



## **Regional extent of permafrost and boreal forest degradations in the central Yakutia by ALOS-PALSAR and AVNIR2 images**

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Wet climate with largely increased in precipitation during summer and snow accumulation during winter had continued 4 years since 2004 winter in eastern Siberia. Soil moisture in the active layer had been significantly increased corresponding with thawing of permafrost near the surface during following years. The perennially water-logged active layer furthermore exacerbated the boreal forest habitat, namely withered and dead forests widely extended in this region. In the present study, we have attempted to extract the region of degraded boreal forest based on the analysis of satellite data in the left and right banks of Lena River near Yakutsk, along with expansion of the water surface area in relation to permafrost degradation.

We utilized ALOS-PALSAR and AVNIR2 images taken during 2006 through 2009. After geocoding and noise reduction of PALSAR images, classification of water surface area including water-logged ground was performed with supervised classification using the threshold of a microwave backscattering coefficient. Then, we compared the distribution of the water-logged area between multi-years. In addition, during the same period, supervised classification of grassland and boreal forest was conducted using AVNIR2 images. Then, both classifications were overlaid and the multi-years change in degraded boreal forest due to water-logged conditions was extracted as well.

Boreal forest in the left bank of the Lena River distributes on river terrace where density of alas lakes is quite low due to consisting of sandy loam soil with underlying permafrost with less ground ice content. In this area, water surface area expanded in concaved terrain and along the valley year by year in conjunction with change from forest to grassland. On the other hand, forest in the right bank of the Lena River distributed in the region with very high density of alas lakes due to underlying ice rich permafrost. During the same period, alas lakes expanded and boreal forest on the periphery of lakes turned to water surface and grassland. Based on the field survey, humidified and deepen active layer in side slope of alas lakes increased topographical instability and finally eroded by largely increased water mass. In brief, the method combining ALOS satellite analyses has great possibility to detect permafrost and forest degradation caused by wet climate in the central Lena river basin.