Anonymous Referee #1

Many thanks to the authors for revising the manuscript. Most of my concerns have been addressed in the revised version. However, although the authors have added validation of model performance, only the performance on streamflow simulation is presented. As known to us, the simulation of cryospheric factors could have large uncertainties even if the streamflow is simulated well. Consequently, I would like to recommend another round of revision, to add the simulations of glacier, snow and frozen soil during historical period, and the validation of these simulations by observation data.

Reply:

We appreciate the reviewer's concern about the model validation and the need to demonstrate the reliability of the cryospheric factors. We have added the validation of the glacier mass balance and freeze-thaw cycle based on observation data (Section 4.1.2). The updated results as follows:

We assessed the performance of the FLEX-Cryo model for glacier mass balance change, freeze/thaw depth and runoff simulation based on historical observations. The model demonstrated strong capabilities across all evaluated aspects. For the glacier mass balance change, the model showed good accuracy throughout the entire assessment period. Monthly simulations yielded a KGE value of 0.45, NSE of 0.83, the correlation coefficient R of 0.95 and RMSE of 130.13 mm/month (Figure 1a and Table 1). Regarding the free/thaw dynamics, the model accurately captured both timing and duration. The simulated freeze onset consistently aligned with observations, typically occurring in late October and early November. Moreover, the simulated freeze-thaw cycle duration closely matched observations, with both spanning approximately 217 days and varying by no more than 15 days. Notably, the model exhibited exceptional accuracy in predicting maximum freezing depth, with a mere 2 mm error recorded in April 2013 (Figure 1b and Table 1).

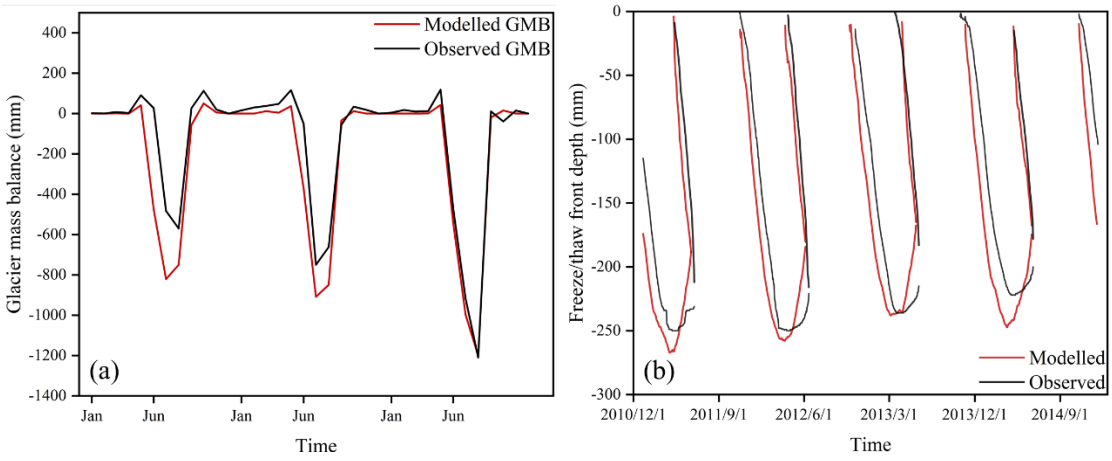

Figure.1 (a) Comparison of the modelled and observed glacier mass balance (GMB) of Glacier 1 from Jan. 2011 to Dec. 2014. (b) comparison of the simulated freeze/thaw depth by Stefan equation and observation.

Table 1. The results of evaluation metrics

	KGE	NSE	R	RMSE
Glacier mass balance	0.45	0.83	0.95	130.13 mm/month
Runoff depth	0.83	0.73	0.74	0.77 mm/day

Anonymous Referee #2

The authors have well addressed and modified the part related to model evaluation and uncertainty analysis, which greatly improves the quality of the manustript in strucutre and reliability of manuscript.

Reply: Thank you for your constructive comments that help us improve the quality of our manuscript.