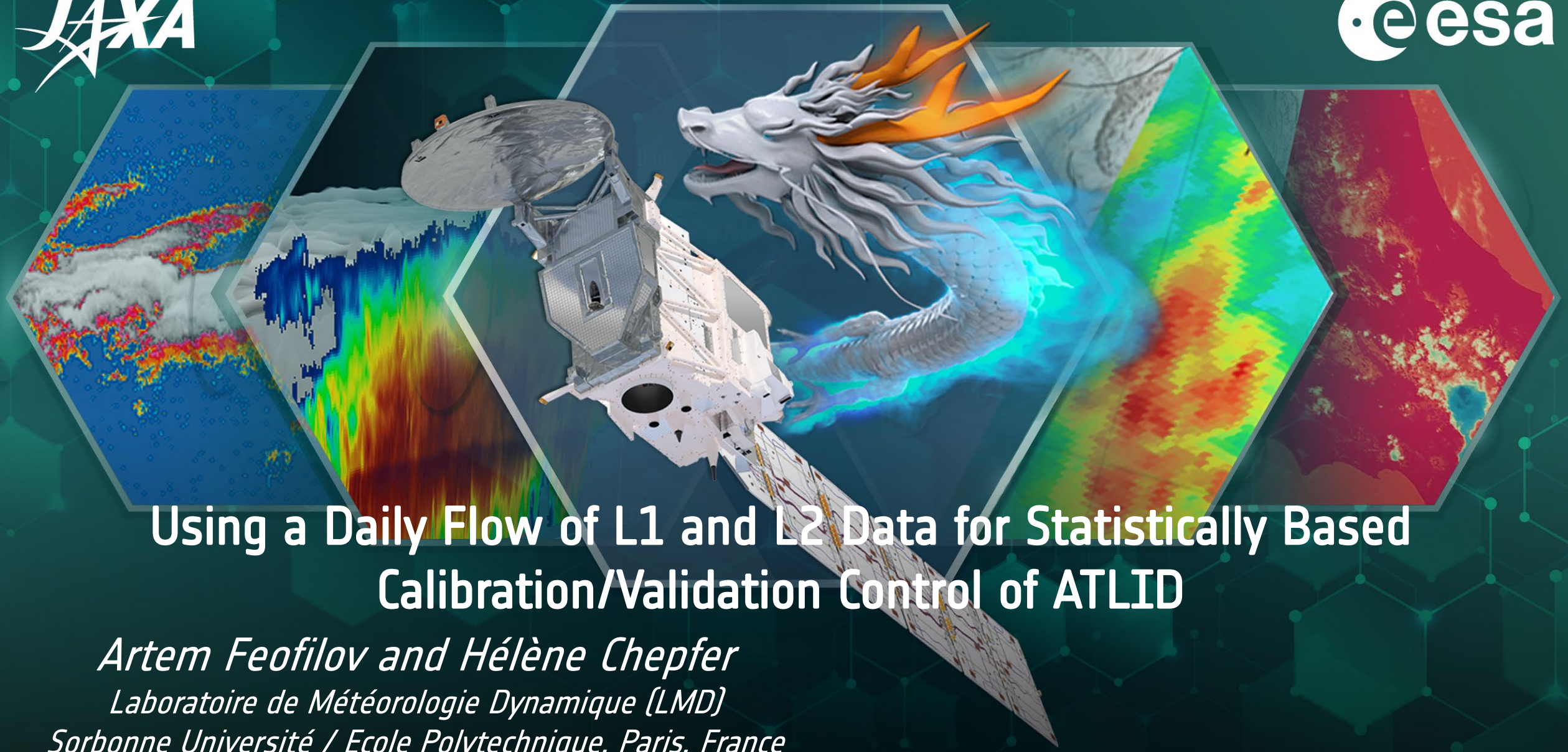

Using a Daily Flow of L1 and L2 Data for Statistically Based Calibration/Validation Control of ATLID

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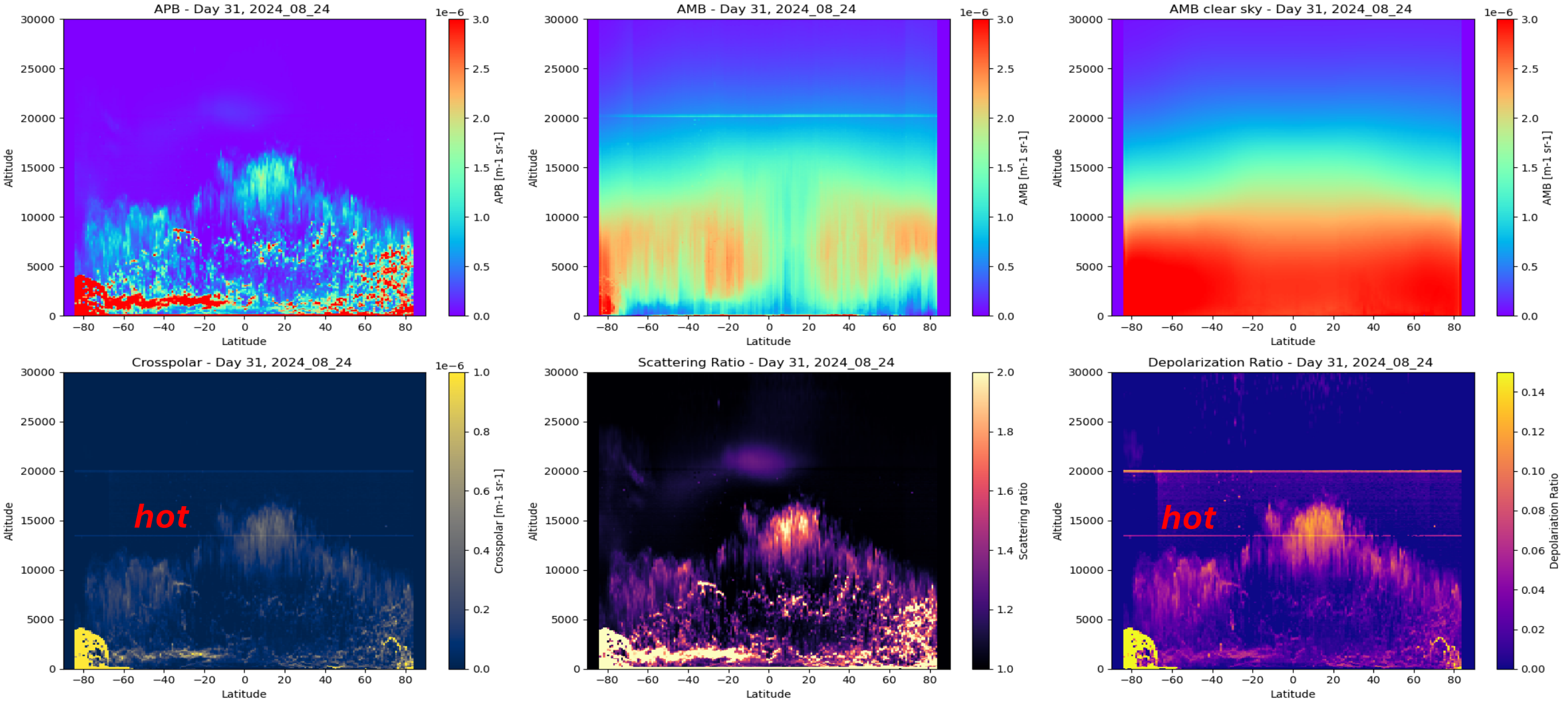
17 – 20 March 2025 | ESA-ESRIN | Frascati (Rome), Italy

