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北西グリーンランド氷床における表面熱収支の季節変動
Seasonal cycle of surface energy balance in the northwest Greenland ice sheet

庭野 匡思 [1*] ; 青木 輝夫 [1] ; 的場 澄人 [2] ; 山口 悟 [3] ; 藤田 耕史 [4] ; 谷川 朋範 [5] ; 對馬 あかね [2] ; 朽木 勝幸 [1] ; 本山 秀明 [6]
NIWANO, Masashi[1*] ; AOKI, Teruo[1] ; MATOBA, Sumito[2] ; YAMAGUCHI, Satoru[3] ; FUJITA, Koji[4] ; TANIKAWA, Tomonori[5] ; TSUSHIMA, Akane[2] ; KUCHIKI, Katsuyuki[1] ; MOTOYAMA, Hideaki[6]

[1] 気象研究所, [2] 北海道大学　低温科学研究所, [3] 防災科学研究所　雪氷防災研究センター, [4] 名古屋大学　環境学研究科, [5] 宇宙航空研究開発機構, [6] 極地研究所
[1]Meteorological Research Institute, [2]Institute of Low Temperature Science, Hokkaido University, [3]Snow and Ice Research Center, National Research Institute for Earth Science and Disaster Prevention, [4]Graduate School of Environmental Studies, Nagoya University, [5]Earth Observation Research Center, Japan Aerospace Exploration Agency, [6]National Institute of Polar Research

The Greenland ice sheet (GrIS) has lost its mass during the last two decades significantly, and the rate of ice loss has accelerated since 1992. It is hypothesized that the recent ice loss can be partitioned in approximately similar amounts between surface melt and outlet glacier discharge (IPCC AR5). In the present study, we investigate physical mechanism of surface melt in recent years from the standpoint of surface energy balance (SEB) using data from automated weather station (AWS) in the northwest GrIS. The AWS was installed at the SIGMA-A site (78^{o}03'N, 67^{o}38'W, 1490 m a.s.l.) in June 2012 (Aoki et al., 2014), and data is now open at ADS (https://ads.nipr.ac.jp/kiwa/Summary.action?selectFile=A20140714-002&downloadList=&scr=top). SEB at SIGMA-A during 2012-2014 was calculated using a one-dimensional multi-layered physical snowpack model SMAP (Niwano et al., 2012; 2014), where observed albedo and snow surface temperature were forced to drive. Obtained monthly mean SEB values at SIGMA-A indicates that the main contributor for melt energy available for the surface melt was net shortwave radiant flux throughout all summer seasons, however, melt energy during July 2012 (GrIS experienced a record-breaking surface melt extent) was exceptionally high (more than 25 W m^{-2}) compared to other summer (JJA) months (lower than 5 W m^{-2}). The annual maximum of melt energy was recorded during July in 2012 and 2014, however it was reached during August in 2013. This result suggests that the melting period of GrIS snowpack differs from year to year, and the further monitoring of surface climate is necessary in order to understand long-term interannual variability of GrIS surface melt.