



## **Study of vegetation impact on the ground surface temperature using remote sensing data with different spatial resolution**

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Permafrost mapping and modeling is based on the understanding of the main controls affecting permafrost parameters: ground temperature, active-layer thickness, cryogenic processes. In the Tundra zone, remote sensing can provide necessary information on spatial distribution of surficial parameters represented by vegetation type and coverage. In this work we will consider shrub complexes, as far as they serve as an entrapment for snow and consequently affect the active layer depth.

A case study was undertaken at central Yamal at the research station Vaskiny Dachi. In summer 2011 a 1.5 km long transect crossing main geomorphologic units of central Yamal was established and subject to multipurpose field study. Detailed description of vegetation and numeric parameters characterizing tundra complexes was followed by active-layer measurements.

The main optical satellite data base is a high-spatial resolution GeoEye-1 acquisition with 0.5 m ground sampling distance acquired at the 15<sup>th</sup> August in 2009 (NGA license, University Alaska Fairbanks, NASA LCLUC Yamal).

Spectral analyses were performed to extract surface class - shrub-dominant communities. Spectral discrimination of surface waters was done using a threshold value in the near infrared band 4.

Various spectral analyses were tested to separate shrubs-dominated areas. Processed were 4 Principal Component (PC) (Schowengerdt, 2007) bands, including masking of surface waters. The lower PC bands contain the subordinate information that can often not be extracted using standard classification methods. PC bands 2 and 3 were interpreted to contain information on 'greenness' and 'moisture and structure', respectively. At this stage, the shrubs were manually digitized guided by the structure information in PC band 3.

The communities sorted out in vector format were used for the following analysis.

For the analysis of the shrub impact on permafrost, interpretation results were compared with a map of the surface temperature and with the field data. The comparison involves the spatial statistics calculation. The map of the surface temperature was plotted using data from Landsat 1999 with 30 meter spatial resolution (band 6-1, High Gain). First of all, an atmospheric correction of the data was made, and then surface temperature was calculated with the algorithm (Chavez, 1988). The average temperature of the surface was calculated, except for the areas of water bodies, and then the spatial statistics was calculated within the vegetation units subdivided at the initial stage of interpretation.