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Some examples of RSP ice cloud retrievals

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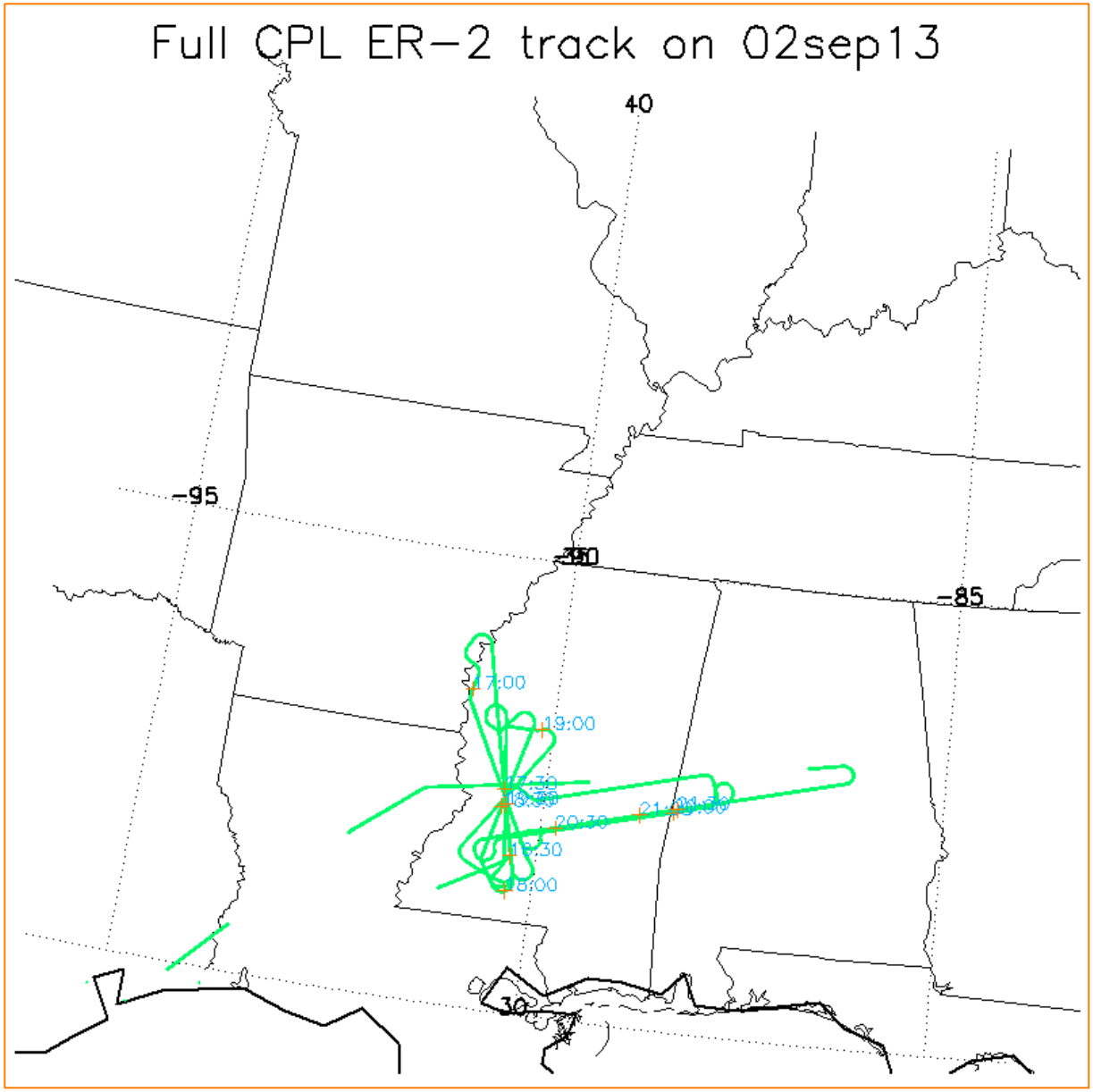
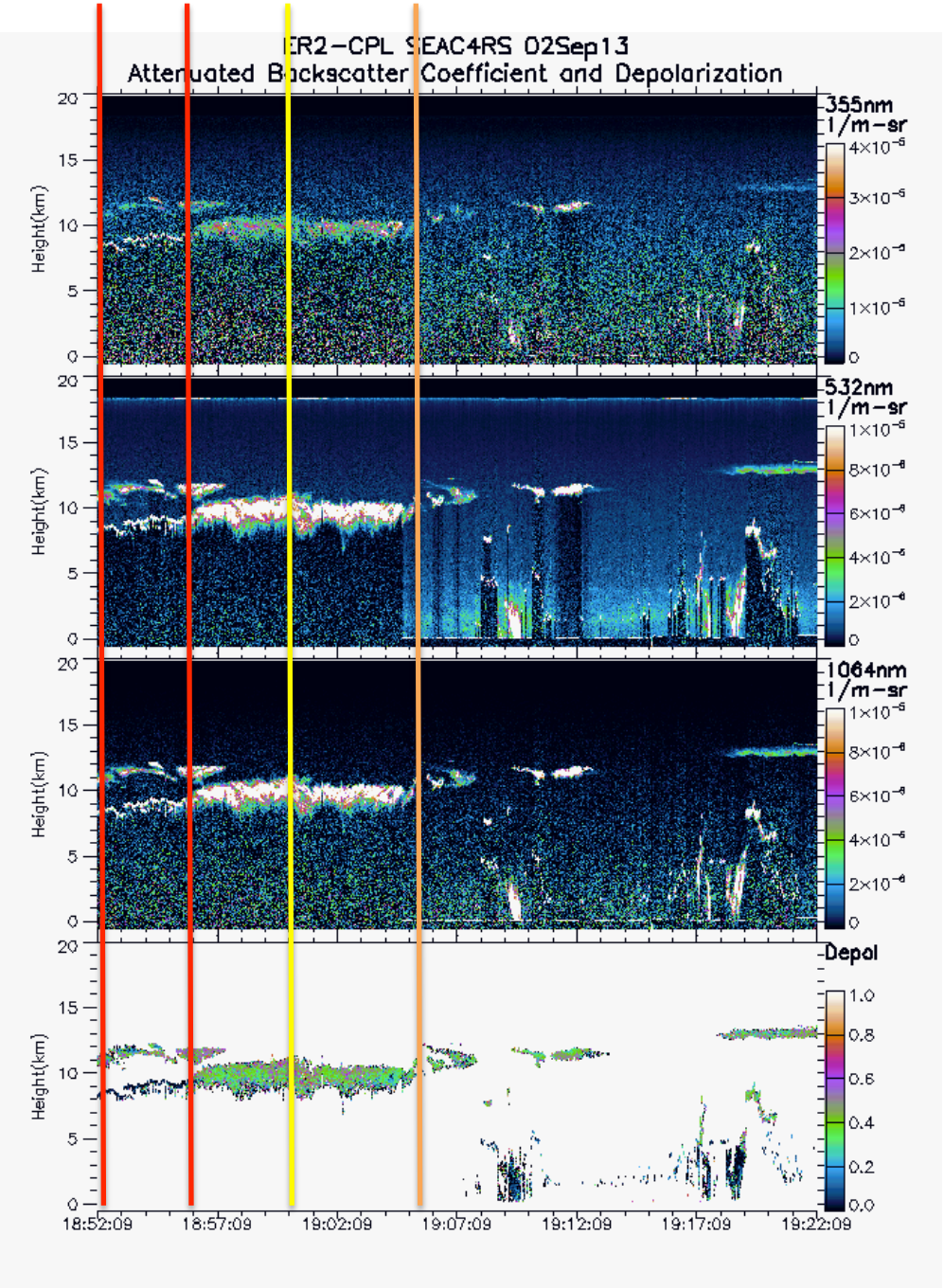
Thanks to CPL team

