Authors response to Referee #1

RC1: Line 31: the two question marks should be deleted

AC: it's a mistake due to a missing reference.

Original manuscript: Meteorological drought is related to precipitation shortages; hydrological drought refers to periods of precipitation shortfall on surface or subsurface water supply ??, while agricultural drought is conventionally linked to soil moisture deficit.

Author's changes to the manuscript (Lines 31-32): Meteorological drought is related to precipitation shortages; hydrological drought refers to periods of precipitation shortfall on surface or subsurface water supply (Sheffield & Wood, 2011) while agricultural drought is conventionally linked to soil moisture deficit.

RC1: Line 248-251: The authors should explain why they used the Spearman correlation instead of the most common Pearson correlation coefficient. Of course, there is a reference concerning this subject (Wedgbrow et al., 2002) but this obliges the reader to find the reference in order to be informed.

AC: We have reconsidered the use of the Pearson correlation coefficient instead of Spearman. In fact, the use of the Pearson correlation coefficient could be preferable when dealing with normal variables. Therefore, the Spearman correlation coefficient has been substituted with the Pearson correlation coefficient. The manuscript will be changed accordingly.

Original manuscript: While in the majority of the papers the Pearson correlation coefficient was employed, in the present study the Spearman correlation coefficient was preferred as a measure of the statistical relationship between the indices, as suggested in (Wedgbrow et al., 2002). The number of significant correlations at 5% and 1% was evaluated for four SPI aggregation timescales (Table 8). The highest number of significant correlations was found in the cases of SPI2 and SPI3, which exhibit very similar performances at 1% significant level. This finding is in agreement with previous studies such as (Hongshuo et al., 2014) that found that VHI and SPI3 have the highest correlation for croplands, whereas VHI and 6-month SPI have the highest correlation for forest in the Southwest of China; and (Ma'rufah, 2017) that found that significant correlation coefficient values on SPI3 and VHI are common in the southern part of Indonesia. Since SPI3 has been used in literature and the percentage of significant correlation at 1% level is relevant, it has been decided to aggregate SPI over a 3 months period and use SPI3 in the following discussion.

Table 8: Number of significant correlations between VHI and various SPI aggregation timescales. Value is expressed as percentage evaluated with respect to the total number of grid cells (987).

	% significant correlations 5%	% significant correlations 1%
SPI1	94.53	90.78
SPI2	97.26	95.44
SPI3	96.66	95.34
SPI6	89.77	85.61

Author's changes to the manuscript (Lines 248-259): The Pearson correlation coefficient was employed in the present study as a measure of the statistical relationship between the indices. The number of significant correlations at 5% and 1% was evaluated for four SPI aggregation timescales (Table 8). The highest number of significant correlations was found in the cases of SPI2 and SPI3, which exhibit very similar performances at 1% significant level. This finding is in agreement with previous studies such as (Hongshuo et al., 2014) that found that VHI and SPI3 have the highest correlation for croplands, whereas VHI and 6-month SPI have the highest correlation for forest in the Southwest of China; and (Ma'rufah, 2017) that found that significant correlation coefficient values on SPI3 and VHI are common in the southern part of Indonesia. Since SPI3 has been used in literature and the percentage of significant correlation at 1% level is relevant, it has been decided to aggregate SPI over a 3 months period and use SPI3 in the following discussion.

Table 8: Number of significant correlations (Pearson correlation coefficient) between VHI and various SPI aggregation timescales. Value is expressed as percentage evaluated with respect to the total number of grid cells (987).

	% significant correlations 5%	% significant correlations 1%
SPI1	93.52	91.29
SPI2	96.76	95.34
SPI3	96.15	94.83
SPI6	90.07	85.82

RC1: Line 300-301: "It's clear from Fig.6 that PPVI identified the reported drought events better than SPI3 and VHI. AUC was 0.828 for PPVI, 0.740 for SPI3 and 0.784 for VHI." We cannot observe the values 0.828 for PPVI, 0.740 for SPI3 and 0.784 for VHI referred in the figures.

AC: The sentence can be rephrased, and the Figure 6 can be adjusted as follows.

Original manuscript: It's clear from Fig.6 that PPVI identified the reported drought events better than SPI3 and VHI. AUC was 0.828 for PPVI, 0.740 for SPI3 and 0.784 for VHI.