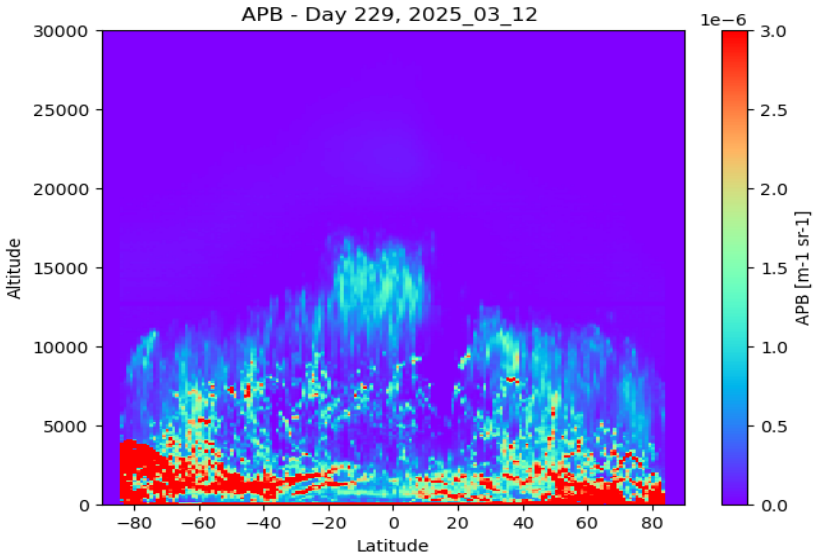
Quality/stability control parameters

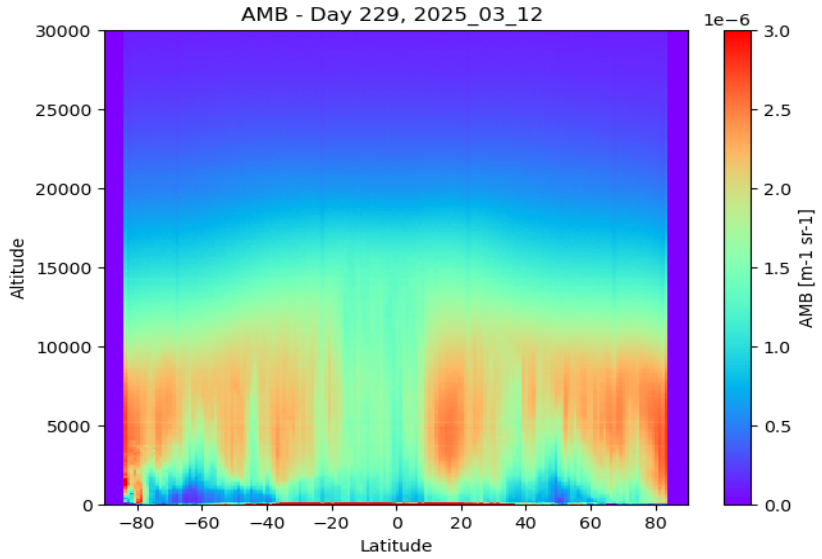
	N	Channel/data	Description
L1	1	Mol.	Center values of histograms of radiance reflected from the ocean with T_{surf} = 300±1 K.
	2	Part.	
	3	Perp.	
	4	Mol. day	Center values of histograms of daytime and nighttime stratospheric molecular signal (~35km) or noise (higher altitudes).
	5	Part. day	
	6	Perp. day	
	7	Mol. night	
	8	Part. night	
	9	Perp. night	
L2	10	K_{corr}, SR histo	Weighted average of the correlation coefficient or deviation for the clustered scattering ratio histograms w.r.t. the reference or the first day
	11	R.M.S., SR histo	

