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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Vegetation vulnerability to drought on southeastern Europe" *by* Patrícia Páscoa et al.

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1. The title of the manuscript is a mistake, since the content does not refer to other territory than Romania. Eastern Europe holds a very diverse geography, so that doing a study on Romania and pretending it is about Eastern Europe is huge mistake. Such a market strategy is used to attract public and citations, but it is not a fair approach.

Response: It was not our intention to mislead the readers when choosing this title. The study area encompasses several other countries including the whole Moldova, and parts of Ukraine, Hungary, Serbia, Bulgaria, and Slovakia. However, and as we akcnowledge the reviewer's concern, the title was changed to: "Vegetation vulnerability to drought in Romania and Moldova regions".

2. Lines 185-190: "Negative correlations are more frequently found on the months of May and June" - can you explain why the correlations are more frequent in May and June?

Response: This result is discussed on the Discussion section as follows:

'Levanič et al. (2013), when analysing the relation between Pinus nigra tree-ring widths from southern Romania and monthly precipitation, as well as 3-month SPI, found July to be the month with the highest correlation with precipitation, whereas July, August, and September showed a high correlation with SPI. Moreover, SPEI and NDVI correlations respond to the water balance, and SPEI tends to increase when NDVI decreases (Vicente-Serrano et al., 2013). In the study area, monthly mean precipitation reaches its maximum in June (Koleva et al., 2008; Cheval et al., 2011; Spinoni et al., 2015), and the maximum temperature occurs in July (Spinoni et al., 2015; Dascălu et al., 2016), which points to increased soil water stress that could explain the increase in the correlations between SPEI and NDVI.'

3. The same amendments would be nice for the next paragraphs, as they are mostly descriptive and not enough explanations are provided.

Response: A short explanation will be added in order to clarify the referred issue. We initially decided to discuss the results only in the last section, but taking into account the comments from all the reviewers we will include in the Results section some interpretation, so it won't be as descriptive. Accordingly, we will also improve the Discussion section.

4. Why no correlation in June for "the area south of the Carpathian Mountains" (L194) and "The areas showing positive correlations from April to June are mostly agricultural land" (L197), so including the areas south of the Carpathians?

Response: The sentence 'The areas showing positive correlations from April to June are mostly agricultural land' refers to Figure 3, (as is stated). It is also stated that

this area ‘exceeds 37%’, which is the value obtained in June at 6 months SPEI. This implies that around 63% of the agricultural land does not present positive correlations in June, and therefore we do not consider that the sentences quoted by the Reviewer are contradictory.

5. Lines 214-219: as mentioned before, the explanations are almost missing, while the very simple description fills the lines. For example, why the standard deviation is lower until July in some forests?

Response: We agree that some details are needed in the results section and accordingly to the comments of the reviewers we will add additional information. In particular, a short explanation will be added in order to clarify the referred issue.

6. The section 3.3 is a very poor description of the drought event 2000/2001, with no explanation and no positioning in the general context of the droughts in Romania, not to say SE Europe as pretended in the title.

Response: The 2000/2001 drought event in SE Europe was chosen for analysis because it is well known and documented, being categorized as one of the worst in the region (http://www.geo.uio.no/edc/droughtdb/edr/DroughtEvents/_2000_Event.php) with strong impacts in several sectors, namely agriculture (Sepulcre-Canto et al., 2012). This drought affected several countries, namely Romania, Hungary and Bulgaria (Sepulcre-Canto et al., 2012), as well as Greece, Turkey and the Balkan countries (http://www.geo.uio.no/edc/droughtdb/edr/DroughtEvents/_2000_Event.php). The extent of this drought episode is depicted on Fig.1, showing the drought classification, as assessed by SPEI 12, across Europe, in February 2001 (http://spei.csic.es/map/maps.html). A short explanation will be added in Introduction and sections 2.4.3 and 3.3 in order to describe with more detail the severe character of the drought event of 2000/2001.

7. The authors claims that "In this section we assess the impact of the strong drought episode of 2000/2001". In reality, the impact has been mentioned very poorly men-

tioned in the section.

