The authors make use of downscaled versions of global climate simulations from the CMIP5 ensemble to study the atmospheric rivers reaching Europe in the present and future climates. They find that ARs will become more frequent and stronger in the future, especially in the RCP8.5 scenario. The results also show that the orientation of ARs will change with for example more ARs coming from the south reaching Scandinavia (Norway).

The study is interesting but I got confused with some of the fields presented in the figures, which quality is not great. Some information about the methods and the fields displayed in the figures is missing, the methodology and results are not well discussed and compared to previous studies, and there are many technical mistakes (typos, English, missing words). Therefore, I think the manuscript needs major revision in order to be in a publishable state.

We thank the reviewer for a thorough review of our manuscript and his/her valuable suggestions that really help to improve the manuscript. We regret that we were too short in the description of the methods and other parts of the text. We will be more comprehensive in a revised version and give lacking details.

Major comments:

About the methods:

- The temporal scale of the RCA model outputs is not clear. From line 209, it seems to be 6-hourly but it would be great to also mention it in section 2.1 or in section 2.2. In the same line, is the extreme precipitation determined from 6-hourly or daily data?

RCA outputs the specific humidity at 6-hourly output intervals. The precipitation fields represent accumulated values over the 6-hourly output period. We will note the temporal scale of the used fields more prominently in an own paragraph section 2.1.

- The authors use an AR minimum length threshold of 1500 km. This is quite short compared to previous studies and I guess the reason for this low value is the limited extension of the domain to the west. Can the authors state the reason for such threshold and maybe discuss it in light of previous studies?

In this study we followed the previous approach from Lavers and Villarini (2013) who used a minimum length of 1500 km to detect ARs in an ERA-I reanalysis product. However, you're completely right that due to our limited domain the algorithm does not detect

1. ARs that do not reach Europe but remain outside over the Atlantic Ocean. Thus, our study can not be compared 100% to global CMIP studies on ARs that take into account also those ARs.

2. Over the western Iberian Peninsula, which is located relatively close to the western model boundary, some AR could be missed or detected with delay (as it may take longer to reach the 1500 km criterion). Over the UK and Norway this does not play a significant role as these countries lie far away from the models lateral boundary.

Thank you for that comment. We will include a short paragraph that makes this clear in a revised manuscript.

- Can the authors confirm that only one AR is detected at every timestep? What happens when an AR covers two latitudinal bins and/or exceeds the IVT 85th percentile in two adjacent 5º bins?

Yes, we can clearly confirm this, as it is checked by our algorithm. ARs are detected separately for each of the 5° latitudinal bins. At this stage it is indeed possible that one AR time step is recorded twice. Therefore, after detection, the whole record is checked for double AR time steps (year, month, day, and hours information is saved). All double time steps are removed. We will make this clear in a revised version.

- Do the authors define a mask of every AR to link them to precipitation?

Exactly, for every single AR a mask array is created which contains likewise information about the exact date and time. All this in 6-hourly resolution.

- Lines 223-224: I think the authors should emphasize the fact that the AR detection threshold is different between the present and future periods in contrast to previous studies and what the advantage of this method is. As for now, it is written later in the manuscript (section 5.2) but it should appear upfront. I believe that this choice limits the influence of the larger moisture content in the atmosphere in the future climate on the results. Is that true? Can this aspect be discussed if relevant?

We also think this fact should be emphasized more prominently already in the methods section.

As stated in Lavers et al., (2012; 2013) the 85th percentile of all 12:00 (noon) time steps represents approximately the median value of moisture content within real observed ARs in todays climate (1998-2005). Thus, our approach conserves the relationship between the median moisture content of ARs with the 85th percentile of all noon time steps. The other way to do would be to apply the historical threshold also to the future atmosphere which contains much more moisture also in the background field. This emphasizes more the thermodynamical aspect but does not ensure full compliance with the algorithm developed for present day AR characteristics.

