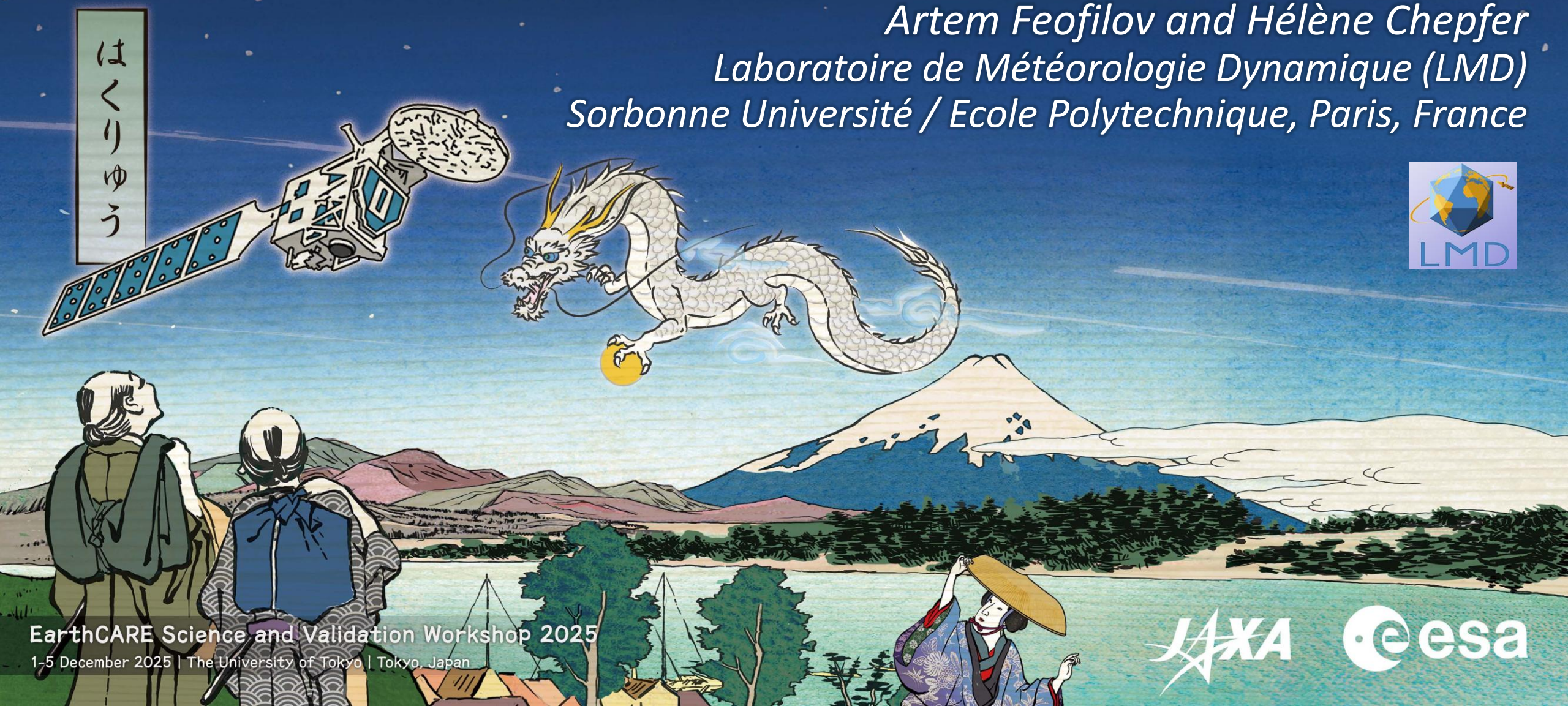
Statistical monitoring of ATLID performance using the latest baseline L1 and L2 data flows

Artem Feofilov and Hélène Chepfer
Laboratoire de Météorologie Dynamique (LMD)
Sorbonne Université / Ecole Polytechnique, Paris, France

