

# シベリア北極域島嶼の氷河の存在環境

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## Environment of glaciers in archipelago, Siberian Arctic

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### Background

Recent global warming proceeded in Arctic region and the shrinkage of arctic sea ice affect on arctic glaciers. Glaciers' mass balances are in negative and glaciers are shrinking in arctic Canada and Svalbard (GMBB, 2009). There are also many glaciers in Russian arctic. However, most of them are not revealed their fluctuations because some of the observations were abandoned decades ago and others were not observed at all. Glaciers in Bennett island are observed in 1980s (Verkulich et al., 1992), and no more studies have done since then.

### Study area and glaciers

De Long islands in Siberian arctic is composed of three islands and 50 % of the area is covered by glaciers (Kadota et al., in prep). Bennett island (76.4N, 149.0E) is of 30km long and 10km wide. There are three icecaps on the island; the largest icecap in the center of the island composed of four glaciers (Verkulich et al., 1992), smaller icecap in the west site of the island composed of two glaciers and smallest icecap in the east side of the island is a glacier with the diameter of 5km. The altitude of each icecap is 384m, 426m and 200m, respectively (world atlas of snow and ice resources).

Mass balance measurement has done in 1987. Mass balance of Toll glacier, which is the largest glacier in Bennett island, in 1986/87 was -0.303 m w.e. (Verkulich et al., 1992) and during 1956-1972 was -0.10 w.e. (Jania and Hagen, 1996).

### Method and results

Meteorological observation is continued at Ostrov Kotelnj (76.0N, 137.9E) in New Siberian Island near Bennett island since 1937. Air temperature in 1960s are coldest since 1930's, as well as the other region. Decadal mean of 1960s and 2000s are -15.4 and -13.6°C, of which difference is 1.8°C. The warming in 1990s are rapid and the warming trend is continued after 2000.

### Sea ice distribution and sea surface temperature

Sea ice shrinkage is observed since around 2000. Siberian arctic is the area where the largest sea-ice-area change was seen. Although the sea ice came across to the continent even in September until 1996, in which the island is surrounded by sea ice, sea ice in September was apart from the land since 2004. In 2007, the minimum sea ice year, most of Siberian arctic was free from sea ice except for a small part of it.

Southern most position of sea ice in September is plotted for 135-155°East during 1979-2010 with SSM/I data. The difference depending on the latitude was negligible. The southern-most position was correlated to annual and monthly mean temperature in September.

Sea ice temperature around Bennett island in 2000s, sea ice area decreased, turned to positive. In 2007, sea surface temperature increased as high as +5°C. Glacier accumulation may be affected by water vapor supply from warmed sea surface.

### Glacier size, ELA and snow line altitude

Glacier area shrinkage revealed by satellite images are 20 % in 1951-2010 for Bennett island and 40-50% for the other two islands in De Long islands (Yabuki, personal communication).

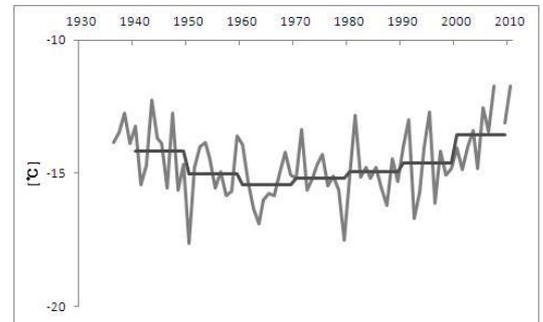


Fig. 1 annual and decadal mean air temperature at Ostrov Kotelnj

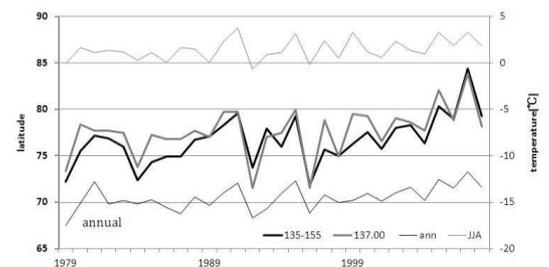


Fig. 2 southern end of sea ice position and air temperature at Ostrov Kotelnj

ELA in Canadian arctic is above 1000m, in Svalbard is ~500m and Bennett island is 200~300m (Jania and Hagen, 1996). The satellite image obtained in 1999 shows that ELA in the center of Bennett island is above 300m.

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#### References

Kotlyakov, V. M. (ed.) 1997. World Atlas of Snow and Ice Resources.

Jania, J. and Hagen, J. O. (ed), 1996. Mass balance of arctic glaciers. 1996. IASC report no.5.

The World glacier monitoring service, 2009. Glacier mass balance bulletin no.10.

Verkulich, S. R., Krusanov, A. G. and Anisimov, M. A., 1992: The present state of, and trends displayed by, the glaciers of Bennett Island in the past 40 years. *Polar Geography and Geology*, 16 (1). 51-57. (from *Data of glaciological study No. 70, 1990, pp. 111-115. in Russian*)