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See the picture of the cryoconite distribution from satellites

Ally Yasumoto (1), Daichi Yamaga (1), Masataka Imai (2), Alireza Bilesan (3), Hiroshi Kawamata (1,4), Nobuyasu Naruse (1,4,5), Yukihiro Takahashi (1,2), Nozomu Takeuchi (6), and Shin Sugiyama (7)

(1) Global Science Campus, Hokkaido University, Japan, (2) Graduate School of Science, Hokkaido University, Japan (spriteselves@gmail.com), (3) Graduate School of Information Science and Technology, Hokkaido University, Japan, (4) Institute for the Advancement of Higher Education, Hokkaido University, Japan (kawamata@high.hokudai.ac.jp), (5) Shiga University of Medical Science, Japan (naruse@belle.shiga-med.ac.jp), (6) Graduate School of Science, Chiba University, Japan, (7) Institute of Low Temperature Science, Hokkaido University, Japan

For severel decades the glacier melt increasing rapidly is a matter of emergency on global warming. Cryoconite spread on glacier is comprised of mineral particles and multi-layered organic granules (dia. 0.2-3 mm) containing cyanobacteria. Because of its dark colour cryoconite can absorb sunlight more than white surface on usual glacier in summer, accelerating the melting and regression as well as darkening of glacier. The valuable field works enabled us to investigate the growth cycle and biotope of cryoconite [1], albeit applied in the small spots and with a long interval. Aerial photography could catch the rough distribution of cryoconite in the wide area, but costly. Here, our remote-sensing study with free satellite images figures out its distribution over Qaanaaq ice cap, northwestern Greenland. A new index combined among multi-spectral bands of Landsat 8, namely visible band 2 (B2, 450- 515nm) and IR band 5 (B5, 850- 880nm), is introduced to distinguish between the glacier and the dense cryoconite area. According to their reflectance spectra, normalized difference cryoconite index NDCI = (B5-B2) / (B5+B2) leads to a negative (small) number for the former, while a positive (large) for the latter. Compared to the reflectance image for band 2, the NDCI image has advantages as followings: 1) normalized pixel value from -1 to +1, 2) no shadow often appeared in the reflectance image, and 3) clear observation of water flow gathered from melted glacier surface. The NDCI values at three points measured in the 2012 summer field work are matched in order to density of the cryoconite observed in photos [2]. Then, from satellite images in 2016 summer we succeeded in determining the threshould value of NDCI to identify the dense cryoconite area. This NDCI threshould is anticipated to apply any images. The criterion process will be shown in the presentation.
[1] N. Takeuchi, Ann. Glaciol. 34, 409-414 (2002).
[2] J. Uetake and co-workers, FEMS Microbiol. Ecol. 92, 1-10 (2016).