



Light-absorbing impurities in the cryoconite on the glaciers over Tibetan Plateau

Zhiyuan Cong (1) and Guangming Wu (2)

(1) Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing, China (zhiyuancong@itpcas.ac.cn), (2) Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing, China (wuguangming@itpcas.ac.cn)

Cryoconite is the mixture by incoherent impurities and ice with dark color presented in the ablation zone of glacier. Cryoconite samples from five glaciers in different regions of the Tibetan Plateau (TP) and surroundings were studied. The iron abundance in the cryoconite from TP glaciers ranged from 3.40% to 4.90% by mass, in accordance to typical natural background level. Because the light-absorption capacity of mineral dust essentially depends on the presence of iron oxides (i.e. free iron), iron oxides were extracted and determined using diffuse reflectance spectroscopy. The ratios of free to total iron for the five glaciers ranged from 0.31 to 0.70, emphasizing that iron in the form of oxides should be considered rather than total iron in the albedo and radiative modelling. Furthermore, the goethite content in iron oxides (in mass fraction) ranged from 81% to 98%, showing that goethite is the predominant form among the glaciers. Using the abundance and speciation of iron oxides as well as their optical properties, the total light absorption were quantitatively attributed to goethite, hematite, black carbon and organic matters at 450 nm and 600 nm wavelengths. We found that the goethite played a stronger role than BC at shorter wavelength for most glaciers. Such findings are essential to understand the relative significance of anthropogenic/natural effect, and then taking the proper mitigation measures.