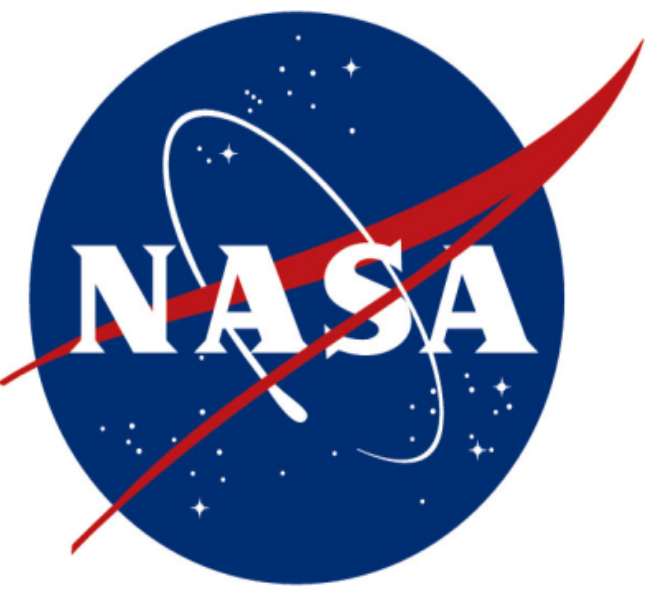
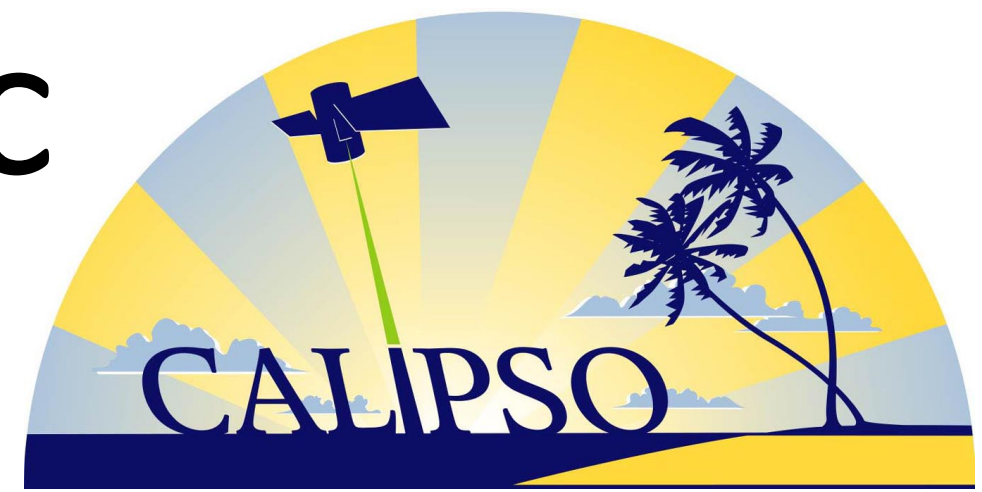