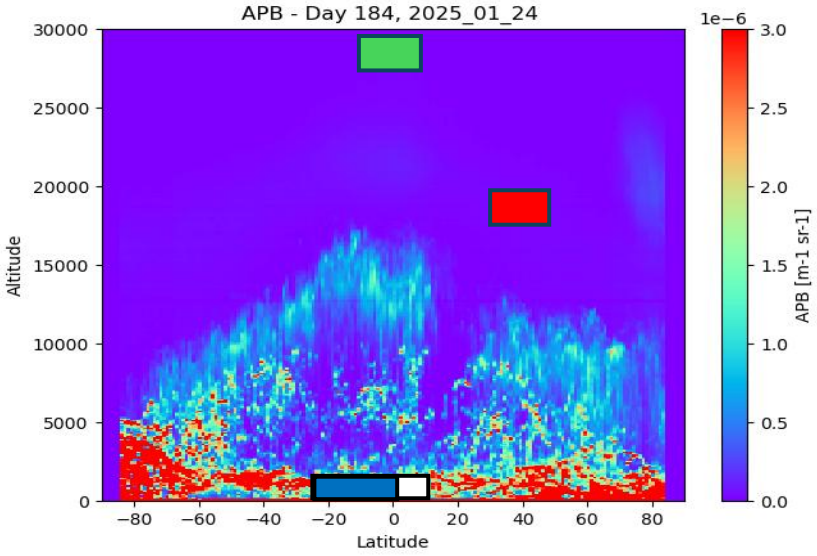


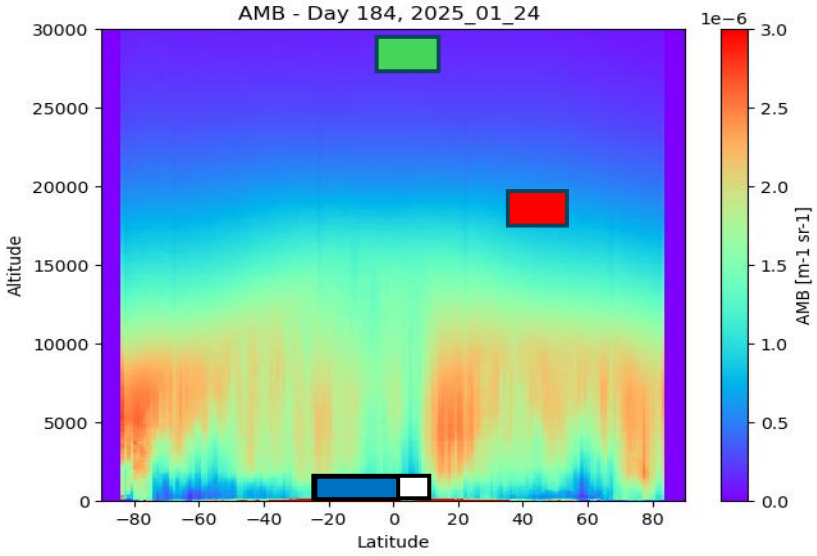
EarthCARE Science and Validation Workshop 2025
1-5 December 2025 | The University of Tokyo | Tokyo, Japan

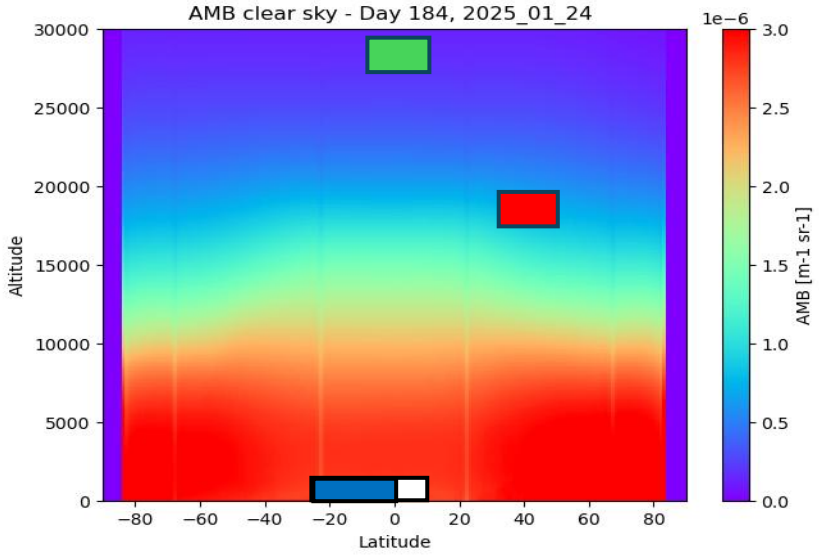
Quality/stability control parameters

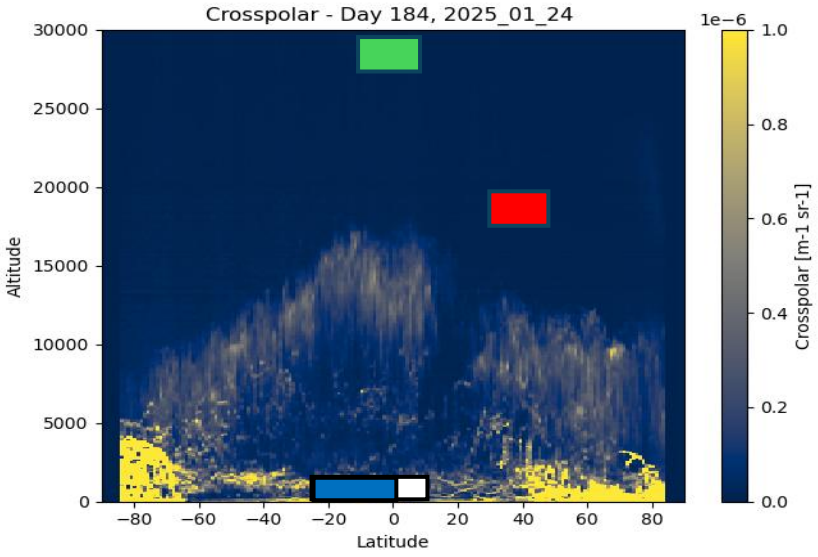
	N	Channel/data	Description
L1	1	Mol.	Center values of histograms of radiance reflected from the ocean with T_{surf} = 300±1 K.
	2	Part.	
	3	Perp.	
	4	Mol. day	Center values of histograms of daytime and nighttime stratospheric molecular signal (~ **18 km**) or noise (higher altitudes).
	5	Part. day	
	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	