We will add a new paragraph that discusses this.

- I believe the ERA-Interim reanalysis is not really described. For example, the spatial and temporal resolution used in the study is missing.

Yes, the information on temporal resolution is missing. Spatial resolution (0.75°) is somewhat hidden (section 3.2.3). We will provide this information more prominently and comprehensive in the methods section.

- In the caption of Fig. 2 and line 329, it is written that ARs are tracked. However, the AR tracking is not explained. I suspect the tracking is used to check the AR persistence and involves ARs masks. Therefore, please add this information in section 2.3.

Yes, the word tracking is misleading here (as it suggests a kind of Lagrangian/Eulerian approach) and we will replace it by “detection”. We did not really track ARs but, as you said, checked persistence of ARs.

About Section 3.2.3:

Lines 351-354: Can the authors explain a bit more how a negative temperature bias in the regional climate model is linked to a “too high moisture load” and to the higher number of ARs in September in the hindcast compared to ERA-Interim? I would expect a higher temperature to be linked to more moisture. Moreover, wouldn’t it be more useful to look at the precipitation in the hindcast, in ERA-Interim, and in the E-OBS dataset, instead of looking at the temperature? Could it also be useful to assess the difference in the specific humidity between the hindcast and ERA-Interim?

Sorry that was not well explained. We consider here the different mean climates outside the model domain (global GCM) and inside RCA which have different thermodynamic equilibrium states. Our line of argumentation was: if RCA has a cool bias (compared to ERAI outside) then we assume that the moisture content of inflowing warmer air masses is higher than the moisture content in air masses within RCA. Then, an increased inflow of the warmer and more humid air with the beginning of fall from outside RCA would probably result in an increase in incidents where the moisture content exceeds the 85th threshold that is based on RCA thermodynamics. However, this is a bit speculative without further analysis which goes beyond the present paper. Therefore, we will remove this paragraph as it is not important for the main conclusions of the paper.

We think indeed it’s a good idea to show the comparison in specific humidity between ERAI and our ERAI hindcast. Unfortunately the EOBS data set does not provide the this variable, so we have to exclude EOBS in this comparison.

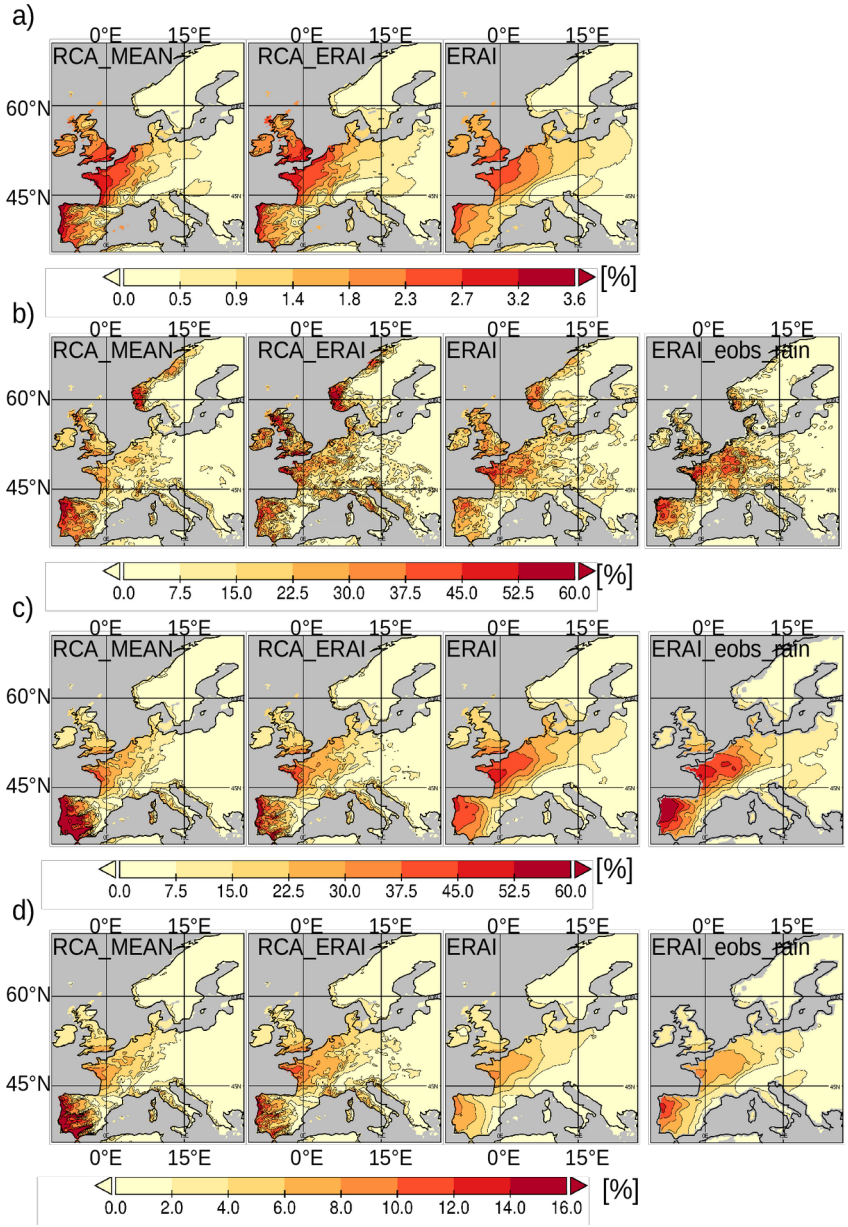
Lines 354-356: This sentence must be rewritten. It is not clear at all.

