[EJ] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-CG Complex & General

[A-CG38]Science in the Arctic Region

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Thu. May 24, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

The Arctic and circumpolar region is the key area for the study of global change because the anthropogenic impact is projected to be the largest in this area due to the complicated feedback processes of the nature. A number of international and interdisciplinary research projects have been conducted for the studies on the land-atmosphere-ocean system. In order to understand the feedback processes occurring in the Arctic and to project the global warming in the future, we need to establish the intense observational network and to exchange the knowledge and information by combining the different scientific communities under the common interest of the Arctic. The objectives of this session are 1) to exchange our knowledge on the observational facts and integrated modelling and 2) to deepen our understanding on wide range of natural sciences related to the Arctic and the circumpolar region. Studies on humanities, social sciences, and interdisciplinary fields are also welcomed.

[ACG38-P20]Overflow of a proglacial stream in Qaanaaq, northwestern Greenland

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Keywords:Greenland, Glacier, Surface mass balance, Freshwater runoff

Increase in freshwater runoff from the Greenland ice sheet and peripheral glaciers and ice caps have great influence on coastal environment. However, few studies have focused on its impact on the human activity in Greenland. On 21 July 2015 and 2 August 2016, a proglacial stream overflowed in Qaanaaq, a village in northwestern Greenland, which resulted in the destruction of a road between the village and Qaanaaq Airport. This overflow was caused by increased runoff from the nearby Qaanaaq Glacier. Possibly, the overflow is the result of recently changing climate in the Arctic region. In this study, we investigated the overflow in 2015 and 2016 by using meteorological data observed at the village, Qaanaaq Airport and site SIGMA (Snow Impurity and Glacial Microbe effects on abrupt warming in the Arctic)-B (77°31′N, 69°03′W; 944 m a.s.l.) (Aoki et al., 2014), and the output of a regional climate model NHM-SMAP (Niwano et al., 2018). Model output at 5 km mesh grid points was downscaled to a 300-m grid, using a previously proposed method (Noël et al., 2016). Discharge of the proglacial stream was simulated by the runoff routing simulation method presented by Liston and Mernild (2012), which was forced by the downscaled model output data. Temporal variation in the simulated discharge showed substantial correlation with observed data, which was acquired by discharge measurement conducted at the proglacial stream from 20 July to 3 August 2017.

The overflow on 21 July 2015 resulted from a combination of the substantial amount of meltwater runoff from Qaanaaq Glacier and the lack of snowpack in the upper part of the glacier. The second highest air temperature in 2015 was observed at Qaanaaq Airport and there was no rainfall on that day. At the upper part of the glacier, the forth greatest amount of melting in 2013–2017 was calculated on that day by

NHM-SMAP. In 2015, snow depth at 944 m a.s.l. of the glacier on 21 July was the lowest in 2013–2017. The lack of snowpack in the upper part was a likely reason of the greater amount of discharge because less amount of meltwater was absorbed by snowpack. The third greatest daily peak discharge of the proglacial stream in 2015 was simulated for 21 July, which was 18,071 m^{3} h$^{\−1}$. The overflow on 2 August 2016 resulted from substantial amount of rainfall. Daily precipitation of 89.6 mm with hourly maximum of 23.4 mm was recorded at the village on that day. This hourly rainfall was the greatest since the observation started from June 2014. The rainfall probably covered a large part of the glacier because NHM-SMAP computed the largest daily rainfall at the upper part in 2016 on that day. The greatest daily peak discharge in 2016 was simulated for 2 August, which was 18,146 m^{3} h$^{\−1}$.

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