

Flood nowcasting procedure for small and very small basins

Federica Martina (2), Francesco Silvestro (1,2), Francesca Giannoni (2), and Maria Laura Poletti (1)

(1) CIMA Research Foundation, Savona, Italy (laura.poletti@cimafoundation.org), (2) ARPAL, Via Bombrini 8, Genova, Italy (federica.martina@arpal.gov.it)

The forecasting of precipitation events and flash floods are critical for civil protection. In the last years the Liguria Region, Italy, has been affected by several flash floods that have caused significant losses in the form of damage to property, infrastructure and the environment; loss of livelihoods and of human life. Liguria Region is a hilly and mountainous area located along the coast of the Ligurian Sea and has a number of small and very small basins heavily urbanized that are subject to the impacts of flash floods.

The temporal and spatial resolution of weather radar data as the input for nowcasting models has shown significant promise in improving forecasts in recent years. The goal of this work is the developing and evaluation of a radar-based flood nowcasting chain for the small and very small basins in Liguria with the use of a spectral-based nonlinear stochastic precipitation nowcasting model (PhaSt) and the conceptual Nash rainfall-runoff model.

In the Liguria Region, one hundred and ninety-six (196) basins were identified and categorized as "small" or "very small" by the Hydro-Meteorological Monitoring Centre of the Liguria Region (CFMI-PC). Most of the basins in Liguria have drainage basins ranging between 101 – 102 km² (Silvestro and Rebora, 2012). However, those classified as small and very small (196) have drainage areas generally ranging from 10-1 to 101 km². It is clear that high intensity precipitation events insisting on these basins produce flash-floods events that are characterized by reduced time to peak and increased peak discharge. For each small basin pre-alarm and alarm discharge thresholds were identified, related to most critical section near the outlet or near the confluence to principal basin in case of sub-basin.

The hydrological chain was tested in 70 strong rain events from 2006 to 2014. The results show good performances in term of capacity to individuate flooded areas, in particular when damaged areas are particularly delimited. The use of a radar based nowcasting model for the forecast of discharge peak allows to have an early warning, particularly important for very small catchments characterized by flash floods.

Hydro-Meteorological Centre of Liguria Region uses operatively small basin chain since 2013 for monitoring activity for Regional Civil Protection. The model has been used experimentally by municipalities of Genova since 2015 and Spotorno since 2016, in order to improve thresholds definition having a feedback from them about real discharge and damages related to each basin and in order to give them an useful instrument to give citizens an early warning in case of flood risk.