Nat. Hazards Earth Syst. Sci., 12, 3171–3173, 2012
www.nat-hazards-earth-syst-sci.net/12/3171/2012/
doi:10.5194/nhess-12-3171-2012

Natural Hazards and Earth System Sciences

Reply to Marchi's comment on "Geomorphic hazards and intense rainfall: the case study of the Recco Stream catchment (Eastern Liguria, Italy)" by Faccini et al. (2012)

F. Faccini, A. Robbiano, and A. Sacchini
University of Genoa, DiSTAV, Italy

Correspondence to: F. Faccini (faccini@unige.it)

1 Reply

"*Geomorphic hazard and intense rainfall: the case study of the Recco Stream Catchment (Eastern Liguria, Italy)*" (Nat. Hazards Earth Syst. Sci., 12, 893–903, 2012) presented the impact of a heavy and short rainfall event in the Ligurian area (NW Mediterranean). It triggered several shallow landslides and flooded a part of the Recco alluvial plain. In the last decades, such events are increasing in Liguria and in the Mediterranean. In the Recco Stream catchment, we analyzed the conditions of geomorphic hazard related to the recent intensification of heavy rainfalls. We demonstrated the inadequacy of the Basin Master Plan for the slope environment. In fact, most of the instability phenomena were triggered in areas classified with medium and low geomorphic hazard. In the section "Information about the target event rainfall" the triggering weather condition was considered. The pre-frontal thunderstorm super cell caused heavy and short rainfalls concentrated on a very narrow area. These phenomena occur particularly in the central area of Liguria, due to Alpine-Apenninic orography and the Ligurian Sea. The radar image in Fig. 3c of the paper shows this situation from a geographical point of view. The isoyeth map of the 1 June 2007 event (Fig. 3b) was drawn on the basis of rain gauges data recorded in the six surrounding weather stations (Chiavari, Genova, Bargagli, Colonia Arnaldi, Polanesi, Bavari). This is supported by a hyetogram recorded at Polanesi station, located in the lower part of the Recco Stream catchment. The flood peak discharge has been preliminarly assessed on a rainfall/runoff evaluation. Further analysis in an un-gauged stream can be carried out by means of post-flood topographic surveys; the peak discharge was assessed by using six significant hydraulic cross sections of the Basin Master Plan (Provincia di Genova, 2002), drawing the flood marks surveyed (Fig. 1). In this case the Recco Stream Catchment Master Plan has correctly assessed the geomorphic hazard related to flood (Fig. 2). The flood peak discharge exceeded a return period of 500 yr in the lower channel network, while in the other

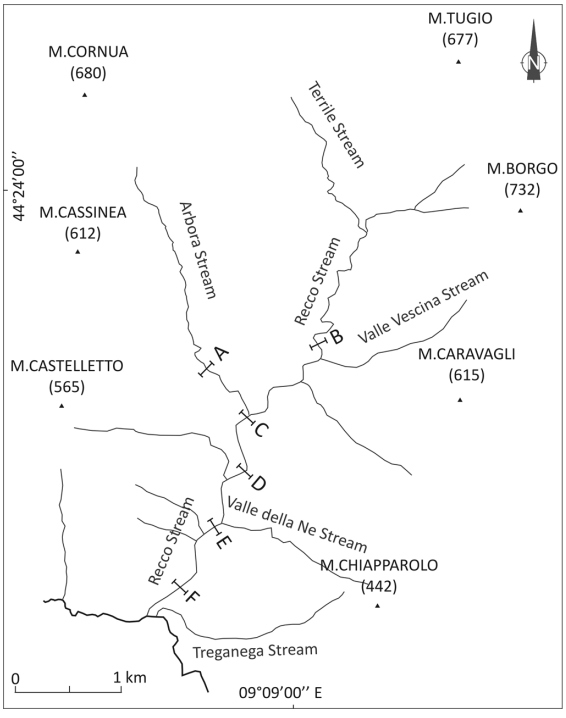

Fig. 1. Locations of cross sections in the Recco Stream channel network.

Published by Copernicus Publications on behalf of the European Geosciences Union.