We agree and will remove this section as it is too speculative (see previous comment above).

What would be the impact of using the E-OBS precipitation instead of ERA-Interim's in the results displayed in the right column of Fig. 5b-d?

We recalculated figures 5b-d using the AR masks from ERA-I combined with precipitation from the E-OBS dataset. We note, that by doing so, we violate the IVT equation shown in line 200 which means there is no physical consistency between the atmospheric moisture content and precipitation. However, the result is shown in the right-most column. For the percentage of yearly maximum precipitation related to ARs (see below figure 5b) the spatial pattern is more or less the same. Differences occur over Norway and the UK where ERAI_eobs_rain shows a weaker signal compared to ERAI.

With respect to the contribution of AR forced precipitation to the total >95th percentile precipitation (figure 5c) and the AR forced precipitation to the total amount of precipitation (figure 5d) we note that the pattern is the same as for ERAI (third column) but the amount of rain related to ARs is overall higher compared to ERAI.



Altered Fig. 5 from the submitted version. AR frequency expressed as % of AR days during the historical period. b) Percentage of annual maximum precipitation related to ARs .c) contribution of AR forced precipitation to the >95th percentile precipitation fraction. d) same as c) but for the total precipitation.(Note that in a) the unit has been changed from total number AR days within 30 years to %AR days of total days as recommended by RC2).

About section 5.2:

Gao et al. (2016) showed that ARs became more frequent north because of the poleward shift of the eddy-driven jet. That is not what the authors seem to obtain by distinguishing the "origin" of the ARs. I believe it would be more interesting and useful to look at the eddy-driven jet response in all scenarios to explain the responses in the number of days with ARs and AR-forced precipitation?

That's true. Gao et al. found in CMIP5 models a peak in AR frequency between 45-55°N. Indeed, our Fig 8a indicates clearly that this peak is farther to the south compared to Gao et al., 2016). This suggests that the regional model may systematically steer ARs on a more southward path towards Europe compared to the global models used in Gao. We think this is an interesting result and will discuss this in a revised version.

Though it would be interesting to look on the eddy driven jet this would require further intense analysis. Also we think our regional model is not an ideal tool for this analysis as it excludes wide areas of the North Atlantic.