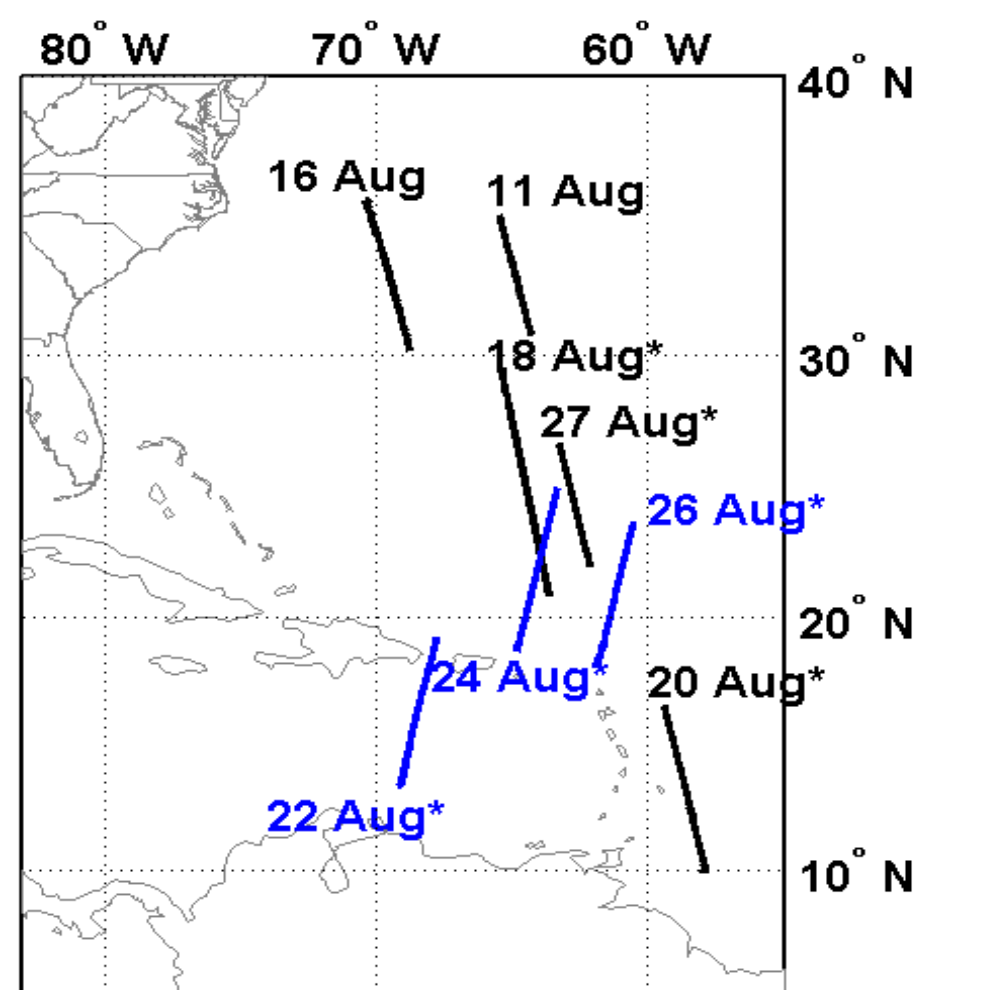
Lidar ratios of transported Saharan dust across the Atlantic Ocean from HSRL and CALIOP at 532 nm and 1064 nm.



Raymond R. Rogers, Damien Josset, Mark A. Vaughan, Chris A. Hostetler, Z. Liu, Ali Omar, Michael D. Obland, Johnathan W. Hair, Richard A. Ferrare, David B. Harper, Anthony L. Cook

