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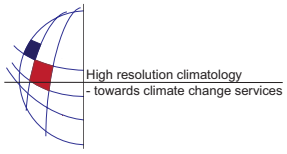

MicroRadarNet: a Network of Integrated High-Resolution Weather Micro Radars to Service Tracking and Forecasting of Local Precipitation Patterns

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MicroRadarNet (MRN) is a network of high-resolution, low-cost, low-power consumption micro radars for continuous, unattended meteorological monitoring. The MRN project started in the framework of the European INTERREG IIIB Alpine Space Programme (within the FORALPS project) since 2004 and was developed and operated by the Remote Sensing Group at the Politecnico di Torino from its early design stages. MRN is currently under its release and operational validation phase, cooperating with professional weather operators (e.g. civil protection offices) to run extensive on-field tests.

The key aspects of MRN are a short range strategy (about thirty kilometers) and the implementation of an effective sensor network approach. Raw spatial and temporal data is processed on-board in real-time, yielding a consistent evaluation of the information from the sensor and compressing the data to be transmitted. Network servers receive and merge the data sets coming from each unit yielding a synthetic, high-resolution plot of meteorological events (updated every minute). This networked approach implies in turn a sensible reduction of the overall operational costs, including management and maintenance aspects, if compared to the traditional long range C-band approach.

An ever-growing database of meteorological events is being collected, thus providing a real-data test bench to refine assessment and data enhancement algorithms. Assessment techniques have been adopted for the estimation of precipitation, based on systematic rain gauges comparisons. Efforts were also devoted to the design and implementation of specific decluttering algorithms. New techniques to mitigate the effect of co-channel interference sources are also under testing. It is shown how these enhancement algorithms further improve the assessment process raising the overall data quality. Furthermore, new data analysis modules for the identification of precipitation patterns are being evaluating, including tracking routines for the short term prediction of meteorological cells motion and morphing. We strongly expect that these enhancements will be of some interest to the final users, contributing to the relevance of the provided weather information. Finally, particular attention has been devoted to set up efficient data availability and presentation mechanisms in other to ease weather services access for a broad range of purposes. Up-to-date Web techniques have been implemented accordingly.

A consistent amount of case studies clearly shows that MicroRadarNet has enough potentialities to act as a fast-reacting weather monitoring tool. The proposed strategy, based on a network of short range radars, shall effectively collect high-resolution quality datasets while lowering the overall operational costs. This could prevent, by design, the volumetric resolution loss at higher ranges, as well as the need for atmospheric corrections and the shielding shortcomings which typically occur in orographically complex areas.