Comment on hess-2022-25
Anonymous Referee #2

General comments:
This study mainly analyzed in detail the changes in of nonlinearity and stability of streamflow recession characteristics under climate warming induced by climate variation in the Yarlung-Zangbo River basin (YRB) in the Tibetan Plateau, and the spatial divergency of the impact of climate variation between five sub-basins in YRB.
The authors did a very detailed research on streamflow recession characteristics changes in the YRB, and the manuscript was well-written and easy to follow. But there are still some problems to be improved. It is acceptable for publication after minor revisions.

Additional evidence, such as the changes in total days with the mean temperature above 0 °C in a hydrological year (or the recession period), to further testify to the changes in recession characteristics under climate warming. I believe these explanations could strengthen the manuscript quality.

Reply: We calculated the total number of days with mean temperature above 0°C (MTD) in a year and the recession period, respectively, for the five sub-basins (Fig. R1). The annual MTD increases significantly at a rate of 0.48~0.82 days·a^{-1} in the sub-basins. The total of mean MTD in the recent period of 1997 ~ 2015 is 8~18 days greater than that in the early period of 1980 ~ 1996 (Fig. R1a). Meanwhile, the annual MTD in the recession period increases, tested to be significant in the mainstream of YRB (e.g., NGS, YC and NX), and insignificant in the two sub-basins of YBJ and LS. The multiyear mean MTD in the recession period is 2~7 days greater in the recent period than in the early period (Fig. R1b).

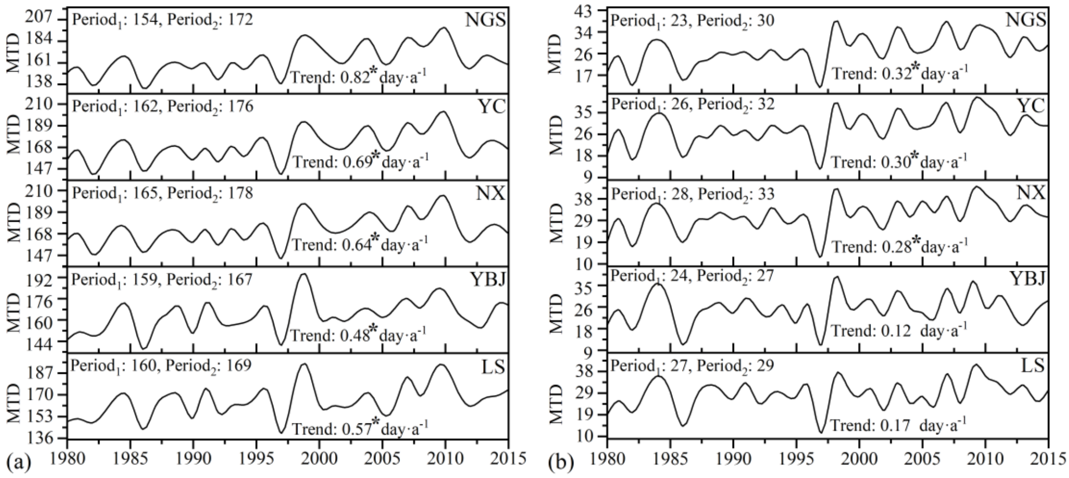

Figure R1: The total number of days with the mean temperature above 0 °C (MTD) in a year (a) and the recession period (b) from 1980 to 2015 in the five sub-basins. The subscripts "1" and "2" refer to the early period from 1980 to 1996 and the recent period from 1997 to 2015, respectively. * is significant tested by TFPW-MK (p< 0.05).

The increased MTD promotes thawing of the frozen ground, and thereby increases the active soil layer thickness (ALT, as shown in Fig. 2h in the original manuscript). Eventually, climate warming decreases streamflow stability and increases nonlinearity of the hydrographs in the study sub-basins.

Minor comments

1. Line 291. Figure 4: The data points of -dQ/dt~Q are usually scattered to some extent as observation errors and other disturbance in stream and catchment. However, there are pretty concentrated and regular in figure 4. I guess the presented data points of -dQ/dt~Q are more likely extracted from fitted recession segments of Q~t instead of observed hydrograph. The data points of -dQ/dt~Q should be directly calculated from observed hydrograph.

Reply: For Figs. 4a-4e in the original manuscript, the data points of -dQ/dt~Q are extracted from the fitted recession segments of Q~t. We have redrawn the figures of -dQ/dt~Q using the observed hydrographs and then fitted the lines in each of the two periods (1980-1996 and 1997-2015) (see Fig. R2). These fitted values of the recession parameters (b and log(a)) are different with those of Figs. 4a-4e in the original manuscript, but changes of b and log(a) between the two periods are consistent with those in Figs. 4a-4e. So, it does not affect our conclusions of changes in streamflow recession characteristics under climate change.

We will adapt Fig R2 in our revised manuscript.