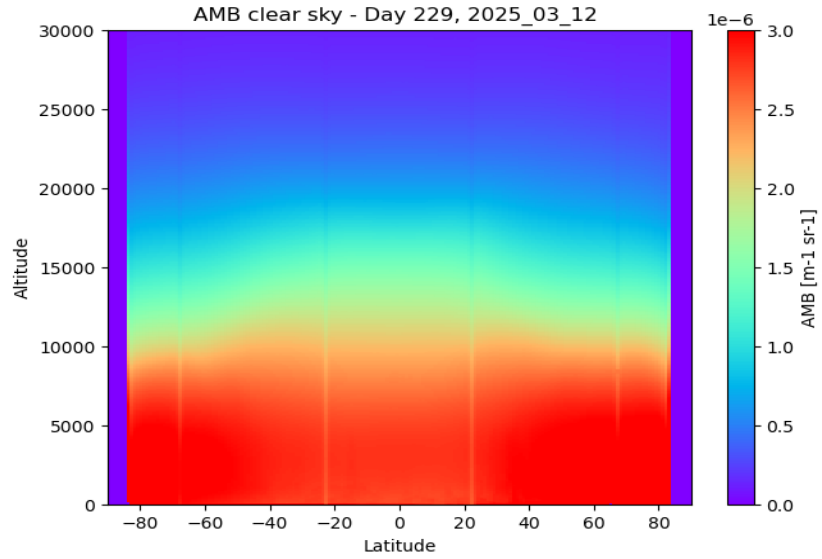
Lat/alt daily files, hot/cold pixels

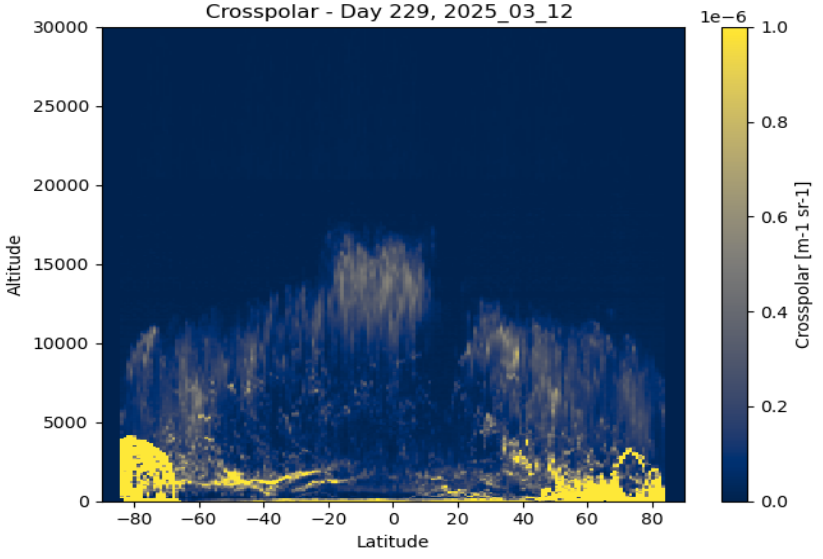


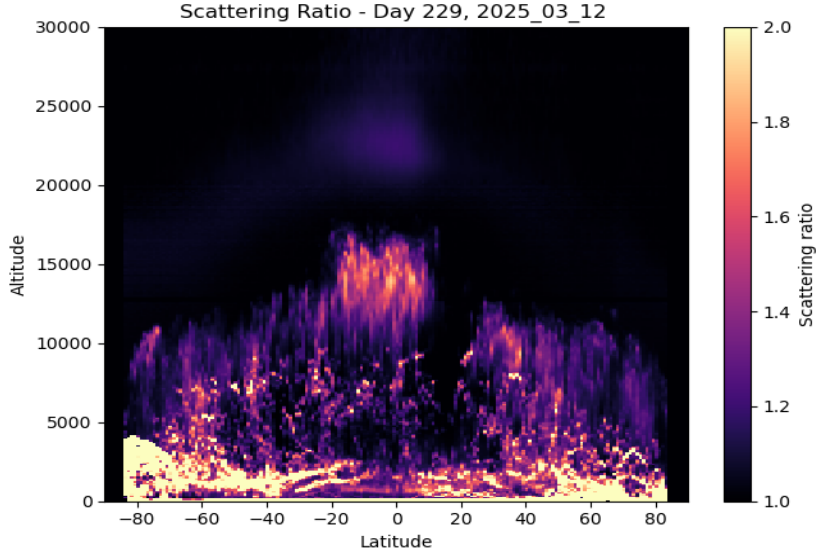
Lat/alt daily files, current state

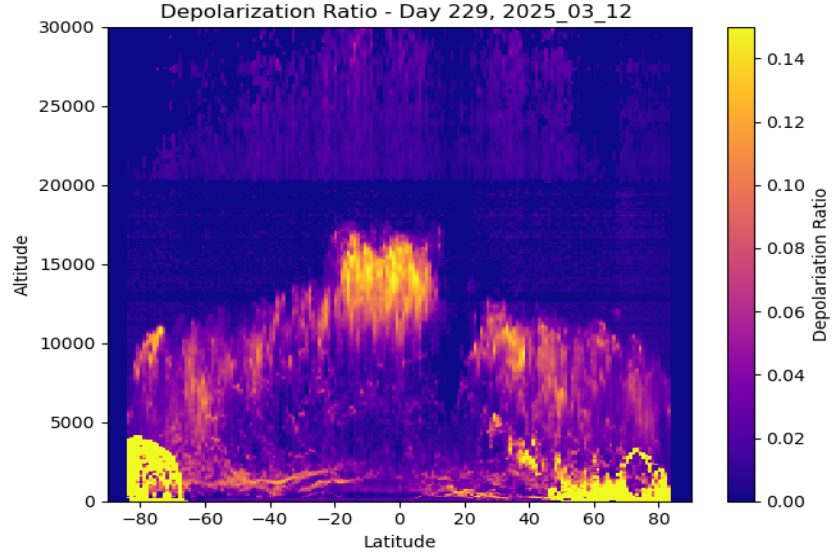




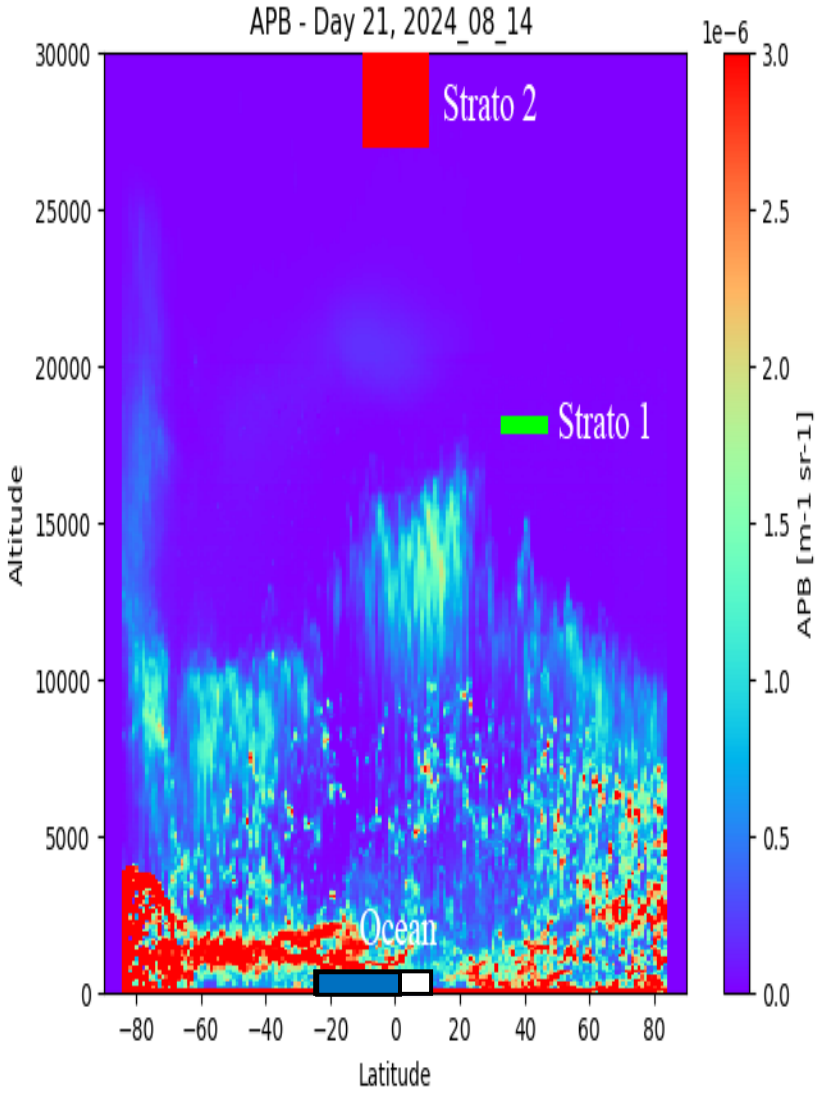


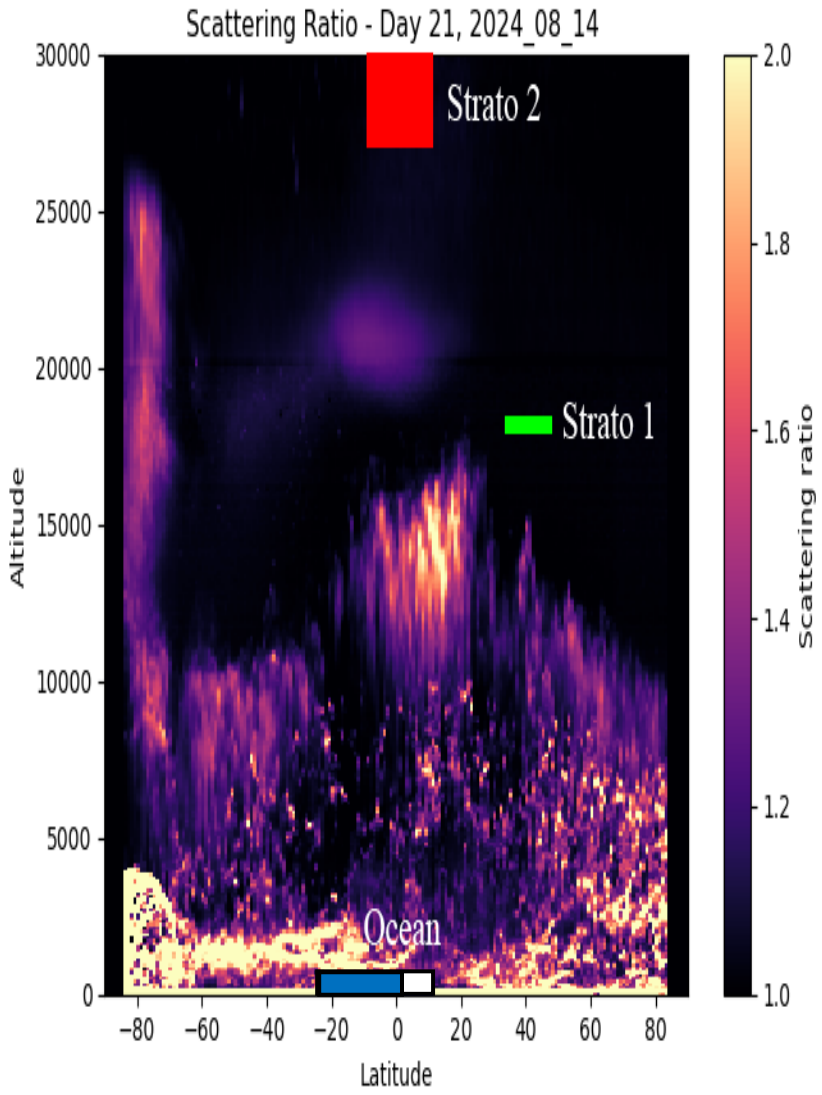


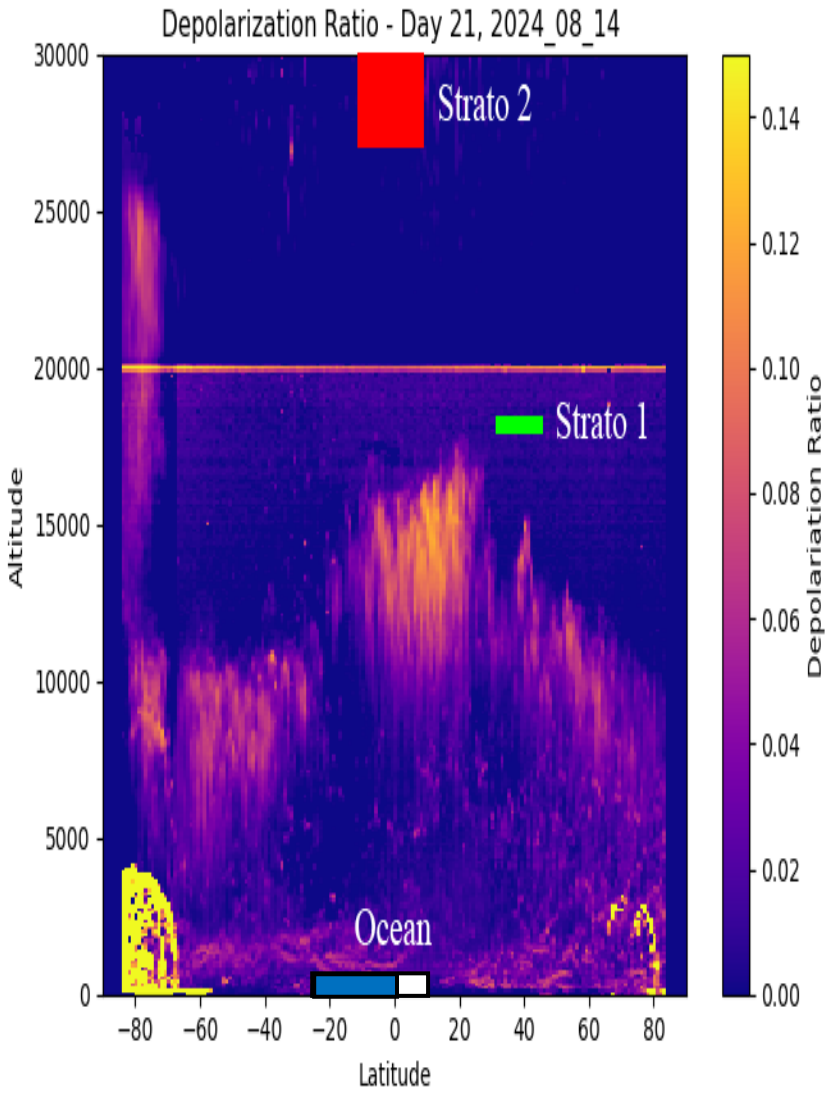




Choosing the reference zones

