Supplement of
Mitigating impacts of low energy laser pulses on CALIOP data products

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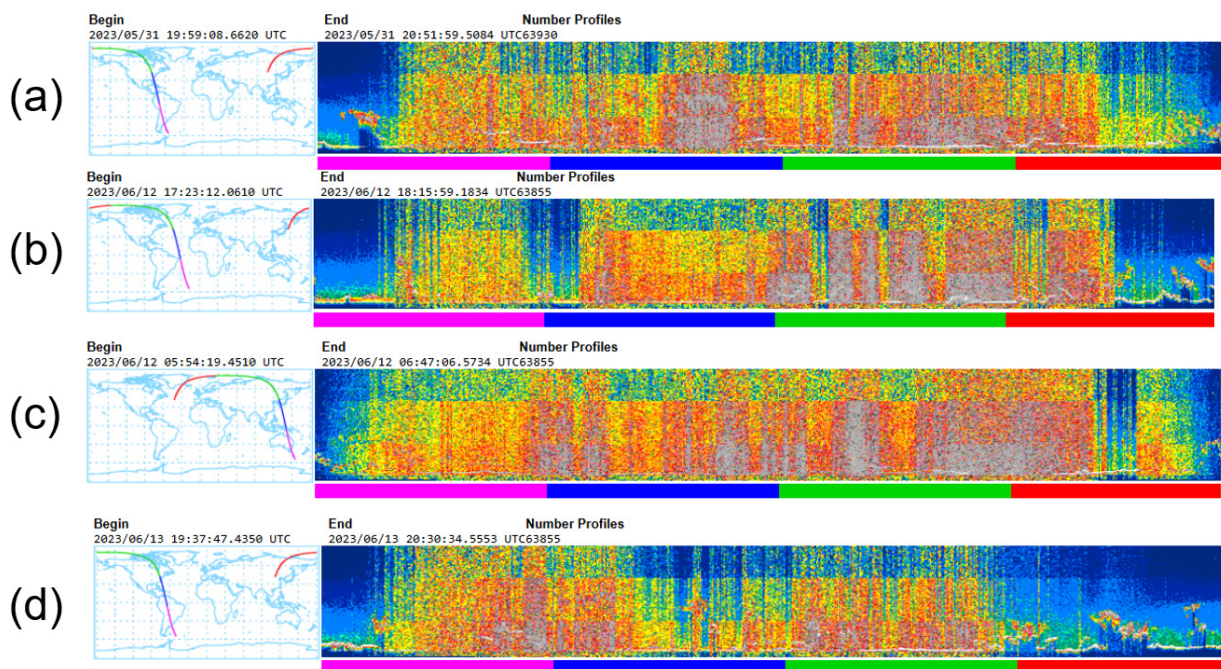
Figure S1. Examples of half-orbits experiencing low energy shots for nearly their entire duration in early 2023. Orbit ground-tracks are shown on the maps. The right-hand images show 532 nm total attenuated backscatter with altitude on the vertical axis and along-track distance on the horizontal axis. Granules: (a) CAL_LID_L1-Standard-V4-51.2023-05-31T19-59-14ZD.hdf, (b) CAL_LID_L1-Standard-V4-51.2023-06-12T17-23-15ZD.hdf, (c) CAL_LID_L1-Standard-V4-51.2023-06-12T05-54-23ZD.hdf, (d) CAL_LID_L1-Standard-V4-51.2023-06-13T19-37-48ZD.hdf.

