21 Stratospheric ice	10 rain from melting
6 melting snow	11 melting snow	0 Ground	11 melting snow	11 melting snow	11 melting snow	11 melting snow	11 melting snow	11 melting snow	11 melting snow	11 melting snow	11 melting snow	11 melting snow
7 rimed snow	14 rimed snow but don't know if liquid too	0 Ground	14 rimed snow but don't know if liquid too	13 snow	15 rimed snow and supercooled	15 rimed snow and supercooled	13 snow	13 snow	13 snow	13 snow	13 snow	13 snow
8 snow	12 snow but don't know if liquid too	0 Ground	12 snow but don't know if liquid too	13 snow	16 snow and supercooled	16 snow and supercooled	13 snow	13 snow	13 snow	13 snow	13 snow	13 snow
9 Ice cloud	18 Ice cloud but don't know if liquid too	0 Ground	18 Ice cloud but don't know if liquid too	20 ice cloud	19 ice and supercooled	19 ice and supercooled	20 ice cloud	20 ice cloud	20 ice cloud	20 ice cloud	20 ice cloud	20 ice cloud
10 stratospheric ice	21 Stratospheric ice	0 Ground	21 Stratospheric ice	21 Stratospheric ice	19 ice and supercooled	19 ice and supercooled	20 ice cloud	21 Stratospheric ice	21 Stratospheric ice	21 Stratospheric ice	21 Stratospheric ice	21 Stratospheric ice
11 insects	24 insects	0 Ground	24 insects	24 insects	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	22 STS	23 NAT	21 Stratospheric ice	31-33 Aerosol - Types
12 Signal likely extinguished, rain likely present	2 possible rain (ground clutter,...)	0 Ground	2 possible rain (ground clutter,...)	1 clear sky	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	2 possible rain (ground clutter,...)	2 possible rain (ground clutter,...)	2 possible rain (ground clutter,...)	31-33 Aerosol - Types
13 Signal likely extinguished, mixed-phase likely present	5 possible mixed-phase	0 Ground	5 possible mixed-phase	1 clear sky	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	5 possible mixed-phase	5 possible mixed-phase	5 possible mixed-phase	31-33 Aerosol - Types
14 Signal extinguished rain likely present	2 possible rain (ground clutter,...)	0 Ground	2 possible rain (ground clutter,...)	1 clear sky	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	2 possible rain (ground clutter,...)	2 possible rain (ground clutter,...)	2 possible rain (ground clutter,...)	31-33 Aerosol - Types
15 Signal extinguished, mixed-phase likely present	5 possible mixed-phase	0 Ground	5 possible mixed-phase	1 clear sky	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	5 possible mixed-phase	5 possible mixed-phase	5 possible mixed-phase	31-33 Aerosol - Types
16 ground clutter removed, possible rain in clutter	2 possible rain (ground clutter,...)	0 Ground	2 possible rain (ground clutter,...)	1 clear sky	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	2 possible rain (ground clutter,...)	2 possible rain (ground clutter,...)	2 possible rain (ground clutter,...)	31-33 Aerosol - Types
17 ground clutter removed, possible snow in clutter	3 possible snow in ground clutter	0 Ground	3 possible snow in ground clutter	1 clear sky	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	3 possible snow in ground clutter	3 possible snow in ground clutter	3 possible snow in ground clutter	31-33 Aerosol - Types
18 ground clutter removed, possible cloud in clutter	4 possible cloud in ground clutter	0 Ground	4 possible cloud in ground clutter	1 clear sky	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	4 possible cloud in ground clutter	4 possible cloud in ground clutter	4 possible cloud in ground clutter	31-33 Aerosol - Types
19 ground clutter removed, unlikely cloud/precipitation	-1 Unknown	0 Ground	-1 Unknown	1 clear sky	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	22 STS	23 NAT	21 Stratospheric ice	31-33 Aerosol - Types
20 uncertain	-1 Unknown	0 Ground	-1 Unknown	1 clear sky	7 Liquid	17 supercooled	20 ice cloud	25-30 Aerosol - Types	22 STS	23 NAT	21 Stratospheric ice	31-33 Aerosol - Types

