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The Italian Automated Lidar-Ceilometer Network (ALICEnet): infrastructure, algorithms and applications

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ALICEnet is a network of Automated Lidar Ceilometers (ALCs) operating across Italy. The geographical distribution of the measuring stations, extending from the north to the south of the country, allows monitoring of aerosol vertical profiles over a wide range of environmental and atmospheric conditions, dominated, for example, by anthropogenic particle production, Saharan dust transport or volcanic ash advections. The network, coordinated by CNR-ISAC and involving different institutions, is also a contributor of E-PROFILE, a EUMETNET program for surface-based profile observations.

The ALICEnet infrastructure and data processing flow (including signal correction and automatic calibration procedures) are here described, together with the inversion and retrieval algorithms. These latter allow to retrieve the aerosol properties over the vertical profile, to identify different layers, and to assess the atmospheric boundary layer (ABL) characteristics, such as the ABL and mixing layer height. Based on this setup, both use of near-real time data (e.g., to monitor aerosol transport events) and long-term studies (e.g., evaluation of aerosol climatological, site-dependent characteristics) will be possible.

In the present contribution, we focus on two examples of application: a case of long-range transport of Saharan dust and smoke, occurred over Rome in July 2017 during the EMERGE campaign, and the analysis of the climatological features of the mesoscale circulation between the Po Valley and the Alps. For both cases the ALICEnet retrieval procedure is validated based on independent measurements from the ground. Benefits from coupling with other remote sensing instruments, satellite radiometers, and atmospheric dispersion models are discussed.