Remove sentences "At least… (Ma et al. 2020). The authors…likely reasons." on lines 546-548 because it is not relevant for the present discussion.

We agree and will remove the sentences.

About the figures' content:

- Figure 2: is the 85th percentile determined using all points within the 5º bins and all time steps? In any case, please state somewhere how the values shown in this figure were calculated.

Yes, it was calculated from all the grid cells in the range of the respective 5° bin and all time steps. We will make this more clear in a revised version.

- Figure 4, 7: how is the "average moisture transport over land" calculated? Are the authors using a mask for the ARs and averaging the IVT within the mask? Please explain.

Yes this is exactly the way it was done. We will include this explanation in a revised version.

- Figure 5: Row a): the authors describe this row as AR frequency in the caption but, as written in the text, it is only a number of days. One would have to divide by the total number of days in the period to get a frequency. Moreover, since the model output is 6-hourly, I do not understand how the authors convert it to a number of days. What if an AR covers two days during its lifetime? Is it counted twice? Also, if the AR lasts a minimum of three time steps (because of the 18h minimum duration) in the same day, it is counted only once, correct?

Sorry, we were sloppy with describing the method. For the analysis we classified a certain day as AR day if within the 24 hours at least one AR incident was recognized. That means even if only one of the four 6 hour time steps during the day was impacted by an AR, this day is counted as AR day. We will make this clear in a revised version. Consequently, an 18 hour-lasting AR that covers two subsequent days is counted as 2 days. We will also calculate the frequency as suggested (here in % AR days in the period as suggested by reviewer RC2).

Rows b), c), and d): I find not clear what is shown in those panels. It is worth mentioning in the text how those "indices" are calculated and keep the same names throughout the manuscript. Can the authors explain why ARs contribute to the yearly maximum (row b) over southwestern Norway or northern UK but barely contribute to the extreme precipitation (row c)?

We regret the confusion that our description of the indices caused. We will exactly explain how the indices are calculated in a revised version (see below).

Row b): I understand this figure as the percentage of years (among the 30 years of the period) for which the maximum precipitation occurs when there is an AR. Is that correct? In any case, the text should be clarified. The same comment applies to the rows c) and d).

Exactly, if in 15 years out of the 30 year period the annual maximum precipitation can be related to an AR we get a value of 50%.

In figure c) we

1. sum up the accumulated precipitation volume that occurs in all rain events that exceed the 95th percentile rain rate.

2. sum up the accumulated precipitation volume that occurs in all rain events that exceed the 95th percentile rain rate and can be related to ARs

3. we calculated how big is the fraction (%) of the sum in step 2 in the sum calculated in step 1.

In figure d)

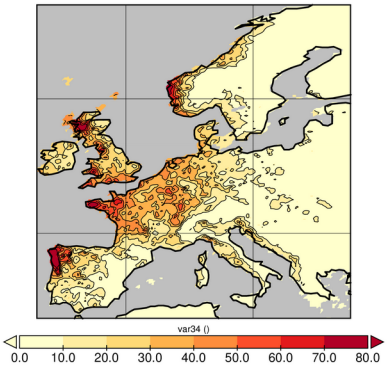
we do same. But instead the >95 th percentile we consider the all rain events (not only the >95th percentile events)

This was done in the same way as done in GAO et al., (2016). See figures 8 & 9 therein. Gao et al. denoted this fractional "fractional contribution of ARs to total precipitation or TO >95th percentile precipitation". We will do the same naming in a revised version.

Row c): how do the authors relate the low values for the Norwegian coast to the study of Benedict et al. (2019) who found that 85% of the extreme precipitation events are related to ARs?

