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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "The Impact of Drought on Soil Moisture Trends across Brazilian Biomes" *by* Flavio Lopes Ribeiro et al.

Anonymous Referee #1

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The authors analyze large scale soil moisture trends, obtained from satellite soil moisture (ESA), as a means to estimate drought risks for specific biomes. They focus on Brazil as case study. Given the variety of biomes and the recurrent droughts in the past decade, Brazil is ideal for studying the impact of droughts. The authors observe different soil moisture trends between biomes, which they attribute generically to their different response and vulnerability to droughts. The authors conclude by proposing the integration of satellite soil moisture observations into drought monitoring.

The paper is well-written and easy to follow, especially given the simple structure "Methodology – Results and discussion – Conclusion". I do have, however, two major comments.

Satellites provide soil moisture for the first 5 cm of soil. This is an important limitation.

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The first 5 cm of soil is not representative of soil water storage. For example, in the Amazon or Cerrado soils can be very deep and clayey. Although in tropical soils the organic layer can be thin, deeper layers still represent an important water storage. Also, the rooting system grows below the first 5 cm, so these soil moisture estimates cannot directly inform us on plant available water storage and, consequently, on risks for vegetation productivity. Another important aspect of surface soil moisture is that the first 5 cm are expected to be very dynamic, since it is the first layer exposed to the atmosphere. As a result, one expects a weak autocorrelation, so that it is difficult and ambitious to link the observed soil moisture trends (over 7 years) to the occurrence of specific droughts during the study period. The authors should at least amply discuss this, because this is an important aspect limiting the use of satellite soil moisture.

While reading the manuscript, I was expecting to see the temporal evolution of drought indexes across Brazil. In my opinion, to put their study into context it is key that the authors show how commonly use droughts indexes vary during the study period. One example is the popular Palmer drought index, but there are others. A comparison between these indexes and the soil moisture trends analyzed by the authors might help understand if some information that is missing in drought indexes can be retrieved from soil moisture analyses. In my opinion, this would be critical to evaluate the impact of the paper.

Minor comments

In the introduction the authors say: “Soil moisture decline reduces biomass. . .”. I would be careful here. A soil moisture decline may limit vegetation growth and microbial activity, but only if soil moisture declines below critical water stress thresholds.

In the same paragraph, the sentence “Indeed, temporal variability of soil moisture in a given biome is needed..” is not very clear. I suggest rephrasing and elaborating a bit.

Two paragraphs later “Most work has been focused on the semiarid..”. It is not clear why this paragraph is placed here. What work are they referring to? Besides the

abstract, this is the first time they mention Brazil in the paper and the reader does not know why.. This paragraph should probably be moved to later in the introduction.

With a more thorough and quantitative analysis of droughts in Brazil (by means of drought indexes), the discussion should be revisited.

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