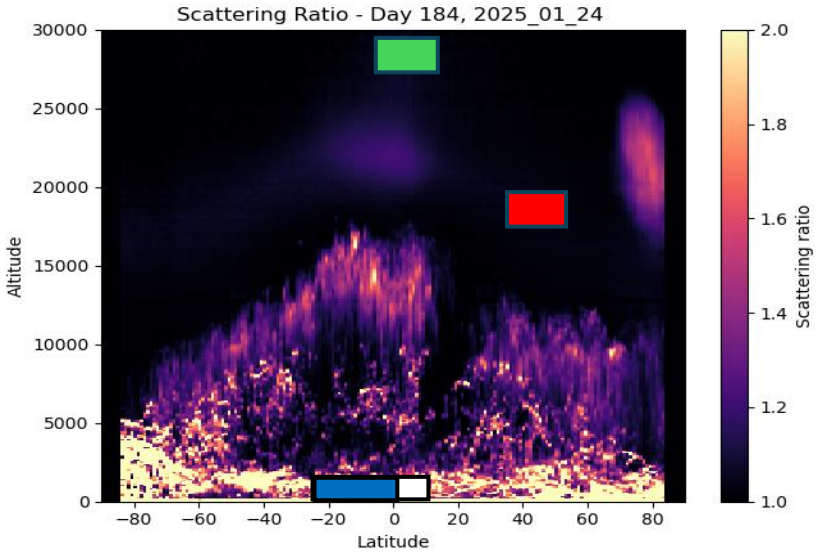
Choosing reference zones

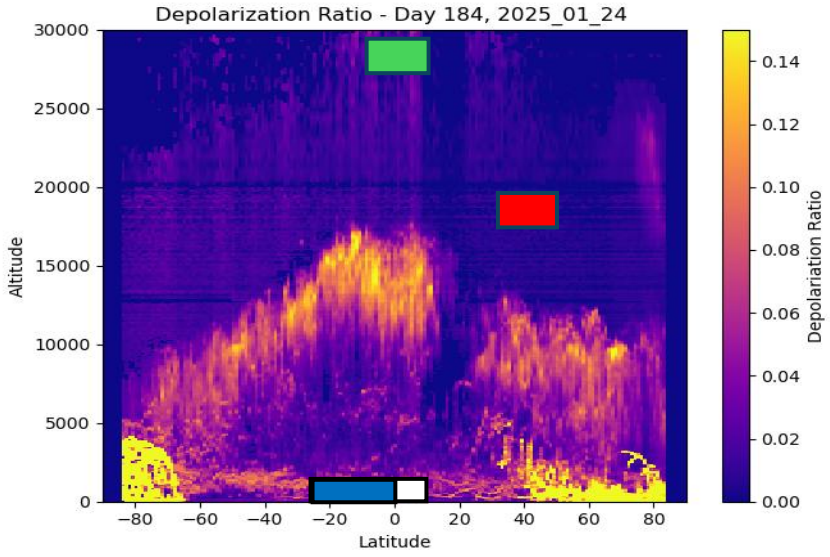




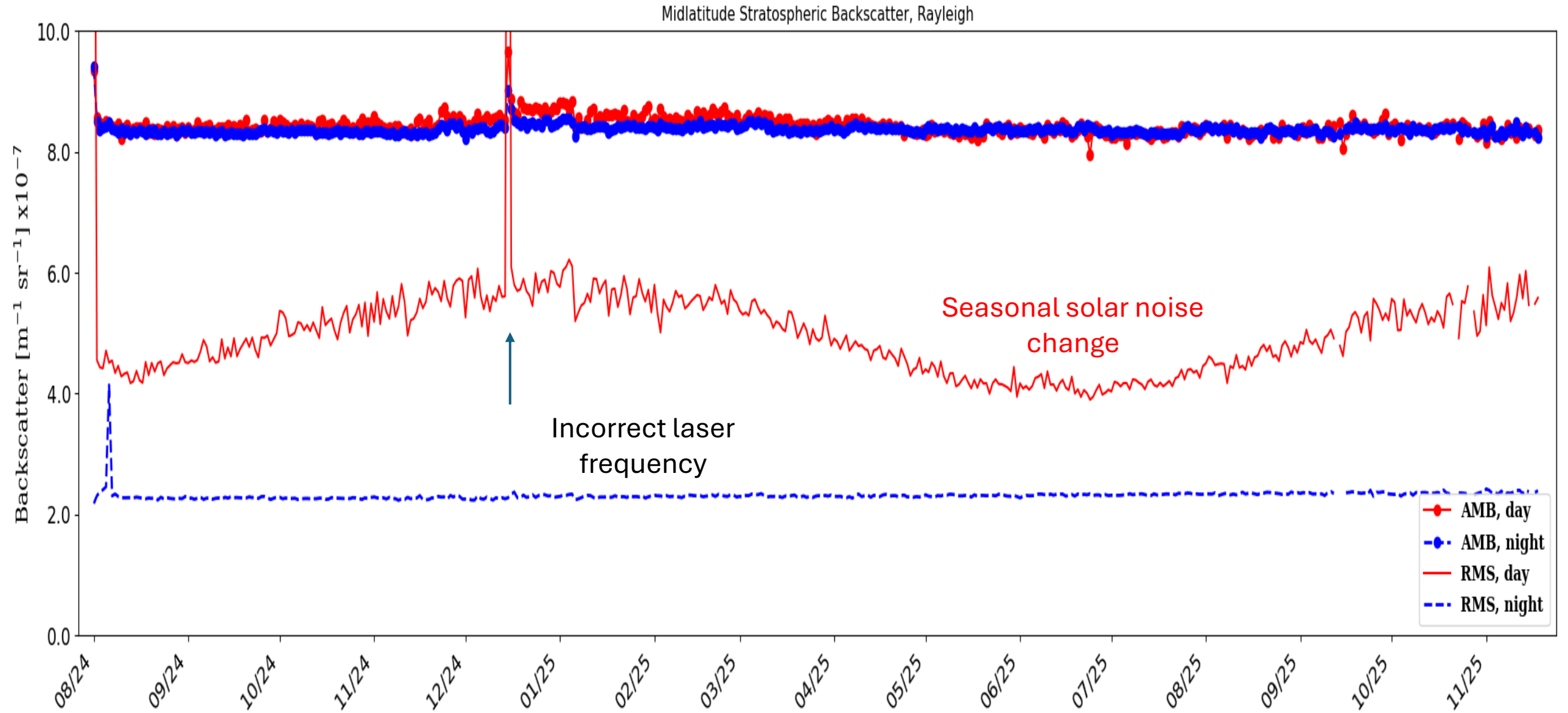




