

General comments:

Anonymous Referee #2	Reply
<p>(...)The authors analyse several episodes of catastrophic floods and also the evolution of the territory. However, the article is based on some hypotheses which are not sufficiently proven, it presents problems of structure and ends with conclusions that are not well supported.</p>	<p>Okay, we are ready to acknowledge the suggestions and to modify the manuscript accordingly</p>
<p>It should be necessary to improve all the meteorological explanations. From a climatic point of view, it is necessary to tell with test of significance you have used and which level of significance the results have (95%?). The linear regression is not good enough to obtain a significative trend. You cannot deduce any trend by comparing only two or three events. To speak about trends requires working with series.</p>	<p>The paper presented is not about the climatological analysis of Genoa, as briefly reported in the title. We consider fully representative (at least in relation to the objectives of the manuscript) the climatological data highlighted in Fig. 3 relative to the increase in average annual temperature (c) and the decrease of the rainy days (b) through the use of the Standardized Anomaly Index. The significance tests have already been discussed in the paper reported in the literature, at least until 2001, but certainly we can update them. The increased frequency of the events does not describe a trend, it's clear! We want to highlight the very high and unacceptable number of disasters at short intervals in the last period of time.</p>
<p>Section 3 mixes different results (that are not clear if they are obtained by the authors or by another people) with some previous research, data and some sentences like lines 9-11 page 2457 that do not includes any specific or new information. Please, modify the structure of the paper and show clearly which are the new contributions, results, data, methodology,...</p>	<p>The paragraph 3 describes "Previous research in the study area and methodological approach". The lines 17 to 29 (P2457) and from 1 to 8 (P2458) can be moved in the discussion, in order to make clearer the exposure of the results with the research.</p>

Specific comments

Anonymous Referee #2	Reply
<p>p. 2452, l. 9-10: The statement "A troubling trend since the beginning of the new century, is the recurrence of such events with greater frequency than in the past" is not well supported by the results of the paper and cannot be included here.</p>	<p>Figures 4 show differences between the rainfall intensity causing floods of the third millennium compared to those of the past, while Figure 12 shows the distribution of floods for periods of 50 years in Genoa, as indicated in the legend. We can remove the word "trend" replacing it with a more appropriate term.</p>
<p>p. 2452, l. 11: Like in my previous comment, the sentence "seem to have a rainfall intensity basically greater..." is not well supported and cannot be included here.</p>	<p>See that we wrote above, and to this we add as shown in Figure 5, in which there is a "history of rain" different for the events of the third millennium.</p>
<p>p. 2452, l. 22-23: Authors compare the population in the 19th century with the peak in the 1970s. Does it mean that the population has not increased in Genoa after 1970?. In line 22 you say "took a peak"; I suppose it is "took"</p>	<p>Figure 9 shows the trend of population in Genoa from the Unification of Italy (1861-1866) to the present. Line 22: is correct "took a peak"</p>
<p>p. 2453, l. 14-18: too long sentence. On the other hand you use the expression of supercells here and in other parts of the paper, referring to a</p>	<p>Ok, let's try to make it more fluent by breaking the sentence. We will refer generally to a convective system: supercells is only defined for specific</p>

