

This work describes a new methodology for the analysis and definition of dry spells in the Mediterranean, based on a time-varying threshold instead of a fixed precipitation threshold. Despite trends and drought return periods are not modified by the use of one diagnostic or the other, the new one is able to estimate dry spell duration in a more accurate way. The methodology is well described and robust, supported by a fair number of references, and results are consistent with previous literature but also highlight the new findings. A few improvements (pointed out as major revisions, they are in fact small majors) are needed before this work could undergo publication on NHESS

On behalf of the co-authors, I would like to thank the reviewer for this positive feedback on the manuscript and the comments to improve it.

1) it is not clear why the authors choose to use ET₀ instead of potential evapotranspiration (line 114). In addition, many references are provided for the ET₀ definition, but the equation is needed (line 150) to understand all the components that are part of the calculation.

We copy here the explanation already given to reviewer 1 on the same question: As noted in the Harris et al. 2014 paper describing the CRU dataset, they used a variant of the Penman–Monteith method, the FAO (Food and Agricultural Organization) grass **reference evapotranspiration** equation (based on Allen et al., 1994).

The two terms PET and ET₀ are often mistaken or reversed (many authors, in particular in the hydrological science literature are in fact using ET₀ but they call it PET). The potential evapotranspiration is the evapotranspiration from a hypothetical crop surface with adequate water and only influenced by the atmospheric conditions. Hence, the available water in the soil does not limit potential evapotranspiration. The reference evapotranspiration concept was introduced in the late 1970s to avoid ambiguities that existed in the definition of potential evapotranspiration, related to a specific crop and its development stage. Reference evapotranspiration is defined as the rate of evapotranspiration, only influenced by the atmospheric conditions, from a clipped grass-surface having 0.12 m height and bulk surface resistance equal to 70 s m⁻¹, an assumed surface albedo of 0.23 (Allen et al., 1994), and no moisture stress.

Therefore ET₀ represents the evapotranspiration for a given surface (grass) when PET is basically equal ET₀ but modulated by a crop coefficient (K_c) that can vary with the different vegetation covers. To compare between different sites it is often more efficient to use ET₀, also since the estimation of crop coefficients for each station location could be difficult, in particular since the K_c varies in time during the year.

We added in the manuscript =

“In the CRU dataset, the ET₀ is computed from a simplified version of the FAO Penman-Monteith (FAO-PM) equation (Allen et al. 1998) that uses data of air temperature, sunshine duration, vapor pressure deficit and a climatology for wind speed. The detail for the computation is given in Harris et al. (2014). By comparison, Potential Evapotranspiration (PET) is the evapotranspiration from a given crop

surface, requiring the use of crop coefficients that can vary in time due to the development stage of the vegetation. The use of ET₀ allows the comparison between stations and does not require estimating local crop coefficients.”

We choose to not include the equations for the Penman-Monteith equation since it is available in many studies, such as Harris et al., (2014) aforementioned or McMahon et al (2013) (in the reference list) who provided an excellent review of these concepts.

It is not clear (line 150-151) what the meaning of setting wind speed at 2m/s would be.

It was a mistake. After re-reading carefully the paper of Harris et al. 2014 describing the CRU dataset, one can read section 3.3.7 that “a fixed monthly climatology for wind speed (New *et al.*, 1999)” is used.

The sentence has been removed.

2) why is a dry day defined when $\langle P - ET_0 = 0 \rangle$, and not when $\langle P - ET_0 \leq 0 \rangle$? In this respect, authors are also required to better describe how AED can be considered a measure of this quantity. These two points need a deeper discussion.

Indeed, it was not written explicitly in the text but a dry day is when $P - ET_0 \leq 0$. We modified accordingly.

On the top of these, a few minor corrections would be appreciated.

a) line 115: what is an evaporation pan?

It is a very basic device to measure evaporation, a bucket filled with water and the amount of water evaporated is measured daily. Most common type is the Colorado pan.

See more details here = https://en.wikipedia.org/wiki/Pan_evaporation

And here =

<http://www.fao.org/3/X0490E/x0490e08.htm#pan%20evaporation%20method>

b) line 227: please designate the acronyms for the two threshold here, and rephrase lines 227-229 (figure 3 is also involved in this part, not only figure 2).

We added line 227 : “named thereafter respectively S1 and SET₀”

We also added the reference to figure 3.

c) line 244: figure 4 shows the high variability of the ET₀/SDII index during the summer months: a description of this feature is required.

We added line 244 “During the summer months there is also a large variability and the ration is often exceeding 1”.

d) line 296-300: authors say "ET0 in summer is not high enough to exceed the daily precipitation". This statement is not supported by figure 8, then it needs rephrasing. Rather, what is noticeable is that ET0 variability is much lower than that of daily precipitation

On figure 8 is plotted simultaneously the daily precipitation (in blue) for the year 1998 and the ET0 for the years 1960 (in red), 1998 (yellow), 2000 (purple). As you can see in Figure 8, individual rainfall events do exceed the ET0 in 1960, 1998, 2000, so yes the statement that ET0 in summer does not exceed individual rainfall events is correct.

We rephrased the sentence ("to exceed daily events of intense precipitation ") to highlight that we are talking about individual rainfall events and not monthly or seasonal averages.