Dear reviewer and editors,

We sincerely appreciate the reviewer for the insightful and constructive comments, which have significantly enhanced the quality of our manuscript. We have carefully revised the manuscript to address all the concerns raised. Below, the reviewer comments are shown in black, with our responses in blue.

Q1: The authors base their study on a daily index that they briefly discuss the derivation and discusses the concept of flash droughts which seems like an impossibility to me. The main result of the study is the fitting of a double-logarithmic function for the combination of frequency and duration of the drought periods. As one of the motivations are these flash droughts, how can this research help with that?

REPLY: As you rightly pointed out, the distribution of parameter *k* in our study indeed reflects the distribution of droughts. In arid regions, the absolute value of *k* is larger, and the maximum drought duration tends to be longer. In contrast, in humid regions, the absolute value of *k* is smaller, the maximum drought duration is shorter, and flash droughts also frequently occur there. We have incorporated this information in section 4 discussion.

This finding also facilitates the identification of flash drought events with greater precision. As evidenced by the spatial distribution of parameter k , flash droughts persisting for several days to several tens of days occur more frequently in humid southern regions, where higher absolute values of k correspond to elevated occurrence frequencies of short-duration droughts.

Additionally, we have made the following improvements to the description of Figure 7b.

It is indicated that although the drought occurrence frequency in humid and semi-humid regions is relatively higher, the corresponding drought duration is generally shorter, whereas drought duration in arid and semi-arid regions is generally longer.

Q2: Is the derived function well-constrained and in what range is it valid? In Figure 7b, the frequency curve seems to not approach zero rather flatten at a constant value, what does that do to the overall distribution?

REPLY: We understand your concern. In fact, according to the equation, as drought duration $\tau \to \infty$, frequency *f* should approach 0. Table 1 below presents the numerical values of τ and f when k>-0.6 in Figure 7b ($125 \leqslant \tau \leqslant 150$) marked as red line in Figure 7b(as follows) . It can be seen that *f* indeed decreases with increasing τ and approaches 0 value slowly. Tables 2 and 3 present the results for-0.8 <k ≤ -0.6 and k ≤ -0.8.

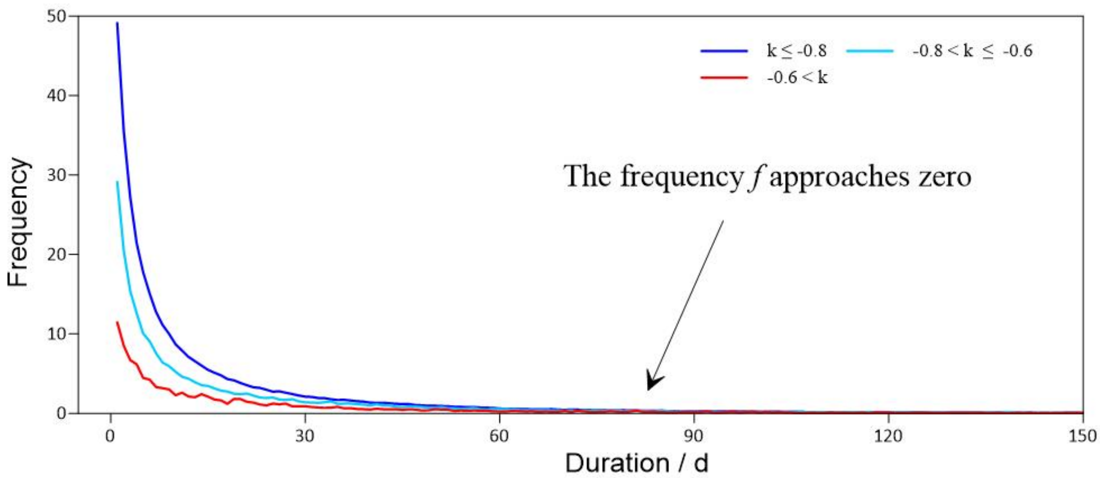

Figure 7b The relationship between the drought duration and its frequency with different parameters

Table 1 Parameter *f* value with τ when k>-0.6

τ value	*f* value	τ value	*f* value	τ value	*f* value
125	0.0615	134	0.0923	143	0.0154
126	0.0923	135	0.0462	144	0.0615
127	0.0308	136	0.0154	145	0.0154
128	0.0308	137	0.0769	146	0.0615
129	0.0615	138	0.0000	147	0.0462
130	0.0923	139	0.0308	148	0.0615
131	0.0615	140	0.0769	149	0.0769
132	0.0769	141	0.0154	150	0.0462
133	0.0615	142	0.0769		

Table 2 Parameter *f* value with τ when -0.8<k≤-0.6

τ value	*f* value	τ value	*f* value	τ value	*f* value
125	0.0866	134	0.0909	143	0.0563
126	0.1169	135	0.1169	144	0.0519
127	0.0693	136	0.0476	145	0.0346
128	0.0866	137	0.0519	146	0.0649
129	0.0606	138	0.1212	147	0.0303
130	0.0736	139	0.1429	148	0.0433
131	0.0779	140	0.0693	149	0.0519
132	0.0823	141	0.0866	150	0.0303
133	0.0693	142	0.0606		

Table 3 Parameter *f* value with τ when k⩽-0.8

τ value	*f* value	τ value	*f* value	τ value	*f* value
125	0.1006	134	0.0793	143	0.055
126	0.0974	135	0.0575	144	0.0612
127	0.0874	136	0.0681	145	0.0500
128	0.0874	137	0.0593	146	0.0518
129	0.0843	138	0.0662	147	0.0587
130	0.0675	139	0.0562	148	0.0587
131	0.0868	140	0.0581	149	0.0487
132	0.075	141	0.0643	150	0.0575
133	0.0787	142	0.06		

Q3: The discussion section of the manuscript is extremely short and does not enlighten the reader on how more specifically this can be used, in what way, uncertainties, limitations, differences to other index used in other areas of the world etc.

REPLY: In section 4 discussion, we have added more information about this as follows:

Several limitations should be acknowledged. First, the exclusion of the Qinghai-Tibet Plateau due to sparse station data may affect the completeness of the spatial pattern in western China. Second, MCI's climate-adaptive coefficients are calibrated for China and may not be directly applicable to other regions without recalibration. Third, the double-logarithmic fitting assumes stationarity in drought statistics; climate change may alter these relationships over time, requiring dynamic updating of parameters. Finally, the study focuses on meteorological drought; propagation to hydrological and agricultural droughts involves additional complexities not captured here. The use of MCI rather than SPI or SPEI introduces both advantages and limitations. MCI's multi-timescale design (incorporating 30-150 day precipitation anomalies) captures drought evolution better than SPI alone, but the *index is region-specific. Future research will employ complementary drought indices and independent observational networks to validate the robustness of the duration – frequency relationship across diverse hydroclimatic regimes.*