



Potential for Profiling of Snow and Precipitation with Operational C-Band Birdbath Scans

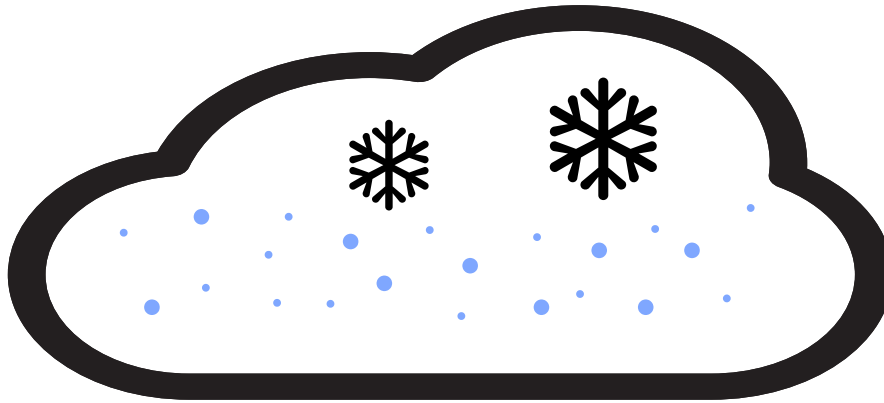
DFG priority program PROM, subproject POMODORI

LMU: **Paul Ockenfuß**, Stefan Kneifel
DWD: Mathias Gergely, Michael Frech

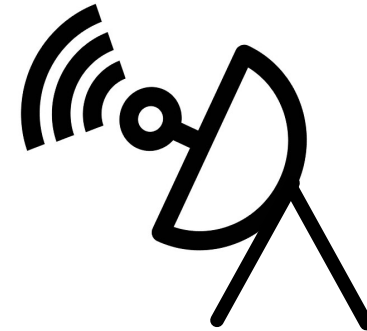
PROM Annual Meeting, Leipzig, 26. July 2024



Pomodori

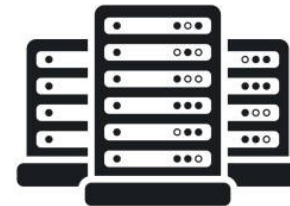


Vertically Looking Radar



Scanning (C Band) Radar

+





Previous Work



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- Riming climatology: How often, how long, which temperatures



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- Internal structure of riming events, vertical evolution of rime mass fraction



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- Internal structure of riming events, vertical evolution of rime mass fraction
- Correlation with Radiosonde profile, reflectivity, disdrometer rain rate



Operational C-Band Birdbath Scans



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- Time: Every 5 min
- 15 “rays” of 1s duration, independently saved on disk



(Dis)Advantages compared to cloud research radars



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- Coarser resolution than cloud radars; e.g. Cloudnet 30 s, ~30 m resolution



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- + Equidistant spatial coverage over full Germany
- + Same format and procedures on all sites, high data availability, regular scanning pattern



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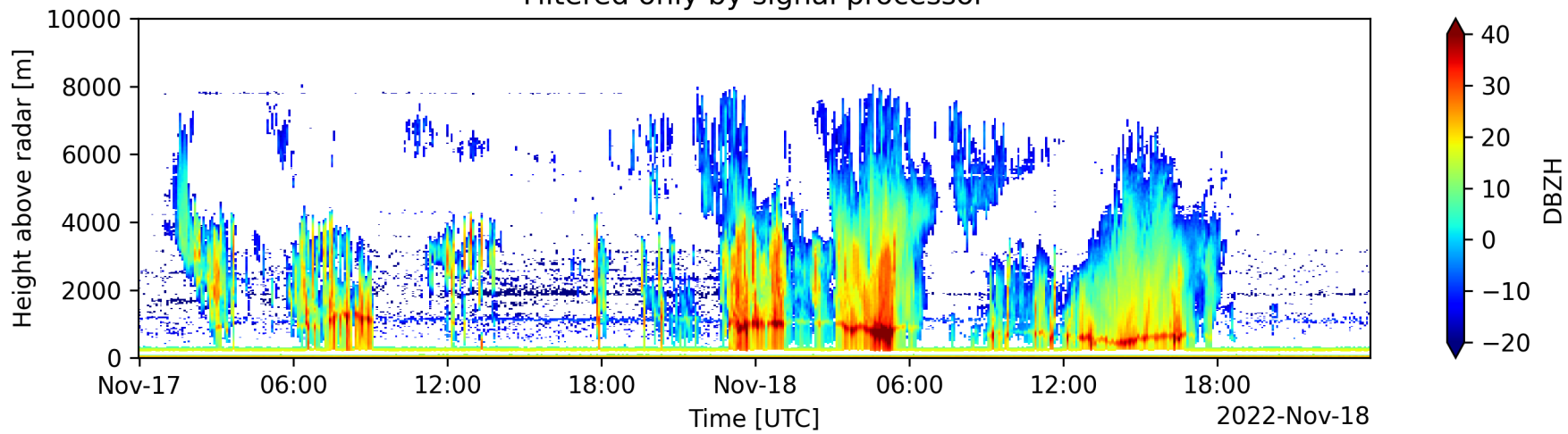
- + Equidistant spatial coverage over full Germany
- + Same format and procedures on all sites, high data availability, regular scanning pattern
- + Less attenuation than Ka-/ W-band cloud radars