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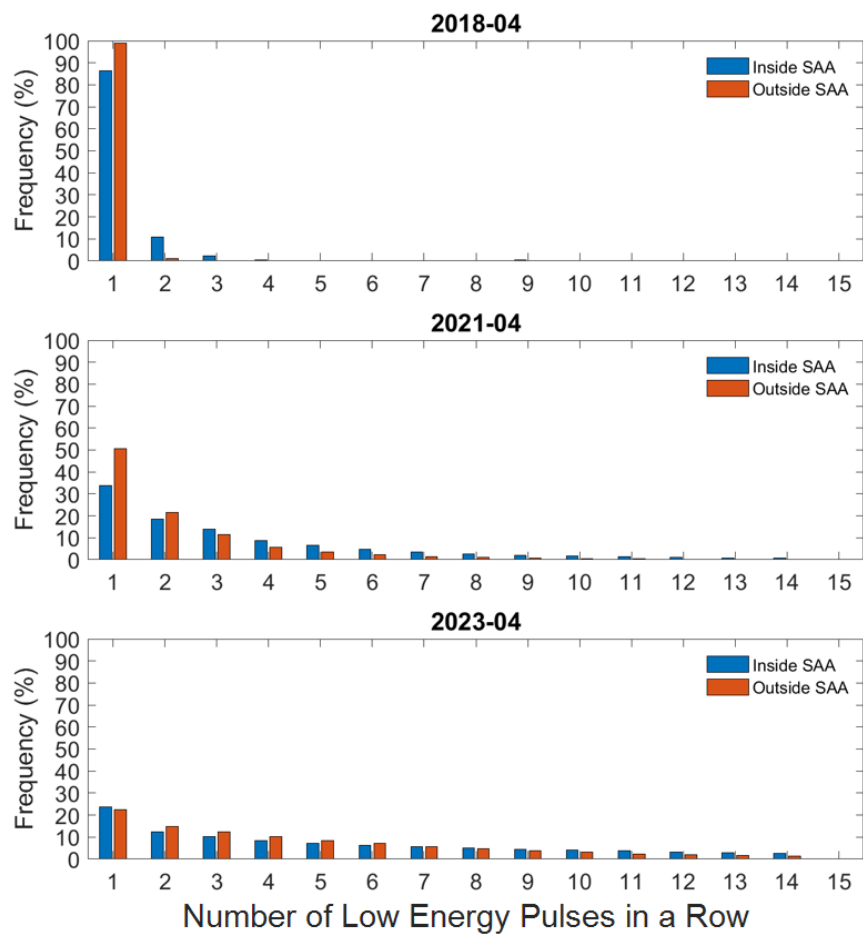
Figure S2. Frequency of number of low energy laser pulses (532 nm energy < 10 mJ) in a row inside the SAA and outside the SAA for April 2018, April 2021, and April 2023.

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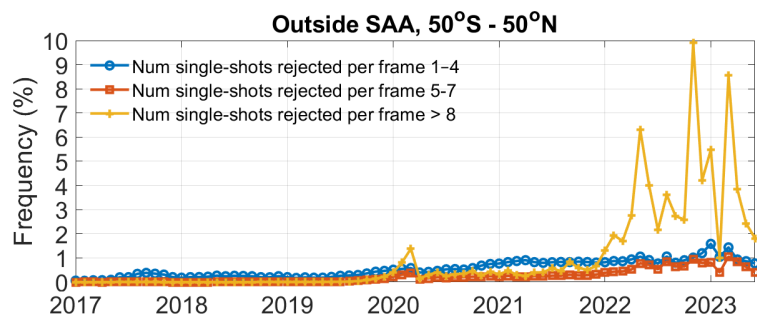
Figure S3. Frequency of frames having 1–4 single-shot profiles rejected by LEM (blue), 5–7 single-shot profiles rejected by LEM (red) and > 8 single-shot profiles rejected by LEM outside the SAA, 50°S–50°N for January 2017 through October 2022.