<p>precipitation system that could be a multicellular or a mesoscale convective system or convection embedded in stratiform precipitation. The word “supercell” implies a thunderstorm structure with a rotational movement inside it. Please, avoid the use of supercell and substitute it for the specific one for each event or amore general like a convective structure.</p>	<p>studies on some of the events described: but are not available specific studies for all events.</p>
<p>p. 2453 l. 5: October and November 2014? It is not clear</p>	<p>We think that the reference is to the line 25 and not 5. In 2014 there were two important floods in Genoa on October 9 and November 15.</p>
<p>p. 2454, l. 23-27: Leiro is written different in Figure 1 than in the text; the Branega catchment is not in Figure 1.</p>	<p>Leiro is the right name. In figure 1 we have to add the word “T. Branega”.</p>
<p>p. 2455, l. 21-23: Pay attention, the Genoa cyclone does not move to the Po Valley. In some occasions the cold air that arrives to the Mediterranean through the Po valley helps to the Genoa cyclogenesis. There are a great number of references dealing with the Genoa cyclones that could help you to understand better the phenomena, like the works developed in the MEDEX project (Jansà et al, 2014). Please, improve your explanation.</p>	<p>We will correct with: “It is a cyclone that forms or intensifies from a preexisting cyclone to the south of the Alps for orographic effect (Jansa et al., 2014) over the Gulf of Genoa, Ligurian Sea. This cyclone generally remain stationary but sometimes can determine the weather on Central Europe (Saez de Camara, 2011) or on Italian penisinsula (Trigo, I. F., T. D. Davies, and G. R. Bigg, 1999: Objective climatology of cyclones in the Mediterranean region. <i>J. Climate</i>, 12, 1685–1696) according to “Vb” and “Vd” Van Bebber cyclone tracks (bartholy J., pongracz r., margit pattantyus A., 2006, European cyclone track analysis based on ecmwf era-40 data sets. <i>International Journal of climatology</i>, 26: 1517–1527)</p>
<p>p. 2456, l. 1-5: the major parts of the references you cite in the text are not from SCI papers and do not justify your explanations;</p> <p>for instance Sacchini is a reference about planes not about weather regimes.</p> <p>Air masses contrast is not necessarily responsible of triggering thunderstorms. They can help to increase the thermodynamic instability but they do not trigger convection.</p> <p>Remember, avoid the use of the word “supercell”</p>	<p>Unfortunately many authors who have previously dealt with the study of floods in Genoa have not published SCI papers. What they said is still reflected in other SCI cited papers.</p> <p>Sacchini et al. 2012 describe the weather system over to the climate of Liguria in the text accompanying the paper. In the case of pre-frontal thunderstorms that provoked the flash floods in 2010, 2011 and 2014 these were not indeed triggered by the contrast between different air masses, but because of the wind shear to the various altitudes in the context of baroclinic atmosphere; the trigger has occurred, however, on the ground where happened the convergence with northerly currents coming from the Po Valley (from direct observations of writers, event reports of the bodies, anemometer measures that however are not the subject of this study, from the meteorological point of view, it is restricted only to the descriptive phase). We will remove air masses contrast and we will insert shear ad factor of instability and trigger. We'll avoid "supercell" and we'll insert convective system.</p>
<p>p. 2457, l. 17-18: Tell how you calculate the SAI index</p>	<p>Standard Anomaly Index = Standardized anomalies, also referred to as normalized anomalies, are calculated by dividing anomalies by the standard deviation. Eg.: 2014 annual rainfall -</p>

	Average Annual Rainfall/(Standard deviation)
p. 2457, l. 22-30- p.2458, l. 1-8: Improve all the trend analysis with a more robust methodology.	We can verified the trends by statistical tests as Mann-Kendall
p. 2458, l. 9. Which maps do you use?	We have written (P2458 lines 10-17): This study utilizes maps produced after the annexation of the Republic of Genoa to the Kingdom of Savoy (1815). During the period 1815–1830 it was in use the so called map “Gran Carta degli Stati Sardi di Terraferma” at 1:50 000 scale, surveyed and produced by Military Corps. For all the areas analyzed, this historic map has been compared with maps produced afterwards by the Italian Military Geographic Institute IGMI (after Italian unification, 1861): in particular the maps of 1878, 1907, 1923, 1934 and 1939 were used. Finally the recent Regional Technical Cartography (CTR by Regione Liguria Administration) mapped in 1980, 1994 and 2007 obtained by aerial snapshots and the Google Earth satellite have permitted the comparisons of recent development.
p. 2459, l. 1-9. Why do you only explain 6 events? You cannot justify the meteorological characterization of 5 of the six events produced after 1970 with references from 1970 and 1971. Have you analysed these events? If not, you should mention specific references for any event.	We have written (P2459, lines:1-5): As mentioned earlier, Liguria in general and Genoa in particular have been subjected to flood events due to the predisposing conditions of climate and urban morphology. Considering only Genoa city, in the last forty-five years, ten important events took place: six of them caused very severe damage and casualties (Table 4). We have then analyzed and described the six most serious events that have caused the loss of life: 1970, 1992, 1993, 2010, 2011 and 2014. About the 1970 event there are the references of Bossolasco et al. 1971 and Cati, 1970. About the 1992 event there are the references of Conti et al., 1994 and Cipolla et al., 1992 and Tropeano et al., 1993 About the 1993 event there is the reference of Tropeano et al., 1995 About the 2010 event there are the references of Faccini et al., 2014 and recently Faccini F., Firpo M., Luino F., Piccazzo M., Sacchini A., Turconi L. (2014) – <i>Geo-hydrological risk and change in rainfall regime: an example from the 4th October 2010 event in Molinassi and Chiaravagna catchments (Genova, Italy)</i> . Proceedings of the International Conference “Analysis and Management of Changing Risks for Natural Hazards”, 18-19 November 2014, Padua (Italy), AP2, 1-8. About the 2011 event there is the reference of Silvestro et al. 2012 About the 2014 event there is the recently short paper of Faccini F., Luino F., Paliaga G., Sacchini A., Turconi L. (2015) - <i>Yet another disaster flood of the Bisagno stream in Genoa (Liguria, Italy): October the 9th -10th 2014 event</i> . Rendiconti Online

