SENSITIVITY STUDY on the PERFORMANCE of the SINGLE CALCULUS CHAIN AEROSOL LAYERING MODULE

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In this study an assessment of the aerosol layering module (LTOOL) that is planned to be implemented in the Single Calculus Chain (SCC; D'Amico et al., 2015) will be performed. Currently, the LTOOL module (1.6.8) is applied to the EARLINET Lidar Data Analyzer (ELDA) optical products and has been integrated in the SCC development web interface. The algorithm layering analysis utilizes the wavelet covariance transform (WCT) for the layer boundary detection, in order to extract geometrical features i.e, the Planetary Boundary Layer height and the lofted aerosol layers (e.g. Siomos et al. 2018). Local extrema of the WCT profiles indicate points of monotonic increase/decrease in the applied backscatter/extinction profiles and as a result, at least one peak is included in the profiles within the layer boundaries. As the LTOOL module should automatically identify vertical regions of significant aerosol load where the aerosol composition is quite stable, the lidar signal from noisy structures should be discerned. Thus, a dilation parameter is applied in the WCT. However, the detection sensitivity of the inflection points decreases when choosing for layers far wider or sharper than the dilation value. Consequently, it is important to quantify the effect of this value in the retrieval of the layer boundaries under different aerosol conditions and check whether a fixed value is applicable or it will be let as a user defined option in the SCC database. Additionally, for multi-wavelength backscatter lidars, different layers may be identified when the WCT is applied to different wavelength, as the profile shape is also affected by the vertical distribution of the aerosol intensive properties. Comparing the geometrical retrievals produced using backscatter profiles of different wavelengths under the same aerosol conditions, is important to investigate the stability of the aerosol type. Moreover, the stability of the intensive properties within the layer boundaries is a metric that quantifies the algorithm's ability to detect aerosol layers with homogeneous composition. Finally, as the algorithm should reproduce layers with a sufficient degree of spatio-temporal homogeneity, selected diurnal case studies from the EARLINET stations will be analyzed in order to investigate the algorithms accuracy in identifying persistent layers.

References

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