

Interactive comments on “The Role of Atmospheric Rivers in compound events consisting of heavy precipitation and high storm surges along the Dutch coast” by Nina Ridder et al.

Referee #2

This study provides an analysis of the association between atmospheric rivers (ARs) and events compounded by extreme precipitation and high coastal water levels throughout the Dutch coast. I feel that this article is very suited for the particular region and it presents a major innovation that should be considered for publication after a certain number of improvements (most of them minor).

I fully agree with the revision provided by Anonymous Referee #1, which I think is very complete and will help to improve the manuscript substantially. I just would add some comments:

Major Comments:

My main concern is the statistical strength of the results obtained here. I am not a close friend to complicate the analysis with statistical test when they are not really necessary, but in this case I think they are.

For example, in section 4.1, you say that almost 20% of days have AR detections. Then you say that 28% of days in Delfzijl does not show AR-CE association, but you are analyzing the same day or within ± 1 , which may become the former 20% in a 60% of the days that are considered in the analysis. So you are claiming that CEs occur 72% of the time in coincidence with a something that exists, in general, up to 60% of the time... can the null hypothesis be rejected with this values? Personally, I doubt it... I strongly suggest to include suitable statistical test in the final version of the manuscript.

Minor Comments:

P2 L14-17 : Please, update this figures regarding the poleward transport of water vapor, and the width/length ratio in ARs with Guan and Waliser, (2015).

Guan, B., & Waliser, D. E. (2015). Detection of atmospheric rivers: Evaluation and application of an algorithm for global studies. *Journal of Geophysical Research: Atmospheres*, 120(24), 12514-12535.

P2 L25 : Please, consider to add a sentence on the source regions of moisture for Atlantic ARs. Take a look at <https://www.earth-syst-dynam.net/7/371/2016/esd-7-371-2016.html>.

P3 L7 : Replace “EOBS” by “E-OBS”.

P3 L21 : Please, add something like “when synoptic forcing conditions are favorable” after “precipitation events”.

P3 L23 : Add more information about the stations. To whom they belong?

P4 L4-7 : I think that it is completely unnecessary to describe ERA-In. Please, consider to replace this needless description by a citation.

P5 L23 : “processes” is written two times in the same sentence. Consider to find an alternative.

P6 L24 : replace “winter six months” by “extended winter”.

P10 L6 : Do you mean Fig. 8a?

P10 L27 : Please, consider to rewrite the title of this subsection.

P12 L14 : “we provide vital information”... consider to replace “vital” by “important”, or similar.

Table 1 : Include the period (1979-2015) in the caption.

Figure 4 : Include “ARCEs”, “no ARCEs”, etc... in each box of the Figure.

Figure 5 : This figure is very complete and helps a lot to understand the results, but, please, simplify the legend and be consisted. For example, if I understood properly, the only difference between red and black lines is AR and no-AR detection. Then, why do you say “days” for the red line, and “t-series” for the black one? The same applies to the dots.

Figure 6 : This results refer to “Den Helder” only. Please, clarify somewhere in the caption.

Figure A1 : Please, rewrite the last sentence in the caption.