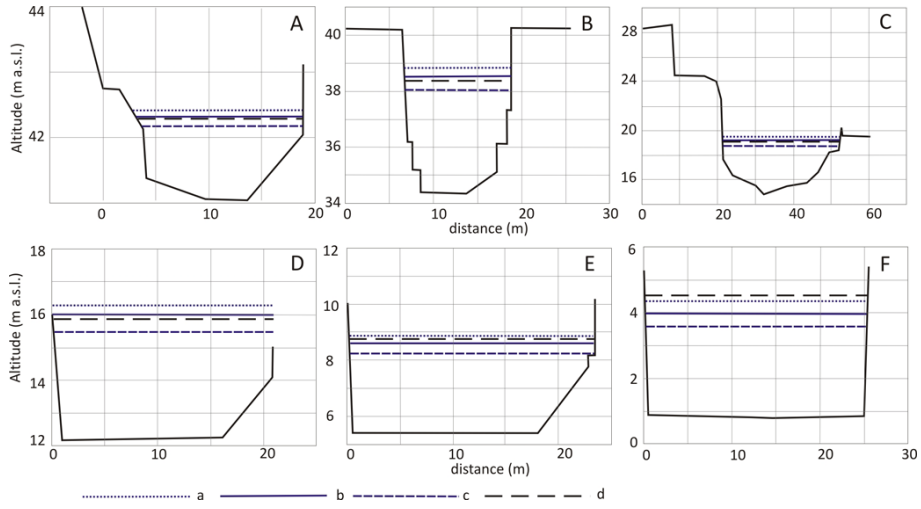

Fig. 2. Hydraulic cross sections and water surface elevations (redrawn from Provincia di Genova, 2002): **(a)** return period on 500 yr; **(b)** 200 yr; **(c)** 50 yr; **(d)** flood marks surveyed (1 June 2007).