Filtering Clutter

isn 2022-11-17 to 2022-11-18

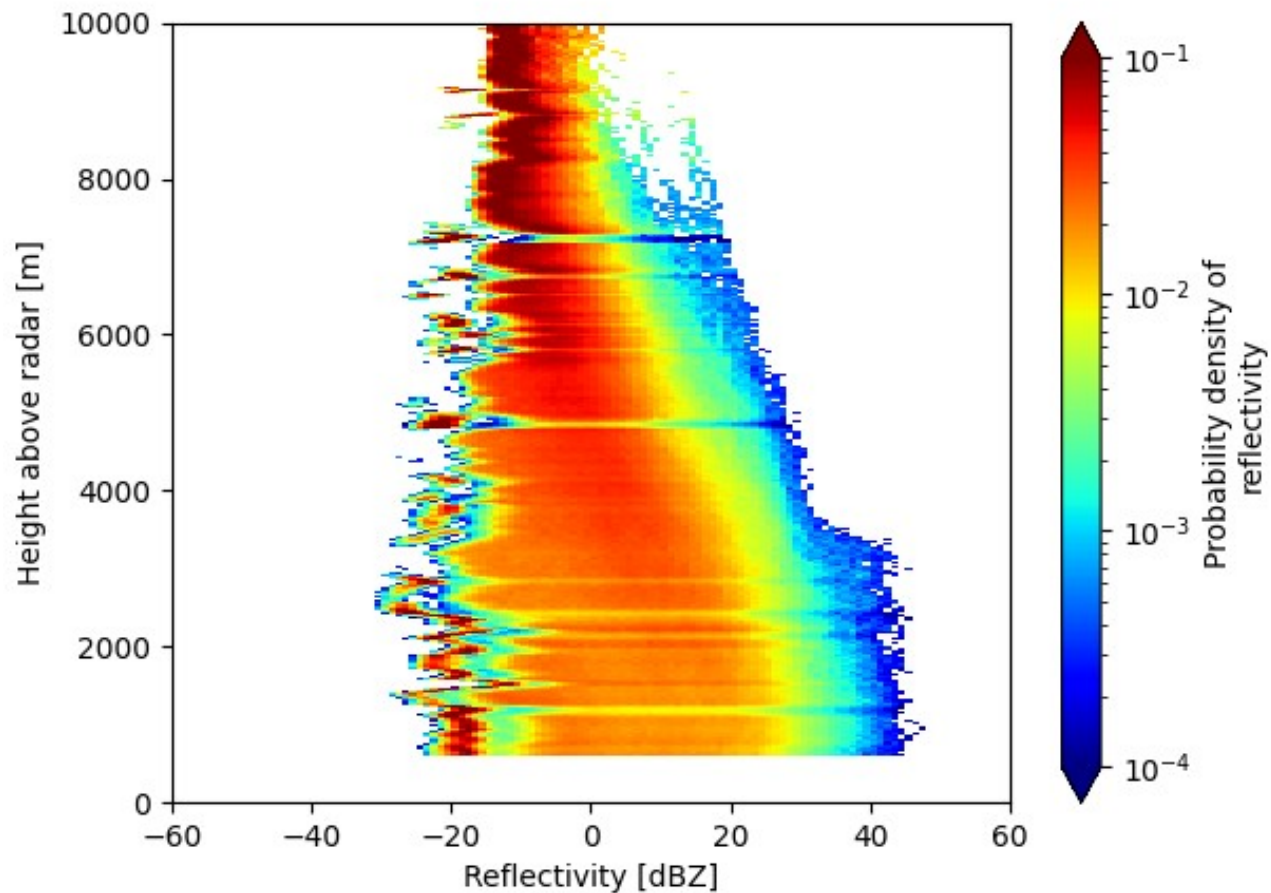
Filtered only by signal processor





Filtering Clutter

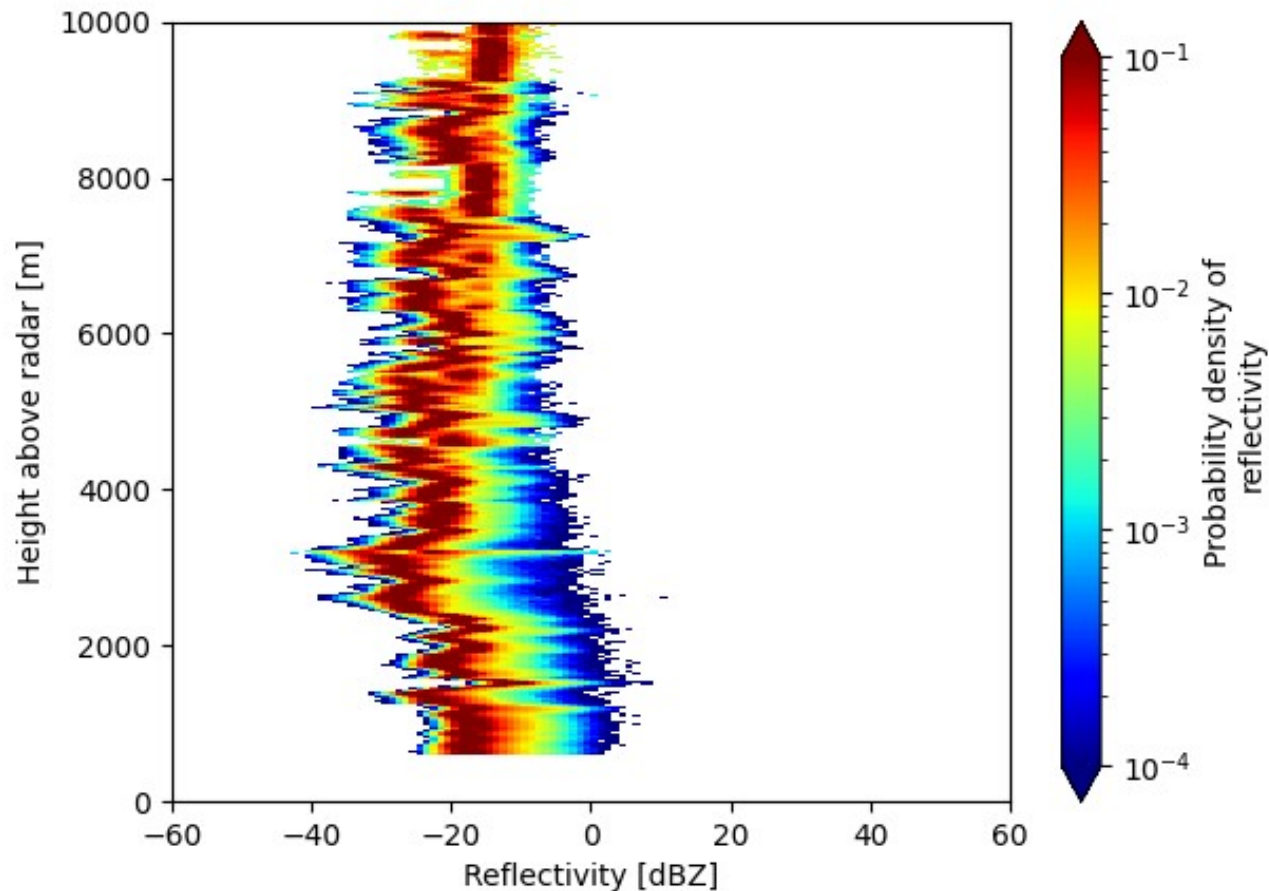
Fully valid observations, according to the signal processor criteria





Filtering Clutter

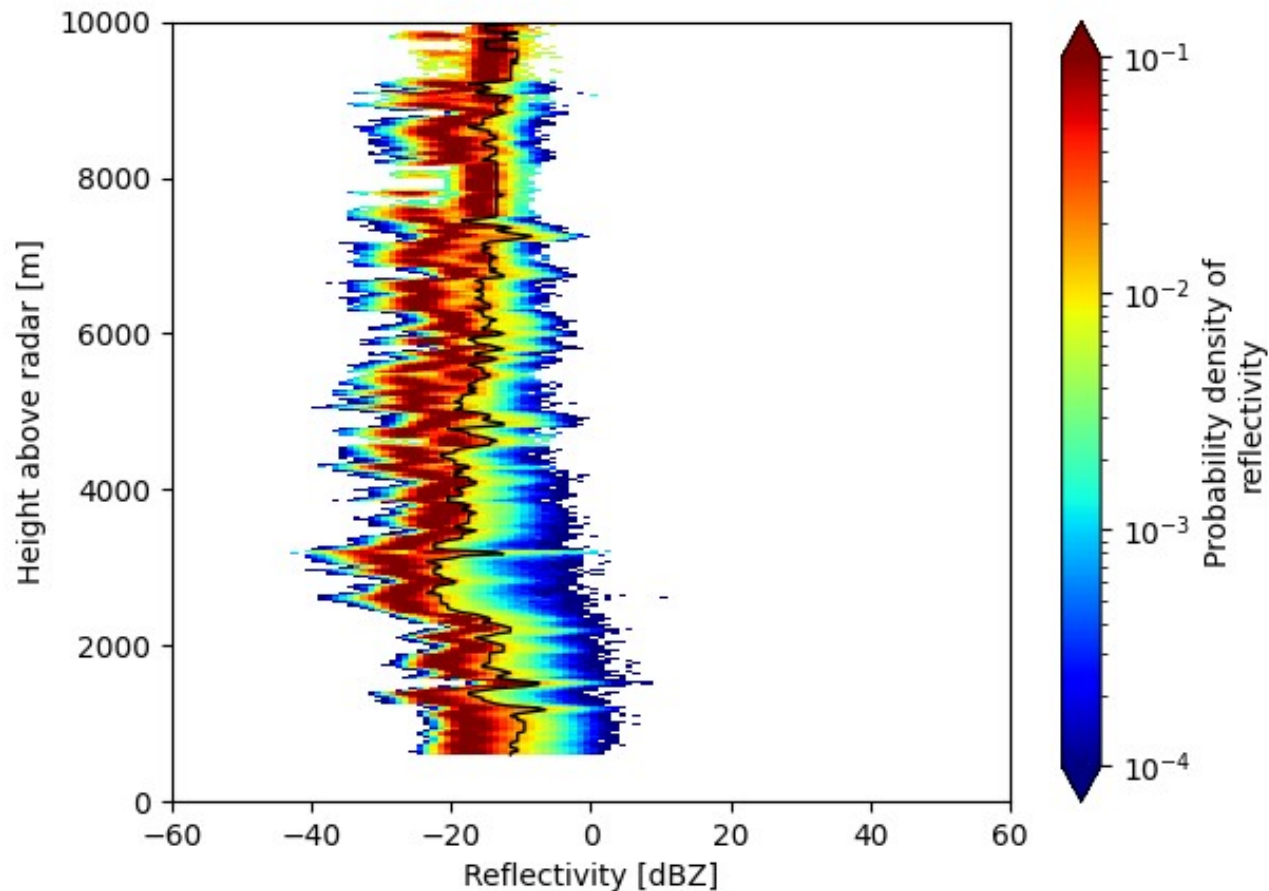
“Partially” valid observations: Some of the 15 rays forming one observation have not passed the signal processor quality checks





