Cloud Optical Thickness of Multilayer Clouds with SEVIRI

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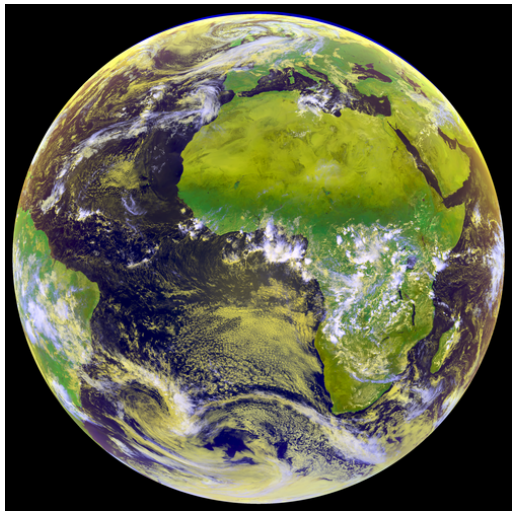
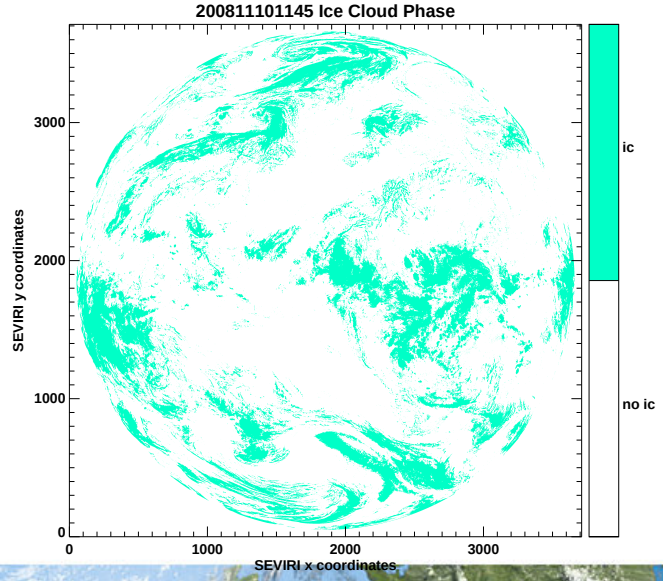
Cirrus Clouds: APICS + MeCiDA

- MeCiDA [Krebs et al. 2007, Ewald et al. 2013]: thermal multispectral and morphological threshold tests





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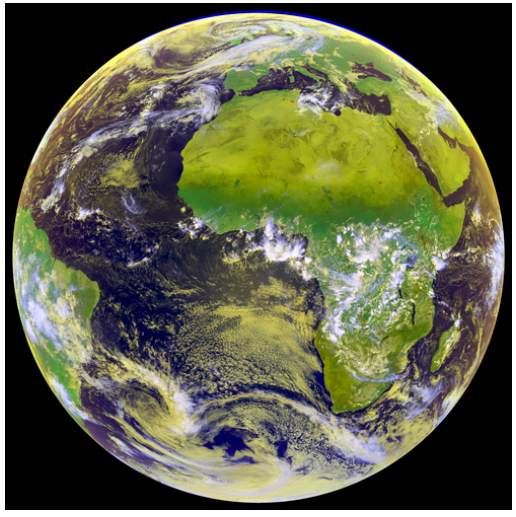
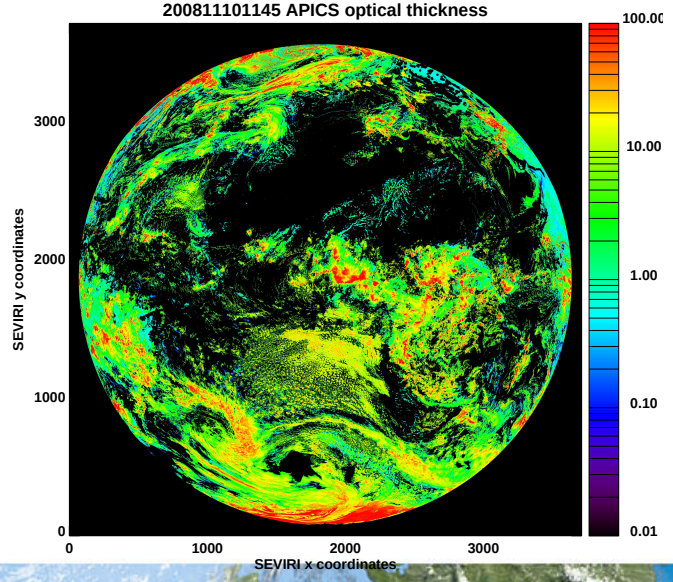
Cirrus Clouds: APICS + MeCiDA