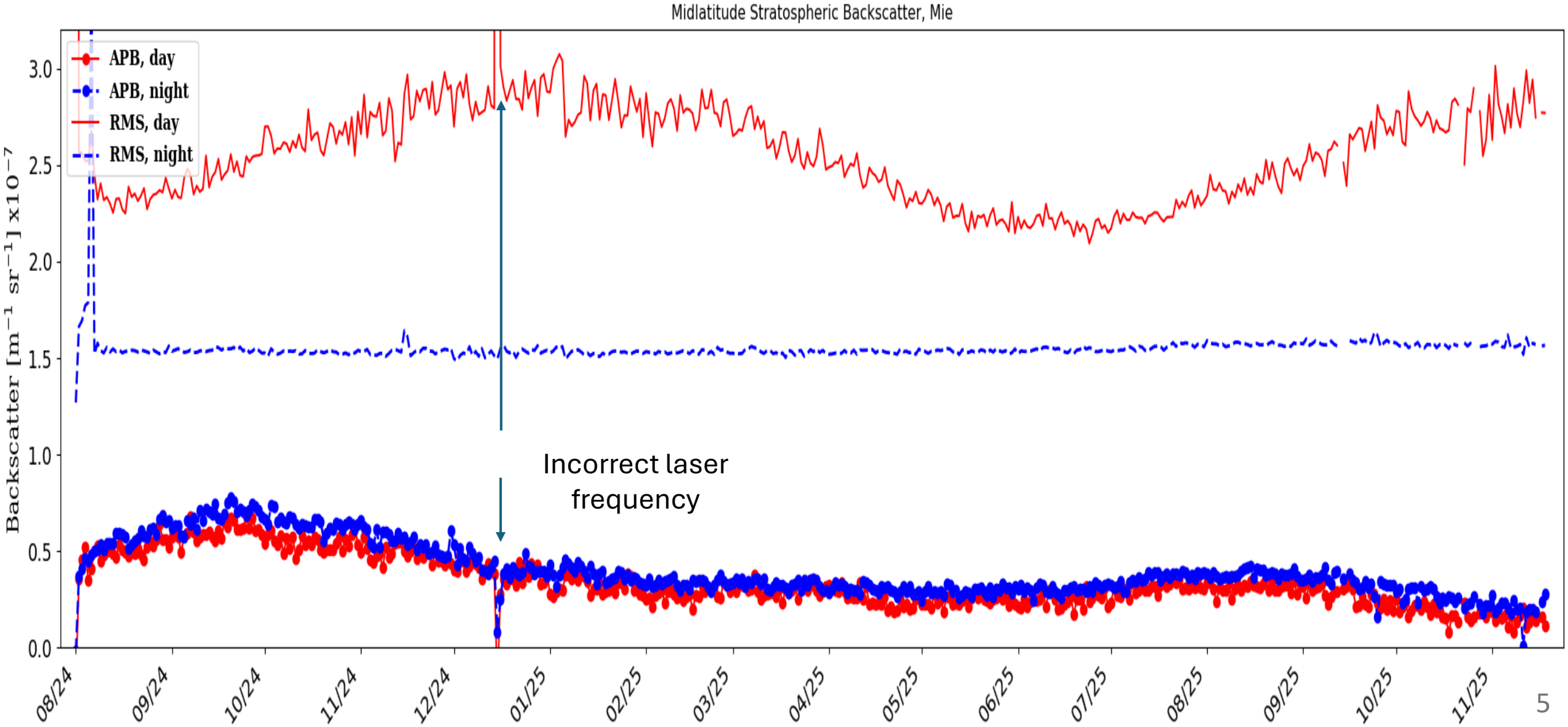




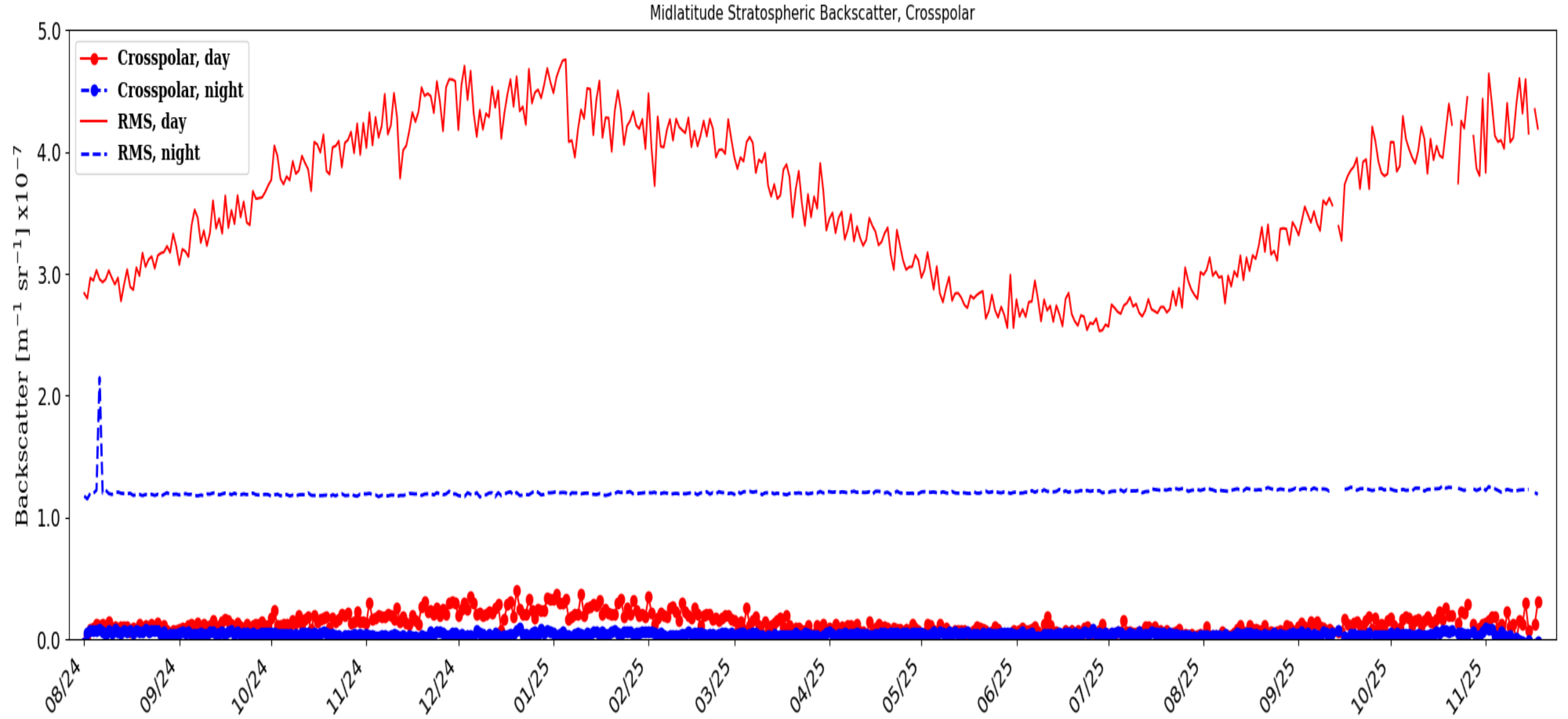
Results: Strato1, 18km, Rayleigh