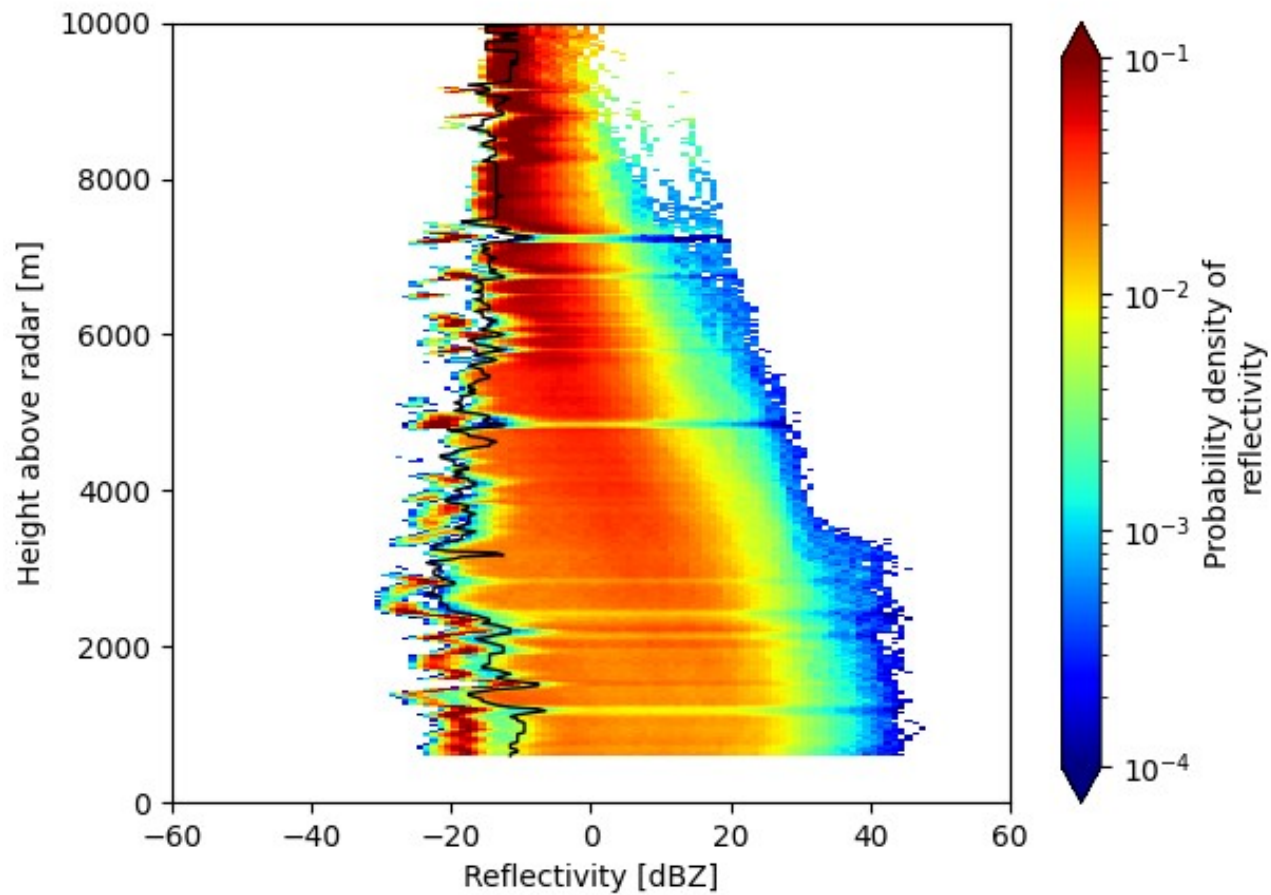
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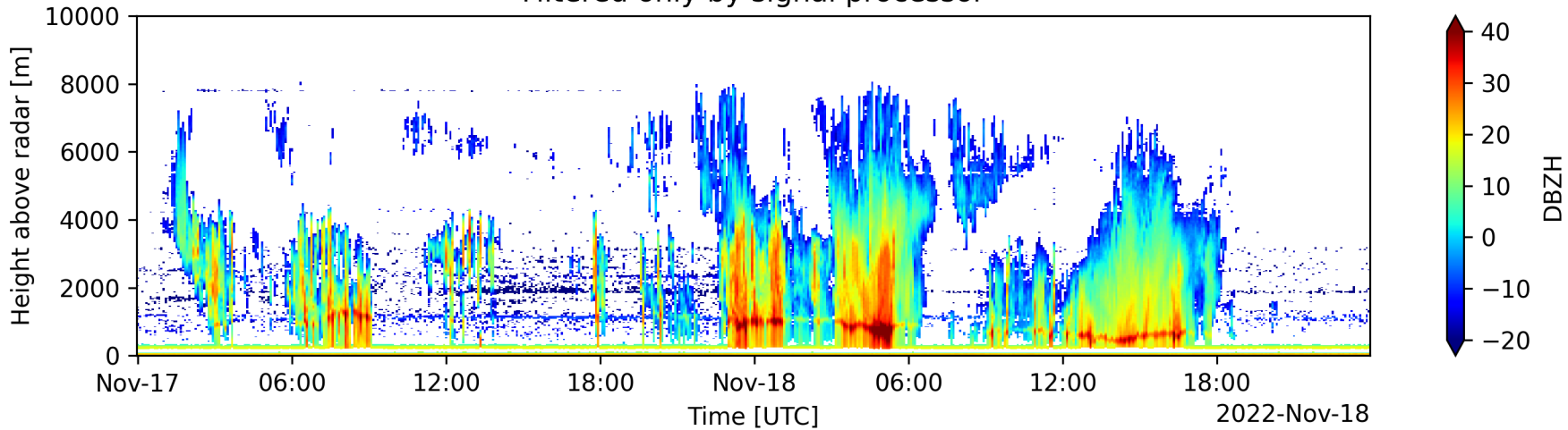




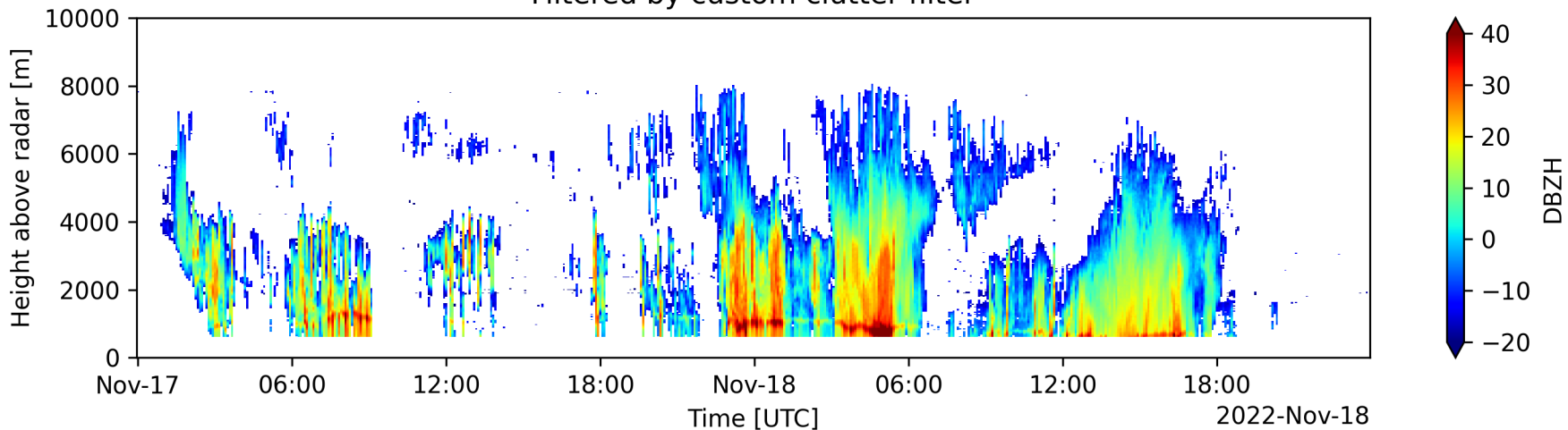
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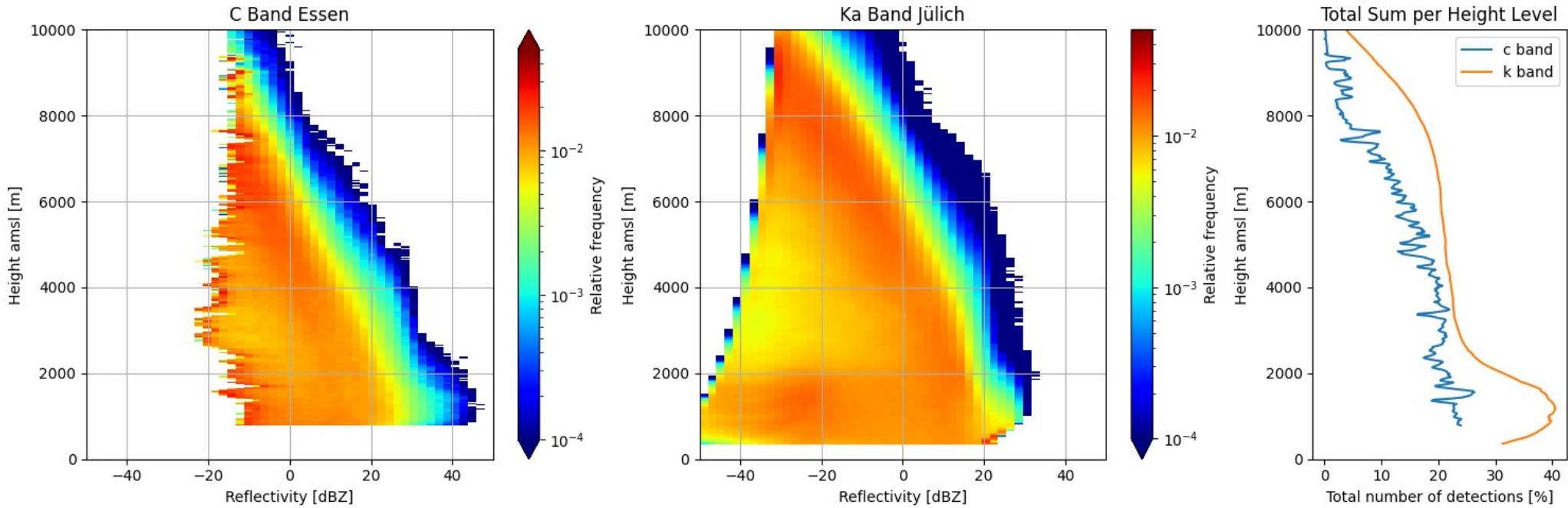


