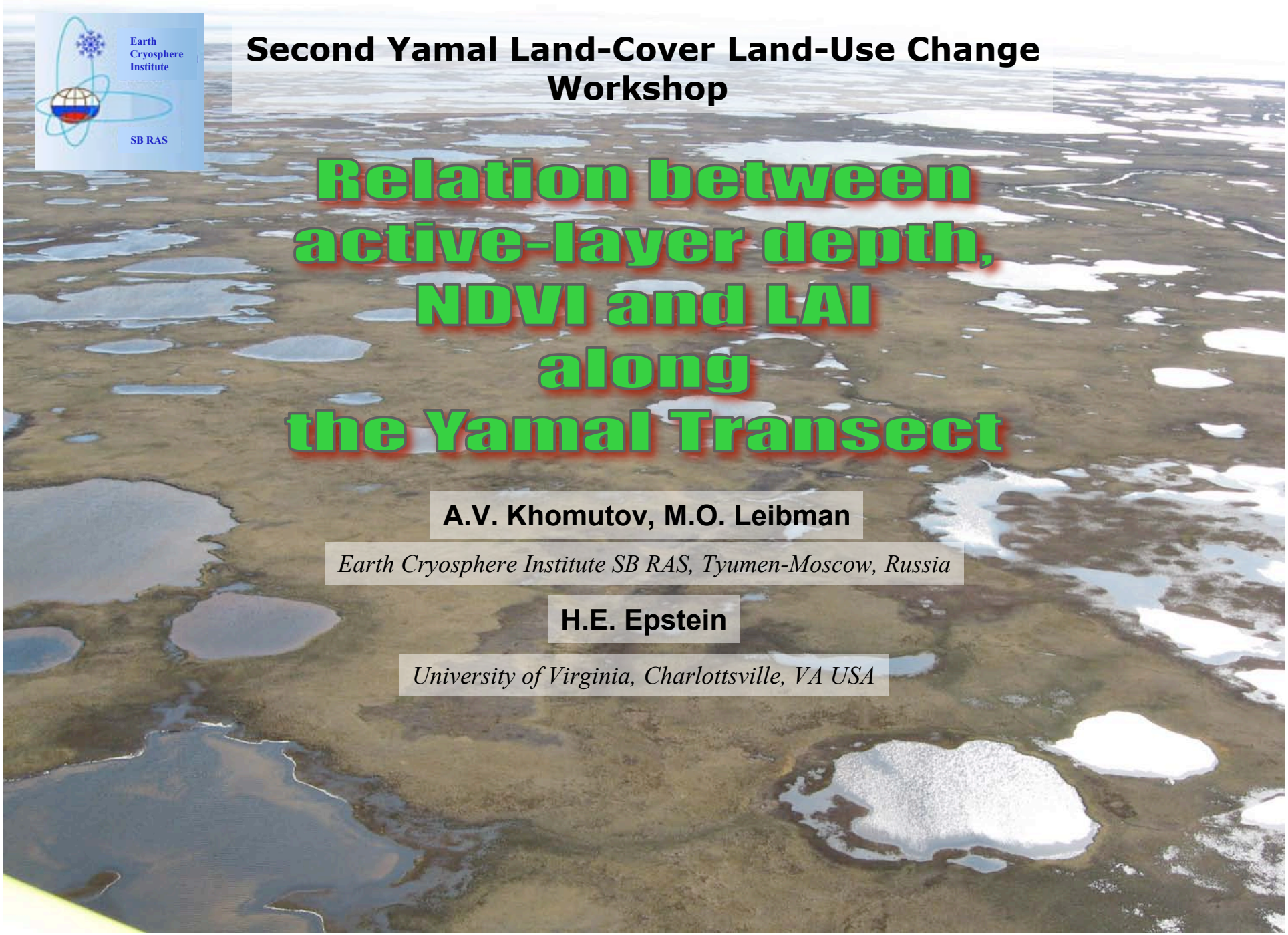

Second Yamal Land-Cover Land-Use Change Workshop

Relation between active-layer depth, NDVI and LAI along the Yamal Transect

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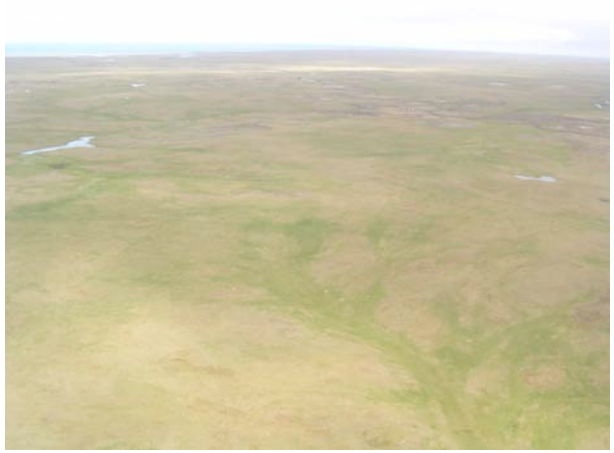
