

Characteristics of cryoconite on the Lewis Glacier in Mt.Kenya Africa

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There are glaciers in the high mountains around the equator of East Africa because of low temperature throughout the year and heavy snowfall in wet season. As glaciers and ice sheets worldwide have shrunk recently, the tropical glaciers in Africa has also been reported to shrink significantly. Although melting of glaciers is usually believed to be caused by temperature rise with global warming, it is also caused by decrease of the surface albedo of glaciers. The albedo reduction is caused by impurities in snow and ice, such as cryoconite. Cryoconite is dark-colored materials consisting of mineral particles and organic matter on glacier surface. These mineral particles and organic matter often form spherical aggregates called cryoconite granules. The dark coloration of cryoconite is due to humic substances produced by bacterial activity. As cryoconite decreases surface albedo of glacier and accelerates melting of the glacier, it is important to know their physical, chemical, and biological characteristics. However, there is little information of cryoconite on African glaciers. This study aims to describe characteristic of cryoconite on Lewis glacier in Mt.Kenya, Africa.

Microscopy of the cryoconite revealed that its characteristics were distinctive between the lower and upper areas of the glacier. Cryoconite consisted of mineral particles and filamentous cyanobacteria, but cryoconite granules were formed only in the lower site. The amounts of organic matter in cryoconite were more abundant in the lower site than in the upper site. Optical analyses of cryoconite showed that spectral reflectance of cryoconite in the lower site was low and constant in the visible and near-infrared wavelength range while that in the upper site was relatively higher. The difference is probably due to effect of organic matter, which can darken cryoconite. The reflectance of mineral particles in cryoconite was similar to that of cryoconite in the upper part, indicating less effect of organic matter on the reflectance. The factors causing the different characteristics of cryoconite between upper and lower sites are uncertain, but they may affect surface albedo and melting of the glacier surface.

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