

## ***Interactive comment on “Estimating the water needed to end or ameliorate the drought in the Carpathian region” by T. Antofie et al.***

### **Anonymous Referee #2**

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Review of “Estimating the water needed to end or ameliorate the drought in the Carpathian region” by Antofie et al. The paper sets out to quantify the amount of water needed to ameliorate drought in the Carpathian region. The paper is a case study of applying the Palmer drought index. As a part of the special issue I will recommend the paper for publication, but first after a major revision.

#### Main comments

1. The authors come to the conclusion that the most likely end of a drought is during the wet season, and vice versa. This reasoning is not correct. Obviously, a wet climatological period will on average end a dry period, but that is not how the end of a dry period is usually defined. A drought is defined as the anomaly of a time period (month,

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several months, season) against its own climatology. For longer periods of accumulation, a wet season will obviously dominate the drought signal, therefore a wet anomaly in the normally wet season leads to a recovery regardless of the precipitation of the dry season. This is trivial, and hardly something to discuss. The most trivial example is the dry season being interrupted by the monsoon/rain season. The real problems starts when there is a dry anomaly in the wet season. The recovery of droughts should rather be studied with regards to the inter-annual variation of the precipitation and what governs this. Obviously, even a wet anomaly in the dry season could compensate for this. Therefore, my suggestion in the review process: Can the recoveries be related to large-scale patterns, or are they random variations? If the answer to the former is yes, then can they be predicted?

2. The authors do not mention the motivation of the study until the end of the results section, where the winter wheat is mentioned. Please start off the paper with this information. Furthermore, there is little information on when is the sensitive period for these crops. I would assume that most important would be to have enough water during the initial growing period, but it is important to have a wet winter, or it is enough with spring rains? My point is that the authors should concentrate on the most important and sensitive season and accumulation time. This would also make the analysis easier.

3. Why was the Palmer drought index used? It is not very commonly used outside the US and it has clear disadvantages? SPI is the index recommended by WMO, and it should at least be used as a comparison index. If you want to include soil moisture also standardized soil moisture index could be used.

4. Figure 3 and 4 nicely shows what I think is an inherent problem in the Palmer index. From this it is obvious that the number of severe and extreme droughts are grossly overexaggerated. I cannot from this draw any conclusions on the reason behind this, but it might be a problem in the calibration of PDSI or the fact that it is a cold region, or that two short time periods are evaluated. Using the numbers from table 1 you can see that the categories slightly wet to extremely wet comprise 25% of the cases, whereas

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slightly dry to extremely dry 41%. There is a dry bias in the current setup of PDSI which will also bias your results. 5. How exactly do the authors define a drought? In the Appendix you mention that extreme “wet/dry spells” should be at least 3 months? But in the results you talk of extreme droughts occurring 5-45 days per year? I assume you mean the daily index temporarily goes below extreme values, but that is a short dry spell, not a drought.

Minor comments:

1. You used the term “ameliorate” in the title, and that is correct English. However, even though I consider myself to be able to read English at a professional level I had to look up the word to be certain what it meant. I would seriously consider to replace it with something more common.
2. P1496, L14. You state here that PDSI can be used as meteorological, hydrological and agricultural drought index, but also indexes like SPI and SPEI can be used the same way, it is more a matter of the time scale.
3. P1496, L22-25. Sentence is not easy to understand, please rephrase.
4. Figure 1. Please improve the figure with country names, colorbar for elevations, and put it into a European context.
5. Figure 8 is too small and cannot be interpreted.

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