Response: In this topic we will clarify in our work that the aim is to analyse and assess the drought (characterized by means of SPEI) impacts on vegetation activity, as obtained using remote sensing data (NDVI). The type of analysis throughout the manuscript was already adopted in several works (Ji and Peters, 2003; Lotsch et al., 2003; 2005; Quiring et al., 2010; Brown et al., 2008; Wang et al., 2015; Vicente Serrano et., 2012; 2013; 2014; Gouveia et al., 2017). The scientific recognition of these methodologies to achieve the goals we proposed lead us to apply this well-known methodology to a very interesting region that we thought lacked studying. Accordingly with our goal and the methodology used in the manuscript, the results described on section 3.3 were obtained considering the months of April to October of the year 2000, corresponding to the months of high vegetation activity. We included two figures (Fig. 9 and 10) that fully support our results. The methodology used allowed to quantify the drought duration and area stricken and presenting vegetation under stress conditions (showing low NDVI anomalies). Fig.9 also allow the evaluation of drought occurrence. Additionally, we also assessed the stress shown on each land cover type in Fig.10. These impacts of drought on vegetation dynamics, namely their duration, frequency and extension, were discussed on the Discussion and Conclusions section on Line 345 Moreover, the analysis of the impacts of drought on different socio-economic sectors, such as agriculture or water storage is not the aim of this work, but will be the purpose of an additional work, now in preparation. However, and acknowledging that the main target of our analysis is misleading, we opted by clarify this issue in the above mentioned sentence, as follow: ‘In this section we assess the impact of the strong drought episode of 2000/2001 on vegetation activity, as described using satellite data (NDVI)’

8. This is valid with section 4 too, where the authors claim again that "impacts of droughts on vegetation were analysed". The drought impact is actually indirectly tackled in this paper in the form of the well-known relations between SPEI and NDVI.

Response: Please see answer to previous comment.

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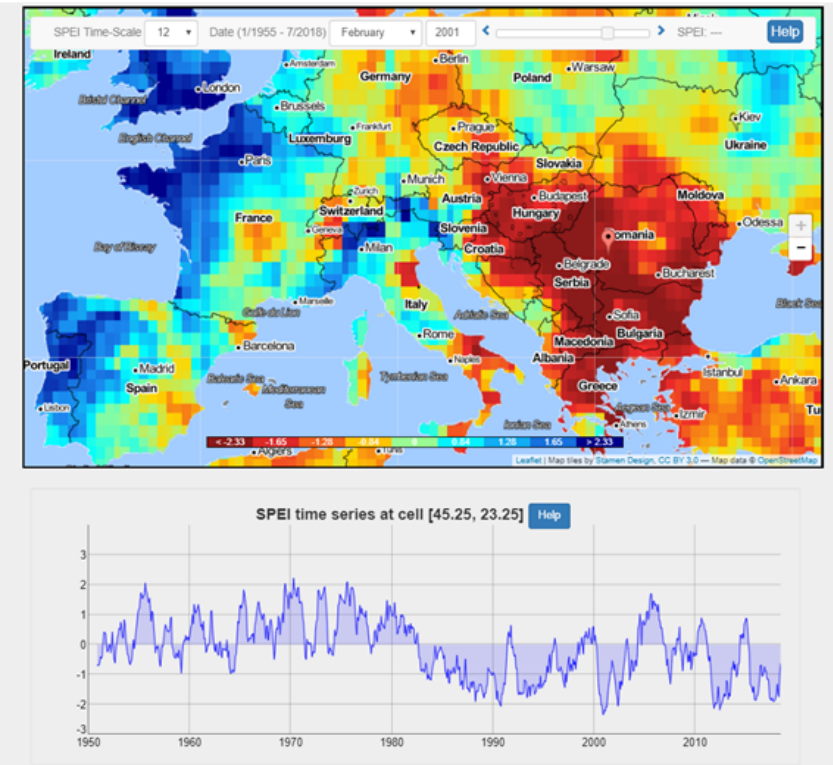

Fig. 1. SPEI 12 across Europe, in February 2001