

## Antarctic ice sheet surface temperature change derived from MODIS and AWS

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Antarctic ice sheet holds approximately 70% of the fresh water on earth. If it melts, sea level will rise about 57m. So, it is important to know the dynamics.

Temperature rise in the entire Antarctic ice sheet in the past 50 years have been reported from studies using ice sheet surface temperature derived from satellites and atmospheric surface temperature observed by meteorological observation.

These two types of temperature are different from the view of radiation balance, however, often used on same time and confused in these studies. In addition, their difference is not considered.

In this study, we show the difference and structure of Antarctic ice sheet near surface temperature from same point and same time comparison of ice sheet surface temperature derived from MODIS Daily Land Surface Temperature Product (MODIS LST Product) and Atmospheric surface temperature observed by AWS. And we also show the Antarctic ice sheet near surface temperature change in recent years considering its features.

MODIS LST Product estimates land surface temperature based on split window method using thermal infrared bands. Spatial resolution is 1km and its automatic geometric correction accuracy has improved.

Automatic Weather Station set on the whole region of Antarctica by AMRC, Wisconsin University, and so on. And it is observing Atmospheric surface temperature, pressure, wind speed and wind direction per 10 minutes of 3 meters height. In this analysis, we use 90 points Atmospheric surface temperature since 2002 to 2010.

As a result, ice sheet surface temperature is lower than Atmospheric surface temperature. This difference shows inverse temperature structure from ordinary one in troposphere and it changes seasonally. Especially, the difference is large in summer night and winter.

It is considered that the difference is caused by surface inversion layer occurred to balance of solar radiation and radiative cooling. Because, MODIS LST Product is ice sheet surface temperature, however, AWS is Atmospheric surface temperature of three meters height. So, their difference of observation height causes temperature difference.

The difference is classified to latitude. Low latitude area, temperature difference is same as the features on whole region. On the other hand high latitude area, temperature difference almost doesn't change during a day.

It is considered that this difference is caused by change of solar radiation quantity with change of solar height.

From the results obtained in the entire Antarctic ice sheet surface temperature changes from 2002 to 2010 from MODIS, temperature rate of change shows a downward trend in whole region. Rate of change of temperature is determined at each pixel of the image while the entire Antarctic tends to decrease in a wide region, the surface temperature tends to be elevated in most of the coastal area of East Antarctica, coastal area of the Antarctic Peninsula and slope area.

Possible upward trend in the slope of the temperature, which can be attributed to the influence of thermal belt has increased. That tends to shrink from the temperature difference indicated by the comparison of MODIS and AWS in slope area, considered as ground inversion layer has weakened in recent years is the driving force of the katabatic wind, thermal belt slope becomes relatively temperate belt that steal the sensible heat transport and effect of cold is reduced in recent years are likely to appearance will be considered, and that caused the global warming in the slope.

Keywords: Antarctic ice sheet, Surface temperature, Surface inversion