

Figure S1. (a) Regional monthly mean temperature and precipitation values from 1961 to 2008 calculated from the average of precipitation data from closest Gêrzê and Xainza stations. (b, c) Variations in the percentage of **annual total precipitation** of regional precipitation during different seasons from 1961 to 2008. The thin and the thick lines in b and c indicate the raw values and the linear regression result, respectively.

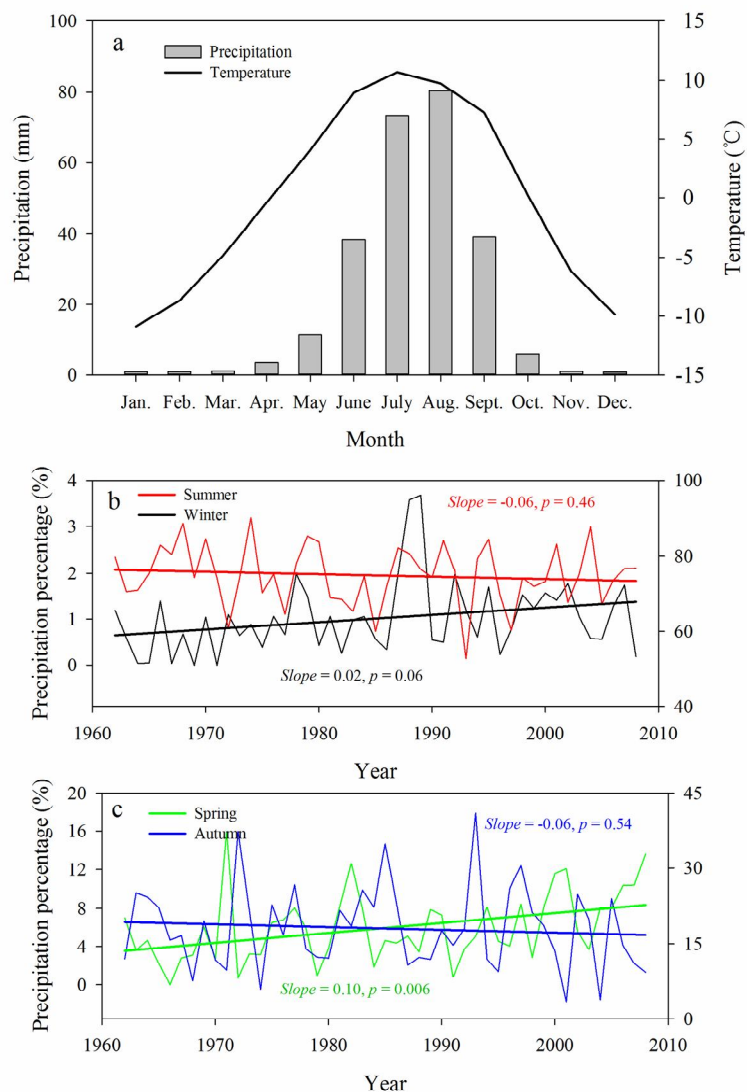


Figure S2. The regional ice core $\delta^{18}\text{O}$ time series (from 1951 to 2002) averaged from three ice cores (including ZK, Muztagata and Puruogangri, without Geladaindong), and from four ice cores (with Geladaindong). The shadowed area indicates the range of one standard deviation from the mean.

