

Historically, the main purpose of ceilometers was to detect cloud-base height. In the past few years several manufacturers have come out with new automatic Lidars and ceilometers intended to provide more complete atmospheric profiling capabilities than the historical cloud-base ceilometers. Modern ceilometers are able to provide continuous accurate and reliable profiles of particle backscatter. Several key climate and meteorology relevant properties can be inferred from particle backscatter profiles (i.e. lidar measurements). These properties are: vertical distribution of aerosol layers; cloud base height; diurnal cycle of mixing layer height and structure; attenuated backscatter profile.

EG-CLIMET Highlights regarding automatic profiling Lidars/ceilometers:

- Aerosol monitoring: EG-CLIMET established that aerosol layers could be efficiently monitored by automatic profiling ceilometers. Such instruments can be key contributors to national surveillance of long-range aerosol transport (desert dust, biomass burning, volcanic ash).
- Mixing height monitoring: EG-CLIMET established that the ceilometer backscatter profiles can be efficiently used to track the diurnal evolution of the depth of the layer in which surface emitted constituents are mixed, provided that ancillary measurements of surface thermodynamic conditions are available.
- Networking: EG-CLIMET established that ceilometer measurements exist overall Europe (about 1000 ceilometers) but only a few countries actually collect and save their data (today only D and UK). In addition few countries retrieve the full backscatter profiles. However, over 10 European countries have expressed an interest in working together to improve networking, saving and exploiting ceilometer backscatter profiles.
- Instrument performance: EG-CLIMET established that the performances and measurement uncertainties of the new automatic Lidars and ceilometers must be clearly quantified to guide new users in their choices.
- Harmonization: Means of monitoring data quality and self calibrating the absolute Lidar/ceilometer sensitivity have been tested and compared by EG-CLIMET, based on various techniques (integrated cloud returns, sunphotometer optical depth, ?).
- Forward modeling: Initial work forward modeling the aerosol and cloud backscatter profile predicted from operational NWP models and comparing with observations are very encouraging suggesting that the observations can be used for evaluating model performance, and, more importantly, for data assimilation.