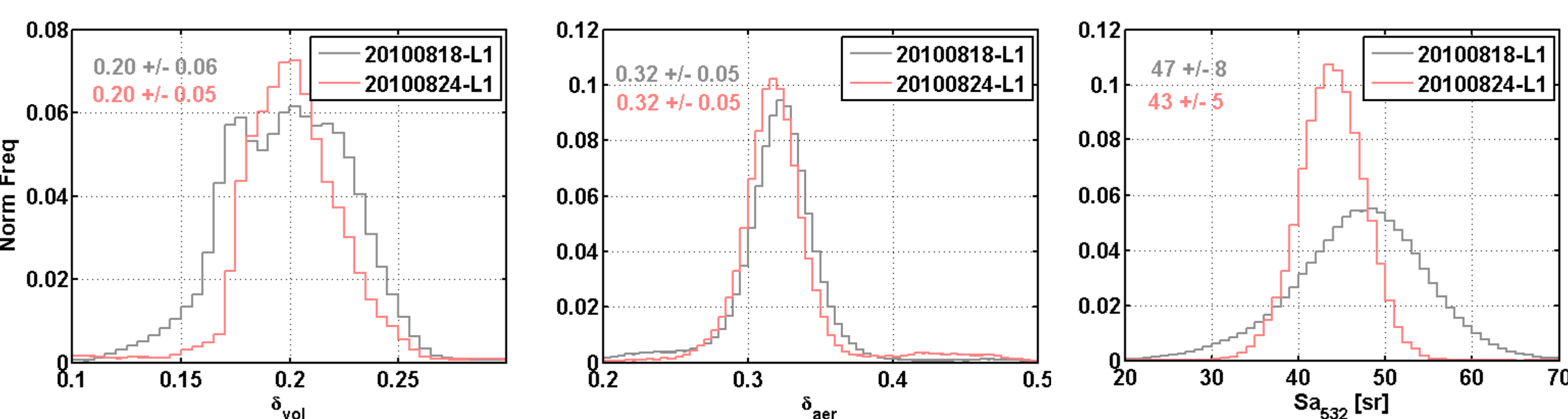
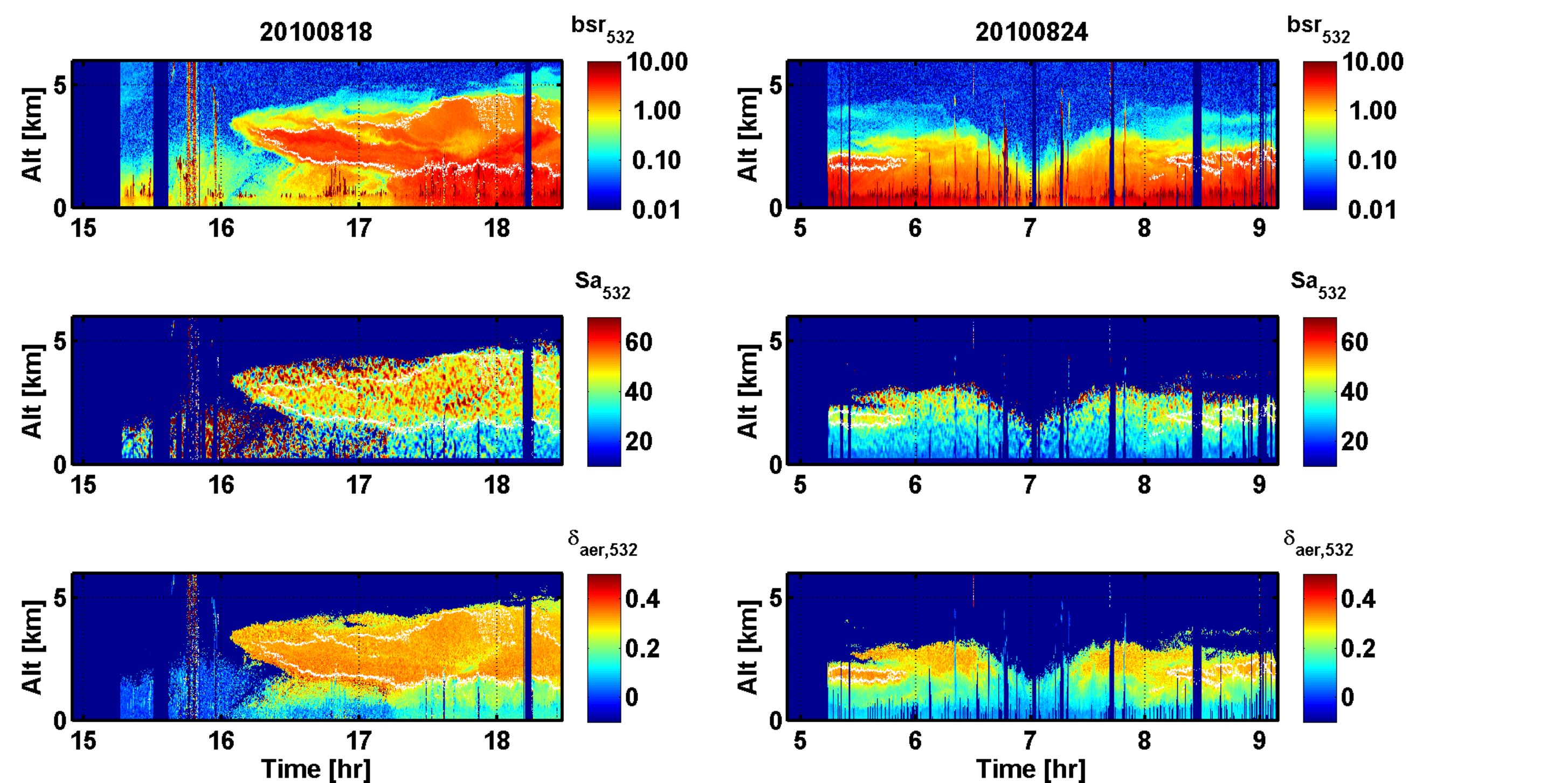
Introduction:

The NASA Langley airborne High Spectral Resolution Lidar (HSRL) was deployed on ten coincident underflights of the CALIPSO satellite (right) from 11 Aug 2010 to 27 Aug 2010 to obtain measurements of dust and marine aerosol over the ocean. We report the HSRL and CALIOP depolarization and lidar ratio for these layers. Also, we apply a two-color algorithm (Vaughan, 2004) to both HSRL and CALIOP attenuated backscatter to retrieve lidar ratio at 1064 nm and compare the results with an ocean surface technique.