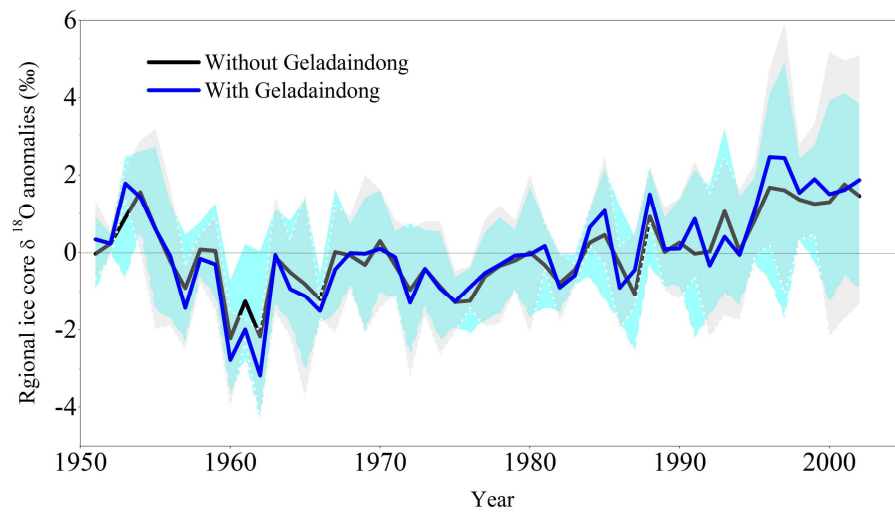


Figure S3. Scatter plots between regional $\delta^{18}\text{O}$ and regional instrumental temperature of the northern TP (RTNTP) (5 year running averages) (a), and scatter plots between ZK $\delta^{18}\text{O}$ and regional instrumental temperature (averaged from Gêrzê and Xainza) (5 year running averages) (b).

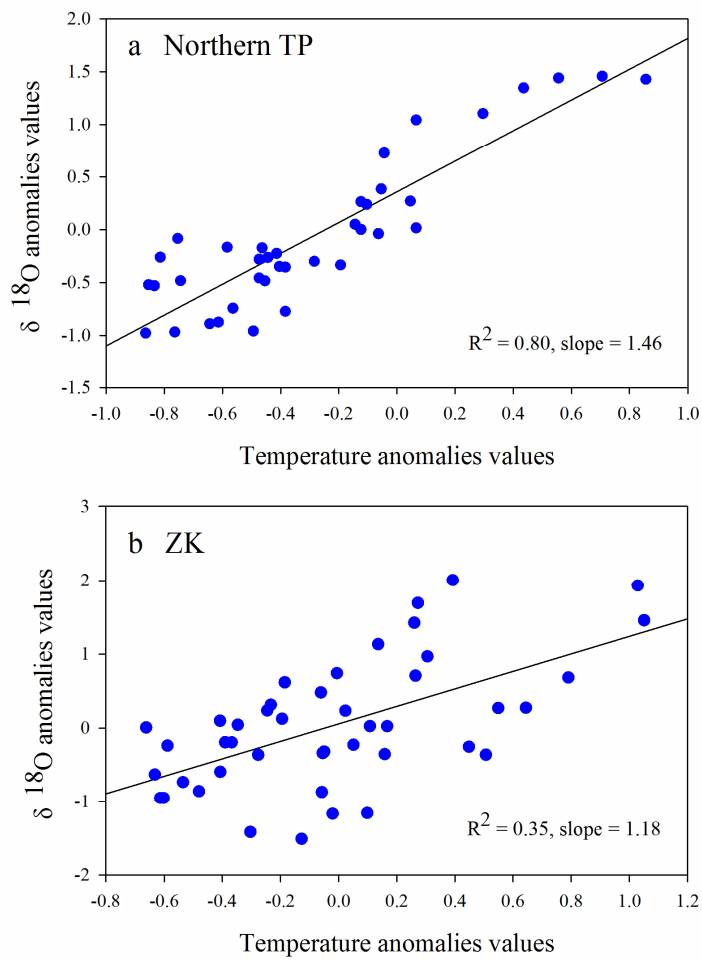


Figure S4. The variations of decadal warming rate with isotope sensitivity values range from 0.3 to 1.5 during 1970-2002 (a) and 1990-2002 (b), respectively. The decadal warming rates were calculated from the regional temperature reconstruction for the northern TP (RTNTP).

