

Estimation of glacier discharge using ice core data

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Qilian mountains are located on the northern fringe of the Tibetan plateau, Northwest China. There are glaciers in the mountains, occupying about 1,930 km², since there is relatively high precipitation (more than 300 mm yr⁻¹) at high elevations in mountain areas. On the other hand, there is little precipitation (less than 50 mm yr⁻¹) downstream along the river. Thus, the people living in this area are confined to several oasis cities at the foot of the Qilian mountains, and the vast Gobi Desert extends downstream of these cities. From olden days, melt water of glaciers and snow on those mountains have provided drinking water and water for irrigation to the people living in those oasis cities. Therefore, the snow and glaciers on the mountain have been important water resources in this area. And those oasis cities have been located along the Silk Road route, which binds East and West, in other words, European and Asian cultures. It could be mentioned, therefore, that the water from the Qilian mountains has supported cultural exchange between East and West. The purpose of this study, therefore, is to estimate the discharge from glaciers and the glacier mass balance using the ice core data basing the observed mass balance process.

Processes of mass balance and discharge from glaciers has been studied at July 1st glacier in Qilian mountains since 2002. Fluctuation of the glacier has been investigated since 1975. We estimated the fluctuation of precipitation and air temperature from the ice core data since 1600s and meteorological data taken near the July 1st glacier since 1930s. Then, we calculated the mass balance and discharge. Calculated mass balance had good agreement with the observed fluctuation of mass balance at July 1st glacier since 1975. Calculated fluctuation of mass balance since 1600s indicated that the mass balance of July 1st glacier was the maximum from 1750 to 1800. And the discharge was large at the end of the 1800s and some recent decades. For further studies, we will try to analyze multi proxy data in order to reconstruct past climate conditions and will compare the fluctuation of discharge with extraordinary events written in historical documents.