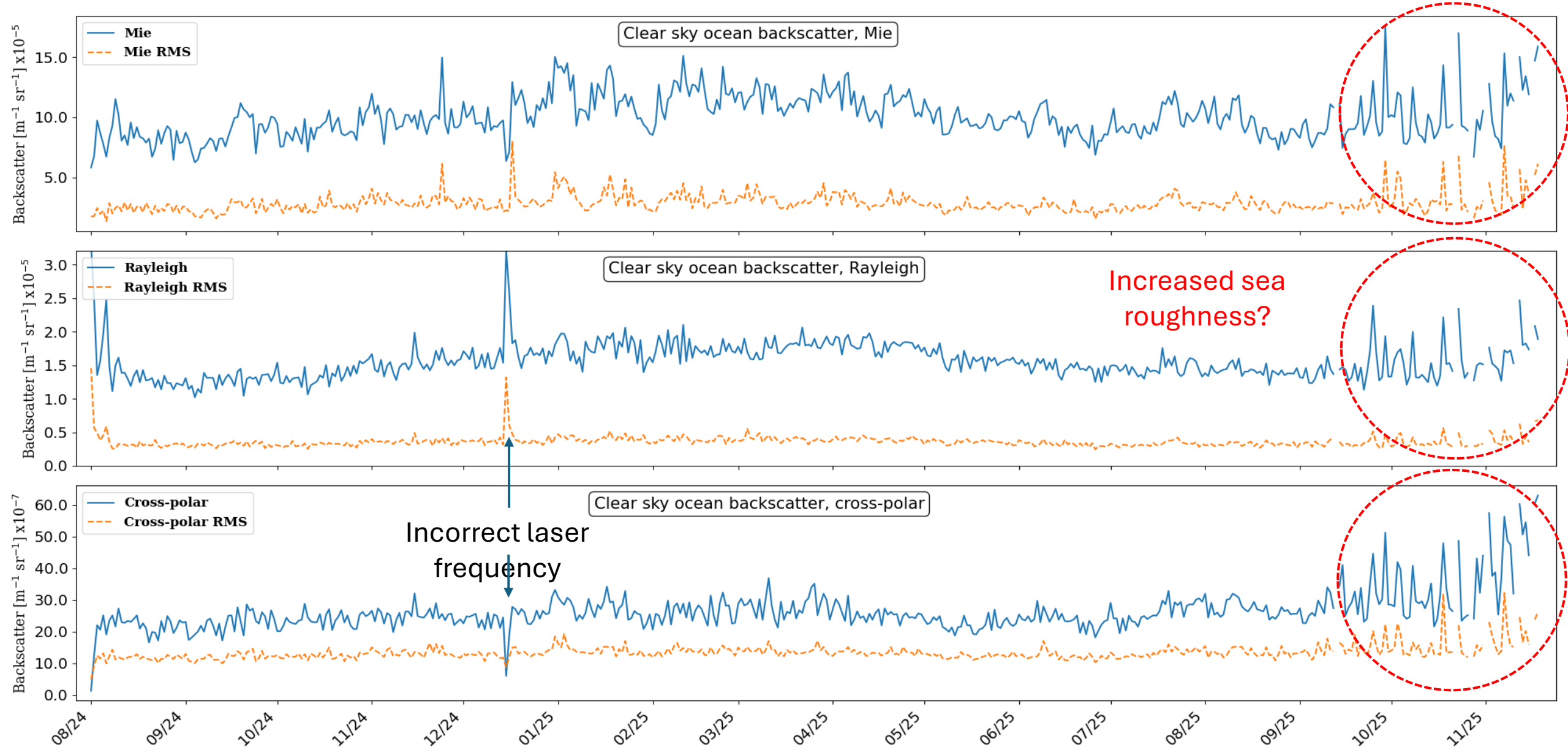
Results: Strato1, 18km, Mie



Results: Strato1, 18km, Cross-polar



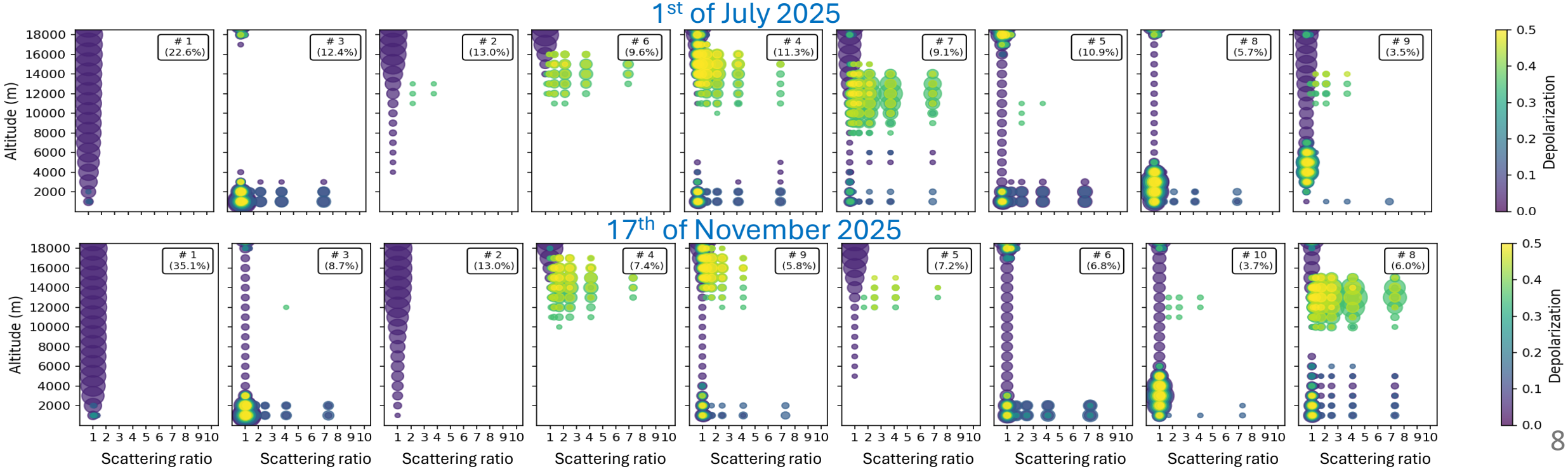