Author's changes to the manuscript (Lines 300-304): It's clear from Fig. 6 that the red curve, representing PPVI, is the furthest from the diagonal line in all the panels of the figure. The Area Under the Curve (AUC) was used as criteria to establish which index gave the best performances. AUC values are shown in Fig. 6 for each index and various configurations of the model.

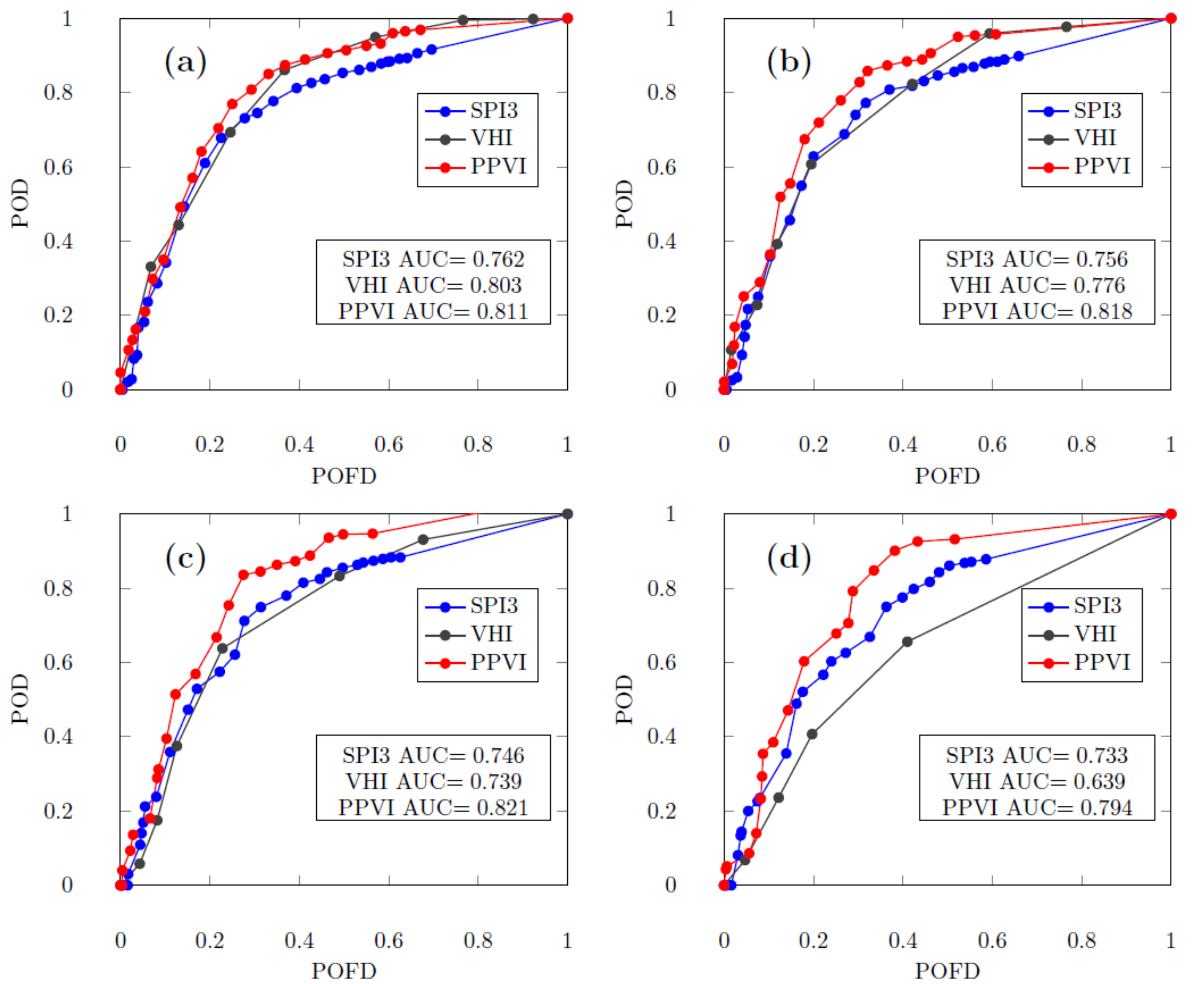

Figure 6: Comparison among the performances of SPI3, VHI and PPVI in identifying reported drought events; thresholds Z, Z_S and Z_V are varying, $z = -1.1$, $z_S = 0$ and $z_V = 40$; n = 80 and four cases for N are shown: (a): N = 10%; (b): N = 20%; (c):N = 30% and (d): N=50%.