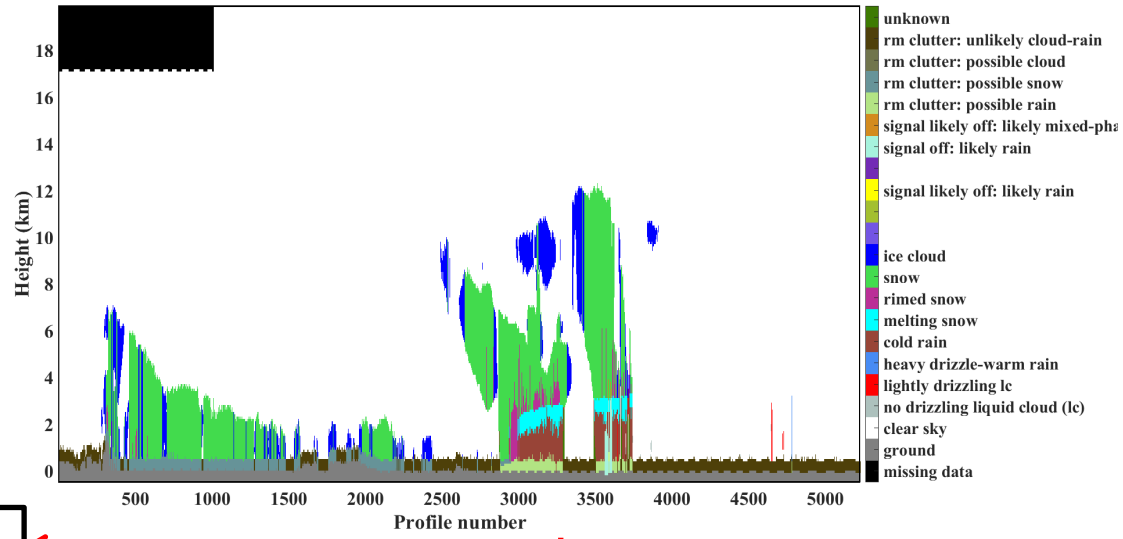
AC-TC: a Synergistic Target Classification

Simulated HALIFAX scene

Lidar Target Classification



Radar Target Classification



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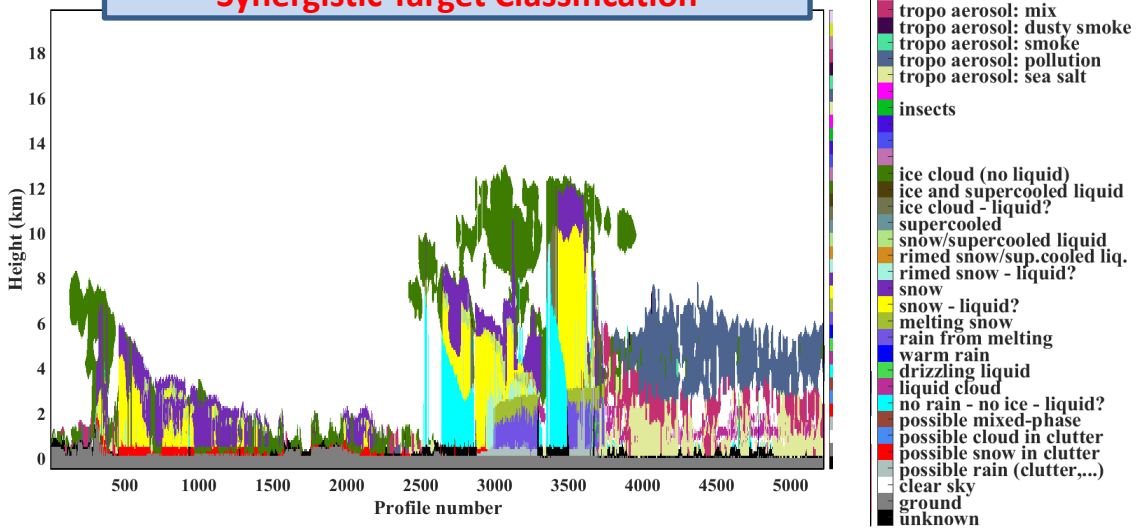
Synergistic Target Classification



Conclusions

- A processor making the most of two worlds to identifies, clouds, aerosols, precipitation and mixture.

- The AC-TC classification is based on the A-TC and C-TC inputs and must be consistent

- Three test scenes (Halifax, Baja and Tropical pacific) were successfully processed with the new classification and processor changes

- We are looking forward to see this processor running on real data!!!