Results: clear-sky ocean surface backscatter



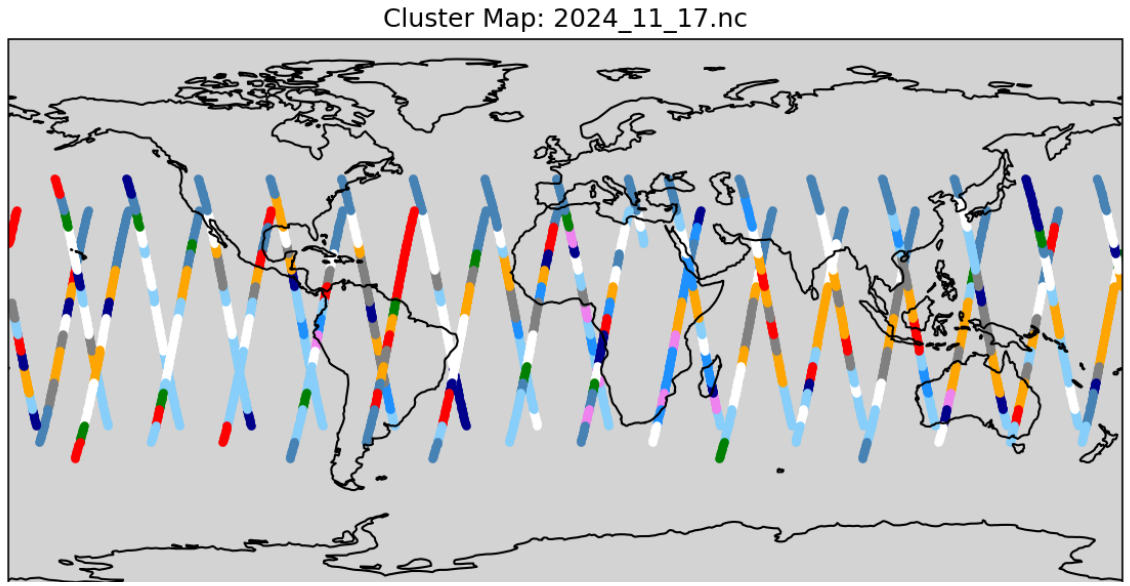
L2 flow analysis: using the whole atmosphere as a reference

