Surface polarized reflectance analysis using space lidar

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Knowledge of the ground surface reflectance for intensity and polarization simplifies remote sensing of atmospheric aerosol. Research conducted for the POLDER mission from the 1990s to early 2000s indicated that the surface polarized reflectance is spectrally invariant and obeys the well-known Fresnel formulae. However, accuracy of the state-of-the-art Earth remote sensing polarimeters has increased. New data has shown discrepancies between recent polarimetric measurements and previous studies and models. In particular, literature reports the use of shadowing factor [1], bulk scattering in addition to specular reflection [2], and spectral dependence for polarized reflectance [3]. Most importantly, the Hot Spot was detected for polarization [4], but it is not included in the Fresnel-based models [5].

We will report results of the surface polarized reflectance observation using data from Cloud-Aerosol Transport System (CATS) [6]. CATS is a polarization sensitive lidar operated onboard the International Space Station in 2015–2017. The observation geometry is limited to backscattering only. However, the CATS polarization sensitivity at 532 and 1064 nm, strong polarization of the outgoing laser light, and nighttime measurements, yield higher signal-to-noise ratio versus the existing analysis of reflected, initially unpolarized, solar light.

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References

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