Benedict, I., K. Ødemark, T. Nipen, and R. Moore (2019): Large-Scale Flow Patterns Associated with Extreme Precipitation and Atmospheric Rivers over Norway. Mon. Wea. Rev., 147, 1415-1428. https://doi.org/10.1175/MWR-D-18-0362.1

If we understand Benedict et al., (2019) right, then they calculated the percentage of the number (N) of >99th percentile rain events. This is not what we did. We followed Gao et al. 2016 and calculated the accumulated volume of precipitation (not the number of events; see above). In the below figure we applied the approach of Benedict et al. (2016) to our RCA_ERAI run. As can be seen for southwestern Norway up to 80 % of >99 percentile events are related to ARs which is comparable with Benedict et al., (2019).



% of number of AR related >99th percentile rain events to total number of >99th percentile rain events (as done in Benedict et al., 2019).

- Figure 8: is this figure showing a simple difference between the future and the historical experiments or does it show a relative change?

Figure 8a (AR days) shows a simple difference; not the relative change. Likewise, for figures 8b, 8c, 8d) and 8e) simple differences were shown (i.e. the % values for the future minus the % values for the historical). We will make this clear in revised version.

Caption: I would not call what is displayed "climatological indices". Please remove. Panel b) does not show "precipitation rates" if it is similar to Fig. 5. Please use the same wording for Fig. 8 as for Fig. 5.

We agree. We will fully harmonize figure 5 and 8 in a potential revised version

"Note all non-robust" -> Note that all non-robust

We will change this in a potential new version

What is the difference between panels c and d? One of the two is not shown in Fig. 5.

Figure 8c is showing the change in % of number of events in the 95th percentile (similar to Benedict et al., 2016 but for the 95th percentile instead of the >99th percentile fraction). Figure 8d is the % of accumulated rainfall associated with AR events in the >95th percentile fraction, hence it is the future change to what is shown in 5 c

Why is the unit in panel c is % if the what is shown is "the number of of events" as written on lines 400-401?

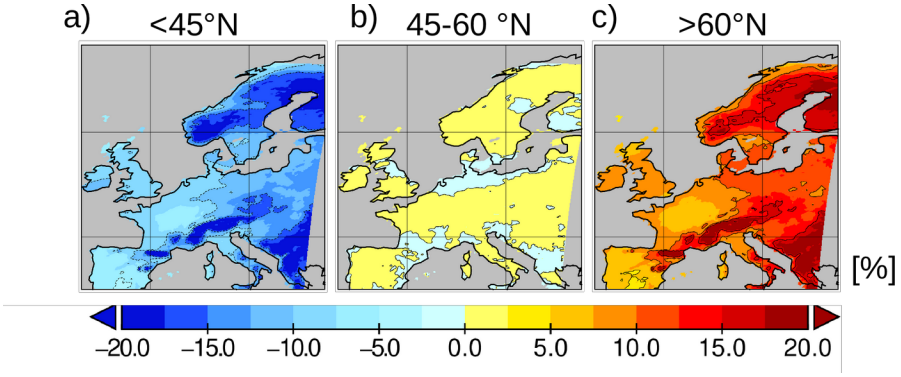
It is the difference change in number of events. Hence, % number of AR events in >95th percentile fraction in future climate MINUS % number of AR events in >95th percentile in historical climate. However, we will remove figure 8c as it does not bring up added information to what is shown in 8d. Then, Figure 8 is will be completely consistent with Figure 5.

- Figure 10: Are the authors sure that panel a) is for ARs originating north of 60ºN and panel b) for ARs originating south of 45ºN? It does not seem in agreement with the text. For example, the sentence "the RCA ensemble clearly shows a relative increase of those ARs originating south of 45ºN (Fig. 10a)." However, Fig. 10a only shows negative values and the caption says that panel a) is for ARs originating north of 60ºN. Please make sure that the caption and text (from line 458 to 475) correspond to the figure. Can the category 45-60ºN be displayed as well? In the caption, what does "relative contribution" mean? Does it show the relative difference between the future and historical experiments or is it a simple difference?

This is a mistake. It should be

"the RCA ensemble clearly shows a relative increase of those ARs originating south of 45ºN **(Fig. 10b)**." (Figure 10b shows increase of originating ARs south of 45°.)

