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Coupling X-band dual-polarized mini-radar and hydro-meteorological forecast models: the HydroRad project

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HydroRad is the name of the project positively evaluated by European Commission under Seventh Framework Programme (FP7) and currently started. The main aim of the project is to develop an innovative dual-polarization X-band mini-radar system and software-based business support tools for the use of weather, climate information in industrial sectors and government emergency management agencies. HydroRad project have seven partners located in Italy, Greece, Cyprus and Moldova.
It is worth mentioning that high-frequency - low-power polarization-diversity mini-radars can constitute a low-cost solution to the problem of hydrologic forecasting for urban and small-scale flood-prone basins and coastal areas and probably the only economically feasible solution for developing countries to provide nationwide weather radar coverage.
Since, they are low power systems, they have range limitations, another major limitation is that measurements at X-band undergo sever copolar and differential attenuation that can cause significant reduction of the horizontal reflectivity and differential reflectivity signal, which must be corrected because it introduces errors in the rainfall estimation.
The capability to invert the polarimetric radar measurements into useful hydro-meteorological products is crucial for the exploitation of the new mini-radar system.
Specific project objectives include:
1. X-band polarimetric mini-radar system design, production and deployment optimizing characteristics in terms of the best trade-off between costs and performances for hydro-meteorological applications;
2. X-band radar algorithm development and system interface to implement, improve and validate X-band mini-radar network measurements. These algorithms are focused on path-attenuation correction, hydrometeor classification, vertical profile correction, nowcasting and rain-rate estimation
3. to set up an integrated tool for short-to-medium-range forecasting using coupled hydro-meteorological models and miniradar data assimilation schemes
4. test the overall system in the Moldova Operational Field (MOF) campaign where three miniradar system data and hydro-meteorological tool will be tested and comparing against a state-of-the-art radar (X-POL) and against in situ weather stations (raingauges, disdrometer and streamflow) measurements. The MOF campaign will last a minimum of one month and maximum up to two months during the wet season in Moldova territory.
5. Hydro-meteorological application and validation where the performance of the overall system during MOF campaign will be carried out through systematic analysis and validation of radar-network products.
Objectives and preliminary results of the HydroRad projects will be presented during the conference, focusing on both algorithmic, applicative and technological issues.