Filtered by custom clutter filter



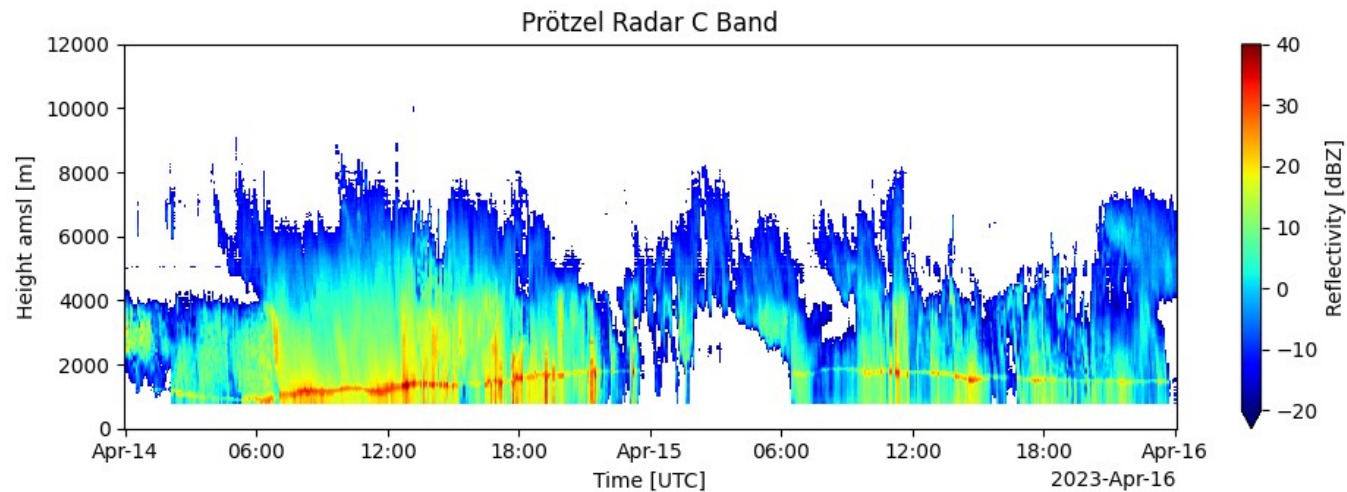
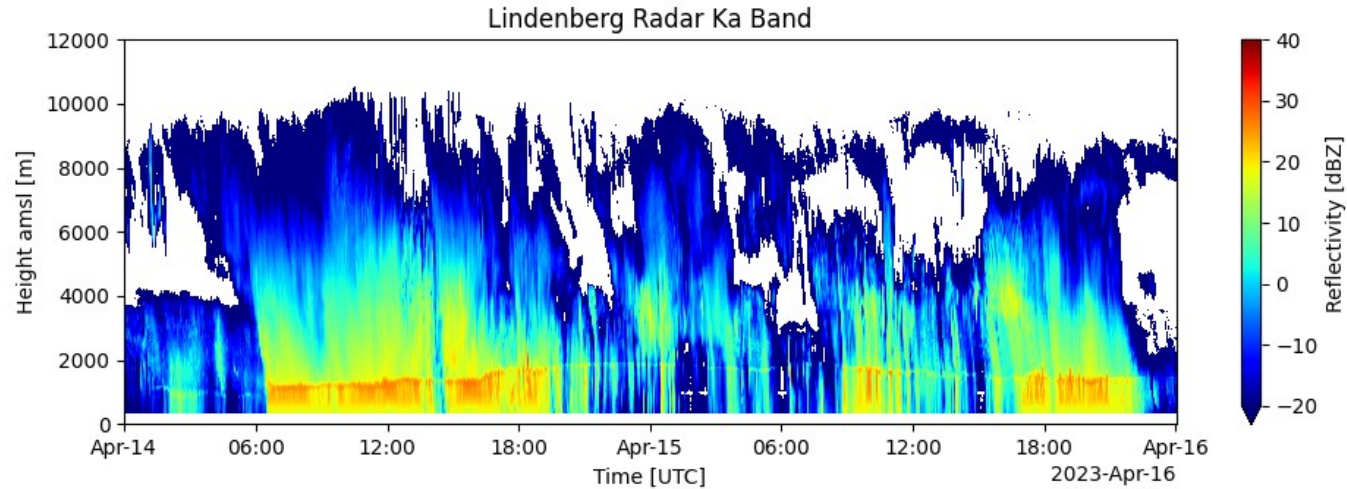


Reflectivity CFAD



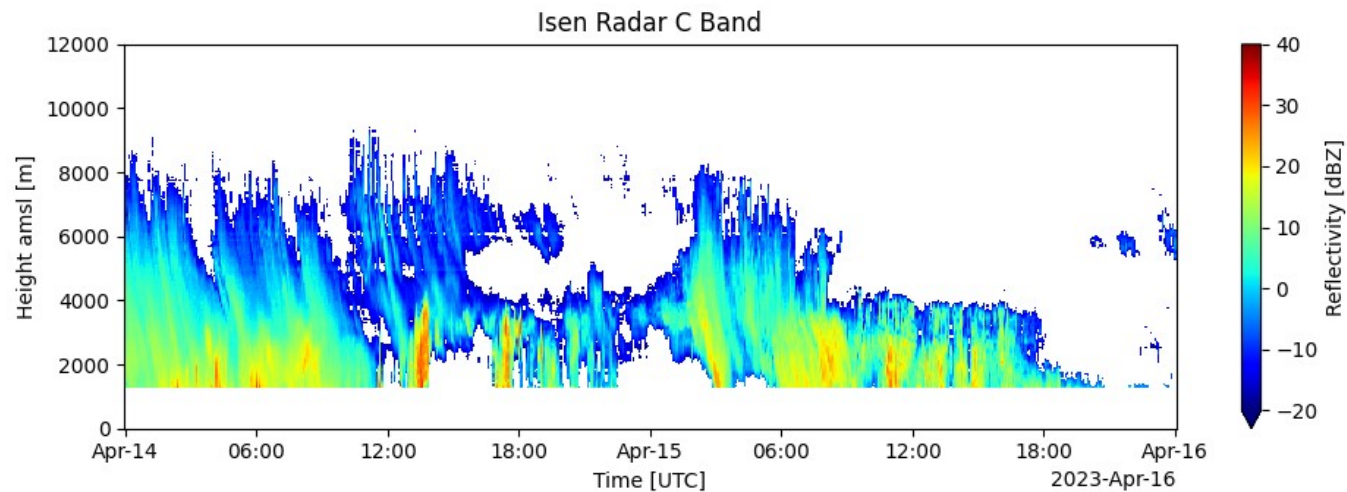
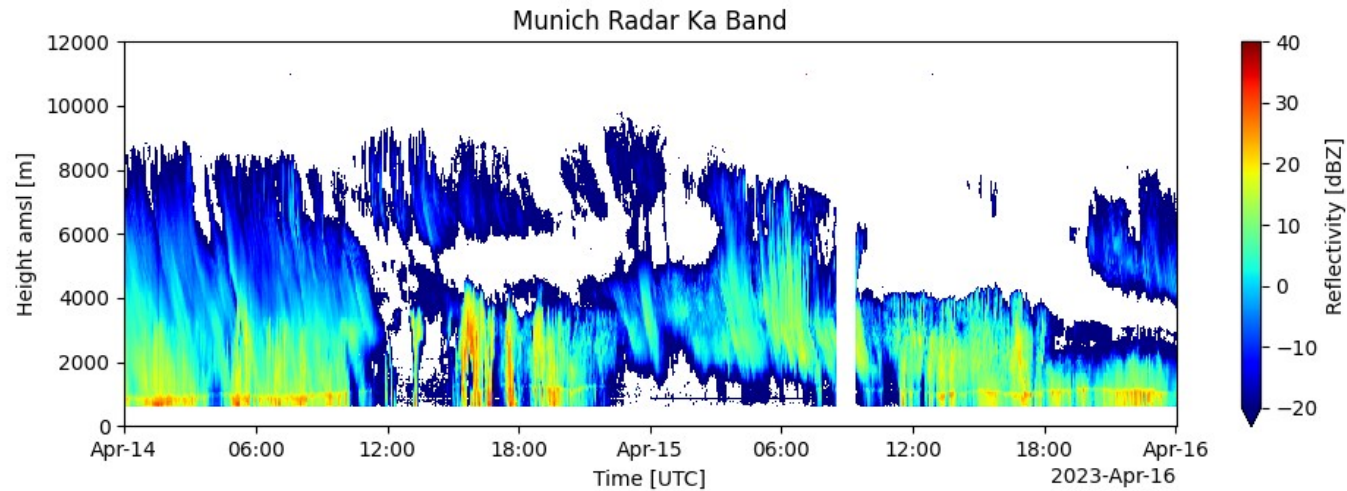