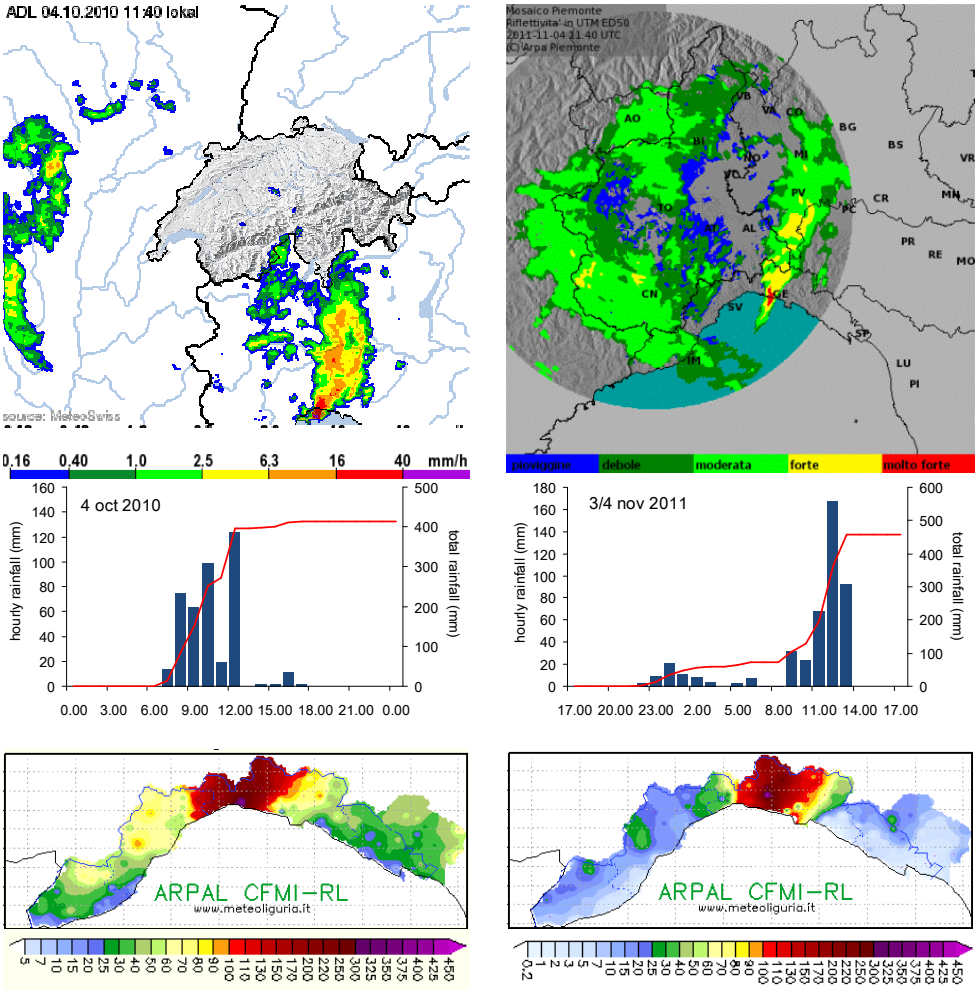

Fig. 3. Radar image, event hyetogram and isohyeth map (24 h total rainfall) of 2010 (left column) and 2011 (right column) events in the Genoa municipality and surrounding areas (from Arpa Liguria, Arpa Piemonte and Landi Meteo Swiss Wetter Radar).

Table 1. Hydraulic cross section data (from Provincia di Genova, 2002).

Cross section no.	River bed (m)	Left bank (m)	Right bank (m)	Q_{50} ($m^3 s^{-1}$)	Q_{200} ($m^3 s^{-1}$)	Q_{500} ($m^3 s^{-1}$)
A	41.04	42.74	43.12	102	130	149
B	34.34	40.20	40.25	162	204	232
C	14.80	23.99	20.50	257	322	364
D	12.15	15.80	15.00	267	332	376
E	5.40	11.35	10.20	280	349	394
F	0.80	5.00	5.10	287	355	400

cross section – related to middle and upper catchment – it's roughly coincident with return periods of 200 yr (Table 1).

In the paper we highlighted some significant topics characterizing the geomorphic hazard of a part of the Mediterranean coastal area. As already discussed in other similar situations (Faccini et al., 2005, 2009), with regard to slope hazard geomorphic assessment, improvements of the Basin Master Plan are needed. Events such those recorded 1 June 2007 are more and more recurrent in Liguria and always show a similar triggering meteorological mechanism and ground effects concentrated in narrow areas (Fig. 3); the well-known flash floods of 2010 and 2011 events in the Genoa municipality and surrounding areas caused human losses (Sacchini et al., 2011; Faccini et al., 2012).

References

Faccini, F., Brandolini, P., Robbiano, A., Perasso, L., and Sola, A.: Fenomeni di dissesto e precipitazioni in rapporto alla pianificazione territoriale: l'evento alluvionale del novembre 2002 nella bassa val Lavagna (Liguria orientale), Geografia Fisica e Dinamica Quaternaria, Suppl. VII, 145–153, 2005.

Faccini, F., Piccazzo, M., and Robbiano, A.: Natural hazards in San Fruttuoso of Camogli (Portofino Park, Italy): a case study of a debris flow in a coastal environment, Bollettino della Società Geologica Italiana, It. J. Geol., 128, 641–654, 2009.

Faccini, F., Firpo, M., Robbiano, A., and Sacchini, A.: Rischio idrogeologico e dinamica degli alvei fluviali in rapporto agli interventi antropici: il caso del Torrente Bisagno a Genova, Abstracts del 4 Convegno AIGA, Perugia 6–7 febbraio 2012, Eng. Hydro. Env. Geology, 14, suppl. B, 110–111, 2012.

Provincia di Genova: Piano di bacino D.L. 180/1998, ambito 15, Approvato con Delibera del Consiglio Provinciale n. 67 del 12.132.2007, available at: http://cartogis.provincia.genova.it/cartogis/pdb/ambito15/index.htm (last access: October 2012), 2002.

Sacchini, A., Faccini, F., Firpo, M., Bozzano, S., Francioli, G., and Robbiano, A.: Heavy rainfall triggering flash floods and shallow landslides: the case study of a Ligurian event (4 October 2010), Abstract volume of 13th Plinius Conference on Mediterranean Storms, EGU Topical Conference Series, Savona 7–9 September 2011, 19–20, 2011.