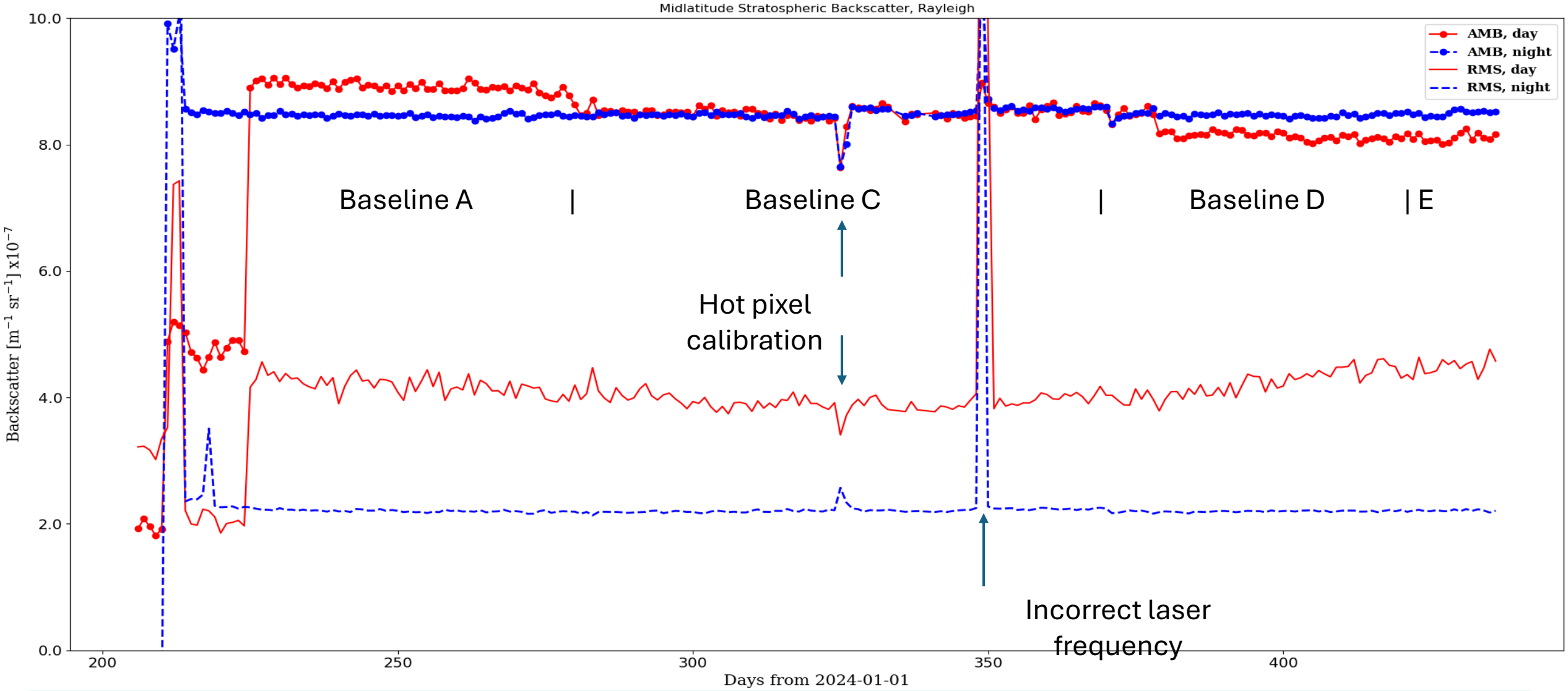




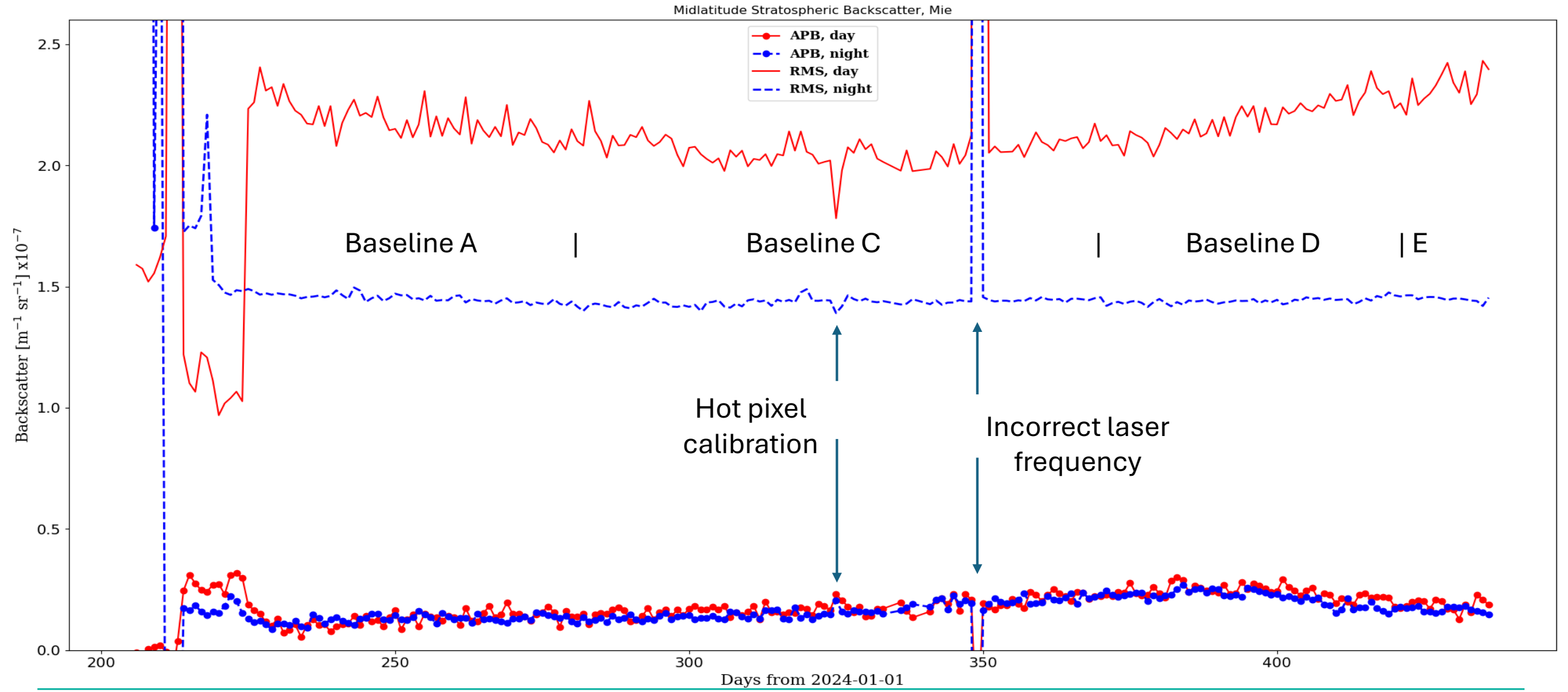


L1 results

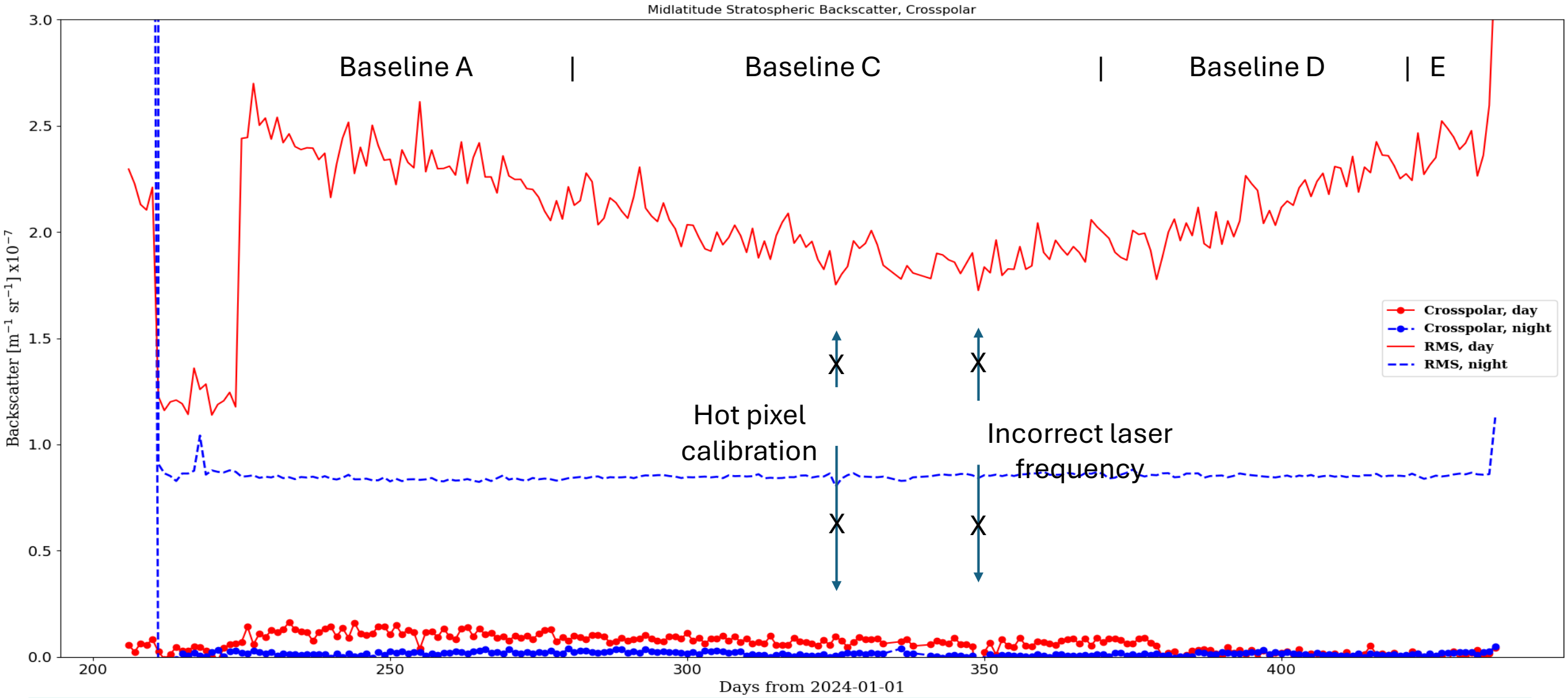
Results: Strato1 18km, Rayleigh



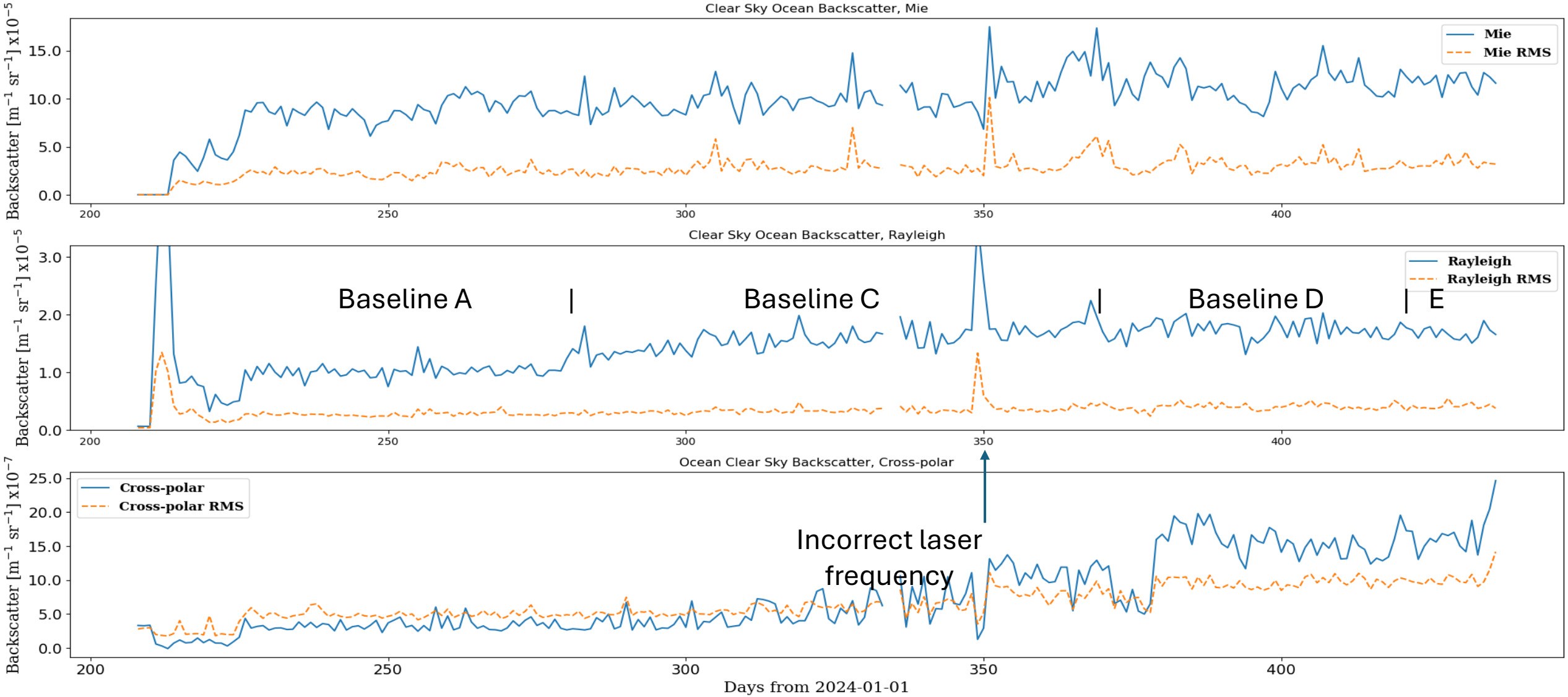
Results: Strato1 18km, Mie



Results: Strato1 18km, cross-polar

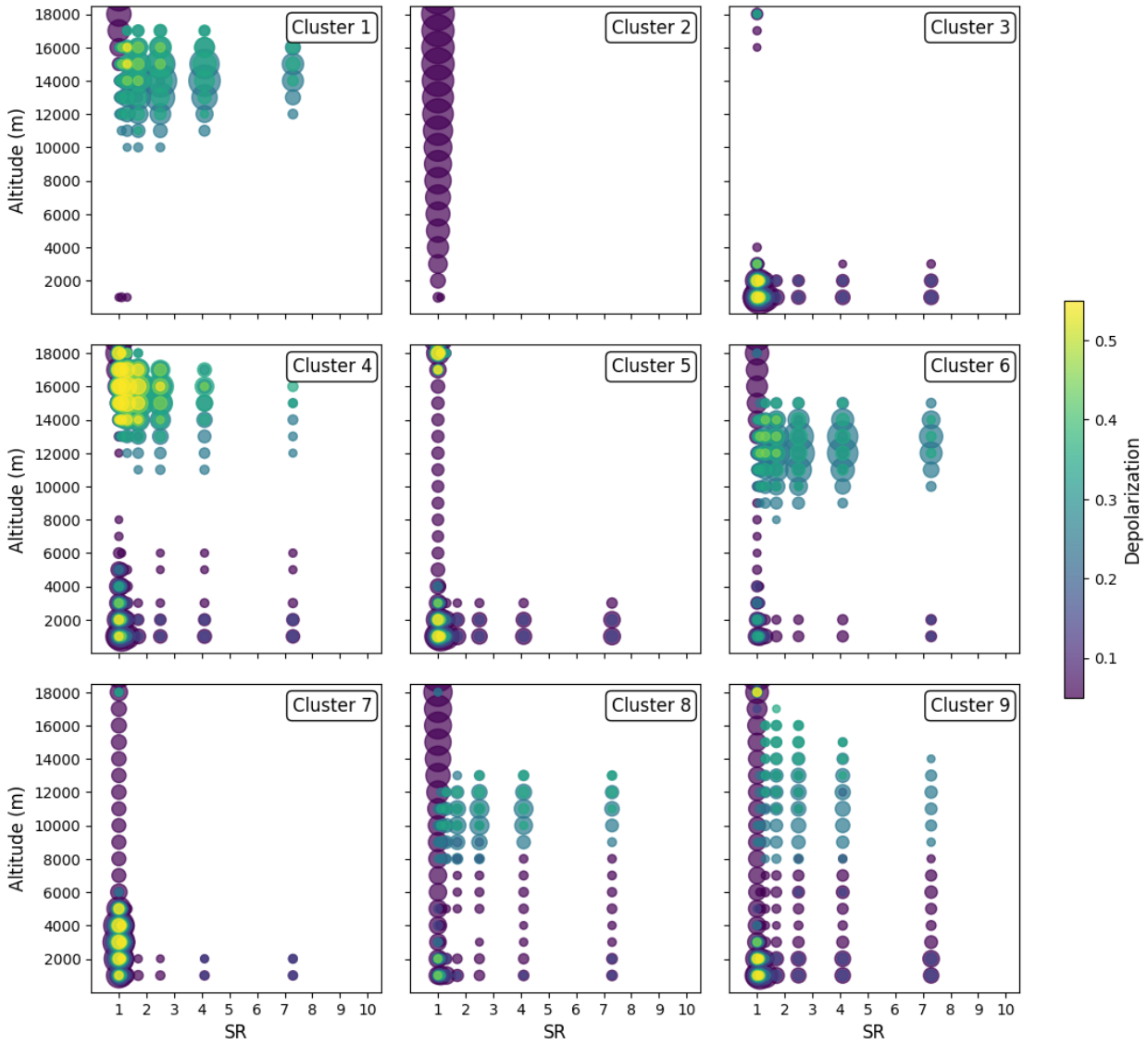


Results: clear-sky ocean surface backscatter



