

Table S1 Comparison of model simulations of the daily streamflow during 2002-2013 with and without frozen soil scheme

Station	With frozen soil		Without frozen soil	
	NSE	RE (%)	NSE	RE (%)
Yingluoxia	0.67	-1.3	0.46	-15.1
Qilian	0.61	7.8	0.50	-12.3
Zhamashike	0.73	0.3	0.38	-10.2

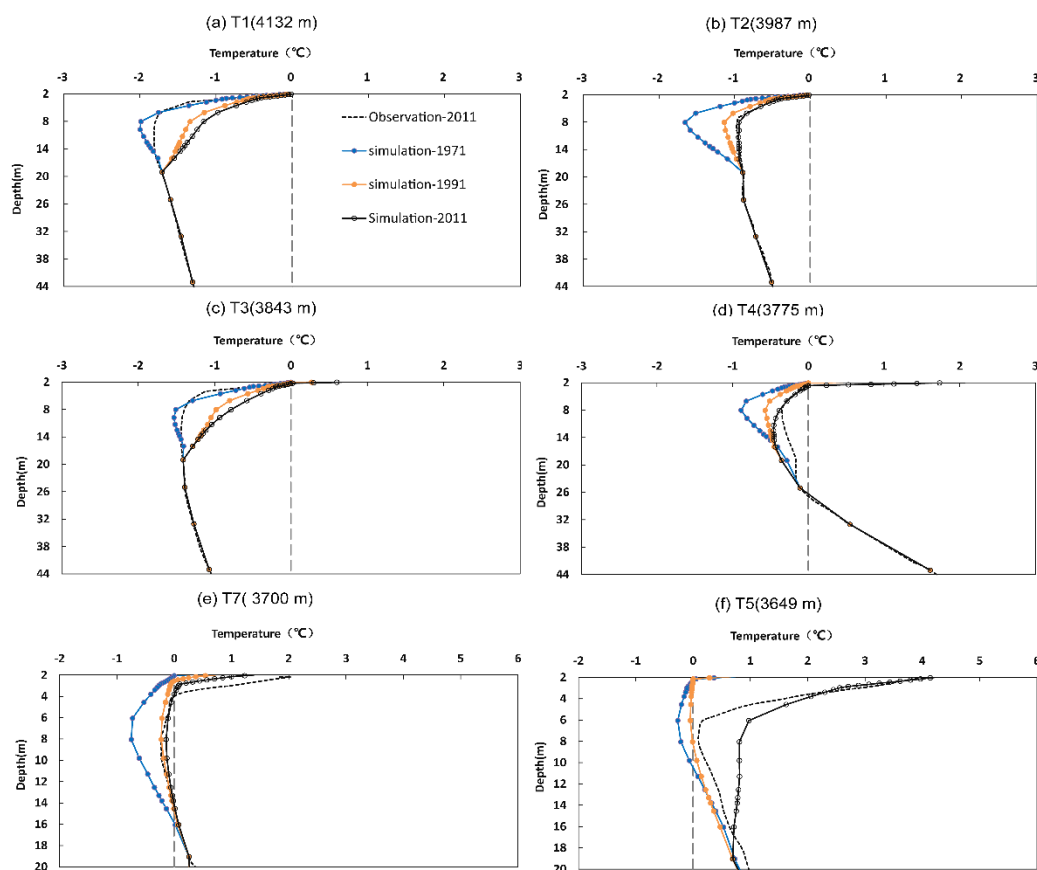


Figure S1 Changes of the soil temperature profiles at 6 boreholes (simulations of 1971, 1991, 2011) and comparison with the observation in 2011 (soil temperature is the monthly mean value in October, the borehole observations were carried out in the same month of 2011)

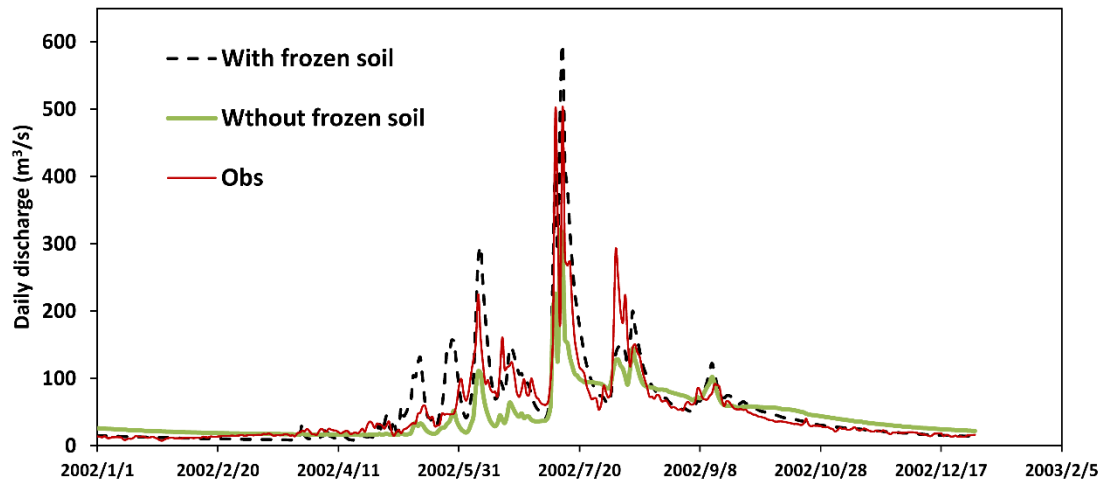


Figure S2. Comparison of the model simulated daily streamflow with and without frozen soil scheme in 2002

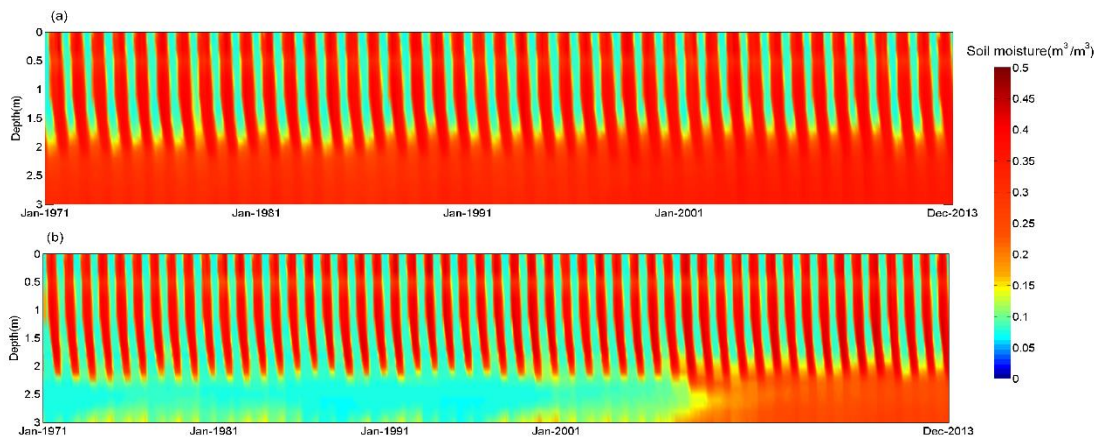


Figure S3. Spatial averaged monthly liquid soil moisture during the period of 1971-2013 in different elevation intervals: (a) the seasonally frozen ground with elevation between 3300-3500 m; (b) the areas where permafrost changed to seasonally frozen ground with elevation between 3500-3700 m