Comparison with Ka-Band



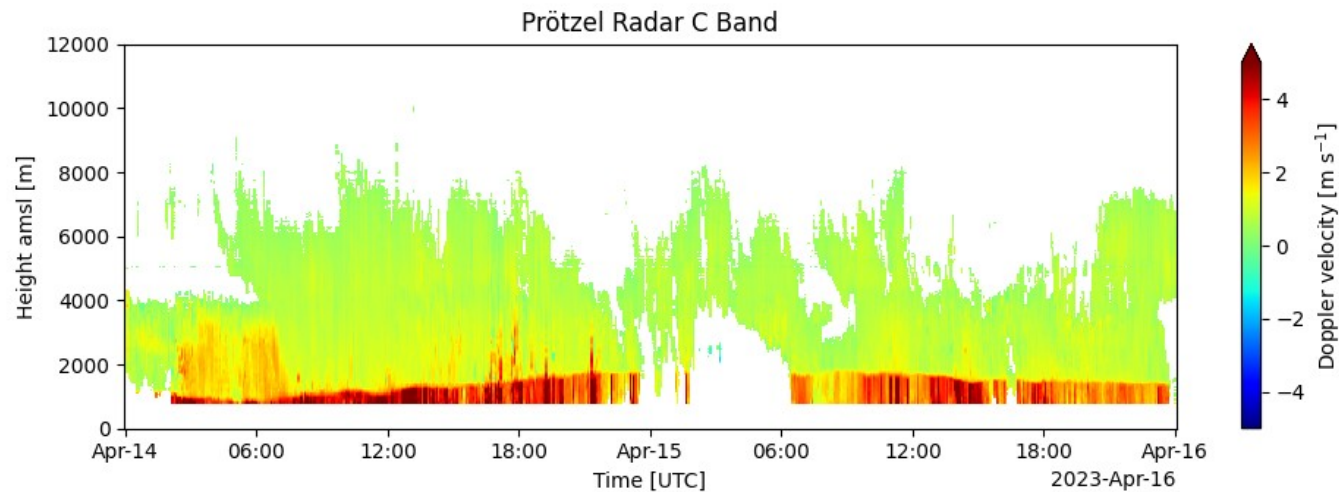
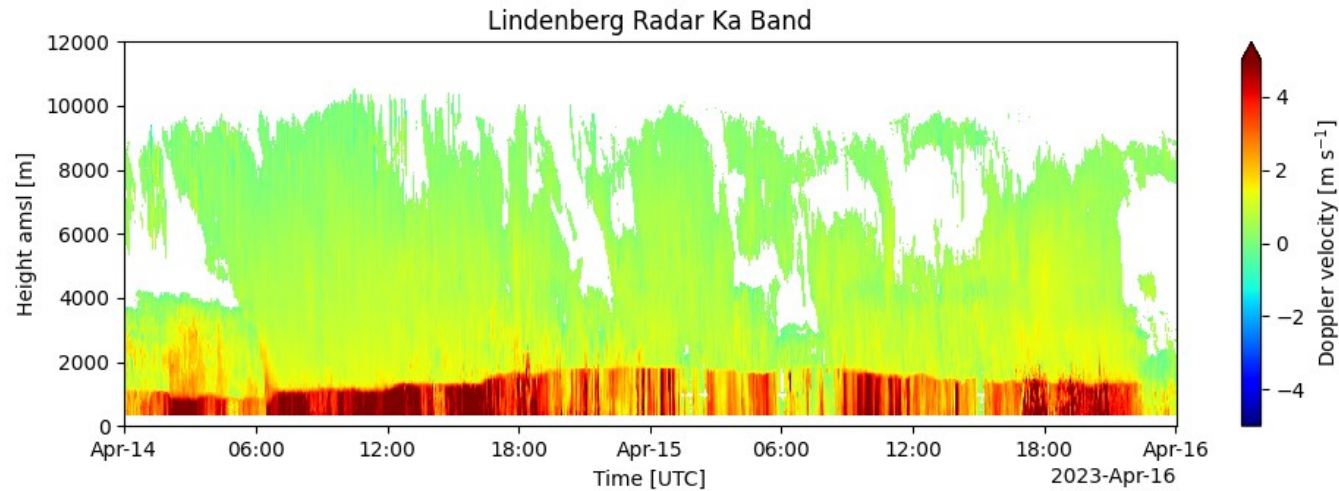


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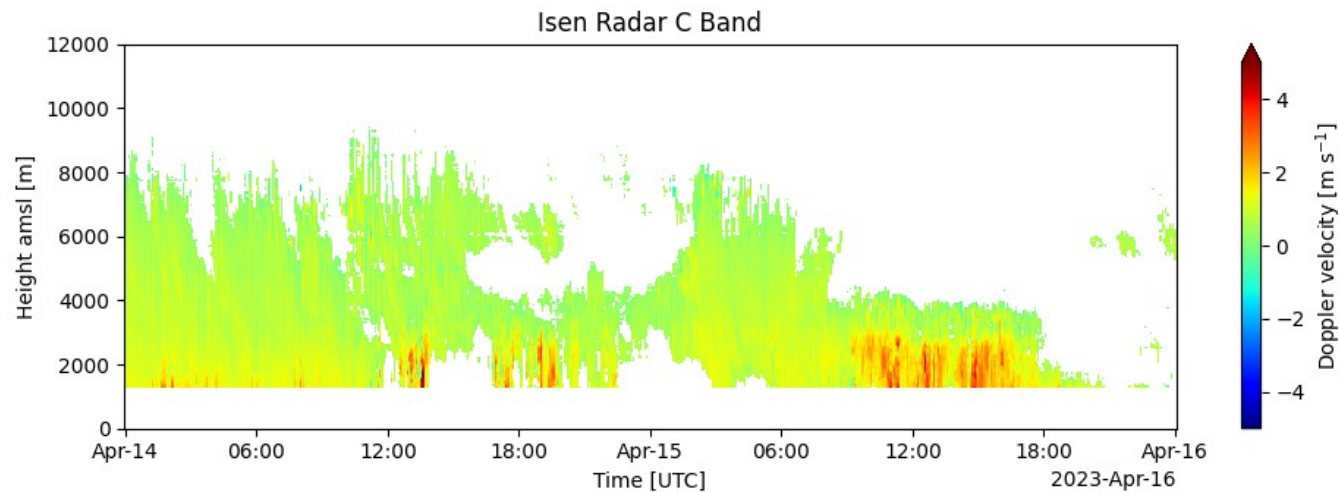
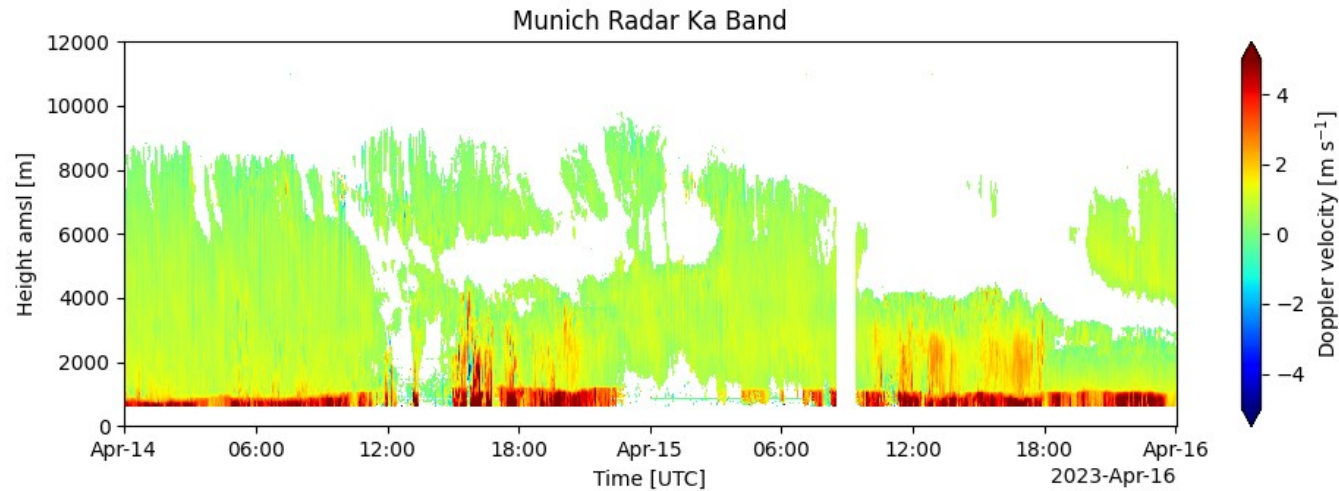


