This manuscript investigates the spatiotemporal responses of runoff to climate change across six sub-basins of the Yarlung Zangbo (YZ) river basin, with a particular focus on differences between the upstream Nuxia and the downstream Nuxia-Pasighat basin. The manuscript is well-written and is of interest to Hydrology and Earth System Sciences. However, some improvements are necessary before publication.

Reply:

Thanks for the comments. At the same time, we have carefully addressed the reviewer's comments point-by-point in the revision.

1. The authors focus on six sub-basins of the YZ basin. Therefore, they should explain the changes in runoff and their possible causes. Additionally, it would be beneficial to elucidate why there is a negative trend in the RKZ sub-basin.

Reply:

"Simulated annual total runoff demonstrates increasing trends of 8.1–18.8 mm/10yr for 1971–2020 across six sub-basins within the NX basin, except for the RKZ sub-basin with an insignificant change (-1.1 mm/10yr), resulting in a significantly increasing trend of 9.4 mm/10yr ($p<0.05$) over the entire NX basin. Strong correlations between annual variation of total runoff, precipitation, and rainfall runoff exist in these sub-basins (CC of 0.90–0.99, $p<0.05$), while total runoff shows weak relationships with temperature and glacier runoff.

Streamflow mutates in 1997 at the RKZ sub-basin of the YZ basin. Increased precipitation and evaporation caused an insignificant runoff change during 1971–1997. However, due to significant decrease of precipitation and increase of evaporation, runoff decreased during 1998–2020, resulting in the insignificant decrease for 1971–

2020."

These have been clearly indicated in the result and discussion section of revision.

2. The authors provide a table showing the parameters and performance of the VIC-Glacier model during the calibration and validation periods. It is recommended that they provide more details about the observed data used for each step.

Reply:

We have added a Table to summarize the model calibration and validation in each step in the revision.

"Table 1. Values of the first (D1, m), the second soil depth (D2, m) and degree-day factor (DDF), and the Nash-Sutcliffe Efficiency (NSE) and Relative Bias (RB, %) of the simulated monthly streamflow with the Variable Infiltration Capacity (VIC)-Glacier model relative to the observation for the eight hydrological stations.

Step1. Calibration and validation of the glacier model					
Sub-basin	Hydrological station	DDF (mm°C^{-1} day^{-1})	Calibration (glacier area observations)	Validation (glacier mass balance)	
			RB (%)	CC	RB (%)
LZ	LZ	10.97	-1.3	0.65-0.96	-15% to -45%
LZ-YC	YC	10.97	-3.7		
RKZ	RKZ	10.97	-6.2		
LS	LS	9.2	-2		
YC-NX	NX	6.8	-1.5		
NX-BXK	YG	6.5	1.7		
	BM	6.5			
	MT	6.5			
Step2. Calibration and validation of the VIC model					

Sub-basin	Hydrological station	D1(m)	D2(m)	Calibration (observed streamflow)		Validation (observed streamflow)	
				NSE	RB (%)	NSE	RB (%)
LZ	LZ	0.1	0.7	0.85	2.1	0.81	1.8
LZ-YC	YC	0.1	0.7	0.83	3	0.81	1.6
RKZ	RKZ	0.1	0.9	0.84	-4	0.71	-8
LS	LS	0.1	0.7	0.84	-2	0.82	-2
YC-NX	NX	0.1	1	0.86	-4	0.86	-5
NX-BXK	YG	0.1	1	0.82	-8	0.83	-5
	BM	0.1	1	0.83	-6	0.83	-5
	MT	0.1	1	0.71	6	0.73	5

3. The authors could expand the discussion on hydrologic modeling, considering the glacier melt component, in other high mountainous basins. They should also explore the possible reasons for variations in glacier contribution within the same basin.

Reply:

Thanks for the comments.

"Forcing inputs, parameters, and representation of physical processes are major sources of uncertainty in glacier simulations. Precipitation is the most important atmospheric input for land surface hydrology models, and an overestimate/underestimate of precipitation may be compensated by an underestimate/overestimate of glacier melt in the model simulation. For example, Zhang et al. (2013) simulated glacier runoff by the VIC-Glacier model with the APHRODITE precipitation estimates in the upper Indus (UI) river basin of the TP during 1961–2009, and suggeted that contribution of glacier runoff to total runoff was about 48.2. However, Meng et al. (2023) simulated glacier runoff by the VIC-Glacier model with the corrected MERRA-2 precipitation estimates in the UI basin, suggested that glacier runoff contributed of 24% to total runoff. The difference between Zhang et al. (2013) and Mengand (2023) mostly resulted from the higher amount of corrected MERRA-2 than APHRODITE precipitation estimates in the UI basin, because the underestimation of precipitation-induced runoff would be compensated by glacier runoff.

Sun and Su (2020) suggested that mean annual glacier runoff contributed about 45% to total runoff in the NX-BXK sub-basin for 1980–2000, using a hydrological model without calibration and validation due to a lack of hydrometeorological observations in the sub-basin. In this study, we utilized newly acquired rain gauge data, and streamflow, glacier mass balance, and glacier and snow cover observations in the NX-BXK sub-basin, glacier runoff was simulated using the well-validated VIC-Glacier model, forced by a comprehensively reconstructed long-term precipitation dataset in this study. The updated contribution of glacier runoff to total runoff during 1971–2020 in the NX-BXK sub-basin was determined to be 19%."

These have been clearly indicated in the discussion section of revision.