Hydrol. Earth Syst. Sci. Discuss., 10, C6326–C6328, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C6326/2013/

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Retrospective analysis of a non-forecasted rain-on-snow flood in the Alps – a matter of model-limitations or unpredictable nature?" *by* O. Rössler et al.

Anonymous Referee #1

Received and published: 19 November 2013

This manuscript by Rossler et al. undertakes an analysis on an extreme flood event that affected the Alps in October 2011. The authors provide a hydrometeorological assessment of the event, and model the flood too. This review only comments on the atmospheric component of the paper. Although it is an interesting flood event, there are many revisions that I would suggest at this stage. Most importantly I don't believe that the atmospheric conditions are discussed correctly, and there are also some issues with terminology. Please find below some comments, which I hope will be helpful to the authors if they revise their manuscript.

Main Comments: 1). The paper does not correctly define an atmospheric river (AR),

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

and as such I have doubts that an AR actually impacted the Alps during this event. ARs are located in the warm sector of extra-tropical cyclones within the warm conveyor belt. At 00UTC 9th October (please see historical weather analysis charts here: http://www.wetter3.de/Archiv/archiv_ukmet.html) there was a warm front over the British Isles and a trailing cold front across the North Atlantic. The AR would be up against the cold front (in the warm sector), and as such the AR part of the storm does not reach Switzerland (even over the analysis charts up to 18UTC 10 October 2011). There is evidence for AR conditions, but they are not near Switzerland, hence I believe your results/discussion/conclusions need to be revised. At 00UTC 9th October there is an upper level warm front (as shown by the open warm front symbols), which is probably a part of the ascending warm conveyor belt. In fact this upper level warm front is also seen in your Figure 3 – the blue line (at 00UTC 9Oct 2011) has a temperature inversion at about 675hPa, as the temperature starts rising with height here. This is probably a key part to the flood event. I also don't think that the storm formed from Hurricane Orphelia, as Hurricane Orphelia dissipated on 3rd October, a week before this flood event. It may help to look at a paper by Joos and Wernli (2012) with regard to your description of PV. Their Figure 1 shows a field of PV, which is more informative than just a red line. Does the red line refer to the jet stream over the North Atlantic? It may be best to show maps of PV as in Joos and Wernli (2012).

2). The terminology needs to be rephrased and reconsidered in places. I will outline some of these in the specific comments.

Specific Comments: P2 lines 39-40: Why is it an anomalous cold front? Also, it is best to avoid terms such as "drastic" temperature increase. A large temperature increase sounds better. P3 lines 84, 86-87: These are not correct terms. "Cold front system" and "warm and moist northwest front" would probably be better as "extra-tropical cyclone" and "warm front" respectively. P6 first paragraph: ERA Interim reanalysis has a 0.7 x 0.7 degree horizontal resolution. It is also a numerical weather prediction model frozen in time. P6 line 156 and throughout manuscript: What does cp. mean? P10 lines 282-

HESSD

10, C6326–C6328, 2013

302: See general comment 1. P10 line 283, P11 line 323: I would suggest changing the word “drastic”. P12 lines 350-352: This line does not make sense. Please rephrase. P12 line 361: With respect to what criteria is the cold front anomalously cold? P13 lines 367-394: I think your Figure 5 references should be Figure 4. Perhaps you should link to your discussion on the cavity circulation (a few pages later on) in lines 382-383? P13 line 397: Can you explain your Figure 5 with the wind profiles in the paper? I was confused with these plots – it appears to me that the wind was coming from the southwest and not the northwest. The same applies to P14 line 404. P14 line 407: Very active cold and warm fronts. You need to show that they are active if you are going to use this terminology (I believe an active front is called an ana front – ana warm front). P14 lines 425-427: Please rephrase this sentence. P15 line 430: I don’t think you want to use the word vaporized. P15 lines 434-436: Can you get the measurements from the windward side? P19 lines 572-575: This needs some rewording. Flood events can be both spatial and temporal; it doesn’t have to be one or the other. P19 line 577: Terminology – “unusual cold moist. . ..”. How is it unusual? P19 line 578: It should be ECMWF reanalysis data, or ERA-Interim reanalysis data. P19 line 584: Terminology – “wet air masses”. P20 lines 592-595: Lavers and Villarini (2013) showed that ARs caused extreme precipitation at long distances from the sea, so ARs don’t just cause high rainfall near the coast. P20 lines 613-615: Please rephrase. P23 Conclusions: See Main comment 1.

References: Joos, H., and H. Wernli (2012) Influence of microphysical processes on the potential vorticity development in a warm conveyor belt: a case study with the limited area model COSMO. Quart. J. Roy. Meteorol. Soc., 138, 407-418.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 12861, 2013.