[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-P21]Surface energy balance at SIGMA-A site on the northwest Greenland ice sheet

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The Greenland ice sheet (GrIS) has been losing snow and ice mass at an accelerating rate since the late 1990s (Shepherd et al., 2012). This is due to both enhanced surface melting during the summer and increased ice discharge into the ocean (van den Broeke et al., 2009). In this study, we investigated the surface energy balance (SEB) (positive downward) by using the data obtained with an automated weather station (AWS) which was installed in the SIGMA project (Aoki et al., 2014) to clarify the contributing factors to surface melting. The AWS is located at the SIGMA-A site (78°03'N, 67°38'W, 1,490 m a.s.l.) on the northwest GrIS and the study period is from 30 June 2012 to 31 August 2013.

The analysis result shows that the snow surface was essentially heated by the net shortwave radiation and sensible heat flux, and cooled by the net longwave radiation and latent heat flux. Surface melting occurred commonly at positive air temperature in summer season. Especially, the GrIS experienced the record surface melt in July 2012 (Nghiem et al., 2012). The monthly averaged air temperature in July 2012 was -0.2℃, which is 3.9℃ higher than that in 2013. The snow height change in July was - 27 cm and + 16 cm in 2012 and 2013, respectively. Comparing the monthly averaged SEB in July between 2012 and 2013, the net shortwave radiation shows the largest difference. The value in 2012 is 18 W m^{-2} larger than that in 2013. In addition, the monthly averaged near-infrared albedo in June 2012 was 15 % lower than that in June 2013, whereas there was relatively small difference in visible albedo. For this reason, snow grain size would increase due to air temperature rise in July 2012. We thus concluded that the positive feedback effect by the snow grain growth – near-infrared albedo reduction played an important role in the observed surface melting in July 2012.

References

Aoki et al., 2014: *BGR*, doi:105331/bgr.32.3.

Nghiem et al., 2012: *GRL*, doi: 10.1029/2012GL053611.

Shepherd et al., 2012: *Science*, doi: 10.1126/science.1228102.

van den Broeke et al., 2009: *Science*, doi: 10.1126/science.1178176.