RSP (ice) cloud products (preliminary)

- Two independent cloud top height estimates using
  - Rayleigh signal in polarized reflectance (generally underestimates)
  - Contrast between 1880 nm reflectances at different viewing angles (works less good for optically thick clouds)
- Liquid index uses cloud rainbow feature in polarized reflectance to detect liquid layers (Van Diedenhoven et al., JAS 2012)
  - LI <0.5 indicates ice
  - LI >2 indicates liquid
  - 0.5< LI <2 indicates liquid under thin ice layer
- Asymmetry parameter, aspect ratio, crystal distortion retrievals using polarized reflectance: Van Diedenhoven et al., AMT 2012; ACP 2013
- Effective radius retrievals using Nakajima-King **with retrieved ice optical model**

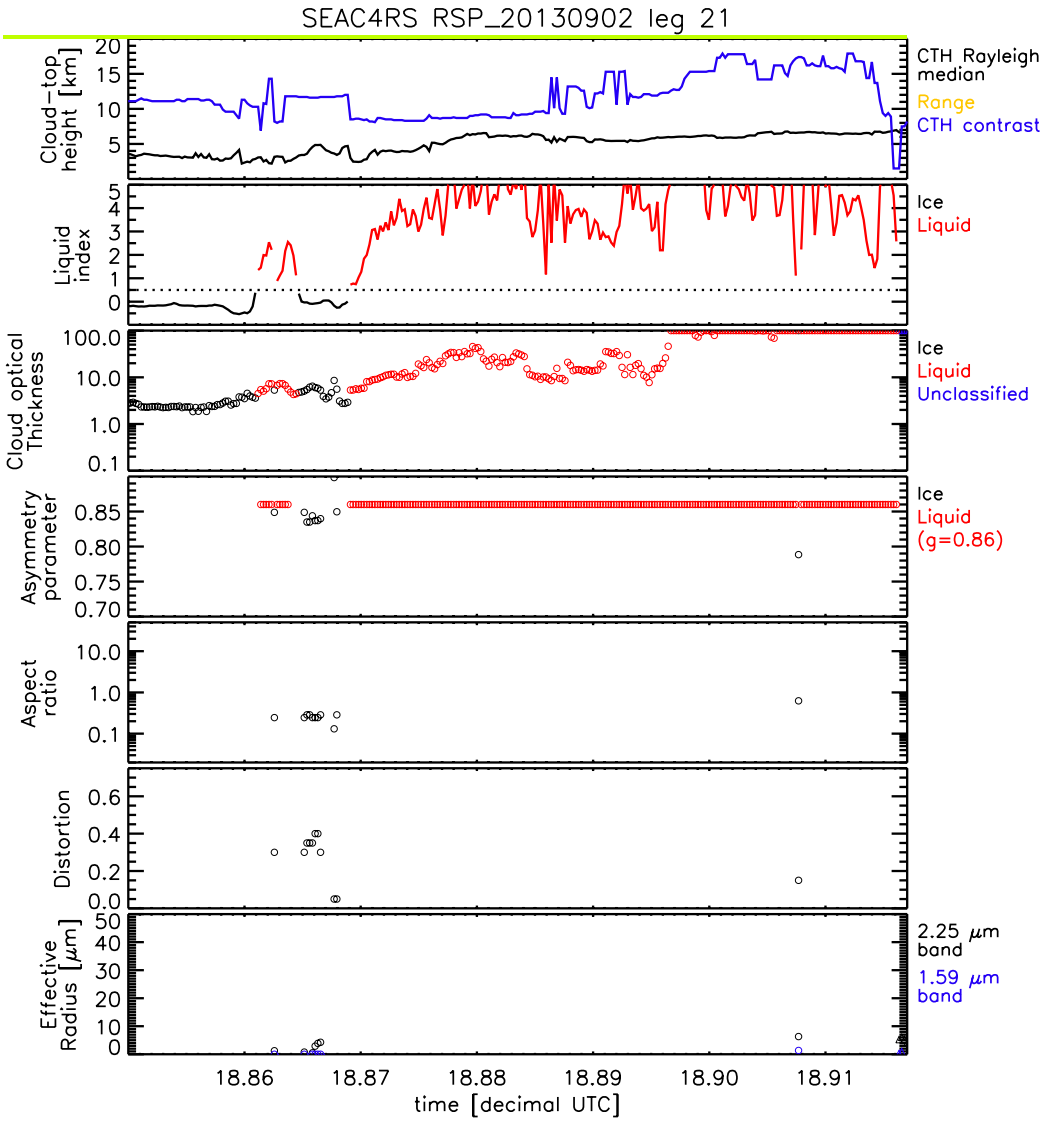

Full CPL ER-2 track on 02sep13
40
-95
-90
-85
30
17:00
19:00
20:30
19:30
18:00

Example 1


ER2-CPL SEAC4RS 02Sep13
Attenuated Backscatter Coefficient and Depolarization
355nm
1/m-sr
532nm
1/m-sr
1064nm
1/m-sr
Depol
Height(km)
18:52:09
18:57:09
19:02:09
19:07:09
19:12:09
19:17:09
19:22:09

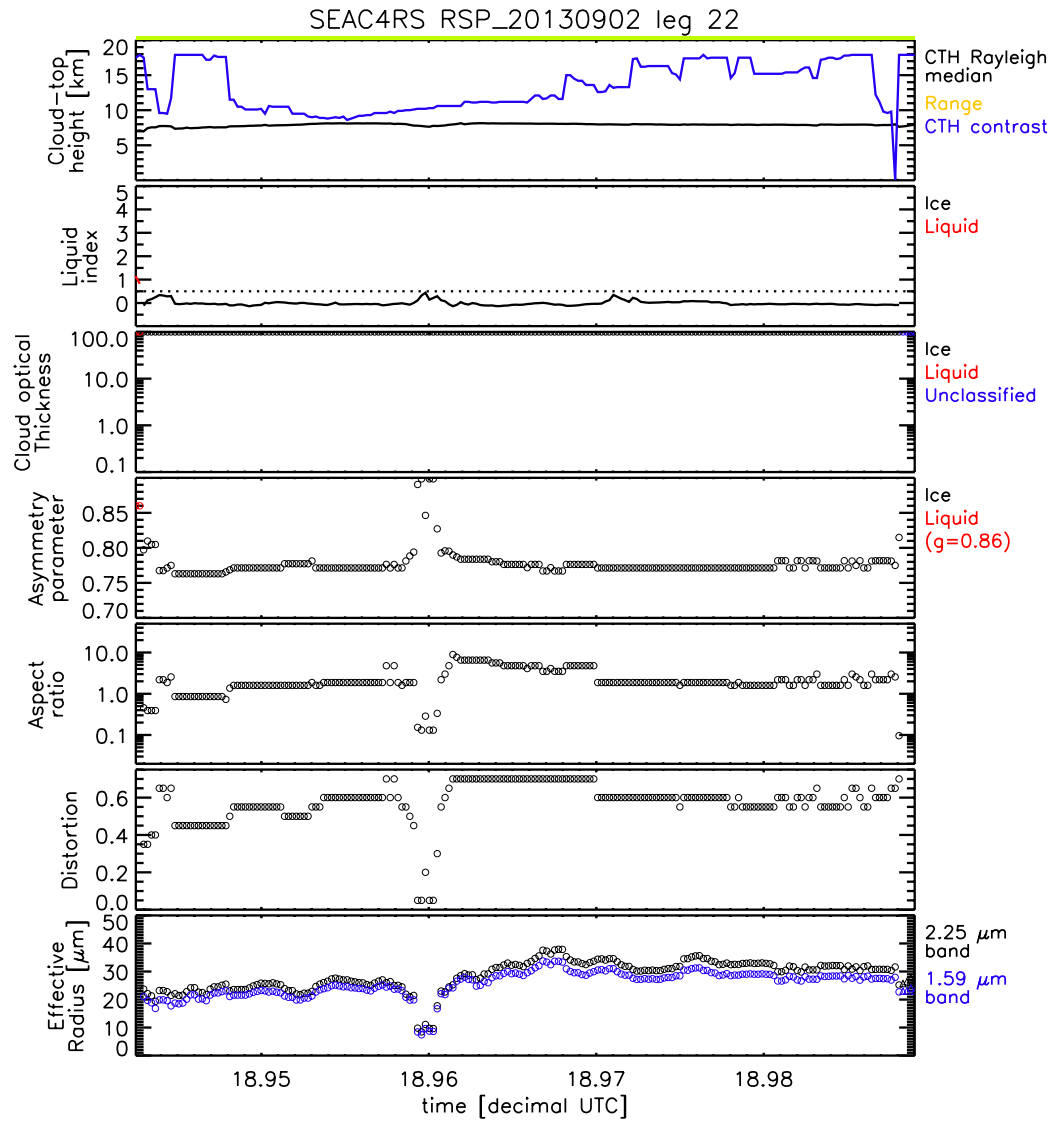
Example 1: Between red lines

- Low depol from CPL and large liquid index indicates supercooled liquid at 8-9 km height