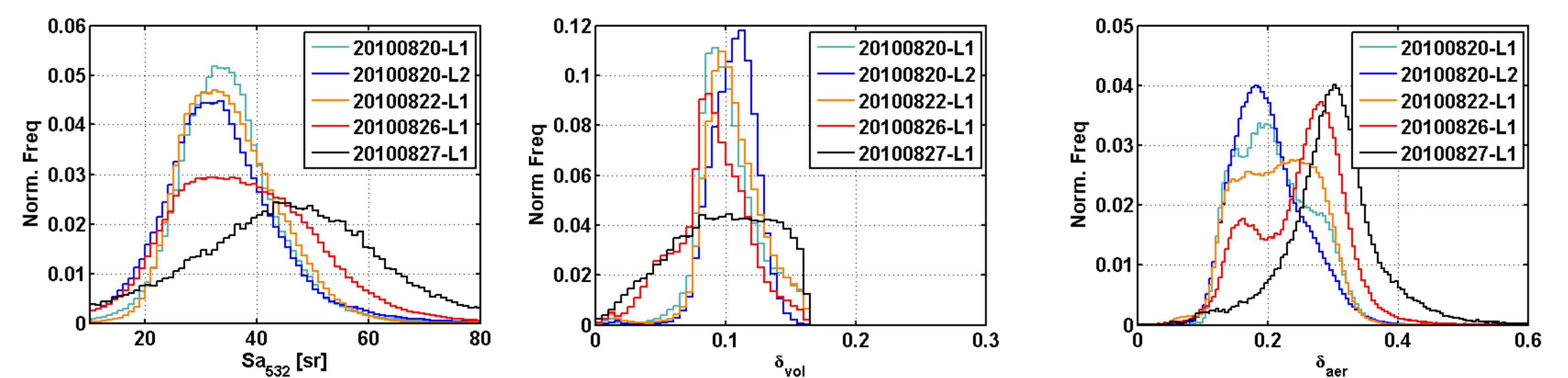
High Depolarization Cases ($\delta_{vol} > 0.17$):

August 18 and 24 showed lofted dust layers with high depolarization:



- Lidar ratio and aerosol depolarization consistent with literature values for dust.

Weak Depolarization Cases ($0.075 < \delta_{vol} < 0.17$):



