

Improvements in CALIOP Smoke Optical Depth over Clouds

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Smoke over marine stratocumulus is ubiquitous off the south west coast of Africa during biomass burning season. The vertical profile measurements provided by the CALIOP lidar are successfully able to distinguish between smoke and underlying clouds. With over 14 years of observations, the CALIOP data set is a valuable asset for quantifying the radiative impact of smoke over clouds in this region. However past studies have shown that CALIOP overestimates the base altitudes of strongly attenuating smoke layers. This is because CALIOP layer detection operates on the 532 nm attenuated backscatter signal. Smoke strongly attenuates light at this wavelength, so CALIOP feature detection at times assigns a base altitude that is higher than the true layer base for optically thick layers. This can be confirmed by the 1064 nm attenuated backscatter signal, also measured by CALIOP.

In order to improve the AOD for smoke over clouds, a new algorithm has been implemented in for an upcoming CALIOP level 2 data release that will extend the base altitudes of smoke layers over clouds. Tunable restrictions are put in place to ensure that smoke bases are only extended within a reasonable smoke-to-cloud gap distance and only when there is strong reason to believe that smoke exists within the gap. This presentation will summarize the new smoke base extension algorithm and summarize its performance. We will demonstrate that base extension is primarily invoked off the south west coast of Africa as expected. We will also quantify the increase in smoke AOD that will be reported in the upcoming level 2 data release.