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Characterization of the time evolution of the PBL structure and dry-layers based on the us of Raman Lidar measurements collected during HYMEX-SOP1

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The exchange processes between the Earth and the atmosphere play a crucial role in the development of the Planetary Boundary Layer (PBL). Different remote sensing techniques can provide PBL measurement with different spatial and temporal resolutions. Vertical profiles of atmospheric thermodynamic variables, i.e. temperature and humidity, or wind speed, clouds and aerosols can be used as proxy to retrieve PBL height from active and passive remote sensing instruments. The University of BASILicata ground-based Raman Lidar system (BASIL) was deployed in the North-Western Mediterranean basin in the Cévennes-Vivarais site (Candillargues, Southern France, Lat: 43°37' N, Long: 4° 4' E, Elev: 1 m) and operated between 5 September and 5 November 2012, collecting more than 600 hours of measurements, distributed over 51 days and 19 intensive observation periods (IOPs). BASIL is capable to provide high-resolution and accurate measurements of atmospheric temperature and water vapour, both in daytime and night-time, based on the application of the rotational and vibrational Raman lidar techniques in the UV. This measurement capability makes BASIL a key instrument for the characterization of the water vapour concentration. BASIL makes use of a Nd:YAG laser source capable of emitting pulses at 355, 532 and 1064 nm, with a single pulse energy at 355nm of 500 mJ [1] .In the presented research effort, water vapour concentration was computed and used to determine the PBL height. [2]. A dynamic index included in the European Centre for Medium-range Weather Forecasts (ECMWF) ERA5 atmospheric reanalysis (CAPE, Friction velocity, etc.) is also considered and compared with BASIL resutls. ERA5 provides hourly data on regular latitude-longitude grids at 0.25° x 0.25° resolution at 37 pressure levels [3]. ERA5 is publicly available through the Copernicus Climate Data Store (CDS, https://cds.climate.copernicus.eu). In order to properly carry out the comparison, the nearest ERA5 grid point to the lidar site has been considered assuming the representativeness uncertainty due to the use of the nearest grid-point comparable with other methods (e.g. kriging, bilinear interpolation, etc.). More results from this measurement effort will be reported and discussed at the Conference.

Reference

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