



A hydro-meteorological description of the 25th October and the 4th November 2011 events in Liguria

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In the course of about two weeks, from 25th of October to 4th of November 2011, two devastating flooding events affected the Liguria region in northern Italy, causing the death of 19 people and damages for tens of millions of euro to infrastructures, buildings, private and public goods. Some small towns changed their appearance and it has been estimated that, in some cases, several years are needed to return to the conditions prior to the flood.

The two events had some similar characteristics: they exhibited all the synoptic and mesoscale environments ingredients leading to heavy convective precipitation events (Doswell et al. 1998; Lin et al. 2001). They were both characterized by the formation of a well organized, very intense and localized finger-shape MCS (Mesoscale Convective System)-like precipitation structure - embedded within a general stormy synoptic weather scenario developed by a large Mediterranean perturbation. These convective fingers remained stationary for a significant number of hours on the same area (of few square kilometres) pouring very high rainfall quantities.

The meteoradar images, for the two events, recorded very similar shapes of such small intense structures. They both developed on the sea some tens of kilometres from the coast. They were very narrow and elongated towards the mainland Appennine range. Moving, few kilometres outside the "shadow" of the finger-shaped MCS the rainfall depth, at event time scale, was reduced by a factor two or three.

The hydrological consequences in terms of basin response were dramatic. Many creeks overflowed their banks, a large number of mud flows and landslides occurred, in the quite narrow area hit by each event.

The technical authorities in charge of hydro-meteorological forecast for the Liguria Region predicted the scenarios with a lead-time of two days. The Regional Civil Protection issued the maximum level of alert for most of the Region including the catchments eventually hit by the events.

Main topics of this works, also along the lines of the FP7 DRIHM (Distributed Research Infrastructure for Hydro-Meteorology, www.drihm.eu) project, are:

- the description of the events by using the very dense real time rain gauge network, the active mosaic of Italian Meteorological Radar Network, the sea surface temperature available from remote sensing and the large number of videos provided by the so-called citizen scientists;

- the results of the operative forecasting system used by regional Civil Protection, together with the interpretation of the decision makers; the usefulness of a probabilistic flood forecasting chain that contemplates also the multi-catchment approach (Siccardi et al., 2005; Silvestro et al., 2011) is made evident;

- the evaluation of the event's ground effects by using crowd sourcing/citizen scientist information and data, in order to check, also by use of recorded ground effects, the granularity of the atmospheric event.