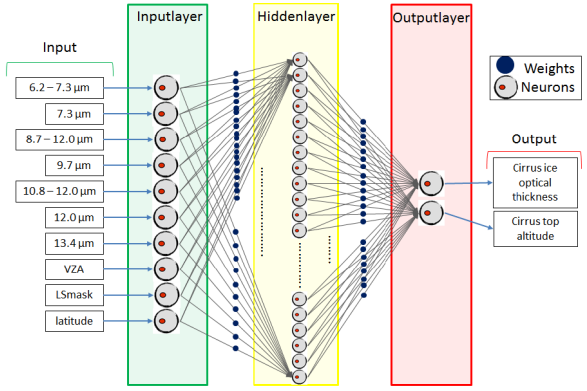
- MeCiDA [Krebs et al. 2007, Ewald et al. 2013]: thermal multispectral and morphological threshold tests
- APICS [Bugliaro et al., 2011]: Water cloud detection + Nakajima-King type algorithm using SEVIRI channels at 0.6 and 1.6 μm

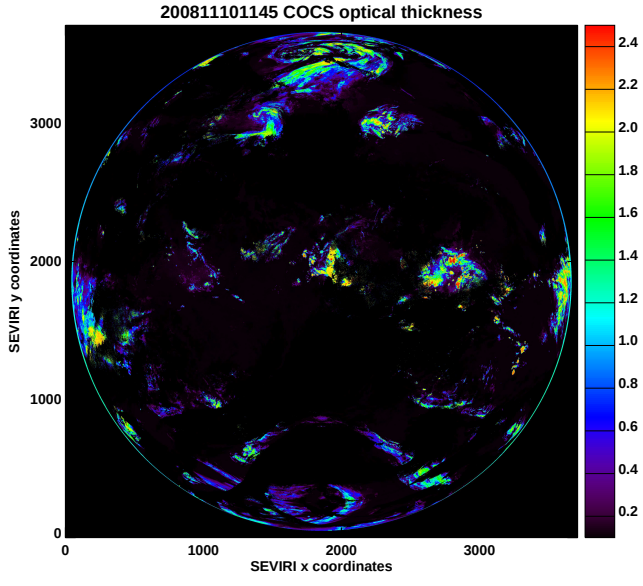




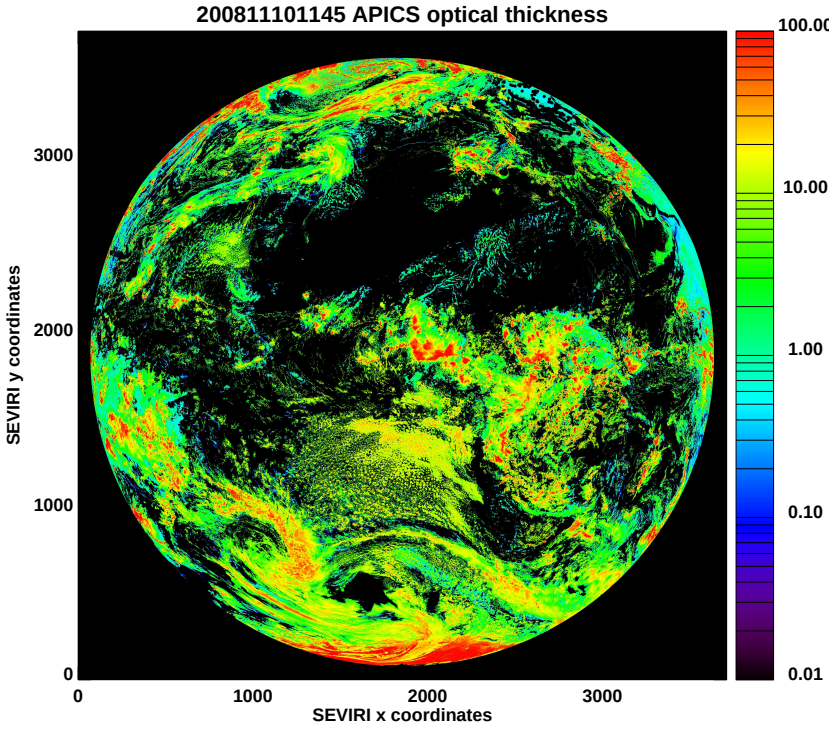
Cirrus Clouds: COCS

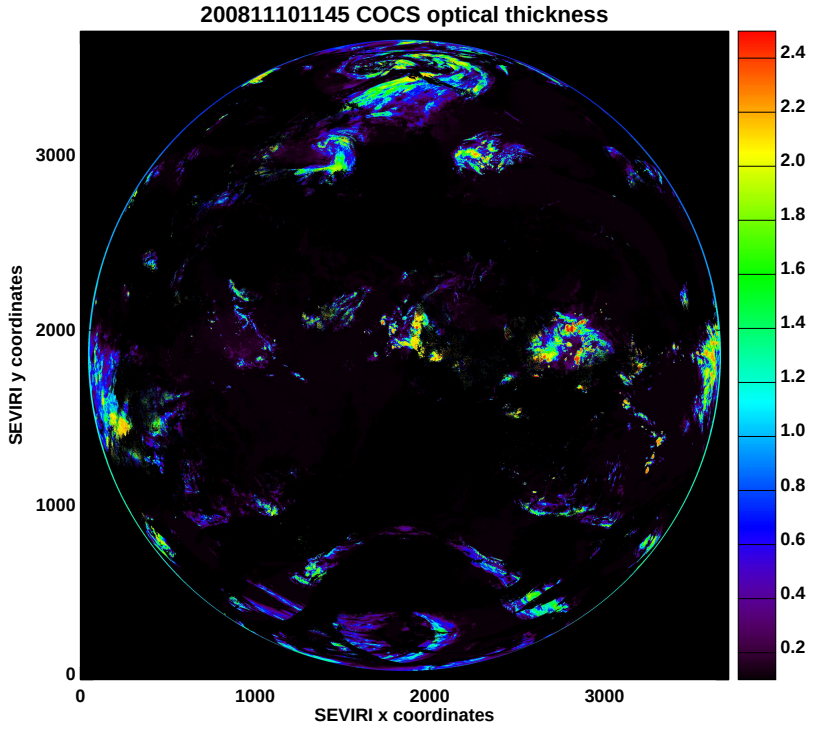
- COCS [Kox et al., submitted]: Artificial Neural Network trained with CALIOP's cloud properties of the highest ice layer and collocated thermal SEVIRI observations
- Provides ice cloud optical thickess (approx. 0.1 – 2.5) and top height during day- and nighttime
- Very sensitive to thin cirrus





APICS – COCS





- How do we interpret the two data sets of cirrus cloud optical thickness?
- Can they be combined in order to provide a characterisation of the cloud scene observed in terms of thin cirrus, multilayer clouds and thick clouds?

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Synergistic Use of APICS and COCS

Concept

- Thin cirrus pixels should show similar optical thickness values for both algorithms

Challenges

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- Cirrus clouds with optical thickness in range 2–5 exist
- Due to the “large” SEVIRI pixel size subgrid water clouds can produce low APICS values

