Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2018-108-AC2, 2018
© Author(s) 2018. This work is distributed under
the Creative Commons Attribution 4.0 License.

Hydrology and Earth System Sciences
Discussions
Open Access
EGU

Interactive comment on "Exploring seasonal and regional relationships between the Evaporative Stress Index and surface weather and soil moisture anomalies across the United States" *by* J. A. Otkin et al.

J. A. Otkin et al.

jasono@ssec.wisc.edu

Received and published: 20 July 2018

Anonymous Referee #2 Received and published: 18 July 2018

The manuscript presents a straightforward, correlation-based analysis of the linear relationship between the Evaporative Stress Index and a variety of land and atmosphere variables. The methods are simple and robust, and the results and conclusions of the paper are relevant and impactful, particularly for the drought monitoring/forecasting community. I have a few questions and issues with the manuscript in its current form,

Printer-friendly version

Discussion paper

CC BY

but I recommend accepting the paper for publication once these issues are addressed.

Specific Comments:

1) The main issue I have with the study is the use of CFSR without ample justification. Because the atmospheric variables are a key part of the study, more details are needed for CFSR. Which of the variables used are observations that are assimilated into CFSR and which are modeled. Did you perform any kind of data verification or comparison with actual observations to ensure data fidelity? NCAR's CFSR data page (https://climatedataguide.ucar.edu/climatedata/climate-forecast-system-reanalysis-cfsr) actually lists "performance not well known as a key limitation of CFSR. This is in contrast to well-validated reanalysis datasets like ERA-Interim and NARR, or observation-based products like PRISM and the GHCN gridded products. Therefore, I recommend the authors either undertake a limited CFSR data validation with observations of TEMP, WSPD, etc., or repeat the correlation analyses using a dataset independent of CFSR, to ensure the results presented here are robust.

Our response:

We chose to use the CFSR atmospheric dataset for this project because it is the dataset used by the ALEXI model. We agree that the absolute magnitudes of the correlations could depend upon which reanalysis or observation datasets are used; however, we anticipate that the regional and seasonal correlation patterns along with the relative importance of each variable will remain similar regardless of which datasets are used.

We agree with your sentiment that more verification studies are necessary; however, that work is beyond the scope of the current project. Several sentences were added to the section describing the CFSR dataset that discuss these variables, cite verification studies, and present an advantage to using this dataset:

"It is important to note that though all of these variables are derived from model output,

CC BY

they are constrained through the assimilation of satellite and conventional observations within the CFSR data assimilation system. Regional verification studies, such as those performed by Lindsay et al. (2014) and Sharp et al. (2015), have shown that the accuracy of the CFSR near-surface variables are comparable to those from other reanalysis datasets. The use of reanalysis data introduces some uncertainty to the evaluation performed during this study but it has the advantage of providing uniform spatial resolution across the entire region."

2) I'm left a little confused by the correlation method description. How many individual (e.g.,) ESI-SPI or ESI-WSPD points were included in the correlation for each month/year? For example, were there 4 pairs of ESI-SPI data points for May, 2008 or just 1 pair of points for May, 2008?

Our response:

You are correct to note that there would be 4 or 5 pairs of data points for each month (or alternatively 60 or 75 per month for the full period of record). To make this more explicit, a sentence was added to the first paragraph of the monthly correlation analysis section that states: "This means that the sample size (n) for each grid point is equal to 60 or 75 depending upon whether a given month contains the end dates for four or five of these 4-week periods."

3) The correlation maps/figures have no indication of statistical significance. Could you perhaps show any area in which the correlation was not significant at (e.g.,) 90% or 95% confidence level as white instead of red or blue? Or maybe contour around areas in which the correlations are significant at some predetermined confidence level?

Our response:

As suggested, we computed the statistical significance at each grid point. This was done using the "rtest" routine in the NCAR Command Language (NCL) package. Figures 1 and 2 were subsequently modified so that only those grid points significant at

CC BY

the p=0.1 level were plotted. For Figs. 4-6, stippling was added to denote the weeks and variables for which at least half of the grid points in a given region had a statistically significant correlation, with p=0.1. The text was also updated where necessary in the revised manuscript.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2018-108, 2018.

Printer-friendly version

Discussion paper

CC BY