Below we replotted Figure 10 with the fraction 45-60 °N included. The changes are everywhere below 3 %.



Bin-analysis of AR detection along 10°W. a) Fraction of AR occurrences caused by ARs that were detected south of 45°N at 10°W. b) same as a) but for the fraction 45-60°N. C) same as a but for ARs originating from south of 45°N. Shown is the

change for RCP8.5 (2070 - 2099 minus 1970-1999). This figure reads like: In southern Norway the AR fraction from south of 45°N (and at 10°W) reduced by up to 20% in the future climate compared to the historical climate.

In general the figure reflects the fact, that the relative increase in registered ARs along 10°W increases stronger in the south than in the North (see also Figure 8a).

- Figure 11: Why does the color bar for the standard deviation panels exhibit negative values? A standard deviation is positive. Is the STD panel a difference between the future and historical standard deviation or the standard deviation of the responses displayed?

The standard deviation denotes the inter-model spread of the responses. The negative values arise from an automated scaling error in our plotting package. We will remove the negative value from the color bar.

About the figures' quality:

I think the quality of the figures should be improved.

Figures 2, 3, 4, 8, 9, 10, and 11 exhibit gray frames around the panels and around the color bars. Could they be removed?

Figure 9 exhibits a colored line in between the two panels as if another figure was below.

Figures 1, 5, 9, and 10 exhibit weird coastlines over Greece. Moreover, Crete and the Balearic Islands are missing.

Figure 11 has too small labels for the latitudes (longitudes missing) and for the color bars. Moreover, the coastlines are discontinued at 20ºE.

Figures 4, 6, and 7: the frames, tick marks, and background grids are almost invisible. Please make them darker or black.

Figures 7, and 11, and Tables 2 and 3: Please arrange the GCMs in alphabetical order as the authors did for Fig. 2.

It would be great if all figures showed the same domain.

Figure 8: can the columns be rearranged such that RCP2.6 is on the left and RCP8.5 on the right? I find it more intuitive and it would be consistent with Figs. 2 and 7 and Tables 2 and 3.

Figure 2: the gray and yellow lines are barely visible.

Figure 5: In the left column, panels b), c), and d) should have RCA_MEAN as title instead of RCA_ENSM. Better remove the titles of the three bottom rows as it would make the panels bigger, improving their readability.

In case a resubmitting is encouraged, we will replot all the figures taking into account the above recommendations together with those from the other reviewers.

Minor comments:

Lines 25-28: it seems from this sentence that Norway is in Central Europe. Please rewrite this sentence, maybe splitting it in two.

We agree.

Sometimes, the authors write ERA-I and sometimes ERAI. Please be consistent in the text and captions and make sure the same acronym is used everywhere (I suggest ERAI).

We agree.

Line 138: why is the coupling between the RCA model and NEMO only over the North and Baltic seas? What about the Mediterranean and the Norwegian seas?

The regional setup of NEMO was originally developed for the North Sea and Baltic Sea which need a very high grid resolution (~3.7 km on average, and 56 vertical levels). Hence NEMO needs very high computational resources. Therefore the other sea had to be excluded.

Line 151: "in a huge ensemble": to which ensemble do the authors refer to? Does it have a name? This ensemble seems similar to the one used in the present study so why not using it?

Yes it's the same ensemble. Will will make this clear.

Caption of Figure 1: Please rewrite it. This figure mainly shows the topography of the domain in brown and the bathymetry in blue-green colors.

We will change the caption appropriately.

The authors very often use very "greenhouse gas scenarios". I suggest to use instead "greenhouse gas emission scenarios" or probably better "GHG emission scenarios".

We agree.

Lines 202-203: please add the units of g, the wind, and dp.

Will be included.

Line 203: "In the two hydrostatic models…": I assume that the authors here refer to the regional climate model RCA and to the IFS model. Why does the reader need this information?