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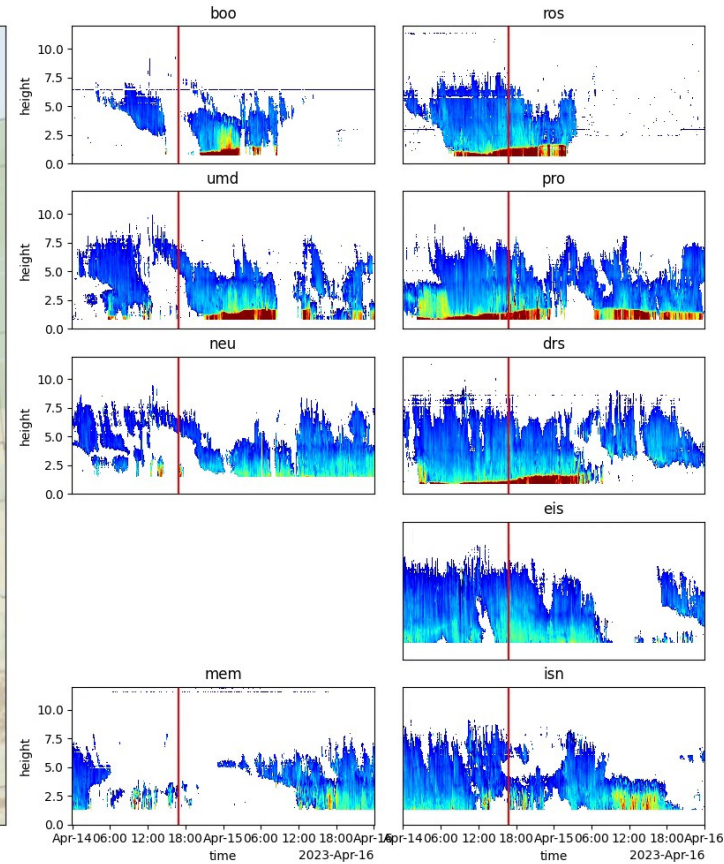
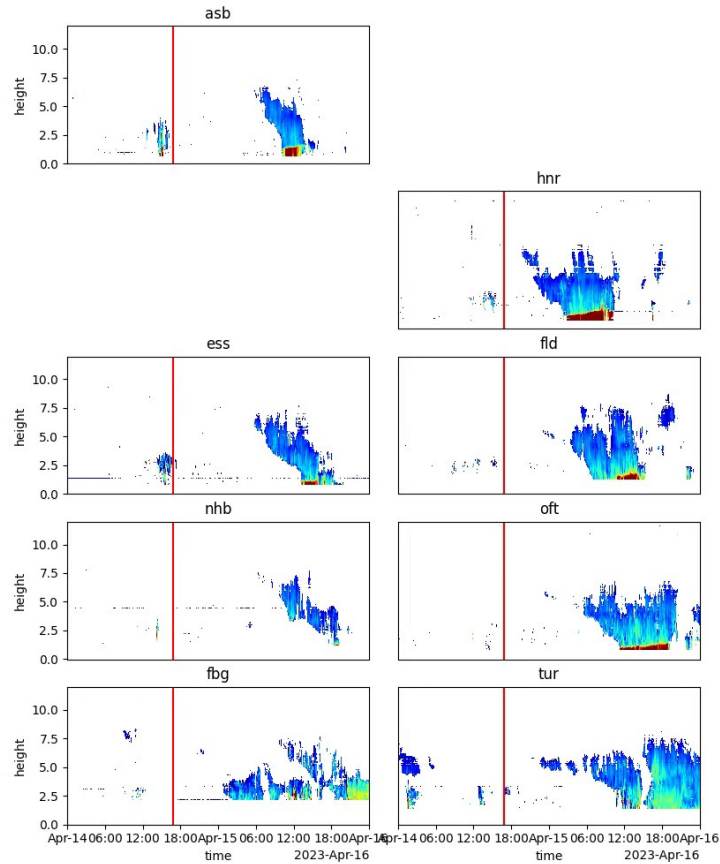
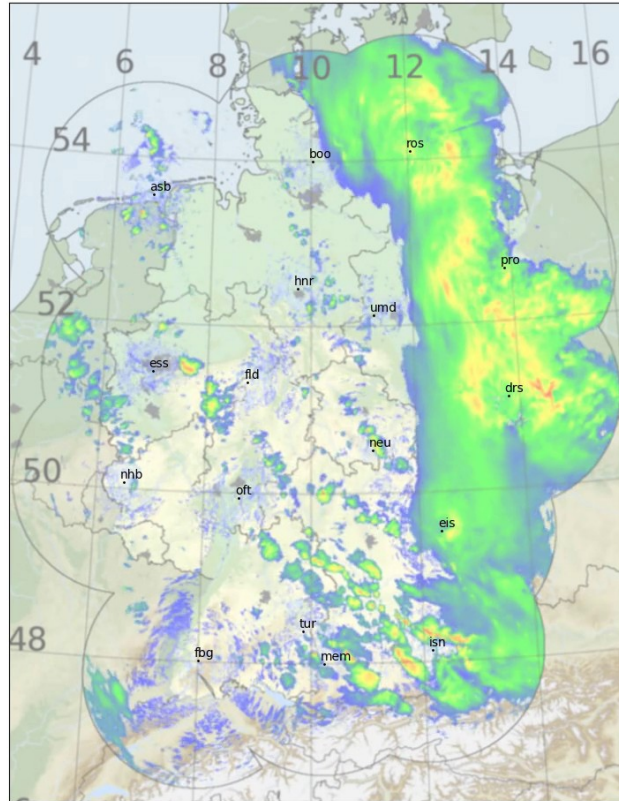
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Map View

2023-04-14 16:50



Animation

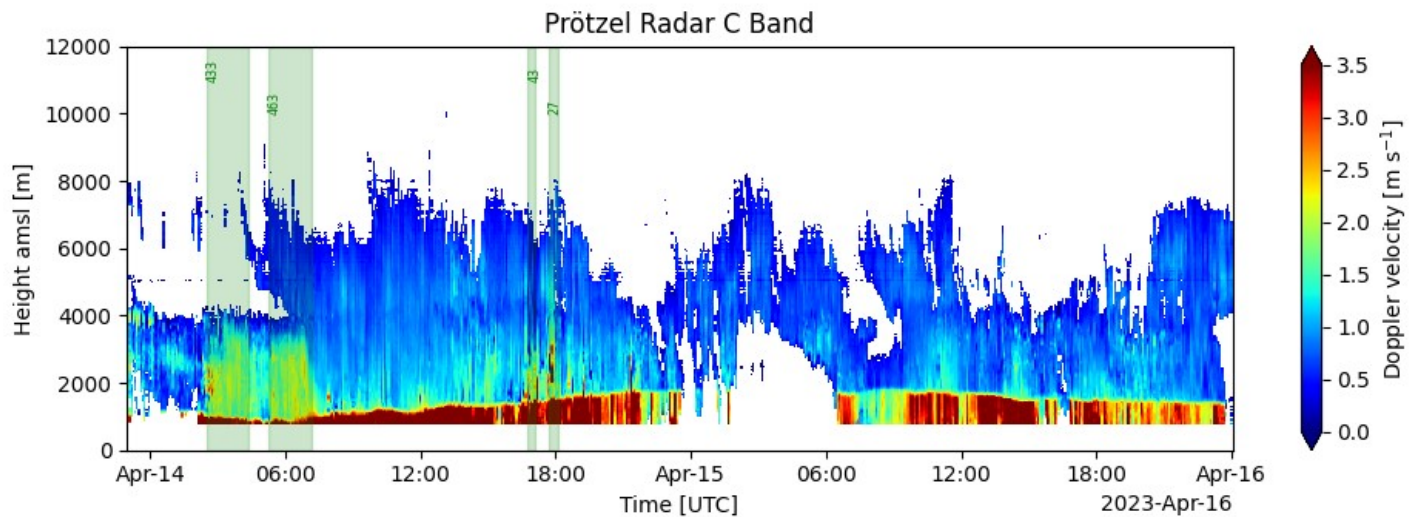
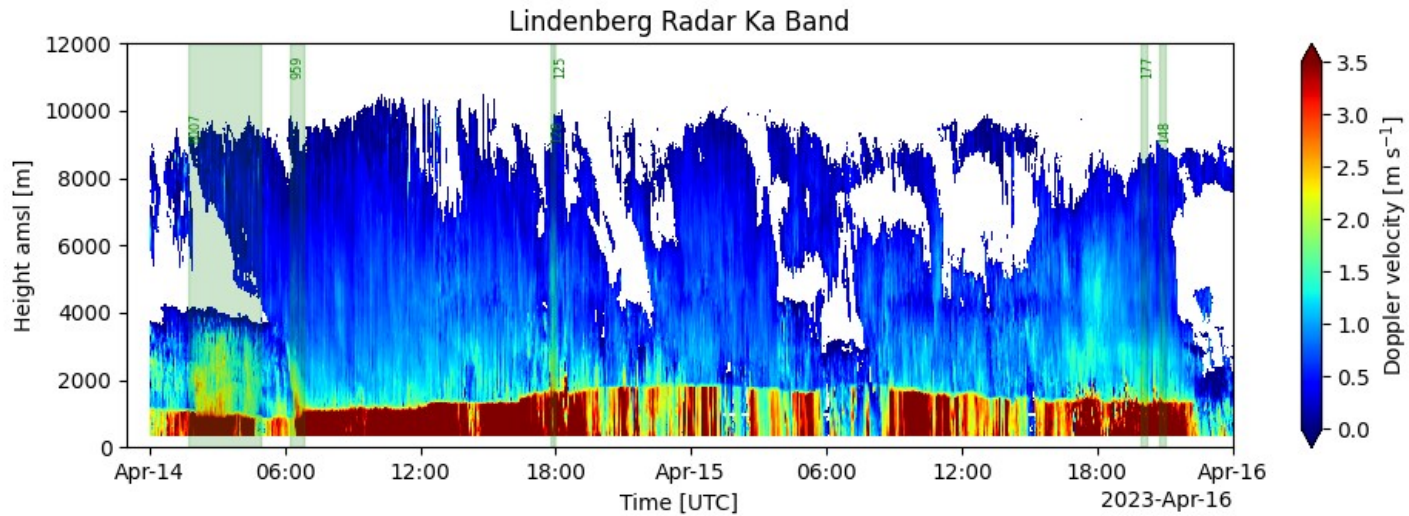


