

Interactive comment on “Simulations of the 2005, 1910 and 1876 Vb cyclones over the Alps – Sensitivity to model physics and cyclonic moisture flux” by Peter Stucki et al.

Anonymous Referee #1

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General comments:

The authors downscale three historic flood events caused by so-called Vb-cyclones and analyse the conditions under which the high-resolution simulations capture precipitation over Switzerland best. They compare model set-ups with different initialization periods, parametrizations and nudging. The most important factor determining the result with respect to precipitation is the correct representation of the cyclone path.

The article is well written and structured. It addresses three extreme precipitation events and is therefore within the scope of the journal. The authors systematically analyse different model configurations and initial data sets which allows them to identify

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influencing factors of higher and lower importance. The result is a good reference for other scientists applying dynamical downscaling to study extreme precipitation events. It also shows the pros and cons of using 20CR reanalysis for initializing regional model simulations, as it turns out that deviations to observations increase for events lying further in the past.

There is however one aspect that is missing in the paper. The authors downscale to a precipitation resolving resolution of 3 km. As a motivation they cite Zängl 2007 and Prein et al. 2015 who analysed the 2005 event (page 3, line 29). The simulations performed by Stucki et al. would allow to study the effect of convection resolving simulations versus simulations with convection parametrization also for the two other cases. The paper would strongly benefit from adding an additional section which discusses the effect of the last downscaling step in more detail.

Specific comments:

p.2 l.4: The cited article (BAFU 2005) is missing in reference section.

p.2 l.12: Cyclogenesis of Vb cyclones can be outside the Mediterranean region but most of them pass the Golf-of-Genoa region (e.g. Messmer et al., 2015).

Table 2: Does a positive mean absolute error means that the model initialized with 20CR produces more precipitation than observed and that initialization with ERA40 (p.11) overestimates precipitation even further? This is probably not the case as it would be in contrast to Fig. 2. Please define what a positive MAE value indicates. From looking at Fig. 2 I also don't understand how MAE48h can be 27.75 for sp10 when averaging over 10 ensemble members. Shouldn't the error be much higher?

p.11 l.28: Please give a short explanation how cyclone fields are calculated (1-2 sentences). To understand what is shown one shouldn't need to read another paper. Please also clarify if cyclone fields and cyclone tracks are both calculated at SLP.

p.12 l.17 +others: You use storm track and cyclone track synonymously. This is con-

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fusing as you only show cyclone tracks. The term storm track is mostly used for the variance at synoptic time scales (e.g. Hoskin and Hodges, 2002: New perspectives on the Northern Hemisphere winter storm track. *Journal of Atmospheric Sciences*, vol. 59, Issue 6,

pp.1041-1061). I suggest that you change "storm track" to "cyclone track" everywhere in the manuscript.

Fig.4 first row: Genoa cyclogenesis is not visible on these figures.

Fig.4 middle row: There is a time step indicated in each panel but the caption suggests that different time steps are combined. This is confusing.

Fig.4 last row: Please redraw. It is almost impossible to see the cyclone tracks. In addition, the caption states "as in middle panels" even though g, h and I show a sequence of days while the d, e and f show single time steps. I also don't understand why the numbers on the colour bars differ for g, h and i.

Fig. 5a: There is a very prominent precipitation peak before the event starts. The text does not give any explanation for this peak.

Figs 7, 8 and 9: Are the black dots supposed to indicate the land sea mask? This does not come out neither in print nor on my screen. Please redraw.

p.24 last paragraph: The decreasing differences to observations with time in 20CR are probably due to the increasing quality/amount of data that is assimilated in 20CR. It would be good to mention how the input data for the 20CR product has changes between 1976 and 1910.

Fig. A2 caption: "(time periods as in Figure 2)". Fig. 2 only shows 2005 Fig. A2 shows all 3 episodes.

Technical corrections:

p.9 l.11: Value in the table is 0.59 the value in the table captions is 0.49 (sp10 48-hour

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precip). Which one is correct?

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