Yes, the information is obvious from the equation, so we can remove the sentence.

Caption of Fig.2 : "IVT thresholds" -> 85th percentile of IVT

will be changed.

"…for the ensembles' historical…" -> … for all models and the historical…

will be changed.

Line 278 (page 10): "heavy precipitation": please write that this is defined using the 95th percentile in order to relate it to what is shown in Fig. 5c.

Will be done.

Lines 279-280: What are "the mean climatic conditions in Europe"? Moreover, it rains a lot in Southwestern Norway and that is not reflected in Fig. 5a.

What we basically want to express is: in humid regions with plenty of rain (both in the total and >95th percentile fraction) ARs can not contribute to the total rain as they do in dryer regions (like Iberia). We will either rephrase this or remove the part of the sentence.

Line 296: What is meant with "weather regimes"? Moreover, what is the point of lines 295-298?

With weather regimes we mean frequently re-occuring synoptical weather patterns such as investigated in Pasquier et al., 2020). We will include a reference to the study of Pasquier at this place.

We wanted to make clear that individual ARs in historical simulations of global climate models can not be directly compared to ARs in hindcast simulations. May be not all readers are aware of this.

Line 321: Do you mean effect of the downscaling? With "regionalization", it sounds to me like the authors split the domain into different regions.

We used the two term synonymous. We will replace "regionalization" by "downscaling" in a next version

Line 324: Can the authors explain the “factor of 10”?

The factor refers to the grid cell size in RCA (550-600 km^2) and the ERAI reanlysis (~6000 km^2)

Line 378: “AR” -> ARs

will be changed.

The reference Massoud et al. (2020) does not seem appropriate here as the paper is not about the US but about the Middle East. Maybe the authors meant the following reference:

Massoud, E. C., H., Lee, P. B., Gibson, P., Loikith, and D. E., Waliser (2020): Bayesian Model Averaging of Climate Model Projections Constrained by Precipitation Observations over the Contiguous United States, Journal of Hydrometeorology, 21, 2401-2418. https://doi.org/10.1175/JHM-D-19-0258.1

We will check and change accordingly. Thank you for the hint.

Lines 418-419: what is meant with “contribution anomalies”? Could it be replaced by responses?

Refers mainly to figure 8d,e. “Contribution anomalies” meant contribution of AR forced rain to the >95th percentile precipitation and contribution AR forced rain to total precipitation.

Line 488: RCA-IPSL and RCA-MPI have weaker responses than GFDL, CAN, and NORESM over the North Atlantic, don’t they?

Yes, we will change this accordingly.

Lines 524-525: “This was done… period (Neiman et al. 2008).” I do not understand how this sentence justifies the use of a different 85th percentile in the historical and future experiments.

We will rewrite this: The detection algorithm was developed based on weather data for the present-day reference period (1998-2005). During this reference period it was found that the 85th percentile moisture content at noon (12:00) time steps corresponds to the median moisture contents found in ARs. Our figure 2 shows that the 85 percentile value strongly increases in the future climate. Hence, assuming that the relationship (85 percentile – median AR) is an intimate criteria to distinguish AR from the background we used the 85th percentile value calculated from the future climate.

Lines 558-559: “Generally the AR imprint…eastern Europe.” Isn’t this sentence in contradiction with Fig. 5 where larger values are found over western Europe?

Yes, in case of western France and the UK this is true. In case of Iberia the impact in ERAI is lower. We will adapt this sentence in a revised version.

Technical issues:

Consider using commas much more often than currently.

Thank you very much for the careful reading. We will adapt all the found typos and technical issues. We will also pass the manuscript a professional language service before any re-submission.