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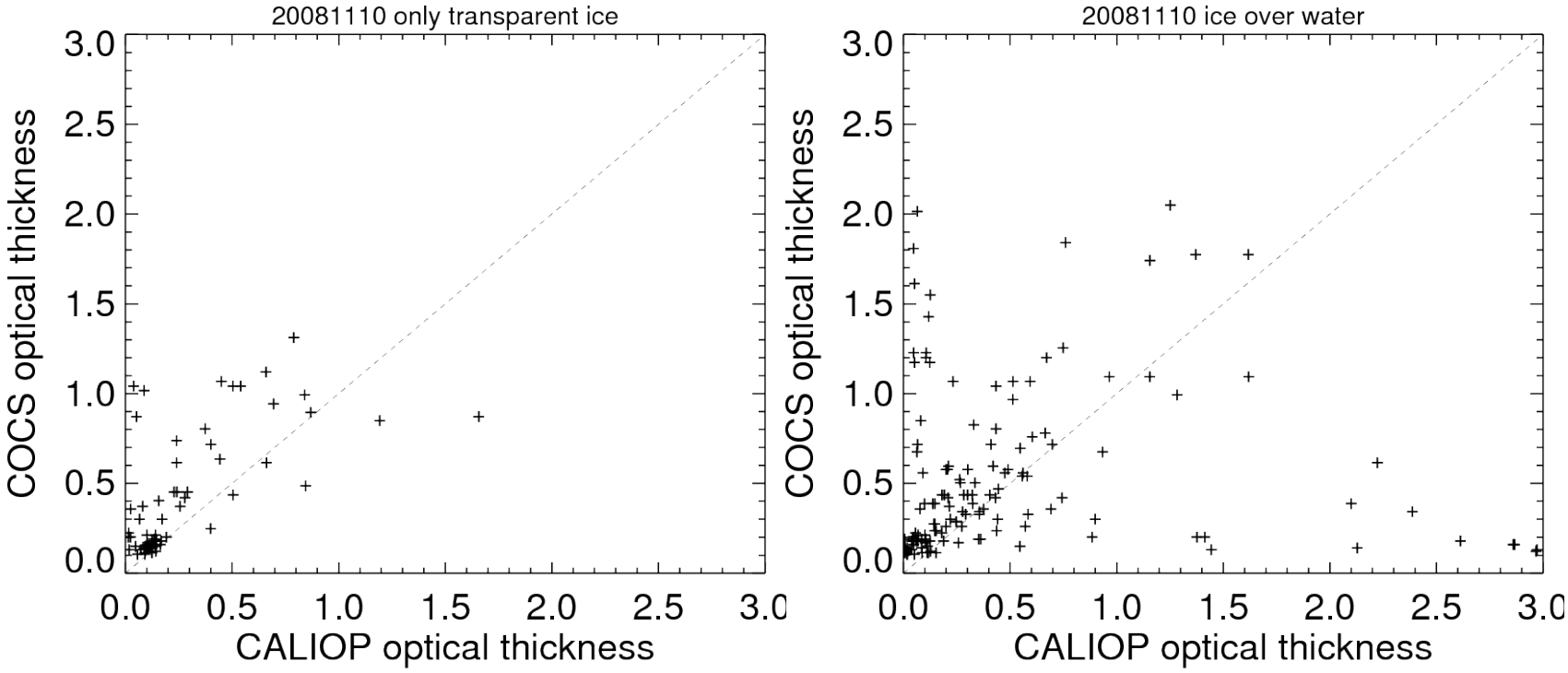

We exploit the ability of COCS to identify the upper ice cloud layer and apply thershold tests to APICS and COCS optical thickness to produce three cloud classes: thin cirrus, thick cirrus and cirrus on top of a low cloud.