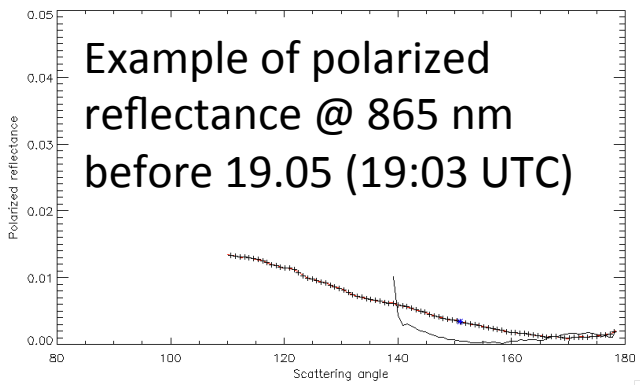
Example 1: Between red and yellow

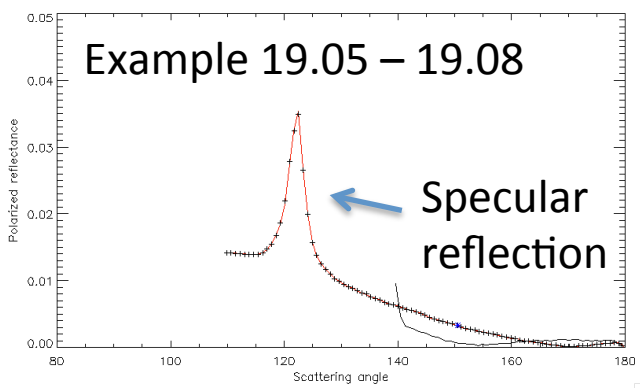
- Compact distorted crystals with asymmetry parameters 0.76-0.78
- 20-30 micron effective radius
- Before 18.96 is multi layered as indicated by CPL

