



## **The use of advanced automated weather stations in a high-resolution mesoscale meteorological network**

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The ARPA Lombardia's meteorological service manages an high-resolution mesoscale meteorological network of automated weather stations in Northern Italy. The mesonet includes a sub-network of seven ultrasonic-anemometer based stations integrated with global and net radiometer, ground heat flux plate, thermo-hygrometer and rain gauge, aimed at characterizing turbulent motion and assessing the surface energy balance. The stations are located both in densely populated areas and in mountain regions.

This work describes the issues related to the collection and post-processing of the huge amount of data provided by advanced stations; their peculiarities within the ARPA Lombardia's quality assurance system and finally some applications of the observed data are presented.

In the context of the meteorological service's applications it is important to separate operational activities from research-and-development. In operational activities data provided by the advanced stations must be processed and delivered on a real-time basis. The sonic anemometer raw data post-processing has been performed by the MeteoFlux eddy-covariance software installed on board of station computers and provides 10-minute averaged data of all standard wind-related data (vector and scalar speed, resultant and unit direction, standard deviation of wind speed and direction), and turbulent indicators, including friction velocity, sensible heat flux, Obukhov length. An extensive set of diagnostic data is also produced, including population counts, and non-stationarity indexes.

In the current research and development application it is worth mentioning the use of advanced station data to characterize station sites, and to implement new sonic anemometer data quality control procedures. These tools are being currently developed within the framework of SonicLib project (see [http://www.boundarylayer.eu/projects\\_soniclib.html](http://www.boundarylayer.eu/projects_soniclib.html)). Among forthcoming uses, feeding ultrasonic anemometer data to atmospheric pollutant dispersion models is currently being evaluated.

Advanced stations data are freely available and delivered upon request by the meteorological service.