

A comparative study of mineral dust on glaciers in Pamir and Tianshan Mountains in Central Asia

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Mineral dust is widely used in ice core studies as an indicator of atmospheric circulation and ground surface conditions in the past. Because of high abundance of airborne dust, concentration of dust is generally high in the ice cores drilled on glaciers in Central Asia. Although there have been many studies on the dust concentrations for the ice cores, only few studies have analyzed the mineral composition and other chemical or physical characteristics of the dust. This study aims to analyze and compare the characteristics of dust in snow of glaciers in Pamir and Tianshan Mountains in Central Asia, to clarify the difference of characteristics of dust in these areas, and to compare with the surrounding ground surface dust to investigate the source of the dust in each glacier. We analyzed dust in snow pit samples collected on the Lenin ice cap and Fedchenko glacier in Pamir mountains areas, and on Urumqi No.1 glacier in Tianshan Mountains. Mineral composition ratio analyzed by XRD and optical characteristics of spectrometer showed that dust mineral composition and reflectivity spectrum were similar between Lenin ice cap and Fedchenko glacier, while they were different from those of Urumqi No.1 glacier. This suggests that dust of the two glaciers in Pamir is derived from a common source while the glacier in Tianshan has different sources. Comparison of the dust between snow and the surrounding ground surface in the Lenin ice cap showed that the dust in snow has very similar characteristics to the ground surface dust. This suggests that dust of this glacier is supplied from the surface of the ground around the glacier. On the other hand, dust of the Urumqi No.1 glacier snow didn't agree with that of the ground surface around the glacier. This suggests that dust of this glacier is not supplied from nearby ground surface, but from distant arid areas far from this glacier. Our results revealed that characteristics of dust deposited on glaciers located in the Central Asia differ between Pamir and Tianshan and each region has different sources. This implies that dust concentrations in the mountain ice cores of Central Asia is necessary to be considered in terms of the source of each region.

Keywords: Dust, Glacier, Pamir, Tianshan Mountains