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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Modeling the response of soil moisture to climate variability in the Mediterranean region" *by* Louise Mimeau et al.

Anonymous Referee #2

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I am very excited to see a manuscript that (finally) shows changing rainfall intermittency is important for soil moisture and hence flooding. This is very important and timely work. I can only expect (and look forward to) seeing the follow up work to this study involving the impact on flooding. Please see my minor (and bordering on pedantic) suggestions below.

I am not sure on the format of HESS – but the "Annexe" references didn't quite match the SI for me. I am not sure I saw a reference to the full calibration parameters?

Page 1, Line 6: "on a 10 year time period" -> "for a 10 year time period"

Page 2, Line 4: I would appreciate Wasko and Nathan (2019) to be cited alongside these as, though similar to Bennett et al (2018), it goes beyond to quantify the impact

of soil moisture changes with flood recurrence.

Wasko, C., & Nathan, R. (2019). Influence of changes in rainfall and soil moisture on trends in flooding. Journal of Hydrology, 575, 432–441. https://doi.org/10.1016/j.jhydrol.2019.05.054

Page 1, Line 9: Just wonder if the following also supports the drying trend you are referring to.

Rodell, M., Famiglietti, J. S., Wiese, D. N., Reager, J. T., Beaudoing, H. K., Landerer, F. W., & Lo, M. H. (2018). Emerging trends in global freshwater availability. Nature, 557(7707), 651–659. https://doi.org/10.1038/s41586-018-0123-1

Page 1, Line 20: Obviously I am more familiar with Australian references, but the following evaluates in-situ soil moisture. I would make the point that one issue with evaluation is the different depths that are measured and modelled by all products.

Holgate, C. ., De Jeu, R. A. M., van Dijk, A. I. J. ., Liu, Y. ., Renzullo, L. J., Vinodkumar, et al. (2016). Comparison of remotely sensed and modelled soil moisture data sets across Australia. Remote Sensing of Environment, 186, 479–500. https://doi.org/10.1016/j.rse.2016.09.015

Page 3, Line 2: Please have a look at the following as I think it is also looking at soil moisture using a scenario-neutral approach:

Stephens, C. M., Johnson, F. M., & Marshall, L. A. (2018). Implications of future climate change for event-based hydrologic models. Advances in Water Resources, 119, 95–110. https://doi.org/10.1016/j.advwatres.2018.07.004

Figure 1: If it isn't too much of a hassle it would be nice to see Figure 1 include an inset of the study site in the context of the greater region (as I am not familiar with the study region). But this is only a suggestion and I don't mind if this isn't performed.

Page 7, Line 2: "series"

Page 8, Line 5: I recognize studies often change all the parameters in the NSRP model for downscaling (e.g. Bordoy and Burlando, 2014). If you are looking for examples of where a parameter is fixed in stochastic generation based on, for example, physical intuition you can see Wasko et al (2015) and Onof and Wheater (1994).

Bordoy, R., & Burlando, P. (2014). Stochastic downscaling of climate model precipitation outputs in orographically complex regions: 2. Downscaling methodology. Water Resources Research, 50(1), 562–579. https://doi.org/10.1002/wrcr.20443

Wasko, C., Pui, A., Sharma, A., Mehrotra, R., & Jeremiah, E. (2015). Representing low-frequency variability in continuous rainfall simulations: A hierarchical random Bartlett Lewis continuous rainfall generation model. Water Resources Research, 51(12), 9995–10007. https://doi.org/10.1002/2015WR017469

Onof, C., & Wheater, H. S. (1994). Improvements to the modelling of British rainfall using a modified random parameter Bartlett-Lewis rectangular pulse model. Journal of Hydrology, 157, 177–195. https://doi.org/http://dx.doi.org/10.1016/0022-1694(94)90104-X

Page 8, Line 14: “resumes” -> “presents”

Page 8, Line 21: where you say the modelling chain is processed 20 times, I think you mean to say “stochastic replicates” or “simulated ensembles” – this terminology I think is clearer.

Page 9, Line 8: A typo has occurred. Remove “the)”?

Section 4.1: These increases of say 432mm, is this for one site in particular? Or across all the sites on average? I am a bit confused here.

Page 10, Line 9, 12: “The” NSRP model?

Page 10, Line 18: “Opposite” -> “Alternatively”

Page 15, Line 1: “The Figure” -> “Figure”

Page 15, Lin 9: “became” -> “be”

Figure 9, 11, 12 captions: I think these say “extreme” drought while in other parts of the manuscript you just say “drought”. I would stick to the terminology “drought”.

Page 17, Line 7: Can you mention in the text what the blue and red symbols in Figure 10 are and maybe specifically mention how the RCP changes predicted are at the “extreme” ends of your scenario space. If I have interpreted the results correctly his point was lost on me but is very important to highlight I think?

Page 21, Line 2: The following manuscript is one of the few manuscripts demonstrating how drier soils interact with higher precipitation intensities.

Wasko, C., & Nathan, R. (2019). Influence of changes in rainfall and soil moisture on trends in flooding. Journal of Hydrology, 575, 432–441. https://doi.org/10.1016/j.jhydrol.2019.05.054

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