

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

Anonymous Referee #2

Received and published: 23 July 2020

The authors quantify the impact of drought on soil moisture patterns (27 x 27 km grid size) acquired from satellite platforms (European Space Agency, 2009-2015) in six different biomes (Amazon, Atlantic Forest, Caatinga, Cerrado, Pampa, Pantanal) in Brazil. A general decline of -0.5% / year is observed at national level with Caatinga showing the most severe soil moisture decline. The evaluation of this manuscript is based on the following questions: 1) Is it a novel work based on a reliable scientific technique? 2) Is it clearly structured and well-written? 3) Are the experimental design and analysis of data adequate and appropriate to the investigation?

Line numbers are missing, therefore it is difficult to post specific comments. The manuscript is well-written but in its current form seems a good scientific report rather than an article. I struggle to find a novelty in this manuscript since the authors simply

C1

apply known statistical methods to near-surface soil moisture maps. Therefore I highly recommend to re-submit the manuscript by adding something interesting to relate climate drought to soil moisture drought. Some further “quantitative” analysis is required (Van Loon, 2015; von Gunten et al., 2016; Hein et al., 2019; Nasta et al., 2020). 1) Climate drought indexes: please see <https://spei.csic.es/home.html> and associated references 2) Soil moisture index: please see Hunt et al. (2009), Martínez-Fernández et al. (2015), Sánchez et al. (2016) Satellite measurements provide indirect estimates of soil moisture only in the topsoil, and unfortunately do not provide soil water storage. Moreover dense vegetation cover disturbs the satellite measurements therefore the authors should devote a sub-section on discussing on these issues. Moreover soil moisture observations from 2009 till 2015 do not drive to strong conclusions on temporal evolution, so the authors should warn the reader that this observation is based on very short time series. Usually drought indexes require necessarily at least 30 years of observations. I understand that satellite data provide only short-term temporal evolution but the authors should highlight this issue. Are there any comparisons between satellite-based soil moisture and ground-truthing in Brazil? The authors should also comment on measurement uncertainty

References Hein, A., Condon, L., Maxwell, R. 2019. Evaluating the relative importance of precipitation, temperature and land-cover change in the hydrologic response to extreme meteorological drought conditions over the North American High Plains. *Hydrological Earth Syst. Sci.*, 23, 1931–1950, 2019 Hunt, E.D., K.G. Hubbard, D.A. Wilhite, T.J. Arkebauer, and A.L. Dutcher. 2009. The development and evaluation of a soil moisture index. *Int. J. Climatol.* 29:747–759. doi:10.1002/joc.1749 Martínez-Fernández, J., González-Zamora, A., Gamuzzio, A. 2015. A soil water based index as a suitable agricultural drought indicator. *Journal of Hydrology* 522, 265–273 Nasta, P., C. Allocca, R. Deidda, N. Romano. 2020. Assessing the impact of seasonal-rainfall anomalies on catchment-scale water balance components. *Hydrological Earth Syst. Sci.* 24:1-17 Sánchez, N., Á. González-Zamora, M. Piles and J. Martínez-Fernández. 2016. A New Soil Moisture Agricultural Drought Index (SMADI) Integrating MODIS and SMOS

C2

Products: A Case of Study over the Iberian Peninsula. *Remote Sensing*. 8, 287; doi:10.3390/rs8040287 Van Loon, A.F. 2015. Hydrological drought explained. *WIREs Water* 2015, 2:359–392. doi: 10.1002/wat2.1085 von Gunten, D., T. Wöhling, C. P. Haslauer, D. Merchán, J. Causapé, and O. A. Cirpka. 2016. Using an integrated hydrological model to estimate the usefulness of meteorological drought indices in a changing climate. *Hydrol. Earth Syst. Sci.*, 20, 4159–4175

Interactive comment on *Nat. Hazards Earth Syst. Sci. Discuss.*, <https://doi.org/10.5194/nhess-2020-185>, 2020.