	Soc. Geol.It., 35, 128-131
p. 2461, l. 18. Do you have radar imagery to justify “very narrow supercells storm”? There are other possibilities	Where there is historical coverage of radar images we can put them (2010, 2011, 2014, or we can use the isohyet of the event (1970, 1992, 1993), that are still limited.
p. 2458, l. 15, l. 22-23. By the comparison of some specific events you cannot conclude any trend in rainfall intensity. On the other hand you compare hourly intensities from different events, but, how long has been sustained these intensities? For instance, in Figure 4 (please, indicate a) and b)), you compare intensities near 40 mm/h sustained 10 hours, it is to say, 400 mm, that would imply that all the events would overpassed this quantity, but some of them do not arrive to 400 mm. These intensities have all of them recorded in the Genoa raingauge? When start the hourly series?	Probably the comment is Referred to P2461 and not to P2458. Figure 5 shows the hourly rain that has characterized four major events among the six chosen for severity of damage: the differences seem obvious, without thereby demonstrate the evidence of a trend. Figure 4 (top) shows the rainfall intensity (mm/h) vs time (hours) of the six selected events (1970, 1992, 1993, 2010, 2011, 2014). This figure was obtained using the data of maximum precipitation registered in the raingauge of Genoa University for 1, 3, 6, 12 and 24 hours. Then we divided the value of raining registered for its duration, obtaining the corresponding average intensity of the rainfall. The series of the Genoa University start since 1833.
p. 2462, l. 1-5. How are you sure that there are not any event previously to 1970 with a major intensity?	We selected the severest events from the great flood of Genoa of 1970, historically the most tragic. Please see tab. 2 for an overview of the floods in Genoa before 1970. The data of the Genoa University can also confirm it.
p. 2462, l. 9. Figure 5 does not present any trend	Ok, well done. Fig. 5 shows rainfall vs. water level for the events of 1970, 1992 and 2011
p.2467, l.1-10. From the analysis of 10 events is not possible to conclude any trend that could be due to climate change. Data and information about flash floods are not systematic since 1800 and the potential increase could be due to a heterogeneous database (we have lesser information for the 19 th century than for the 20 th century). On the other hand the last IPCC report of WGII (2014) and the SREX report about climatic extremes from IPCC (2012) do not conclude that there is “an increase of precipitation rate with the average temperatures confirmed by data of other worldwide recording stations”. On the contrary, as you try to demonstrate, some changes could be mainly due to changes in vulnerability, exposure or uses of soil.	We do not reach any conclusion about climate change, even if the trends b) and c) of Figure 3 are very clear. The rain intensity of the last floods of Genoa are different from previous ones, as shown by Figures 4 and 5. We want to remind that the data are measured in Genoa with continuity from 1833. The increase of flood events, highlighted with the graph in Fig. 12 is probably due more to changes in vulnerability (land use, see section 5) rather than to changes in the rainfall regime. Ok we will adjust the quote IPCC.
p.2467, l.15-20. Avoid the use of the term supercell; translate “nell’alluvione”	Ok. Flood mean “alluvione”, thanks.
p.2467, l.27. Change the damages in liras to euros.	OK. We wrote liras because in 1953 the Italian currency was LIRA, as indicated in the paper of Tropeano et al., 1993.