RC1: Lines 326-328: 'Short-term droughts are often not reported in text-based documents, and information on drought start and end date were retrieved from documents that mainly described the impacts related to drought. PPVI showed a good agreement with reported information in identifying the areas of the country hit by the drought.' In Fig. 7, in the 'Observation' sub-figure, no department is highlighted in red. Does this mean that no drought was observed, or is this a mistake? In the former case, the authors should comment on this situation. In Figures 7 to 9 there is a comparison of indices and 'Observation' concerning the various departments of Haiti. Please define the criteria according to which a department is highlighted in red (drought conditions). Table 11. 'Reported as drought': Define the criteria of this classification.

AC: In Fig.7 no department was highlighted in red since no drought was observed during that week according to text-based documents regarding droughts in Haiti. Departments are highlighted in red if, according to the documents cited in Table 7, drought was observed during that week in the department. The same criteria were adopted in Table 11 to establish if, according to observations, a department was in drought.

Figure 7, 8 and 9 will be modified to include a legend to clearly distinguish between departments in drought and departments not in drought. A description of the criteria used to define drought according to observation will be given. The text of the manuscript will be modified to clarify the criteria adopted to identify drought in the various departments.

Author's changes to the manuscript: (Lines 310 – 319): At first, week 45 of 1995 was considered. No drought events were reported in that period according to the information available in the analysed documents (see Table7). Figure 7 shows that, while SPI3 identified all the southern part of the country as dry areas and VHI showed vegetation suffering in two departments (Centre and West), PPVI did not show signs of drought, except for a minor number of grid cells. Figure 8 shows that in 2015, when the whole country was reported to be in severe drought conditions (see Table 7 and (NOAA, 2017; OXFAM & Action conte la Faim, 2015)), PPVI captured well the pattern, only a few grid cells were not in drought conditions. The SPI3 was also able to catch the situation, while for the VHI only 58% of the county was in drought. During week 8 of 2012, only the Northern part of the country was in drought (Fig. 9), as highlighted by (USAID & FEWSNET, 2012) (see Table 7). Five departments were reported to be stressed (North, North West, North East, Artibonite, Centre, see Table 7). All the three indices showed the North West as the department most affected by drought when considering the percentage of the department area hit by the drought. PPVI then classified Artibonite, North, Centre and North East, while SPI3 as second and third most affected departments identified South and Grand Anse and VHI Centre and Nippes (Table 11).

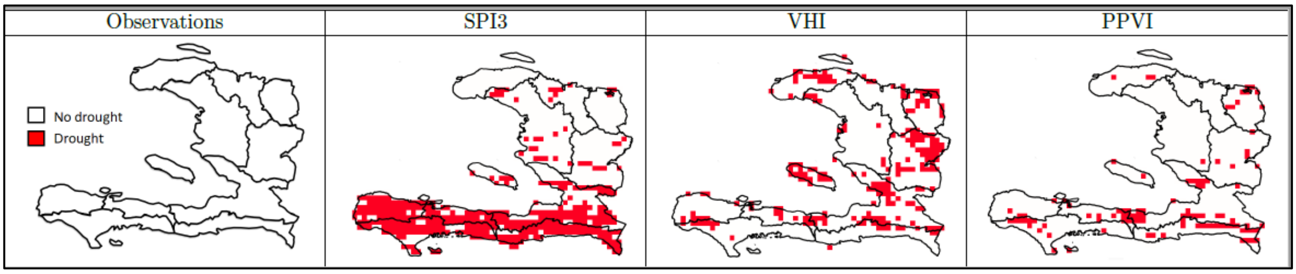

Figure 7: Comparison of the performance of SPI3, VHI, and PPVI in identifying the areas hit by drought. Week 45 of 1995. Departments highlighted in red are the ones in drought according to observations (Table 7), red cells are the ones in drought condition according to the various indices.