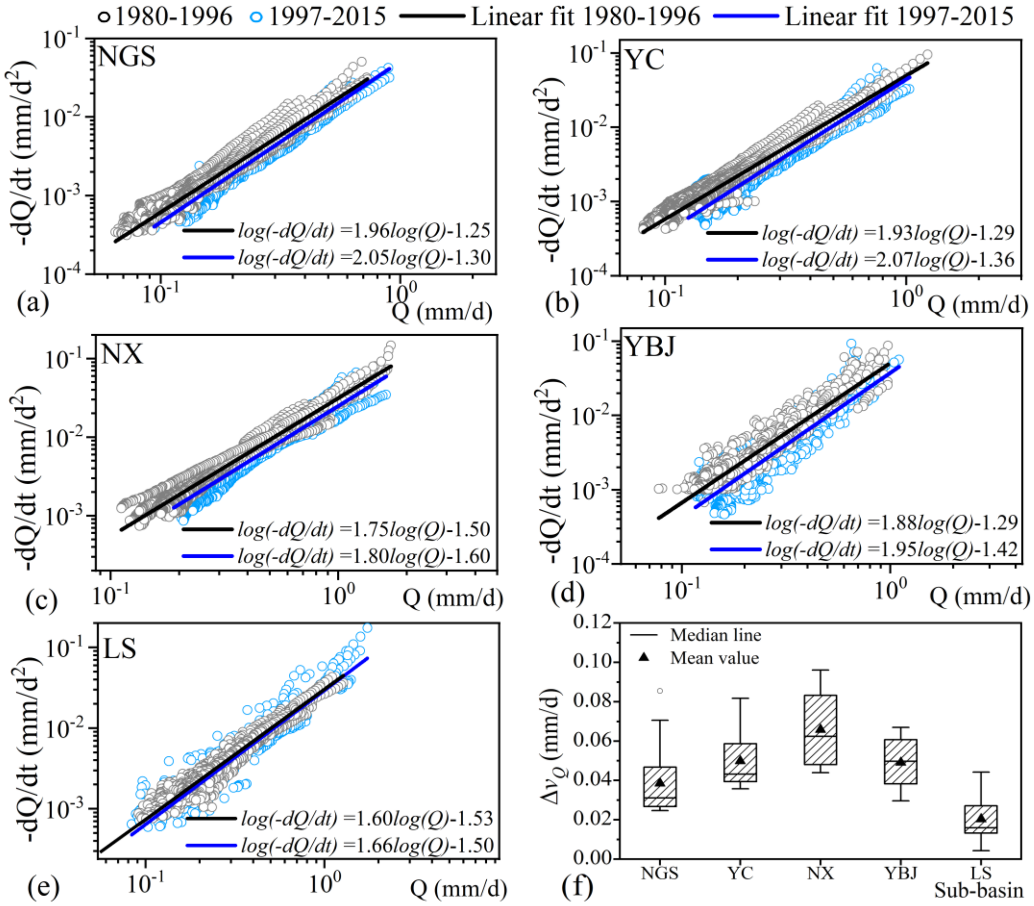

Figure R2: (a)-(e): Plot of -dQ/dt vs. Q in log-log space for recession hydrographs during 1980–2015, and the fitting lines [log(-dQ/dt) = $b$log(Q)+log(a)] for the data points in the two periods (1980-1996 and 1997-2015) for the five sub-basins. (f): Differences of mean recession rates between the two periods (Δv_Q) estimated from the non-overlapping moving averages of the 5-days' series.

2. Line 40. It is weird to put the spatial resolution and timescale of data in one column in Table 1. Another column for timescale of data is better.

Reply: Table 1 is revised as the follows.

Table 1. Information of the data used in this study.

Data	Period	Spatial-Resolution	Temporal-Resolution	Source
Precipitation (P, mm) Mean Temperature (T, ℃) Evapotranspiration (E, mm) Discharge (Q, mm)	1980~2015	0.1°×0.1° Obs. stations	Daily Daily	National Tibetan Plateau Data Center; http://data.tpdc.ac.cn http://data.cma.cn
NDVI	1982-2015	1/12°×1/12°	15-days	http://data.tpdc.ac.cn
Glacial area	1976, 2000, 2013	30m×30m	Annual	http://data.tpdc.ac.cn and China's second glacier catalogue data
	2006~2011 (in 2009)		Mean annual	
Permafrost and Frozen ground	1983-1996, 1997, 2003, 2012, 2017	1km×1km	Mean annual	http://data.tpdc.ac.cn
Active layer thickness (ALT)	1980-2015	0.1°×0.1°	Annual	Calculated by a linear function from Xu et al. (2017)

3. Variable symbols should keep italic type throughout the manuscript.

Reply: We will revise the relevant variables using an italic type in the manuscript.

4. The reference part should be further improved according to the demand of the HESS.

Reply: We will revise the references in terms of the HESS formations.