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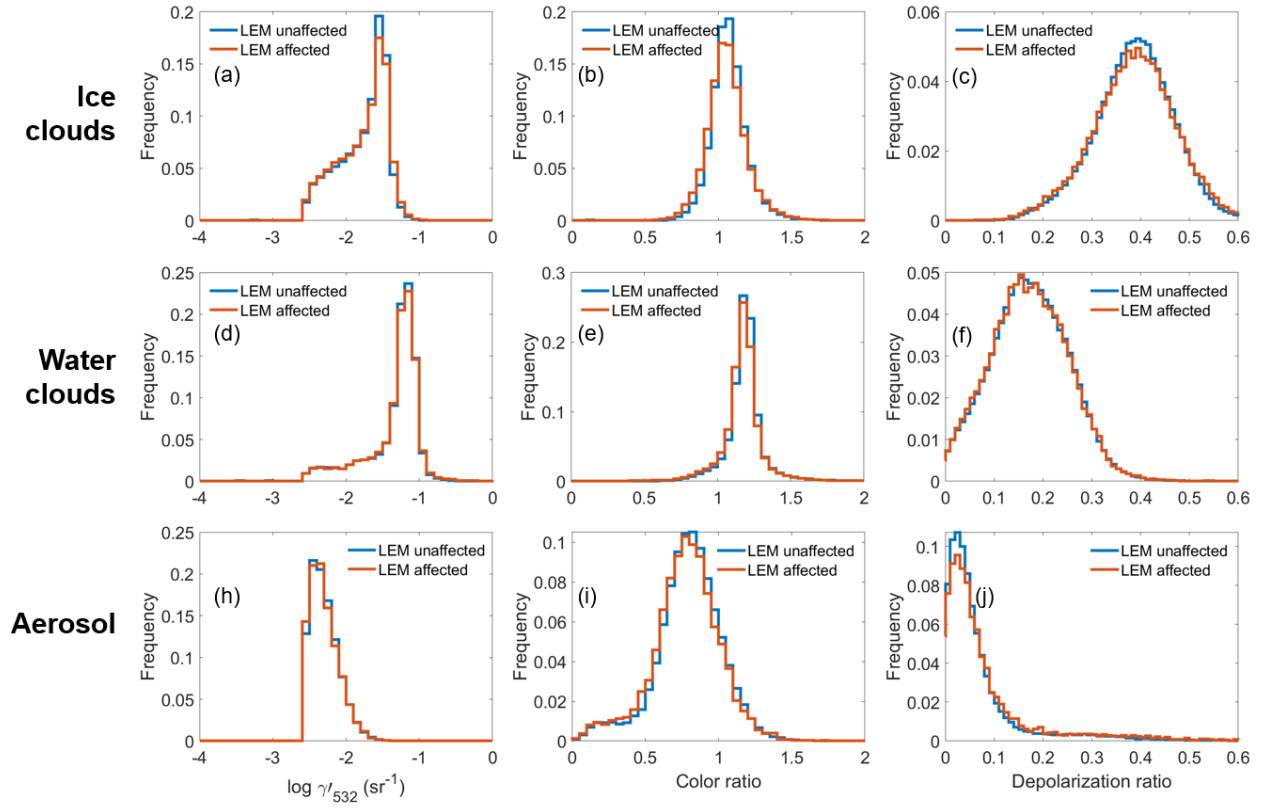
Figure S4. Frequency distributions of layer-integrated 532 nm attenuated backscatter (γ'_{532}), attenuated backscatter color ratio (χ'), and volume depolarization ratio (δ_v) for ice clouds (a-c), water clouds (d-f), and aerosol layers (h-j) detected at 5 km horizontal resolution between 50°S-50°N, excluding the SAA, during 2021 daytime. LEM-affected layers are identified by LEM feature QC flag = 1.

		Median ± MAD	Relative difference in median	Relative difference in MAD	Median ± MAD of all relative differences
Ice clouds	γ'_{532} Unaffected	0.019 ± 0.010	−3.22 %	6.71 %	−0.65 ± 49.0 %
	Affected	0.019 ± 0.010			
	χ' Unaffected	1.038 ± 0.093	−1.16 %	12.4 %	−1.22 ± 10.1 %
	Affected	1.026 ± 0.105			
	δ_v Unaffected	0.385 ± 0.065	0.06 %	9.87 %	−0.004 ± 15.9 %
	Affected	0.385 ± 0.071			
Water clouds	γ'_{532} Unaffected	0.053 ± 0.027	−0.31 %	65.1 %	0.06 ± 131 %
	Affected	0.053 ± 0.045			
	χ' Unaffected	1.164 ± 0.116	−1.08 %	7.56 %	−0.99 ± 10.3 %
	Affected	1.152 ± 0.125			
	δ_v Unaffected	0.166 ± 0.066	−0.61 %	0.43 %	−0.58 ± 35.7 %
	Affected	0.165 ± 0.066			
Aerosol	γ'_{532} Unaffected	0.004 ± 0.002	−1.61 %	−0.27 %	−1.49 ± 35.0 %
	Affected	0.004 ± 0.002			
	χ' Unaffected	0.781 ± 0.171	−2.65 %	4.13 %	−2.38 ± 24.0 %
	Affected	0.761 ± 0.178			
	δ_v Unaffected	0.032 ± 0.055	14.2 %	23.5 %	6.84 ± 464 %
	Affected	0.036 ± 0.068			

Table S1. Median and median absolute deviation (MAD) of layer-integrated 532 nm attenuated backscatter (γ'_{532}), attenuated backscatter color ratio (χ'), and volume depolarization ratio (δ_v) for ice clouds water cloud, and aerosol layers detected at 5 km horizontal resolution between 50°S–50°N, excluding the SAA, during 2021 for daytime. LEM-affected layers are identified by LEM feature QC flag = 1. The final two columns give the median ± MAD of all the pairs of affected and unaffected layers.