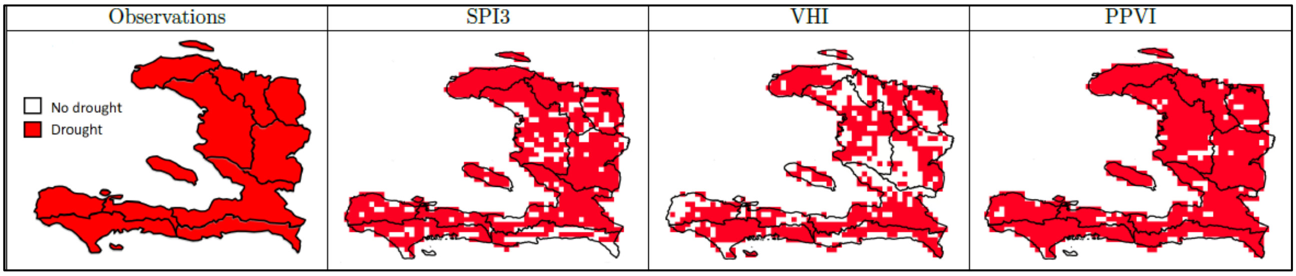

Figure 8: Same as Fig. 7 but for week 33 of 2015. Departments highlighted in red are the ones in drought according to observations, red cells are the ones in drought condition according to the various indices.

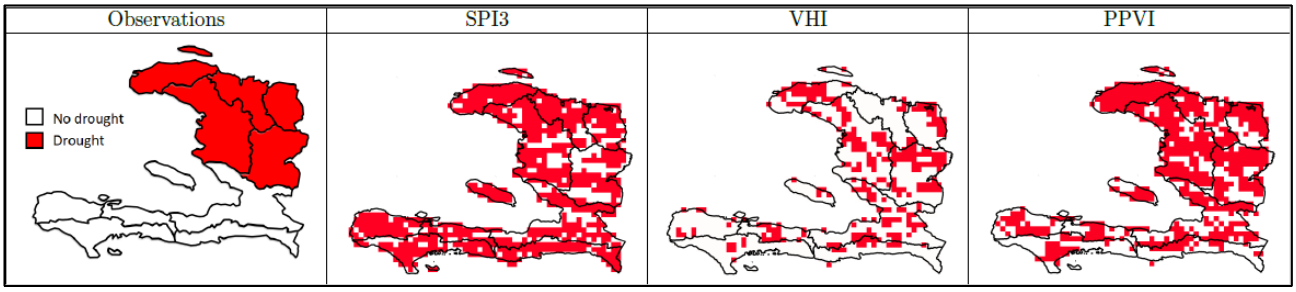

Figure 9: Same as Fig. 7 but for week 8 of 2012. Departments highlighted in red are the ones in drought according to observations, red cells are the ones in drought condition according to the various indices.

Table 11. Performance of PPVI, SPI3, and VHI in identifying departments hit by drought during week 8 of 2012 and comparison with observations. Observations are retrieved from the text-based documents reported in Table 7.

		% of the area			Ranking of affected departments		
Department	Reported as in drought	PPVI	SPI3	VHI	PPVI	SPI3	VHI
North West	Yes	93.1	91.7	47.2	1	1	1
Artibonite	Yes	75.1	72.8	34.1	2	7	5
North	Yes	74.6	82.1	10.4	3	4	9
Centre	Yes	67.2	54.3	45.7	4	10	2
North East	Yes	62.1	72.4	34.5	5	8	4
West	No	61.8	72.1	32.7	6	9	6
Nippes	No	51.2	75.6	36.6	7	5	3
Grand Anse	No	47.8	82.1	10.4	8	3	8
South	No	32.6	75.3	9	9	6	10
South East	No	30.8	84.6	20	10	2	7

RC1: A comparison of PPVI performances to the ones of other composite indices, would be a considerable improvement.

AC: As already discussed in the manuscript (lines 365-368), a comparison with other composite indices is hard, due to the unavailability of composite indices with the same characteristics of PPVI. In fact, previous composite indices do not include both the meteorological and the agricultural aspect of drought or are not available globally or cannot be computed with only remote sensing datasets. In addition, VHI is already a composite drought index since it is derived from the linear combination of TCI and VCI. Therefore, in the manuscript, a comparison of PPVI performance with respect to the ones of a composite drought index was already performed.

References:

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