Adapting the Retrieval for C-Band

	Original Retrieval	C-Band Retrieval
Radar	Ka-Band	C-Band
Time Resolution	30 s	5 min
Rime-Velocity Relation	Ka-Band	X-Band
Melting Layer Detection	Based on Cloudnet Classification	Based on ERA5 Zero Degree Level
Fall Velocity Pressure Correction	Hourly, site specific model profiles	Pressure Climatology
Convection Filtering	Mosimann index (40 samples variability)	Simplified Mosimann Index (4 samples variability)
Temperature Filtering	Wetbulb Temperature from Model Profiles	No filtering

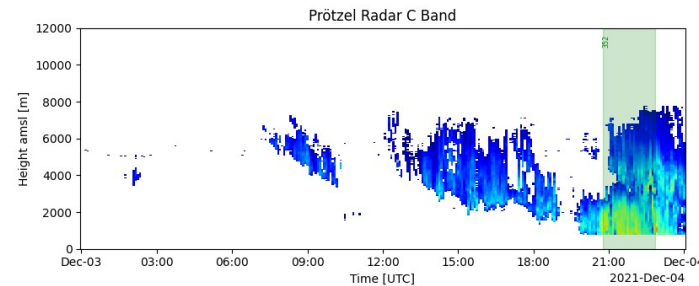
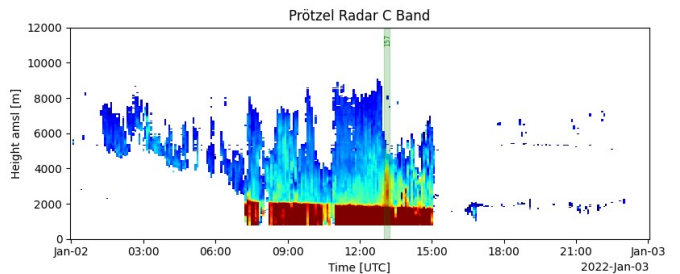
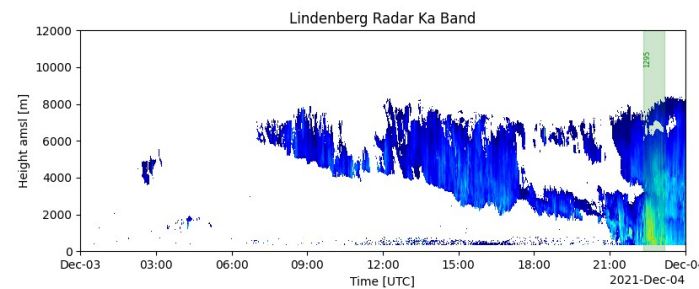
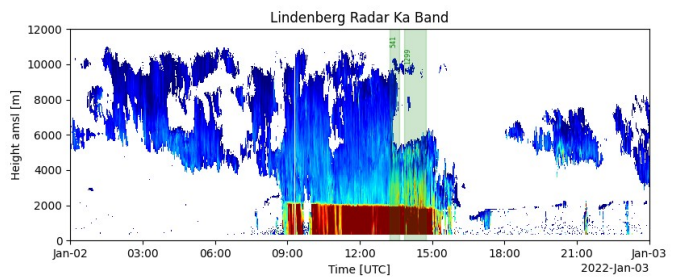
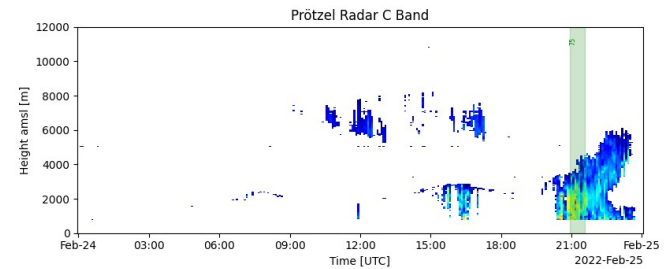
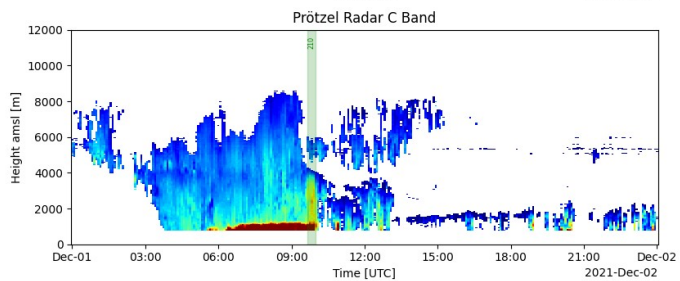
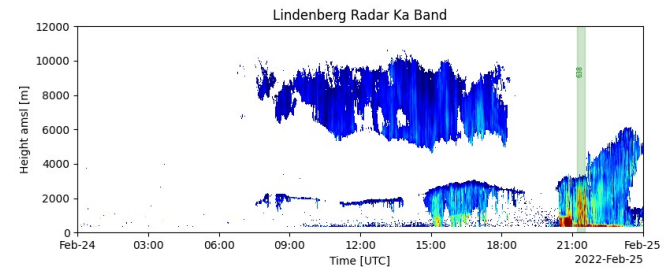
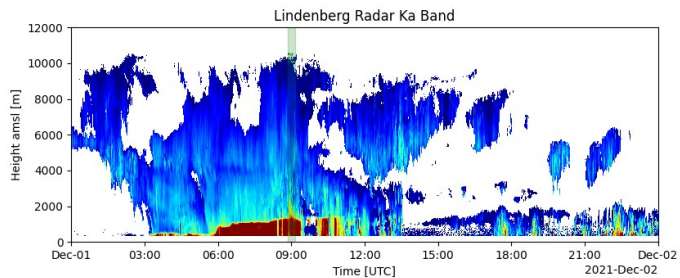


Riming in C-Band



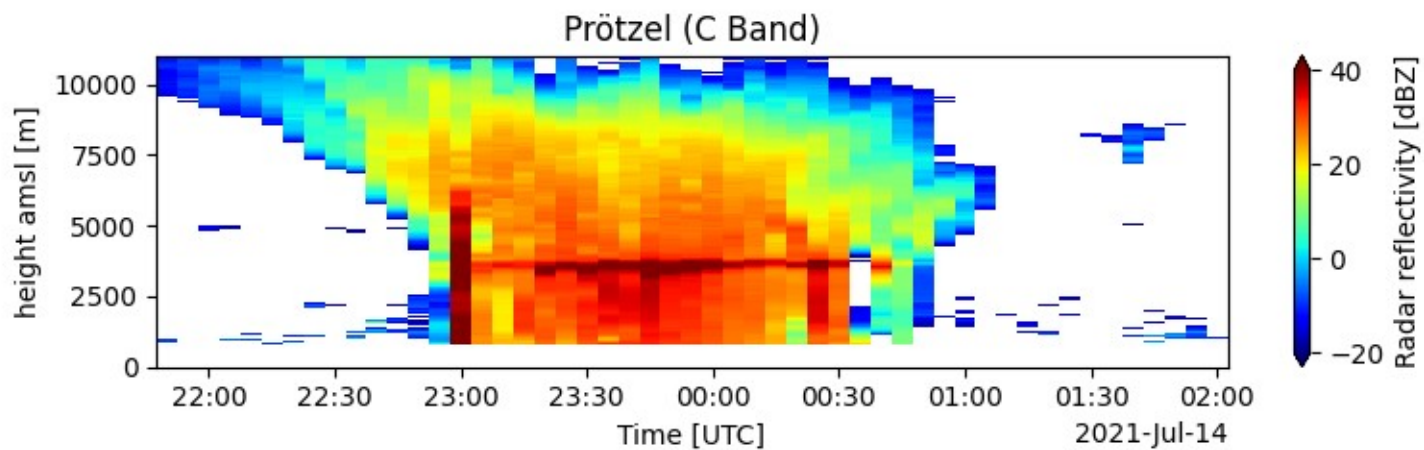
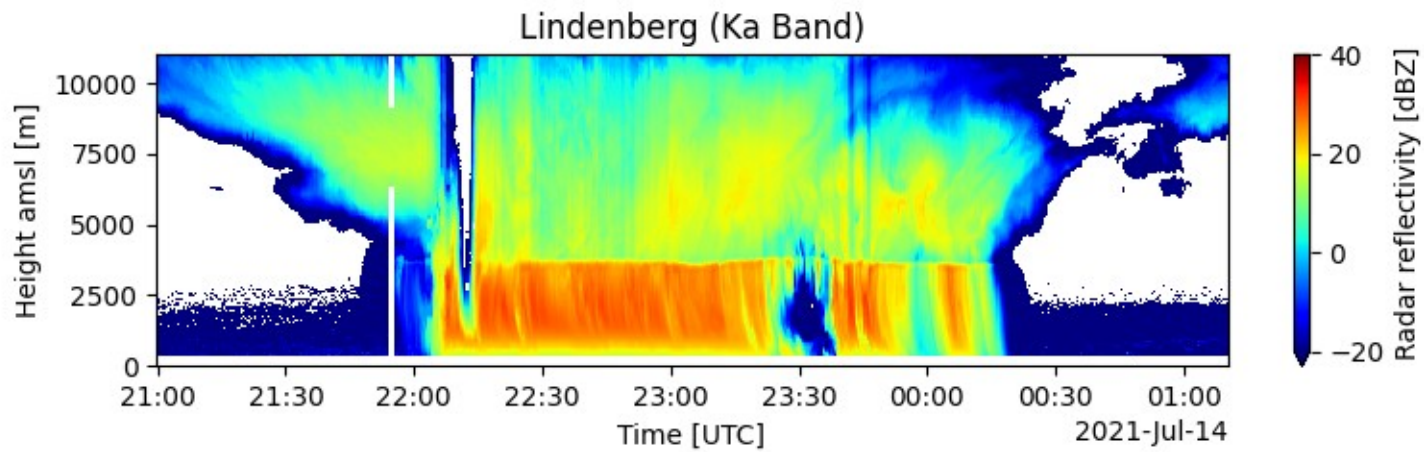


