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Analysis of SKYNET derived AOD during the FRC VI campaign in Davos, and validation of improved data processing and calibration algorithms

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The 6th Filter Radiometer Comparison campaign for Aerosol Optical Depth (AOD) measurements was held from 20th of September to 10th (extended to 17th) of October 2025 in Davos (Switzerland). This campaign was organised by the PMOD/WRC and supported by the World Meteorological Organisation. For AOD measurements, groups with sun-photometers and spectroradiometers participated, including reference instruments representing several major global networks (such as the Cimel-CE318T, belonging to AERONET; the Prede-POM 1 and 2, which are the instruments used by SKYRAD; and the Precision Filter Radiometers, PFRs, that belong to the GAWPFR network). The main objective of the campaign was the harmonisation and traceability of ground-based aerosol optical depth measurements to the WMO AOD reference scale, as maintained by the PMOD/WRC reference Precision Filter Radiometers (PFRs). Furthermore, the fact that these data are collected at the same time and place allows the discrepancies in the measurements to be attributed to the instrumentation, processing algorithms or calibration processes, providing an opportunity to understand the limitations of existing methods and suggest possible improvements. In this study, the AOD from Prede-POMs was compared to the obtained based on the Cimel-CE318T and PFR measurements. Some discrepancies were found in the 340 nm and 1020 nm channels. Prede-POM's overestimation of AOD at 1020 nm could be related to temperature effects or calibration issues (i.e. the performance of the Improved Langley Plot method in Davos, filter degradation, etc.) and requires further investigation. Another task that was successfully carried out was the validation of the SUNRAD algorithm, which is adopted by the SKYNET network to obtain AOD, when applied to raw data from the Cimel-CE318T, showing mostly good agreement with the AOD provided by AERONET (MBD = -0.0005 and RMSD = 0.0014 for Cimel #953 and MBD = -0.0005 and RMSD = 0.0006 for Cimel #1144 for AOD at 675 nm). In addition,

several analyses of the SKYNET calibration method of Prede-POMs have been performed. In particular, two versions of the calibration processing algorithm, along with some variations, have been run: the standard Improved Langley Plot (ILP), and a new version recently developed. Then, the obtained calibration coefficients were used in the computation of AOD for the Prede-POMs, which was compared to the results from AERONET and GAWPFR. This analysis confirmed that the deterioration of a filter affects the determination of the Solid View Angle (SVA), and thus the computation of the calibration coefficients. In particular, it was found that the comparisons improved when the 340 nm channel from Valencia's Prede-POM was excluded during the computation of the calibration coefficients. However, the calculation of a new SVA using disk scan measurements collected during the campaign did not yield a significant improvement in the AOD comparison.