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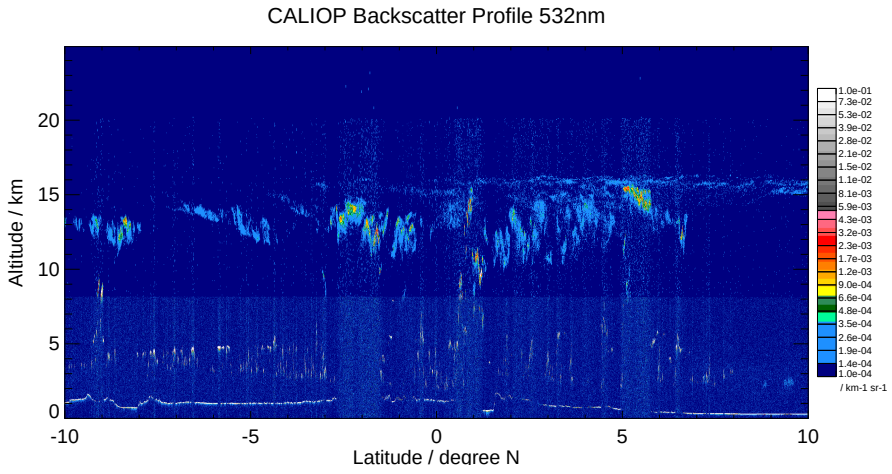
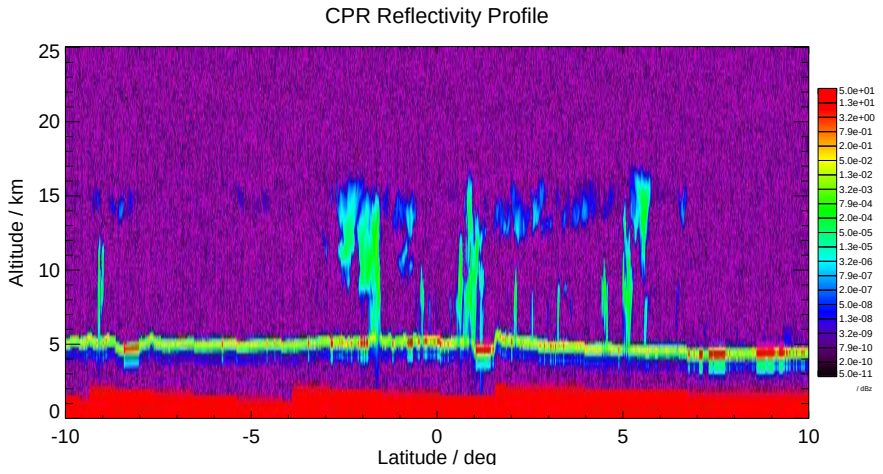
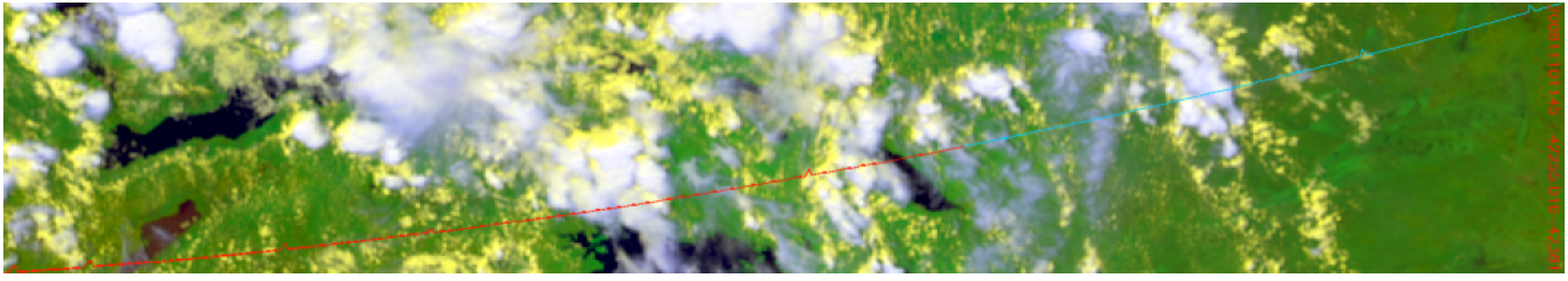
APICS - COCS vs. CALIOP