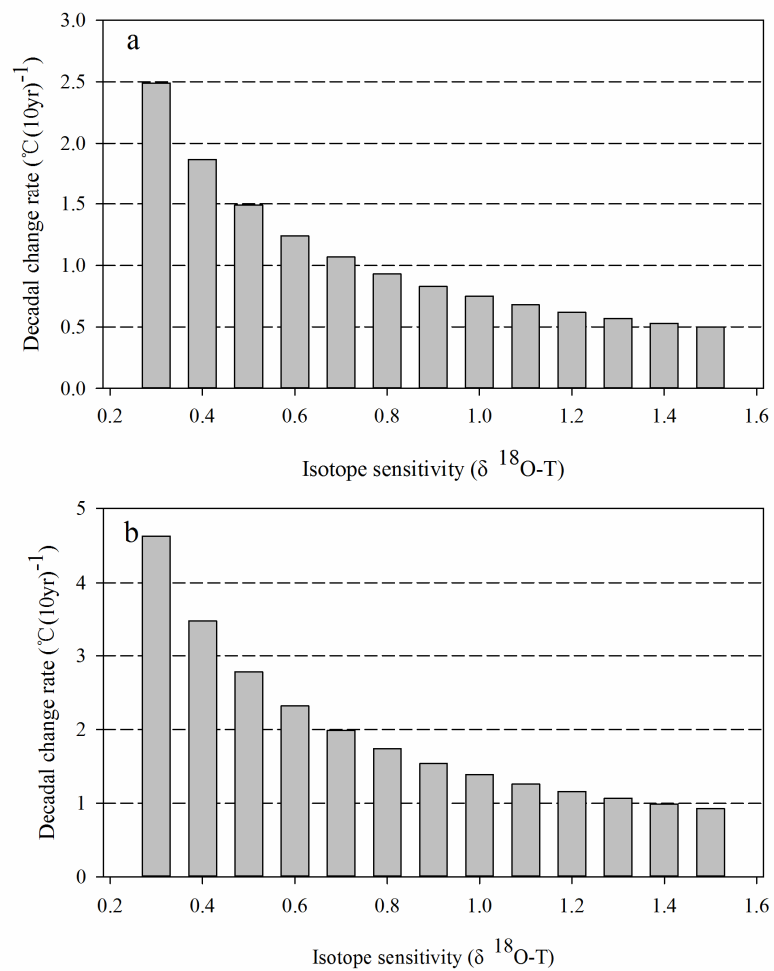


Figure S5. Decadal instrumental temperature trends as a function of elevation of the northern TP over the period 1961 - 2014 (a), and 1970 - 2014 (b).

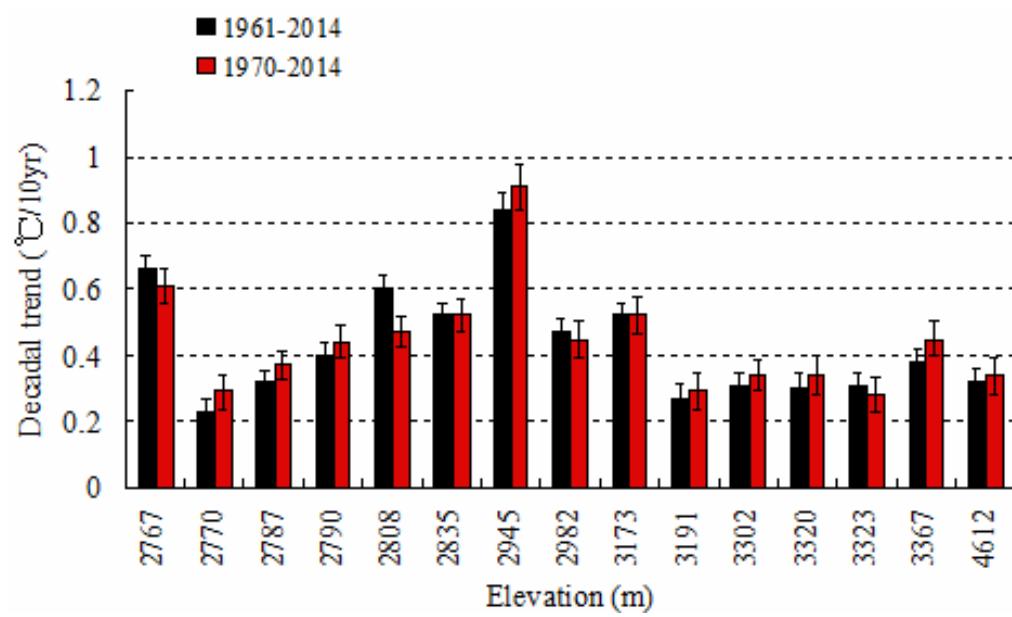


Table S1. Correlation coefficients and linear slopes between $\delta^{18}\text{O}$ values in the ZK ice core and instrumental precipitation (1961-2002) from the averaging records of the Gêrzê and Xainza stations.

		Spring	Summer	Autumn	Winter	Annual
Correlation coefficients	Annual	0.14	0.07	-0.07	0.15	0.02
	5 year running average	0.33 ^a	0.27	-0.20	0.22	-0.07

^a $p < 0.05$