



A Decision Support System based on GEOframe-NewAge in a data scarce environment

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In this work, we present a Decision Support System (DSS) developed for the Civil Protection of the Basilicata region, Italy, for the monitoring and prediction, in near real-time, of hydrological extremes. The Basilicata region was discretized in around 160 Hydrologic Response Units (HRU), whose area varies from few to hundreds square kilometres, according to the criticality of the territory. For each of the monitoring point, the system is able to assess eventual criticality due to rainfall and hydraulic threshold exceedance and provide 36-hours hydraulic/hydrological forecasts. The DSS is based on a WebGIS that is used to run and visualize results obtained by hydrological simulations. The WebGIS automatically downloads in real-time the measurements from 69 meteorological stations of the regional network and the 72-hours forecasts of precipitation (Cosmo LAMI), in GRIBed Binary form (GRIB). Then, it computes the cumulated precipitation over a fixed time interval and verifies the eventual criticality. Moreover, it allows to manage and visualize thematic maps to determine the potential vulnerability and the exposed elements on the territory.

Hydrological simulations are carried out by the open source semi-distributed hydrological model GEOframe-NewAge that interacts with the data elaborated by the WebGIS, spatializes the temperatures using Kriging techniques, extracts precipitations from the GRIB files and the Leaf Area Index (LAI) from the MODIS satellite maps. Then the model performs the radiation budget, estimates snow melting, evapotranspiration, soil water content, and runoff production for each of the monitoring point. Several challenges were faced during the development of the DSS such as data scarcity, a complex dams system, identifiability problems due model complexity with limited data, which were solved using innovative approaches and techniques. The experience is worthy to be shared in order to support application in other context characterized by similar conditions.