

Winter-spring transition of ground conditions over Alaska derived by airborne 6GHz microwave and infrared observations

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The rapid Arctic warming has been reported. Winter to spring shift of cryosphere is the key variables to be monitored related to warming mechanism. Satellite remote sensing is effective for observing cryospheric change from winter to spring.

Although microwave observations with a frequency of 19 and 37 GHz have conventionally been used for the observation of snow covered areas, this study investigated use of the low-frequency 6 GHz band. To acquire information on the winter-spring transition of ground conditions in Alaska, flight observations of a forest, wetland and lake were performed using an airborne microwave radiometer (Fig. 1).

Infrared observation measures surface warming and low frequency microwave can observe inside of snow cover. This combination expands the information on spring snow conditions with warming and melting (Fig. 2). The TB from the ground displayed little regional variation in the cold period. The variation increased when the spring snow melting season began. Surface temperature increased during the spring warming period, however, the ground below the snow cover remained cold.

Flight and satellite microwave observations provided us with the monitoring capability for the spring warming over Alaska, and illustrate the early warming of lowland and late warming in the mountain areas around Fairbanks. Although inside of snow are still cold in the mountain area, significant warming in the forest, and warming in accelerating at wetland and lake in the low land.

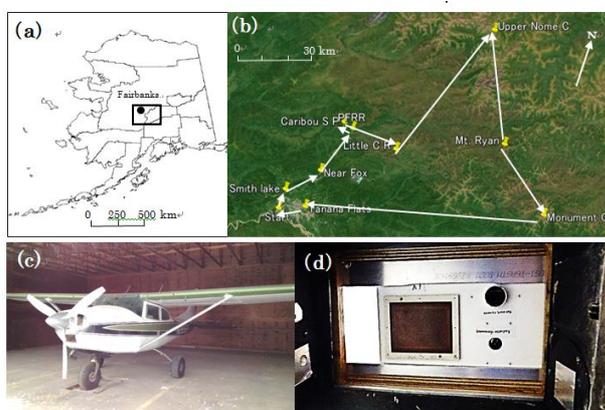


Figure 1. (a) Map of Alaska, (b) Flight observation route, (c) Cessna 182 used for flight observation over Alaska, (d) MMRS2 set at the floor window of the airplane

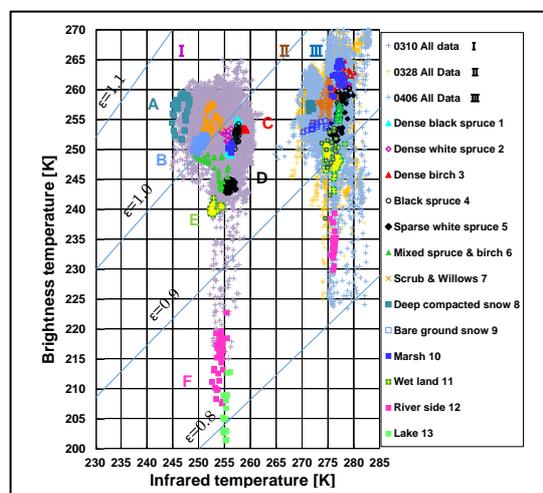


Figure 2. Brightness temperature of 6 GHz microwave and infrared temperature from flight observations, from winter to spring. I: winter, II and III: springs.

References

Alimasi, N., H. Enomoto, J. Cherry, L. Hinzman and T. Kameda, Airborne 6 GHz microwave observations of the winter-spring transition of ground conditions over Alaska, Journal of Japanese Society of Snow and Ice, 78(6), 365-382, 2016