

ACG033-P06

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## Evaluation of distribution of surface albedo and temporal variation in the bare ice area of the western parts of the Gre

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The Greenland ice sheet has recently been reported to be significantly shrunk, especially, in the western ablation area (at latitude 65-71 north and longitude 49 west). In this area, visibly dark-colored ice surface, called dark region, has been found. Such a dark ice surface must affect the melting of ice because of its low albedo. Therefore, it is important to understand the present spatial distribution and formation process of the dark region on the ice sheet to evaluate its mass balance. This study aims to describe the spatial distribution and temporal variation of the dark region in the bare ice area of the Greenland ice sheet using MODIS and Landsat-7/ETM+ satellite images.

The dark regions, defined by the albedo between 0.15 and 0.30, were generally found in the ablation ice area from north to south of the western side of the ice sheet (at latitude 61-83 north). The dark regions were located at the margin of the ice sheet in the northern and southern areas while they were located at the area 50 ? 100 km away from the margin in the middle area. Temporal variations in the dark regions show that their areas generally increased and their mean albedo decreased from 2001 to 2010. In particular, the expansion of the dark region in the middle area was significant after 2005. Spectral reflectances of the dark regions indicate that their low albedo is due to surface impurities.

Landsat images revealed that the dark region in the middle area has the stripe features of blue and black ices. Comparison between 2000 and 2010 images revealed the increase of the black ice area of the stripe feature, suggesting that mineral particles supplied from the ice body accumulated at the surface. Furthermore, the band 2-3 ratio, which is indicative to amounts of red algal snow on the ice surface, showed the significant increase of the area of red snow. This suggests that snow algal production increased in this area. Therefore, it can be concluded that the expansions of the dark region is caused by accumulations of mineral particles from outcropping ice layers that contains a large amount of dusts and of organic matter derived from photosynthetic snow algae.

Keywords: albedo, dark region, temporal variation, impurities