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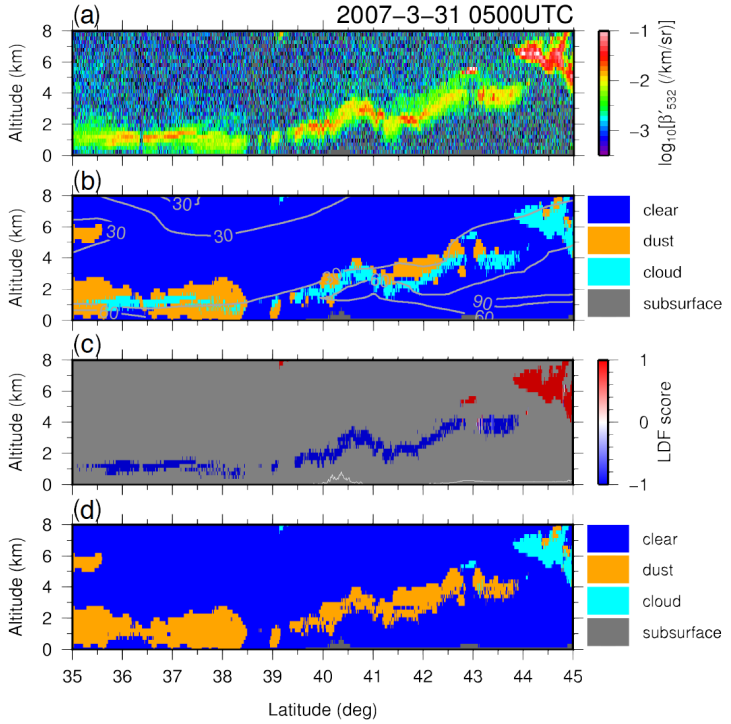

Figure 1. An example of dust misclassification as clouds in the CALIOP cloud mask and the refinement with the discriminant analysis. Latitude-altitude cross sections of (a) the attenuated backscattering coefficients at 532 nm, (b) the data mask based on the C2 cloud mask, (c) the linear discriminant function (LDF) scores for the detected clouds, and (d) the modified data mask after the cloud screening.

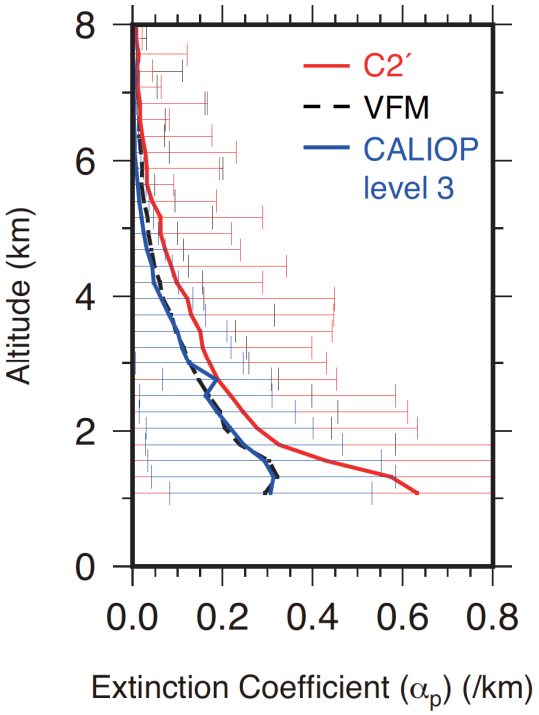

Figure 2. Profiles of the dust extinction coefficient for the C2' cloud mask, VFM cloud mask, and CALIOP level 3 products. Error bars denote the standard deviation.

- Misclassification of dust as clouds in the CALIOP cloud mask (C2) is improved. Strong signals from dust storms lead to misclassify dust into clouds (Fig. 1(a) and 1(b)). Using a linear discriminant function (LDF), misclassified clouds are successfully discriminated (Fig. 1(c)) and resulting data mask correctly classifies the misclassified clouds into dust (Fig. 1(d)).
- The cloud mask is most frequently misclassified in the Taklimakan Desert. The proportion of misclassified clouds to the totally observed dust (dust + misclassified clouds) is ~34.6%.
- Dust extinction profiles are investigated after the cloud mask improvement. Comparison of our results with CALIOP level 3 products indicates that the extinction profile using the improved cloud mask (C2') is up to twice larger than that of CALIOP level 3 products (Fig. 2) in the Taklimakan Desert.