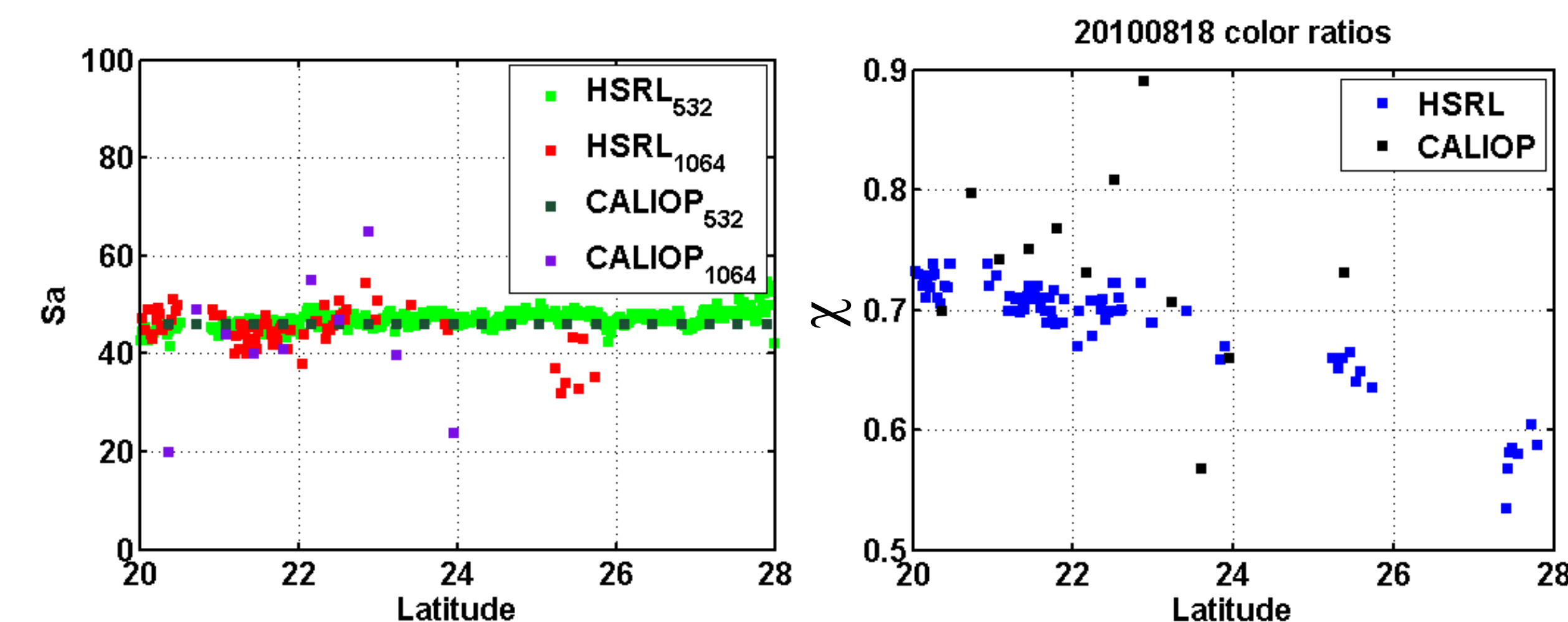
- Implies that dust+marine can be misclassified by CALIOP as polluted dust.

1064 nm lidar ratio retrieval : 18 Aug 2010

Here we apply a two-color algorithm (Vaughan, 2004) to both HSRL and CALIOP attenuated backscatter to retrieve lidar ratio at 1064 nm and the backscatter color ratio, χ by minimizing the function, F:

$$F(\chi, S_{a,1064}) = \frac{1}{2} \cdot \sum_{k=layer_top}^{layer_base} [(\beta_{m,1064}(r_k) + \chi \cdot \beta_{a,532}(r_k)) \cdot \exp(-2 \cdot \chi \cdot S_{a,1064} \cdot \gamma_{a,532}(r_k)) - B_{1064}(r_k)]^2$$