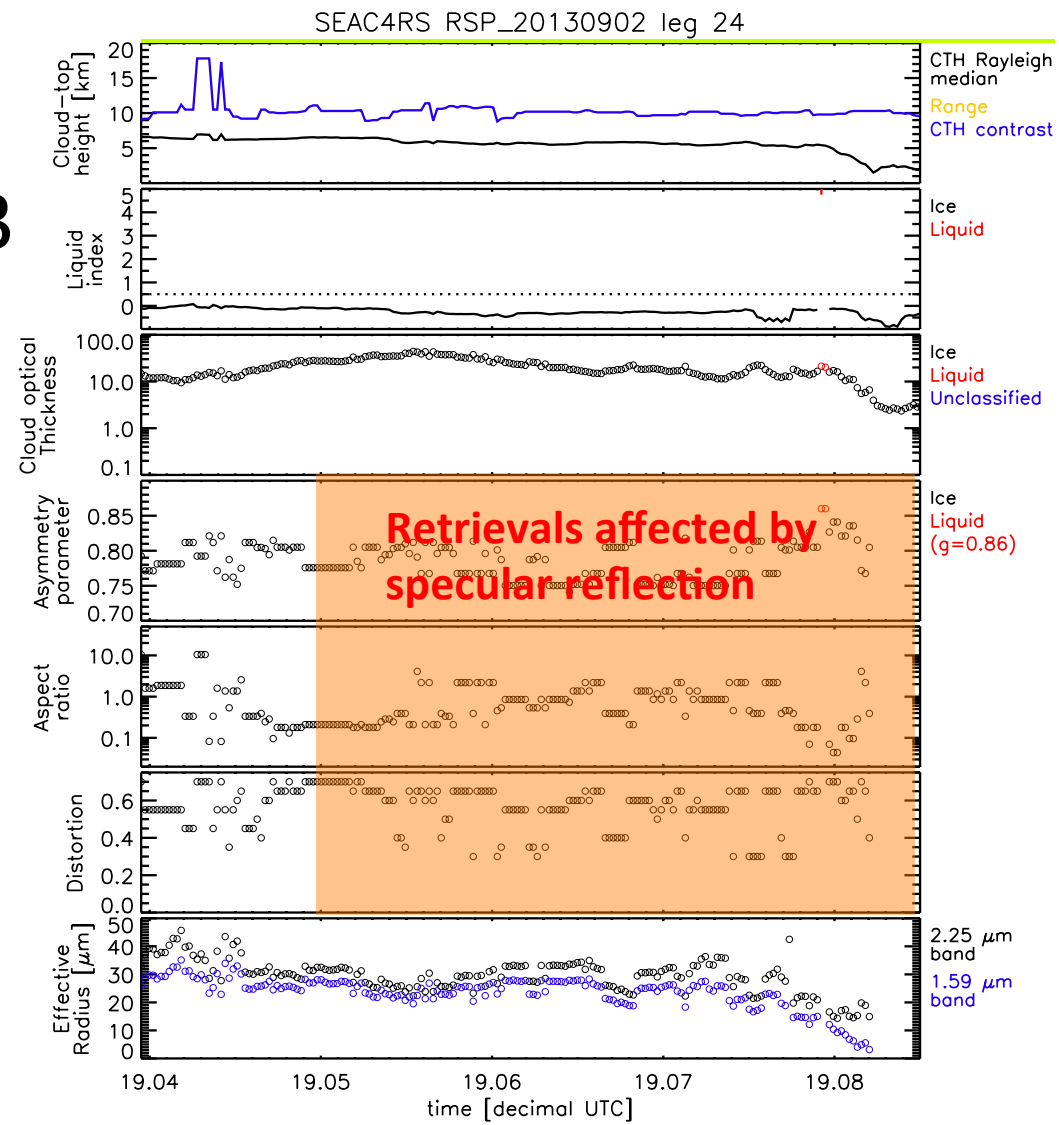


Example 1: Between yellow and orange

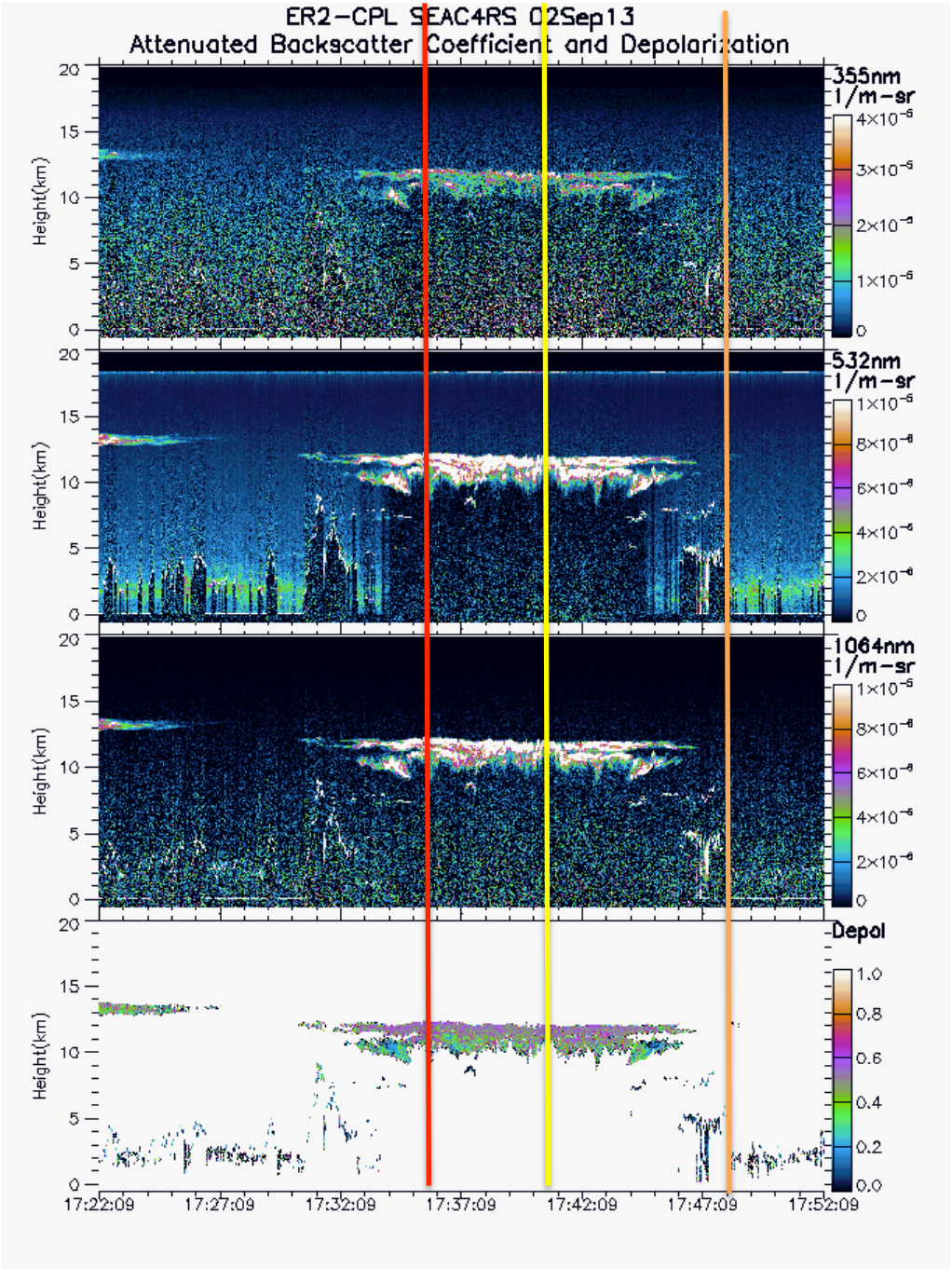
- Transition to oriented plate-like particles after 19:03