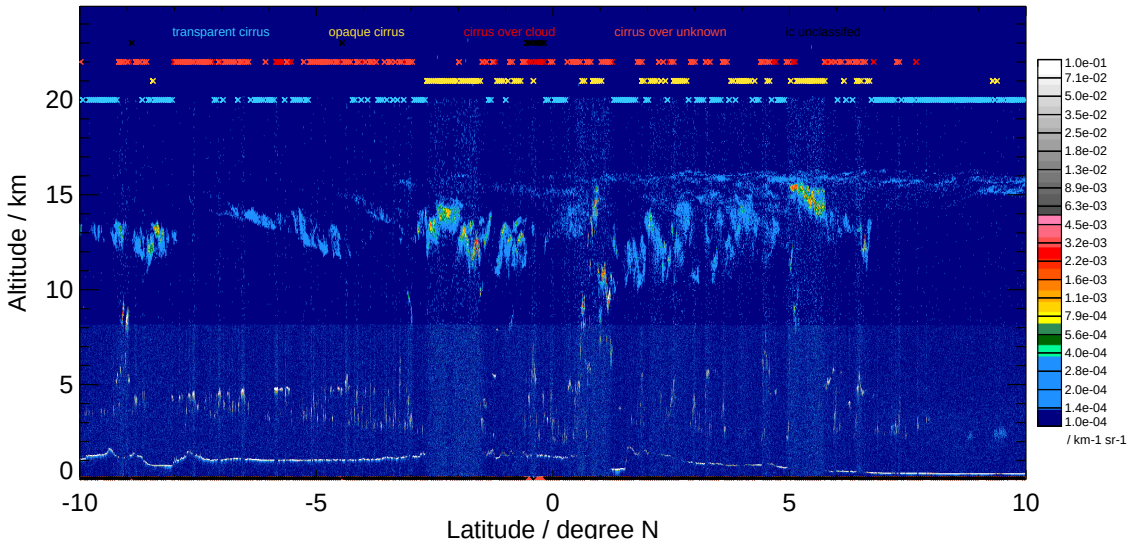




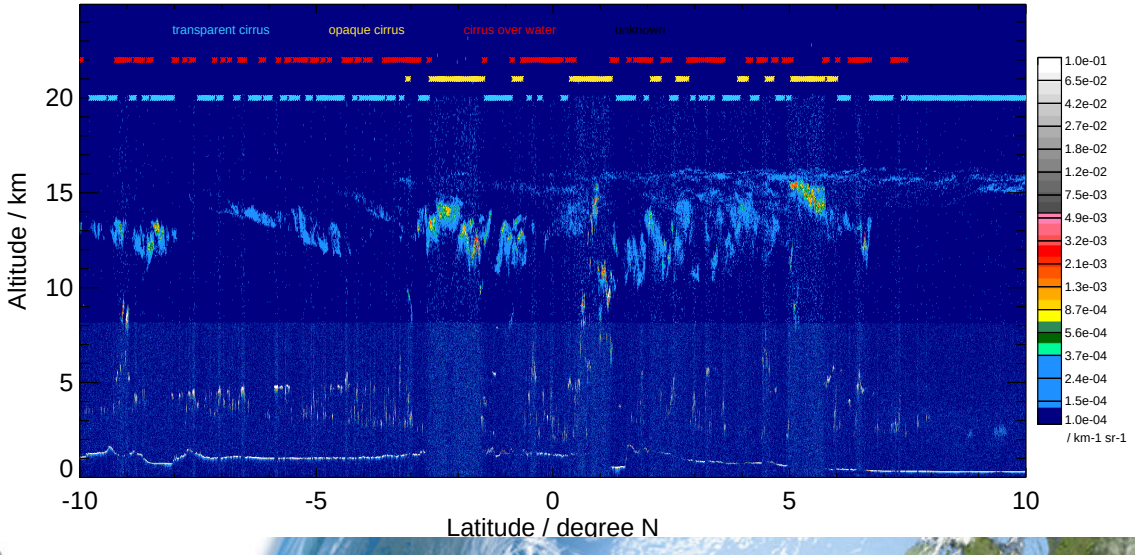


APICS - COCS vs. CALIOP

CALIOP Backscatter Profile 532nm + CALIOP flags



CALIOP Backscatter Profile 532nm + SEVIRI flags



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Cloud Optical Properties for Multilayer Clouds

Ice Cloud Layer

- Assume that cloud optical thickness from COCS is correct
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Remarks

- An effective radius from the thermal algorithm for the ice cloud layer would be positive
- With 3 unknowns, one could also fixed water cloud effective radius and loop over the ice cloud effective radius

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