

Recent trends in daily rainfall extremes over Montenegro (1950 – 2010)

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General comments

In this study the authors analyze trends in precipitation over Montenegro during 1951-2010 with the aid of a set of precipitation indices. This study is a valuable contribution to the overall attempt to understand climate change and its impacts, an effort that also requires the identification of recent trends on a finer scale. The study sets some specific targets that are fully accomplished with the aid of a number of well-established precipitation indices. Thus, the methodology used is clearly defined. The readability of the manuscript could be benefited by changes at the writing level and below I make such suggestions. My recommendation is that the manuscript could be accepted for publication by the journal of Natural Hazards and Earth System Sciences subject to the following, essentially minor, corrections:

Specific comments

- 1) Page 2348, lines 10-15: It is not necessary to describe the software package in the Abstract but it is preferable to highlight the results. Also the concerning the influence of the NAO, the authors could consider shortening the last two sentences and just describe what is the relation between the NAO and precipitation over Montenegro.
- 2) Page 2352, line 7: Do you actually mean “precipitation distributions” here?
- 3) Page 2352, lines 22-25: Perhaps I am missing something here but could you please elaborate on how the variable “mean rainfall” mentioned here is constructed and how its trend in (%/dec) is calculated? This is also depicted in Figure 2. In the case it is mean rainfall then the trend should be in mm/dec. Please clarify.
- 4) Page 2353, line 5: Please elaborate on the meaning of the “anomalies” mentioned here.
- 5) Page 2354, lines 1-3: The material here concerning the influence of the NAO on the rainfall over the western Mediterranean is not relevant.
- 6) Page 2354, line 6: What is the definition of the “consecutive number of dry days” used in this study? Please elaborate.
- 7) Page 2355, line 5-7: Perhaps I am missing something here but I cannot see this contrast between the eastern and western part of the country during spring. Please comment.
- 8) Page 2356, lines 4-10: In this part of the manuscript several figures are discussed briefly. Perhaps you could consider reducing their number to the absolutely necessary to convey your message and/or move some of them in a supplement.
- 9) Page 2357, lines 7-13: Please consider to shorten this paragraph. The focus should be on the results/conclusions in the conclusion section .

Technical corrections

- 1) Page 2348, line 19: Please replace “in the Mediterranean” with “over the Mediterranean” and similarly throughout the text.
- 2) Page 2348, line 19: “serious implications on the environment, society and economic sectors” -> “serious environmental, societal and economic impacts.”
- 3) Page 2348, line 21: “Kostopoulu” -> “Kostopoulou” and similarly throughout the manuscript.
- 4) Page 2348, line 23-24: I have difficulties to understand the sentence “Agricultural ... implicate farming”. Please rephrase.
- 5) Page 2349, line 3: “for whole” -> “for the whole”.
- 6) Page 2349, line 4: Delete “(95% confidence level)”
- 7) Page 2349, line 6: “wet day amounts” -> “wet days amounts”
- 8) Page 2349, lines 7-8: Please rephrase the sentence “Authors.... Spatial pattern”. Something is missing.
- 9) Page 2349, lines 14-15: “Other regions... also showed tendency...” -> “A tendency towards drier conditions but also for extreme rainfall has been identified over other regions across the Mediterranean, including Italy, the Balkans, Cyprus and Israel.”
- 10) Page 2349, line 24: “Recent study of ...” -> “Recently, Ziv et al. (2014)...”.
- 11) Page 2350: line 5: “increased 1.8 %” -> “increased by 1.8 %”.
- 12) Page 2350, line 7: “precipitation days” > “wet days” ?
- 13) Page 2350, lines 8-13: This paragraph could be written as follows: This study aims at the investigation of trends in rainfall extreme indices over Montenegro and their spatial patterns using web mapping techniques. Following the study by Buric et al. (2011) that postulated a link between the North Atlantic Oscillation (NAO) and rainfall over Montenegro, here we quantify the influence of the NAO on the rainfall extreme indices.”
- 14) Page 2350, line 22: “the area” -> “an area”
- 15) Page 2350, line 27: “varies a great deal from” -> “ranges from...”
- 16) Page 2353, lines 10-11: This sentence could be rephrased as follows: “As a proxy for the North Atlantic Oscillation, we use the NAO index¹ defined as an air pressure difference between Iceland and Azores.”
- 17) Page 2352, line 20: What do you mean by “within the indices” ?
- 18) Page 2352, line 25: Please rephrase “Normal 1961-1990”.
- 19) Page 2353, line 16: “bar graph” -> “bar graphs”.
- 20) Page 2353, lines 18-19: “at 95%” -> “at the 95%”, “by black line” -> “by black lines”.

- 21) Page 2353, lines 23-24: "in Mediterranean region of the country" - > "near the Mediterranean coast of the country".
- 22) Page 2353, lines 26-27: "Similar pattern" - > "A similar pattern", "is shown by..." -> "was found by ...".
- 23) Page 2354, line 18: "on spring" -> "during spring" and also correct throughout the manuscript.
- 24) Page 2354, line 11: "future drought" - > "future drought conditions".
- 25) Page 2355, line 21: "concentrate" - > "we concentrated".
- 26) Page 2355, line 23: "of North-Atlantic storm tracks" - > "associated with the North Atlantic storm track"
- 27) Page 2356, line 1: "West Europe" - > "western Europe".
- 28) Page 2357, lines 16-18: Please rephrase this sentence.
- 29) Page 2363: "Locations of the stations" - > "Location of the stations and elevation of Montenegro."