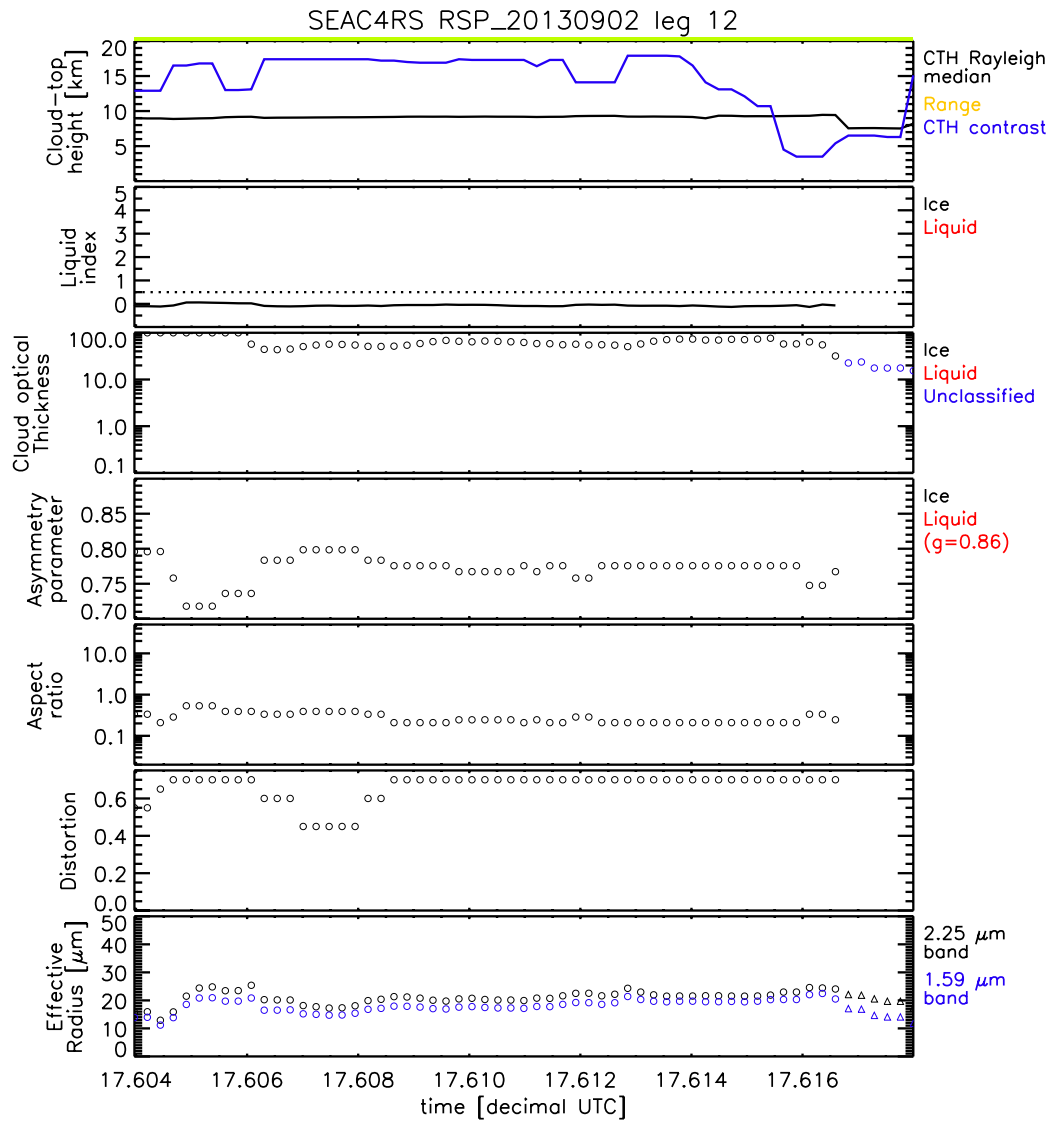


Example 2


ER2-CPL SEAC4RS 02Sep13
Attenuated Backscatter Coefficient and Depolarization
355nm
1/m-sr
532nm
1/m-sr
1064nm
1/m-sr
Depol
Height(km)
17:22:09
17:27:09
17:32:09
17:37:09
17:42:09
17:47:09
17:52:09