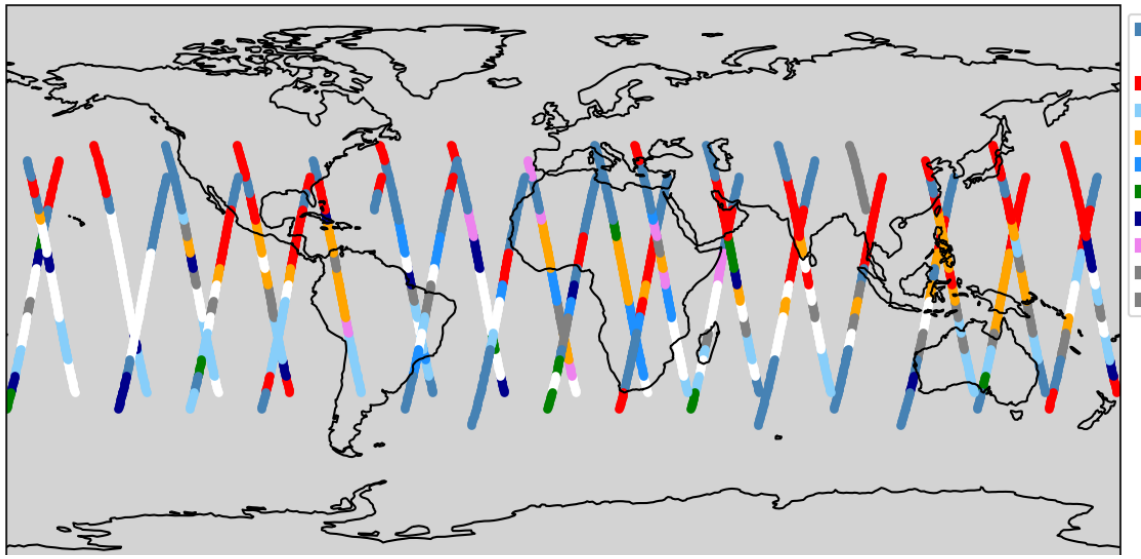
Cluster analysis

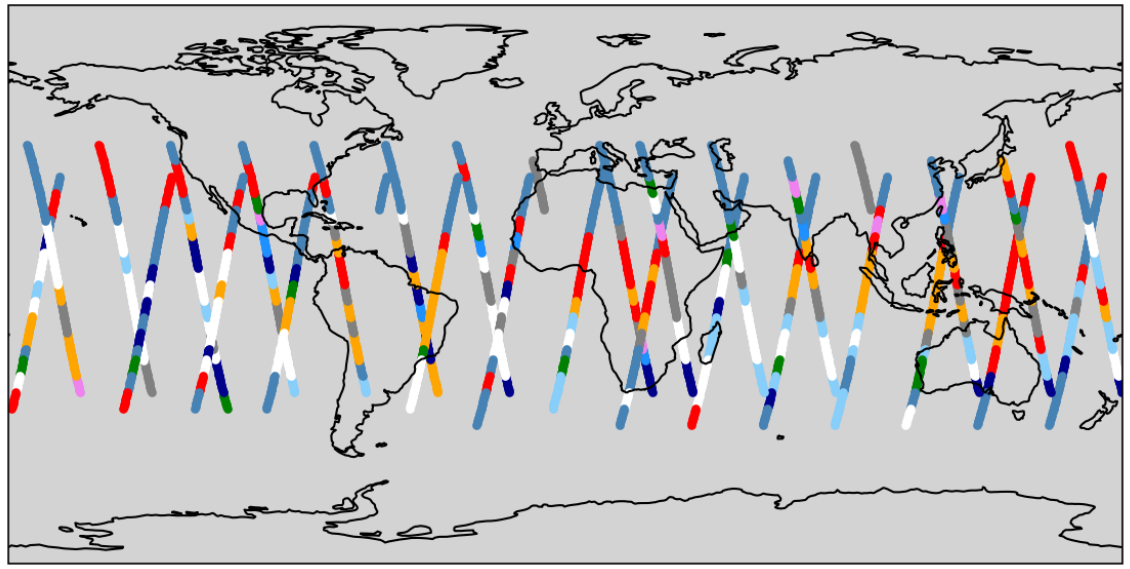
- Daily orbits are split to ~500km chunks
- For each chunk (|lat|<40°), a 3D histogram is built : altitude/SR/depolarization
- 800 histograms per day are regrouped in 10 groups using clustering algorithm (minimal difference within group, maximal difference between groups)
- Clusters in alt/SR/depol space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