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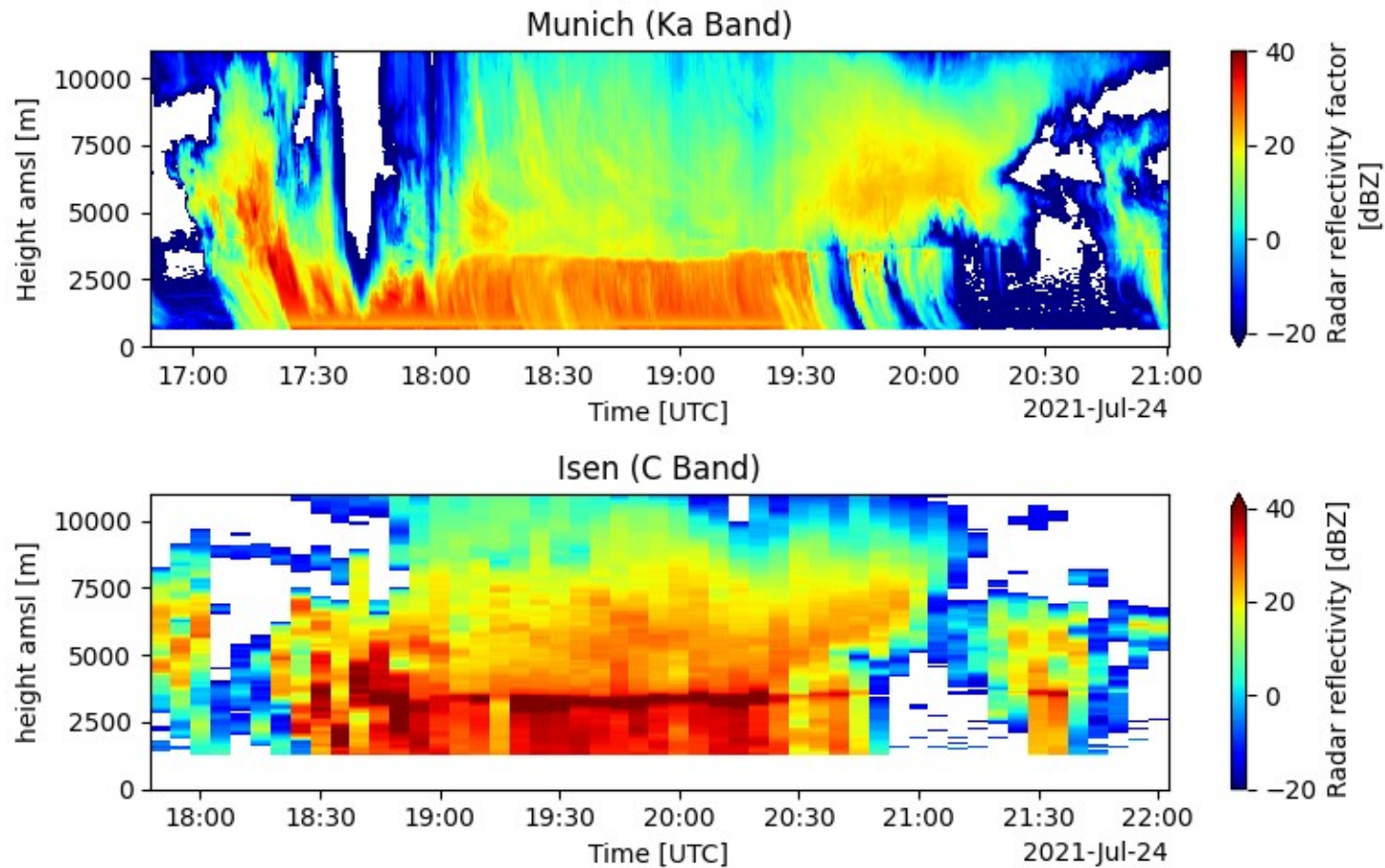


Attenuation?





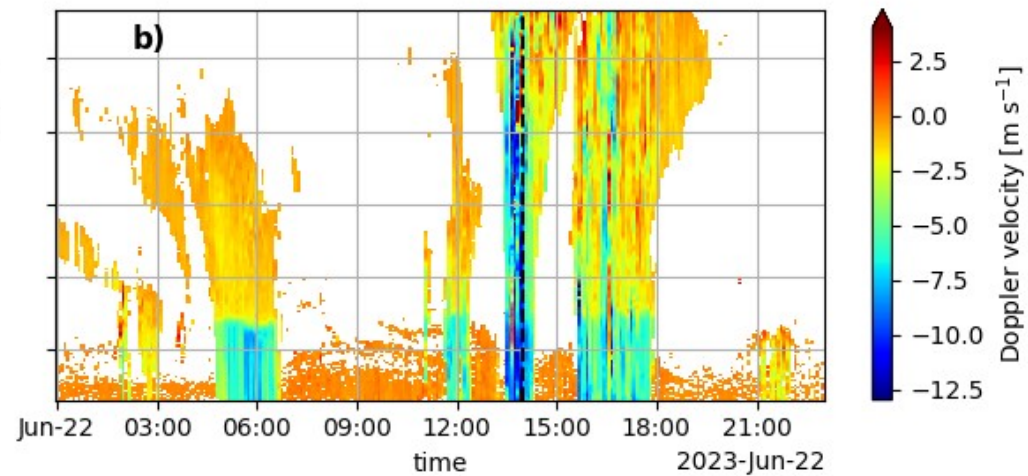
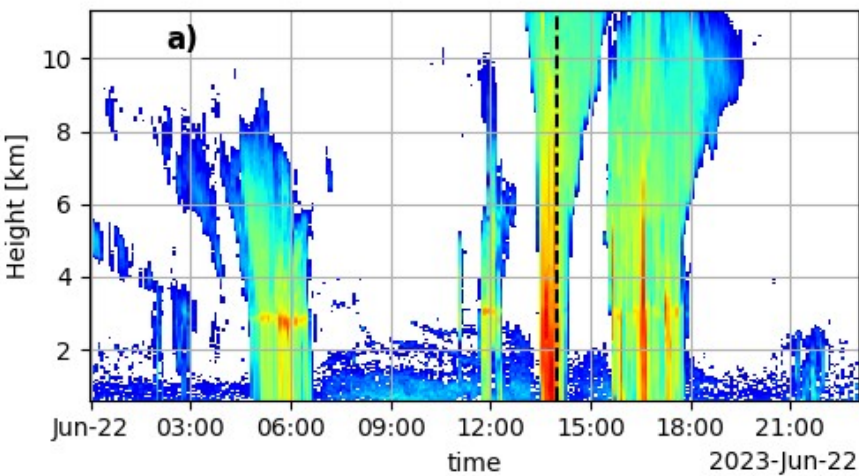
Attenuation?





Hail?

Radar Flechtdorf, June 2023





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- The operational C-band birdbath scan can resolve large scale cloud structures very well



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- The operational C-band birdbath scan can resolve large scale cloud structures very well
- With some modifications, riming detection for cloud radars is transferable to operational radars
- Severe weather (heavy precipitation, hail) can be investigated by C-Band profiles



Velocity CFAD