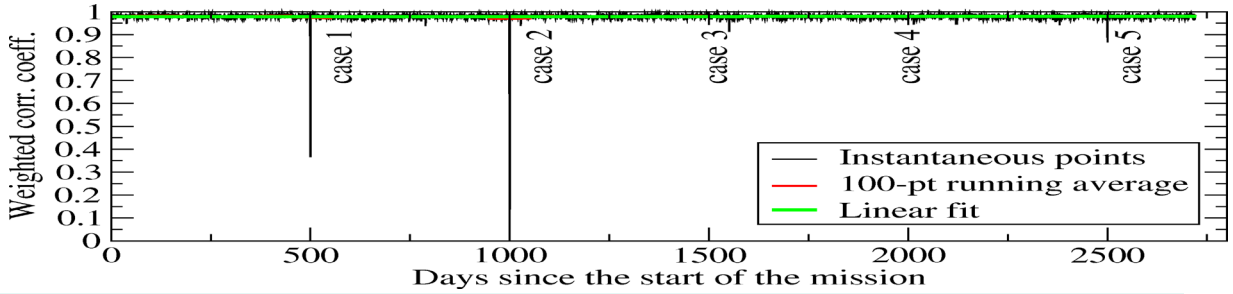
L2 cluster analysis

L2 flow analysis: using the whole atmosphere as a reference

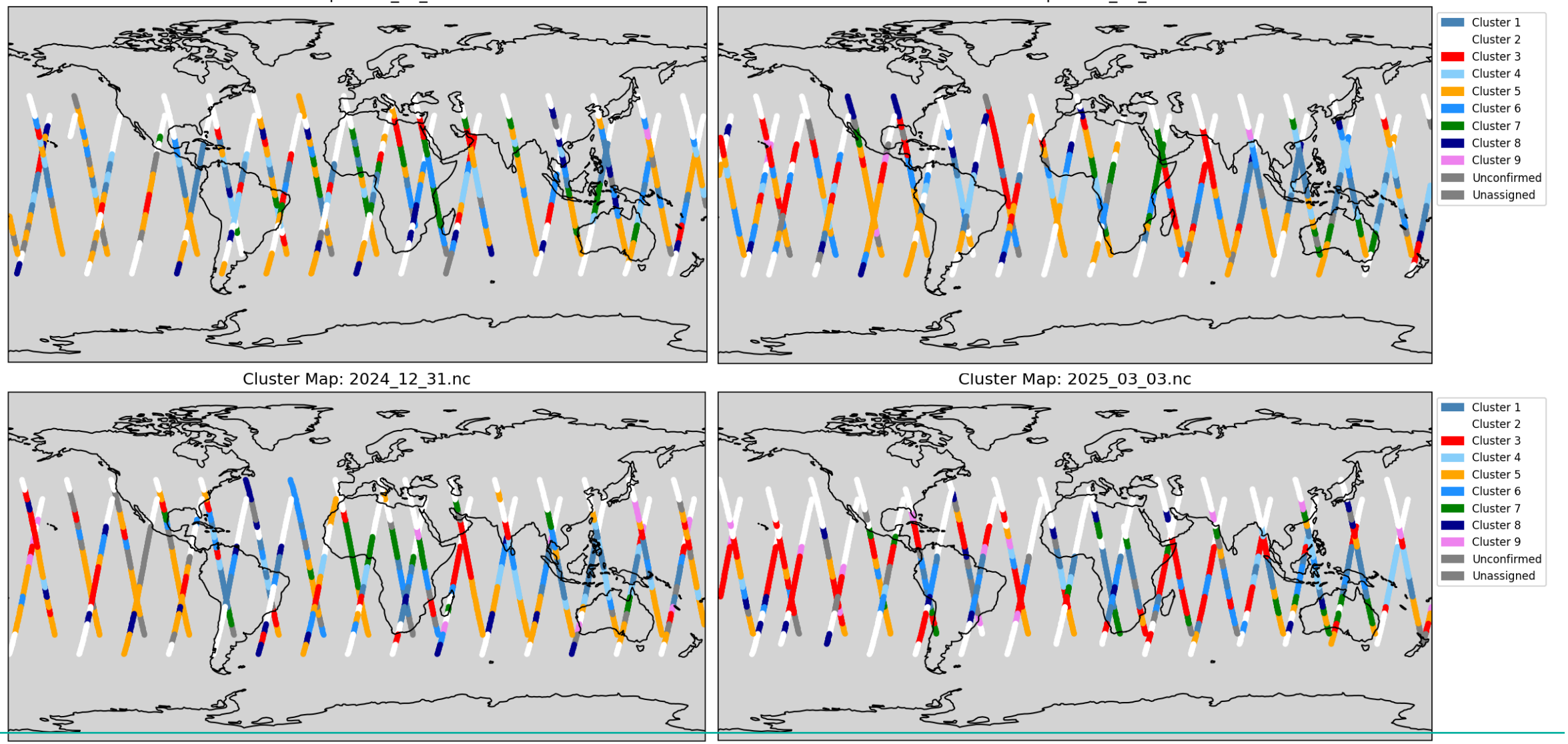


Cluster analysis

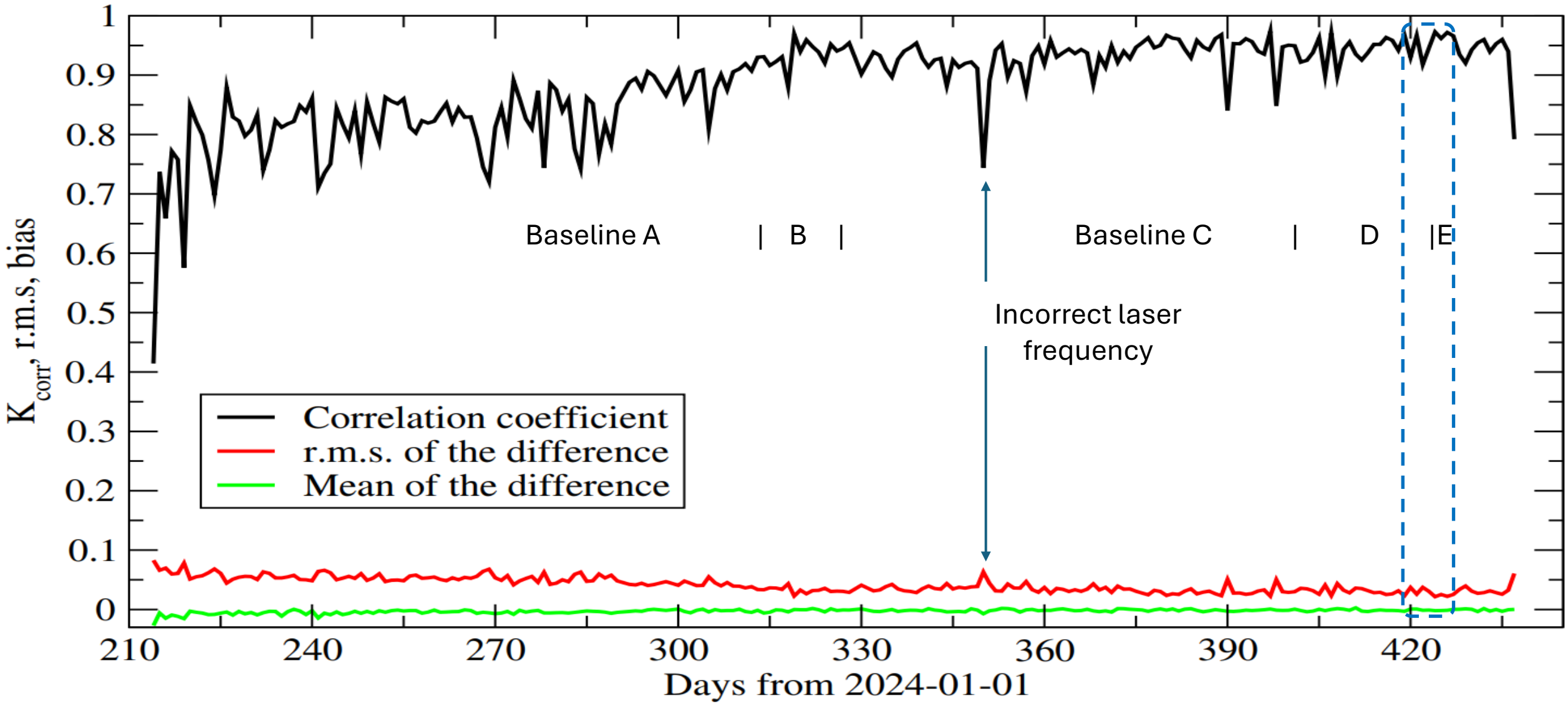
- Daily orbits are split to ~500km chunks
- For each chunk (|lat|<40°), a 3D histogram is built : altitude/SR/depolarization
- 800 histograms per day are regrouped in 10 groups using clustering algorithm (minimal difference within group, maximal difference between groups)
- Clusters in alt/SR/depol space of day D are compared to reference period clusters
- For CALIOP, this approach showed no trends for the period of 2007-2015



L2 flow analysis: geographical distribution of cluster types



L2 flow analysis: correlation coefficient, bias, and rms for clusters



Conclusions

- latitudinal/altitudinal time series are helpful both for the selection of reference zones and for hot/cold pixel detection. Starting from 2025/01/17, no hot pixels visible in L1

Indicator's behavior	Expected
• Mean stratospheric signals are quite stable, both daytime and nighttime ones	? ☑
• Seasonal behavior of daytime noise is observed in all 3 channels	☑
• High sensitivity of Mie/Rayleigh indicators to laser frequency offset both in the stratosphere and for the ocean surface backscatter.	☑
• Cross-polar channel indicators did not show sensitivity to frequency offset	☑
• Baseline changes are traceable, but no major changes observed	☑
• L2 analysis with clusters shows stable behavior starting from Baseline B	?
• Cluster analysis is sensitive to laser frequency offset and D→E change (depol)	☑