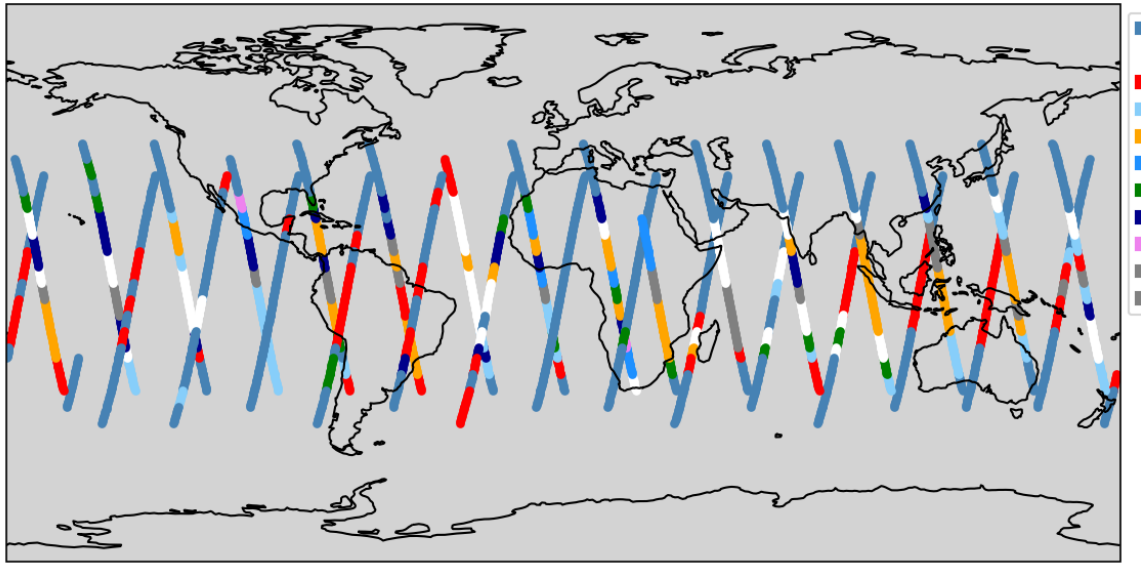


L2 flow analysis: geographical distribution of cluster types

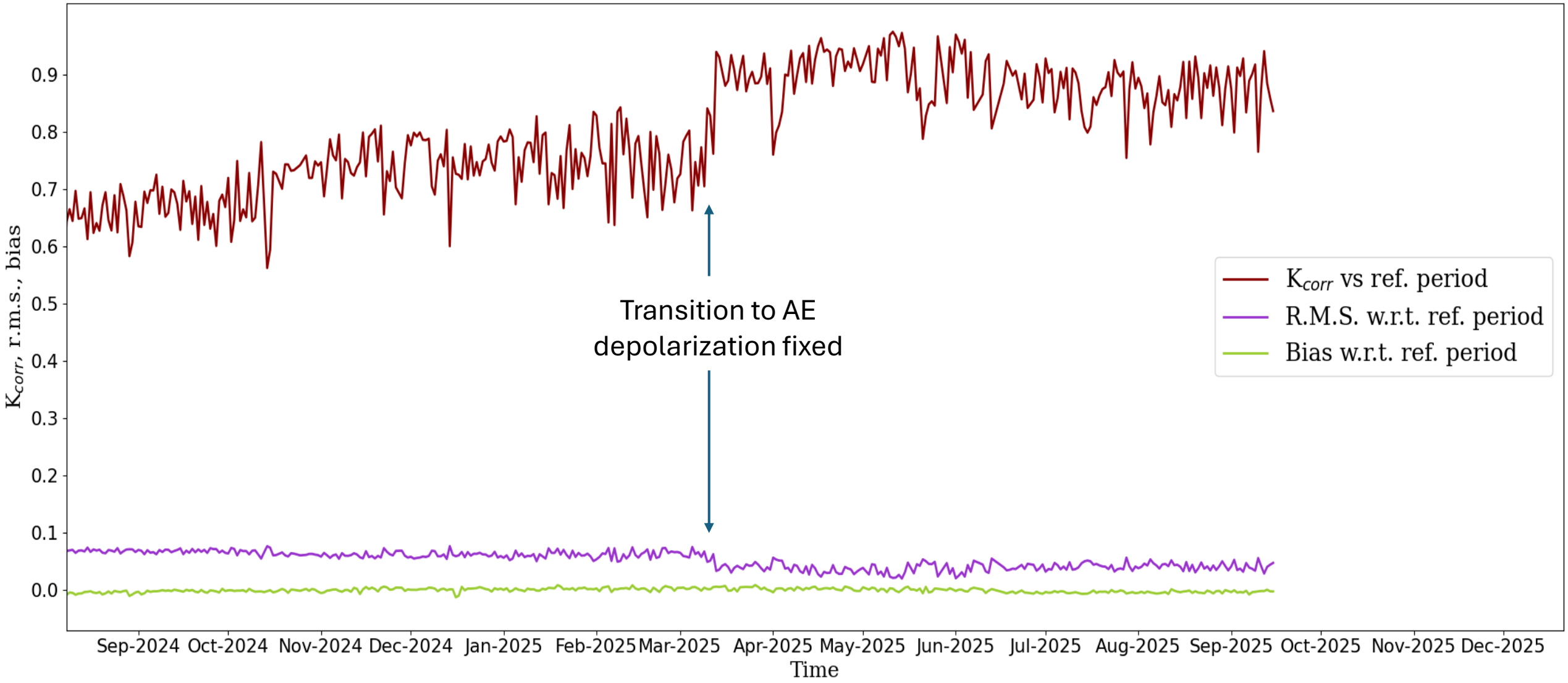




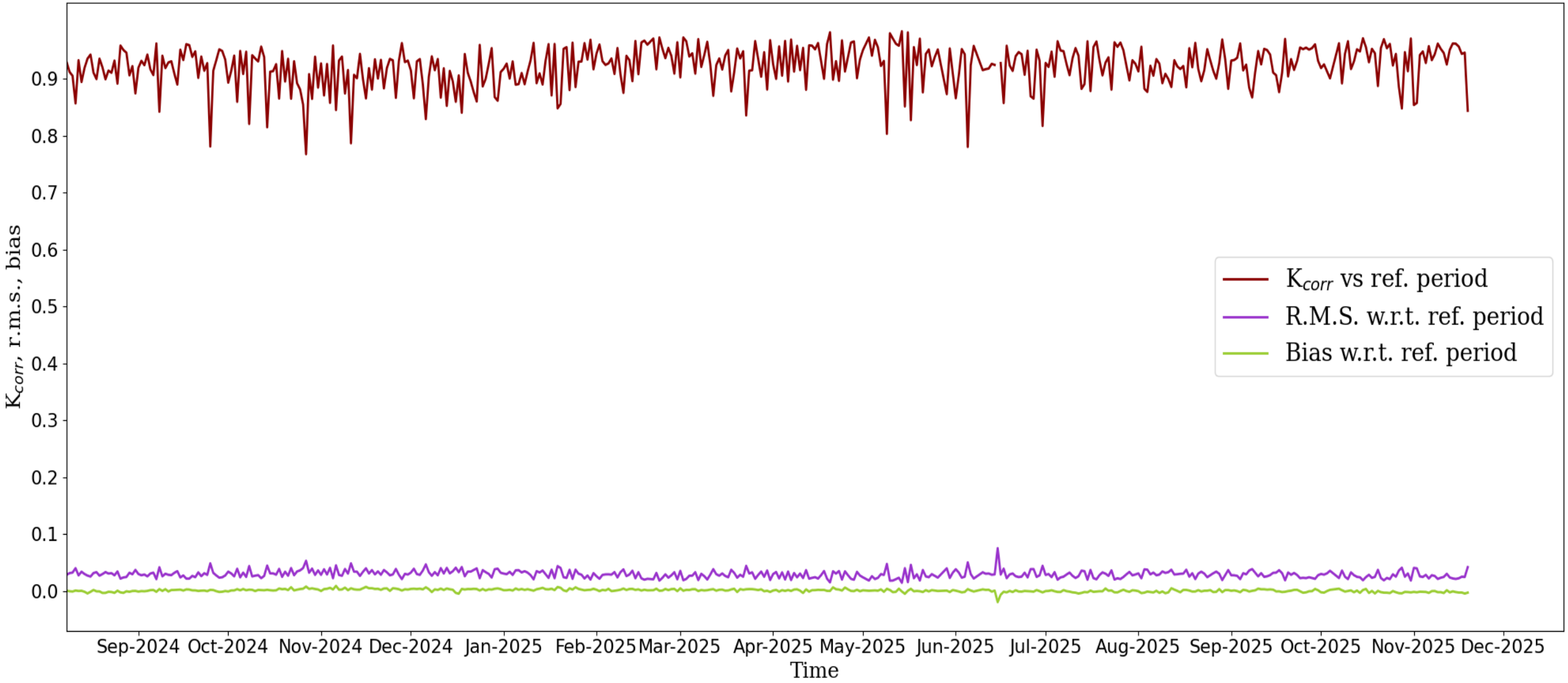




L2 flow analysis: BEFORE BA
correlation coefficient, bias, and rms for clusters



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



Take home messages

- Baseline BA is more stable than a combination of baselines both in L1 and L2, all issues reported before are now fixed ☑

Indicator's behavior	Expected ?
• Mean stratospheric signals are stable across daytime and nighttime	☑
• 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	☑
• Ocean surface indicators demonstrate stronger than usual variability from 10/25	?
• L2 analysis with clusters shows stable behavior for the whole period of ATLID	☑