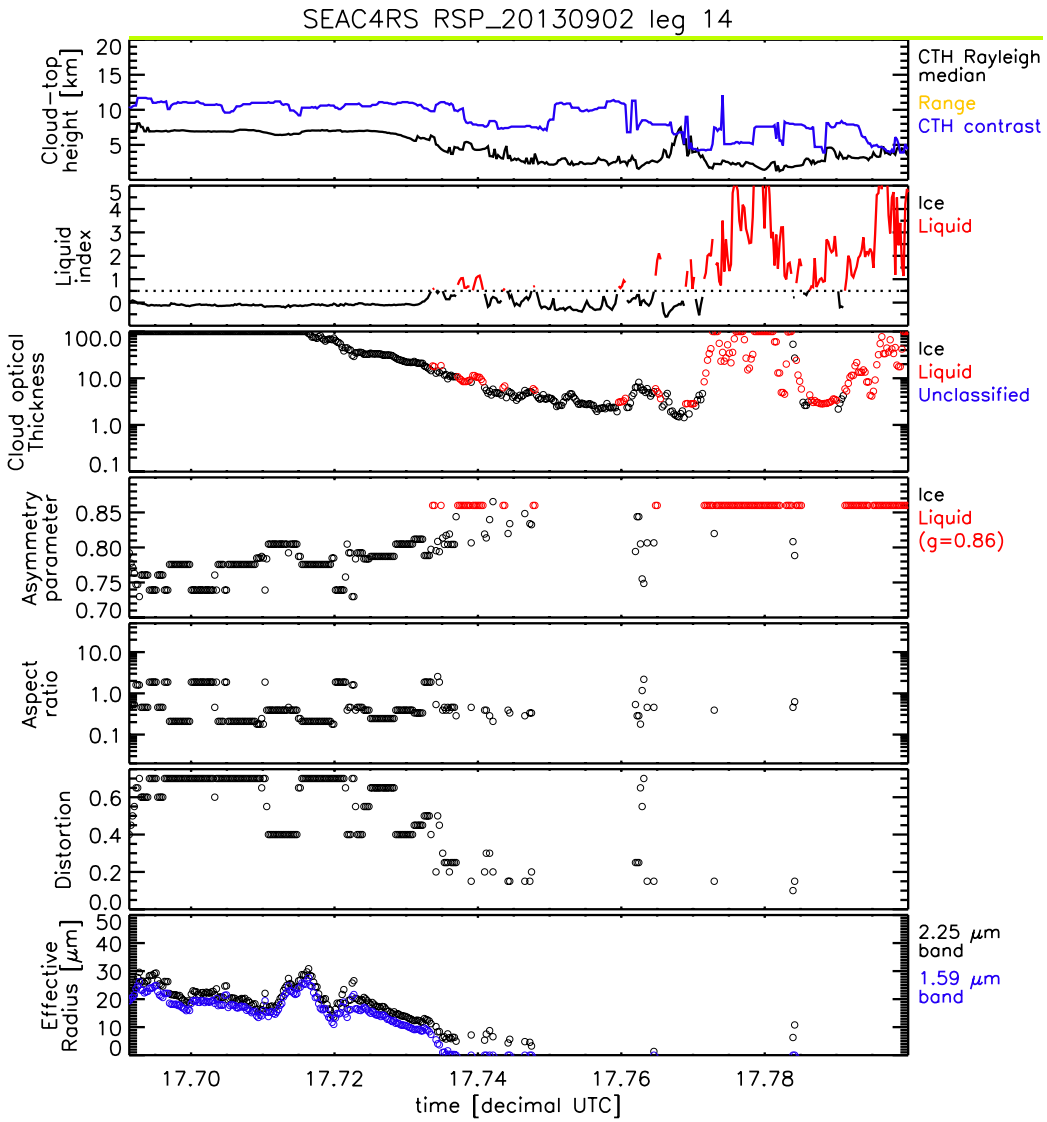
Example 2: Between red and yellow

- Severely distorted plate-like particles
- ~20 micron effective radius

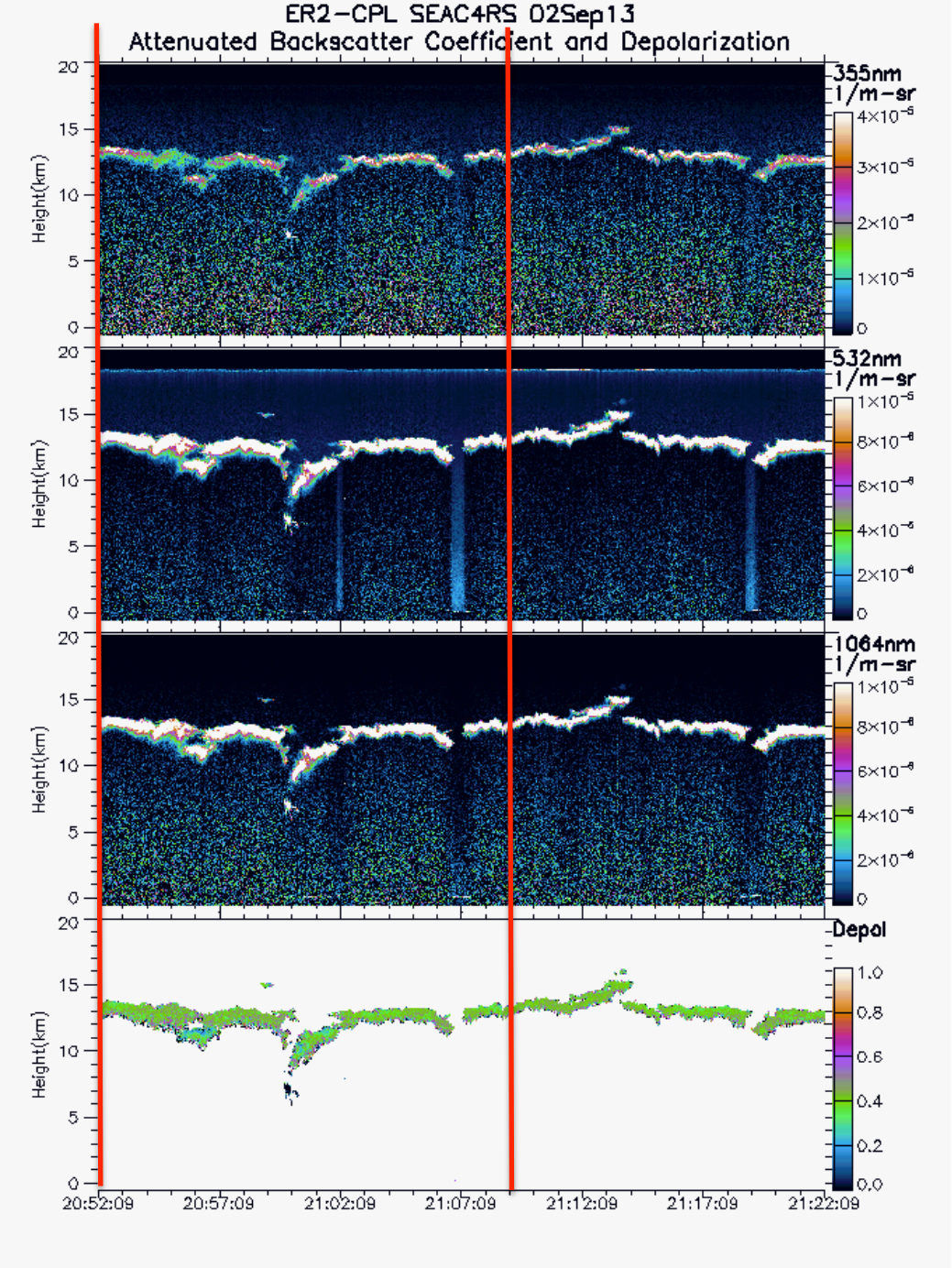


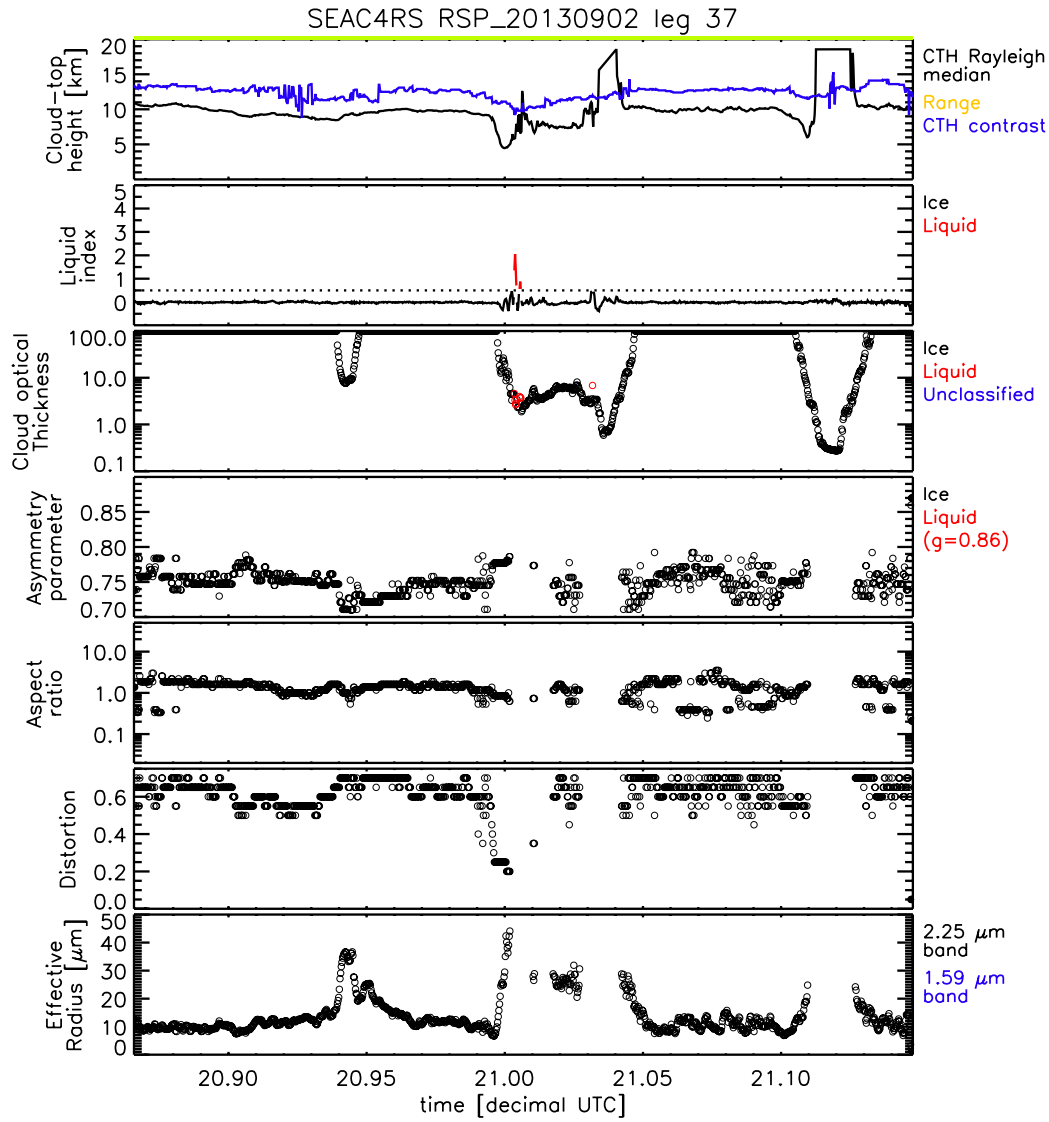
Example 2: Between yellow and orange

- Decreasing effective radii on cloud edge
- Liquid clouds after 17.77 (17:46 UTC)



Example 3


ER2-CPL SEAC4RS 02Sep13
Attenuated Backscatter Coefficient and Depolarization
355nm
1/m-sr
532nm
1/m-sr
1064nm
1/m-sr
Depol
Height(km)
20:52:09
20:57:09
21:02:09
21:07:09
21:12:09
21:17:09
21:22:09

Example 3:Between red lines

- After ~19:20 UTC, small compact distorted particles with R_{eff} ~ 10 microns are generally retrieved
- Asymmetry parameters ~0.75