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One year of CNR-IMAA multi-wavelength Raman lidar measurements in coincidence with CALIPSO overpasses: Level 1 products comparison

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Abstract. At CNR-IMAA, an aerosol lidar system has operated since May 2000 in the framework of EARLINET (European Aerosol Research Lidar Network), the first lidar network for tropospheric aerosol study on a continental scale. High quality multi-wavelength measurements make this system a reference point for the validation of data products provided by CALIPSO (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations), the first satellite-borne lidar specifically designed for aerosol and cloud study. Since 14 June 2006, dedicated measurements have been performed at CNR-IMAA in coincidence with CALIPSO overpasses. For the first time, results on 1-year comparisons between ground-based multi-wavelength Raman lidar measurements and corresponding CALIPSO lidar Level 1 profiles are presented. A methodology for the comparison is presented and discussed in detail. Night-time cases are considered to take advantage from Raman capability of the ground based lidar. Cases with the detection of cirrus clouds in CALIPSO data are separately analysed for taking into account multiple scattering effects. For cirrus cloud cases, few cases are available to draw any conclusions. For clear sky conditions, the comparison shows good performances of the CALIPSO on-board lidar: the mean relative difference between the ground-based and CALIPSO Level 1 measurements is always within its standard deviation at all altitudes, with a mean difference in the 3–8 km altitude range of $(-2 \pm 12)\%$. At altitude ranges corresponding to the typical PBL height observed at CNR-IMAA, a mean difference of $(-24 \pm 20)\%$ is observed in CALIPSO data, probably due to the difference in the aerosol content at the location of PEARL and CALIPSO ground-track location. Finally, the mean differences are on average lower at all altitude ranges for the closest overpasses (at about 40 km) respect to the 80-km overpasses.

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