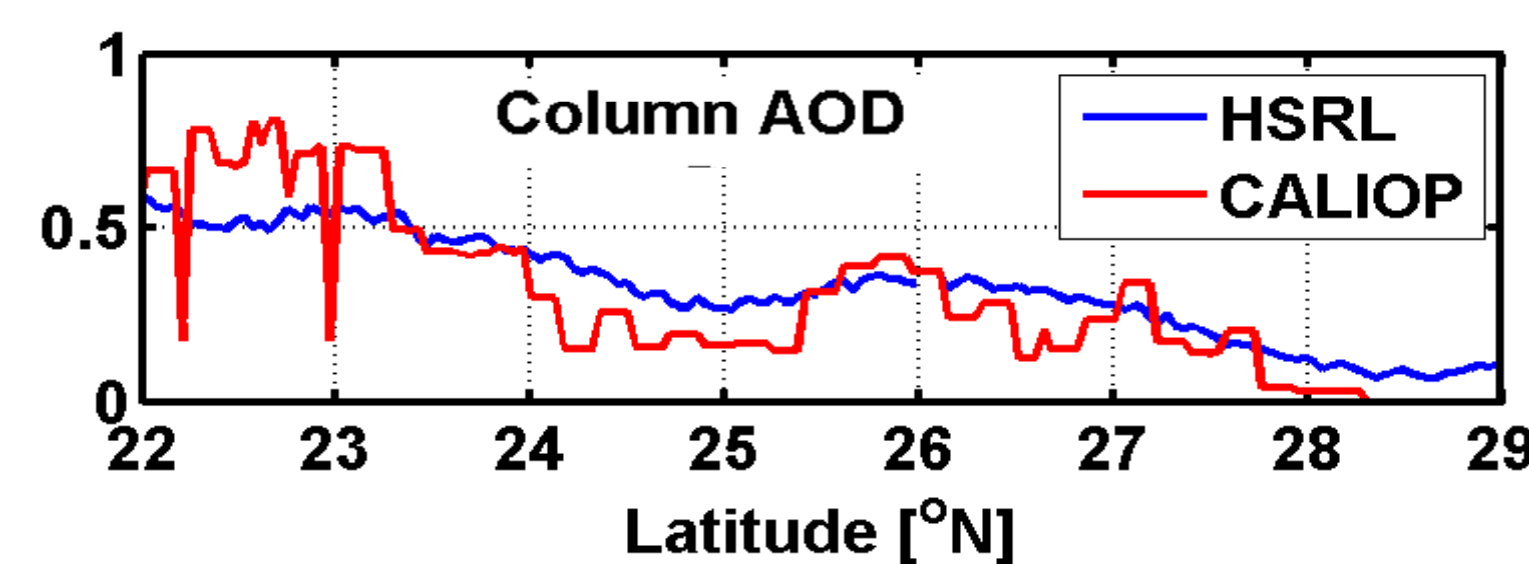
- *Requires Sa and χ homogeneous



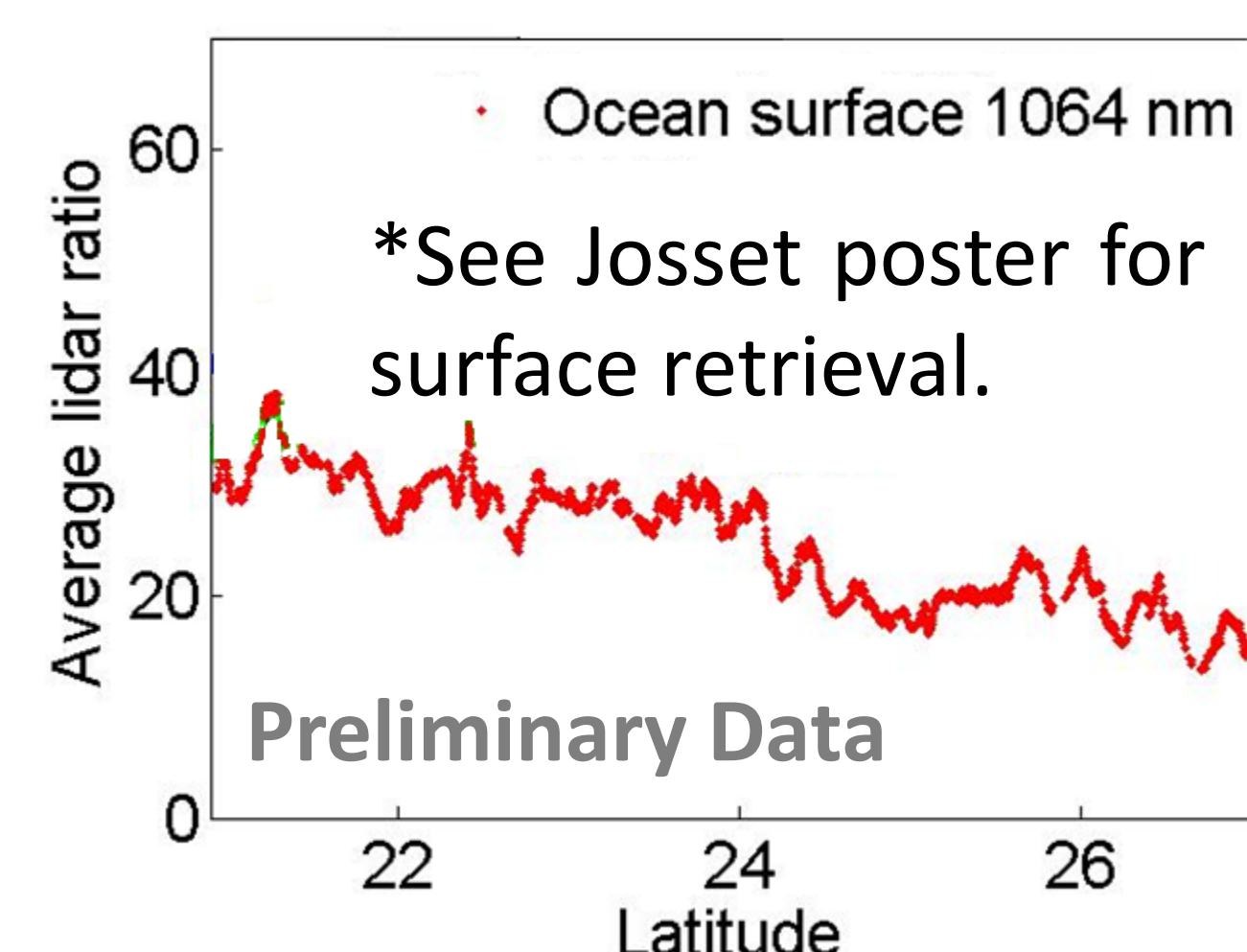
Implications of 532 nm lidar ratio in CALIOP L2 products:

