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Forecasting the weather
- ensemble techniques
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High Resolution Continuous Atmospheric Monitoring using MicroRadarNet: an Application to the Identification and Nowcasting of Local Precipitation Events

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MicroRadarNet is a novel network of micro radars operating at X band. This networked approach is specifically designed for continuous, low-cost, low-power consumption, unattended meteorological monitoring. A vertical plane scanning strategy is operated aside with the conventional horizontal scanning mode to provide effective monitoring within orographically complex regions (like alpine narrow valleys). A sensible reduction of the overall operational costs is achieved, if compared to the traditional monitoring strategy based on long range radars. Moreover, integration of multiple short range maps prevents the spatial resolution loss at higher ranges. A simplified scanning program sensing a single (lowest possible) elevation yields high temporal resolution as well (a composite map is produced every minute).
Raw spatial and temporal datasets are processed on-board in real-time (even higher resolutions are available at this stage, and preliminary investigation of related potentialities is also presented). Raw processing features a consistent evaluation of the signals from the sensors and optimizes the data loads to be transmitted. Network servers perform the final post-elaboration steps on the data streams coming from each unit. Final network products are meteorological mappings of weather events, monitored with high spatial and temporal resolution, and lastly served to the end user through any Web browser.
Since 2006, a MicroRadarNet unit is operationally installed and provides continuous monitoring within an area ranging thirty kilometers around Turin, in the Piedmont region of Western Alps. A final product built upon 120 beams, each sampled every 120 meters, is stored into a SQL database every minute.
Adoption of the TITAN storm identification and nowcasting engine is also here discussed for in-loop integration within the MicroRadarNet data processing chain. A brief description of the engine workflow is provided, to present preliminary feasibility results and performance estimates. Outcomes were not so predictable, since relevant operational differences hold between a Western Alps micro radar scenario and the long range radar context in the Denver region of Colorado. Positive results from a set of case studies are presented, motivating further refinements and integration activities. Comparisons with available rain gauges data in the area as well with third party radar datasets are presented, to highlight the potentialities of this integrated, inexpensive approach to meteorological monitoring.