Line 22: "ER" -> ERA

Line 24: "eat" -> east

Lines 34, 426: "maximal" -> maximum

Line 37: "Iberia(15" -> Iberia (15

Line 40: "likely the originate" -> likely originate

Line 41: "from >60 ºN" -> from latitudes >60 ºN

Line 64: "Pacific Sectors of the World Ocean" -> Pacific sectors

Lines 75, 79, 194: "Laver" -> Lavers

Line 80: "However they" -> However, they

Line 90: "AR" -> ARs

Line 103: "framework employed" -> frameworks

Line 114: "4.5,RCP8.5" -> 4.5, RCP8.5

Line 118: "a validation RCA" -> a validation of the RCA

Line 135: "2005)and" -> 2005) and

Caption of Fig. 1: "Bathymetricy" -> Bathymetry

Line 165: "hindcasst" -> hindcast

Line 180: "W/m2" -> W/m^2

Line 206: Remove “Then”.

Lines 223-224: “for each of the ensemble members respectively” -> for each model

Caption of Fig. 3: “below the threshold” -> below the 85th percentile

Caption of Table 3: “number ARs” -> number of ARs

Caption of Fig. 4: “b):” -> b)

Line 253: “AR” -> ARs, “Fig. 4” -> Fig. 4b

Line 281: “Bretagne” -> Brittany (to be consistent with line 579)

Line 300: Add parenthesis before Fig. 5.

Lines 279, 290, 299, 300, 422: “Figure” -> Fig.

Line 304: “respectively calculated as 0.98” -> respectively 0.98

Line 306: remove “respectively”

Line 314: “is” -> are

Caption of Fig. 6: “detercted” -> detected, “precentage” -> percentage, “AR” -> ARs

Line 323: “is” -> are

Line 325: “of spatial” -> of the spatial

Line 332: “ERAI-” -> ERAI

Line 333: “and larger” -> and a larger

Lines 335, 559: “distal” -> distant

Line 336: “This implies ARs” -> This implies that ARs

Line 338: “as in in semi aride”: remove one “in”

Line 339: “effect the of” -> effect of

Line 346: “Fig. 5b” -> Fig. 5d

Line 360: remove “which is notably lower”

Line 383: “frequency” -> number

Line 398: “5b) no” -> 5b) but no

Line 400: “Figure 8c shows the number” -> Figure 8c shows that the number

Line 404: remove “Apart from this”

Line 412: “Figures” -> Figure

Line 420: “stronger” -> more

Line 421: “response” -> responses, “is” -> are

Line 424: the reference to the paper of Teichmann et al. 2018 is missing in the reference section.

Line 440: add comma between “latitudes” and “it” and remove comma after “found”.

Line 445: “main driver AR” -> main driver of AR

Line 446: “Jet” -> jet

Line 451, 454: maybe not use “incidents” but rather events

Line 455: “for high” -> for the high

Line 460: remove “degree”

Lines 473-474: “sectors” -> sector

Line 483: “frequency of ARs” -> number of days with ARs

Line 484: “similar RCA” -> similar to the RCA

Line 489: “RCA-ECE show” -> RCA-ECE shows

Lines 490-491: “one realisation shows wider” -> RCA-MIROC shows wide, and remove “(RCA-MIROC)” at the end of the sentence.

Line 496: add comma after RCA-MPI

Line 501: “the most heavy” -> the heaviest

Line 504: “is” -> are

Lines 507-508: remove at least one of the “likewise”.

Caption of Fig. 11: “forrcing” -> forcing

Line 519: “2016; 2016;” either a reference is missing or there is one “2016” too much.

Line 541: “Norway(Fig. 11c)” -> Norway (Fig. 11c)

Line 551: “model with” -> model ensemble with, “was applied” -> was created

Line 552: “regionalization” -> downscaling

Line 555: “the contribution to” -> the contribution of ARs to

Line 563: “climate” -> climates

Line 571: “of orographic” -> by orographic

Line 575: “show ARs” -> show that ARs

Line 588: “favors” -> favor

Line 589: “stronger” -> more strongly

Line 596: “arriving Scandinavia” -> arriving to Scandinavia