Vegetation distribution, controlled by topography, may affect scaling methane flux in taiga-tundra boundary, Indigirka lowland, northeastern Siberia

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Assessing methane emissions in high latitude regions has been conducted, although those challenges are scarce because of the limitation of monitoring observations in remote area and the spatial heterogeneity of land surface conditions on permafrost landscapes (e.g. polygon mires). Vegetation cover is the essential information for scaling methane flux, which requires wetland extent where biogenic methane is mainly released. We focused on Taiga-Tundra boundary ecosystem, covered with dwarf shrub tundra, sparse larch forest and polygonal wetlands which grow on permafrost landscape, and are thought to be affected by climate change.

The study investigated that regional methane emission with in-situ flux observations (2009-2016) and satellite remote sensing of vegetation, using spectral unmixing method to obtain fractions of small vegetation patches with ALOS AVNIR2 (JAXA) satellite image (70 ×70 km) in Indigirka lowland eastern Siberia (70°N, 148°E) in July summer. Additionally, digital surface model (AW3D30, JAXA) and series of historical surface reflectance images (Landsat5 and Landsat8, USGS/NASA) were analyzed to understand the spatial distribution and temporal dynamics of each vegetation with topographical gradient on regional scale. Landsat derived normalized vegetation index (NDVI) trends in several recent years indicated that vegetation growth was probably topographically differed at approx. < 18 m and mainly expected on tall erect willows (*Salix boganidensis* and others). There was no methane emission observed in willow class, therefore, lower topographic land cover might be partly altered by less methane emitting willow cover and might affect local net methane emission. Vegetation data supported by topographic analysis allows us to describe regional impact of observed CH_4 emission, and expected to contribute research for vegetation dynamics and CH_4 emission in circumarctic terrestrial ecosystem.

Keywords: Vegetation, methane flux, NDVI