CALIOP's dust lidar ratio yields consistent backscatter and extinction profiles with HSRL within the dust plume for the 18 Aug 2010 case:

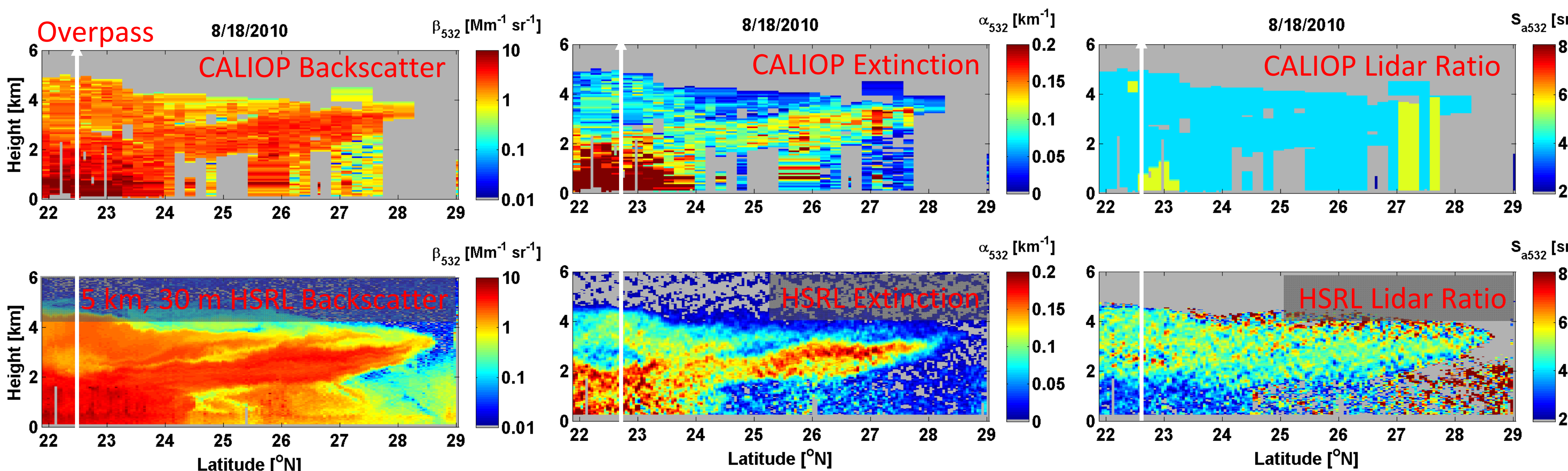
- Some overestimation of extinction occurs in the marine layer below the dust due to misclassification (i.e. lidar ratio).



HSRL $Sa_{1064} = 38 \pm 23$ sr
CALIOP $Sa_{1064} = 39 \pm 22$ sr
HSRL $\chi = 0.69 \pm 0.04$
CALIOP $\chi = 0.74 \pm 0.08$



- HSRL and CALIOP retrieve similar results.
- Lidar ratios are slightly lower than expected from literature, but slightly larger than the column lidar ratio from Josset*.
- Color ratios are in agreement with literature.



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