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TITLE: Severity-Duration-Frequency curves of droughts: An early risk assessment and planning tool for ecosystem establishment in post-mining landscapes

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General Comments

Thank you for giving me the opportunity to review the revised manuscript of Halwatura et al. on developing of severity-duration-frequency curves to be used as a planning tool for ecosystem establishment.

I have reviewed the revised manuscript and the authors response to the two reviewers' comments. My comments follows:

Title

The author uses a colon to, I believe, stress on how the Severity-Duration-Frequency (SDF) curves of droughts developed in this study can be used as a planning tool for ecosystem establishment. They further add that they are specifically looking at ecosystem establishment in post-mining landscapes.

Section 4.3, added upon Referee #1's suggestions, is a good attempt in describing crop species and recommended management practices with respect to drought types. Bivariate SDF curves as such are not new. The authors should clearly demonstrate how these bivariate SDF curves are superior to traditional practices.

How are SDF curves an "early risk assessment tool?" They give the probability of occurrences. How can this be translated into risks?

What is special or different about "post-mining landscape" compared to other degraded landscape?

Section 2.3: Copula Selection

The authors at the outset limits their choice of copula to two (Frank and Gumbel) based on a few previous studies. Given the wide range of climate reported by the authors, I would recommend that they expand their range of copulas to be included in the study and give a clear account of how the best copula was selected. Khedun et al. (2013), for example, found that for the same basin, the choice of copula can be very different from one climate region to another.

There is no detail on the copula selection in the results section. Which graphical and analytical methods were employed in the copula selection? The only place where the authors state that “Frank” is the copula selected for the bivariate analysis is in Figure 2. Figure 2 itself is not necessary since steps 1 to 4 has already been discussed in Section 2: Materials and methods.

Khedun, C., Chowdhary, H., Mishra, A., Giardino, J., and Singh, V. (2013). ”Water Deficit Duration and Severity Analysis Based on Runoff Derived from Noah Land Surface Model.” J. Hydrol. Eng., 18(7), 817–833.

SPI₃ and RDI₃, and SPI₁₂ and SPEI₁₂?

Figure 5: How statistically significant are these correlations, especially in the arid regions.

It is not clear where SPI is recommended and where the other indices are recommended. A table showing the cross-correlation and final recommended indices can help clarify the choice of indices.

Figure 6 shows the bivariate recurrence intervals based on RDI₃ and figure 7 shows the recurrence intervals based on SPEI₁₂ for the 11 locations considered in this study. Same thing for Figures D1 and D2. Why the need to compare with SPI?

An interesting set results would be determining and comparing the recurrence intervals from each indices considered to see which one is more appropriate for each region.

Section 4.1

How is this discussion relevant to the paper? Even though it is a known fact that precipitation in Australia is dependent on ENSO, the authors do not demonstrate this fact in this paper. Tables 1 and 2 do not show which event was due to El Niño and/or La Niña. The authors do not demonstrate the influence of ENSO events on the drought events identified via these indices.

The discussion, therefore is superficial. Same applies for the discussion in the second paragraph of Section 4.1 re the application of SDF in flood monitoring. These comments are only speculative and should not be in the discussion section.

Minor Comments

Page 12 line 1: “two sophisticated climate parameters.” Recurrence intervals are not really “sophisticated” parameters. They have common hydrological parameters that can be derived from univariate or multivariate distributions.

Figure 3: Severity is defined as the cumulative sum of SPI values, but in Figure 3, it is indicated as the maximum SPI value. Please amend.

McKee et al. (1993) uses four different drought thresholds. It seems that the author defines a drought anytime the SPI value is below zero. Why choose 0 as the threshold in this study.

McKee, T. B, Doesken, N. J., and Kleist, J. (1993). "The relationship of drought frequency and duration to time scales." Eighth Conf. on Applied Climatology, American Meteorological Society, Boston, MA.