Earth Cryosphere Institute SB RAS, Tyumen-Moscow, Russia

H.E. Epstein

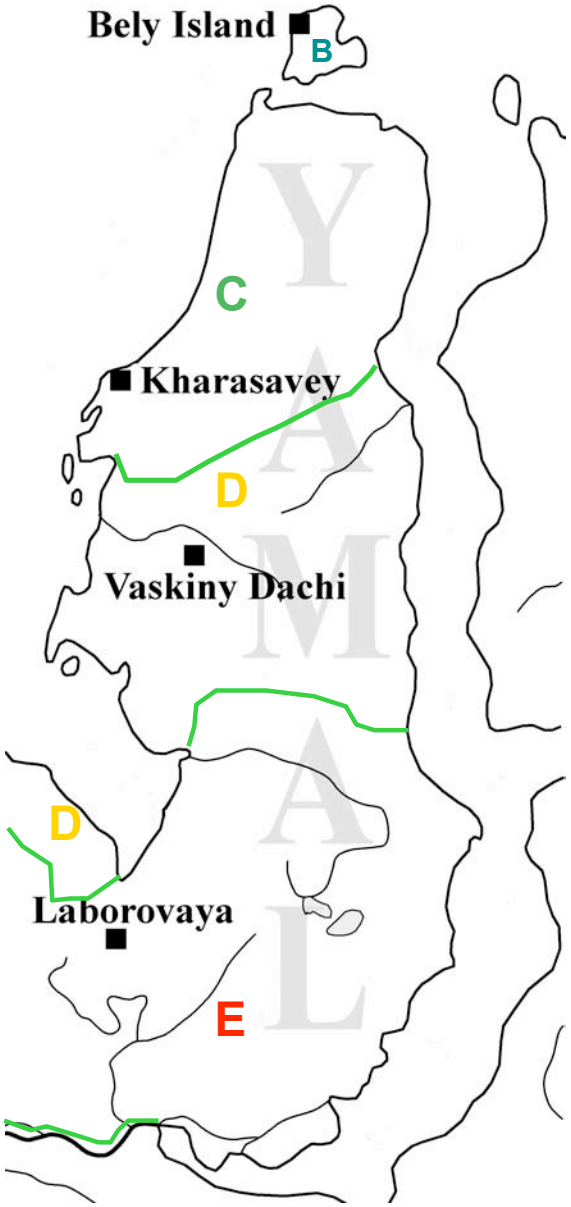
University of Virginia, Charlottsville, VA USA

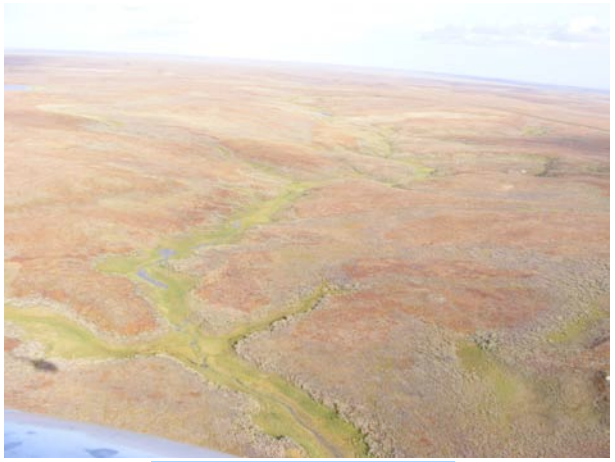
Yamal Transect

Bely Island



Kharasavey





Vaskiny Dachi

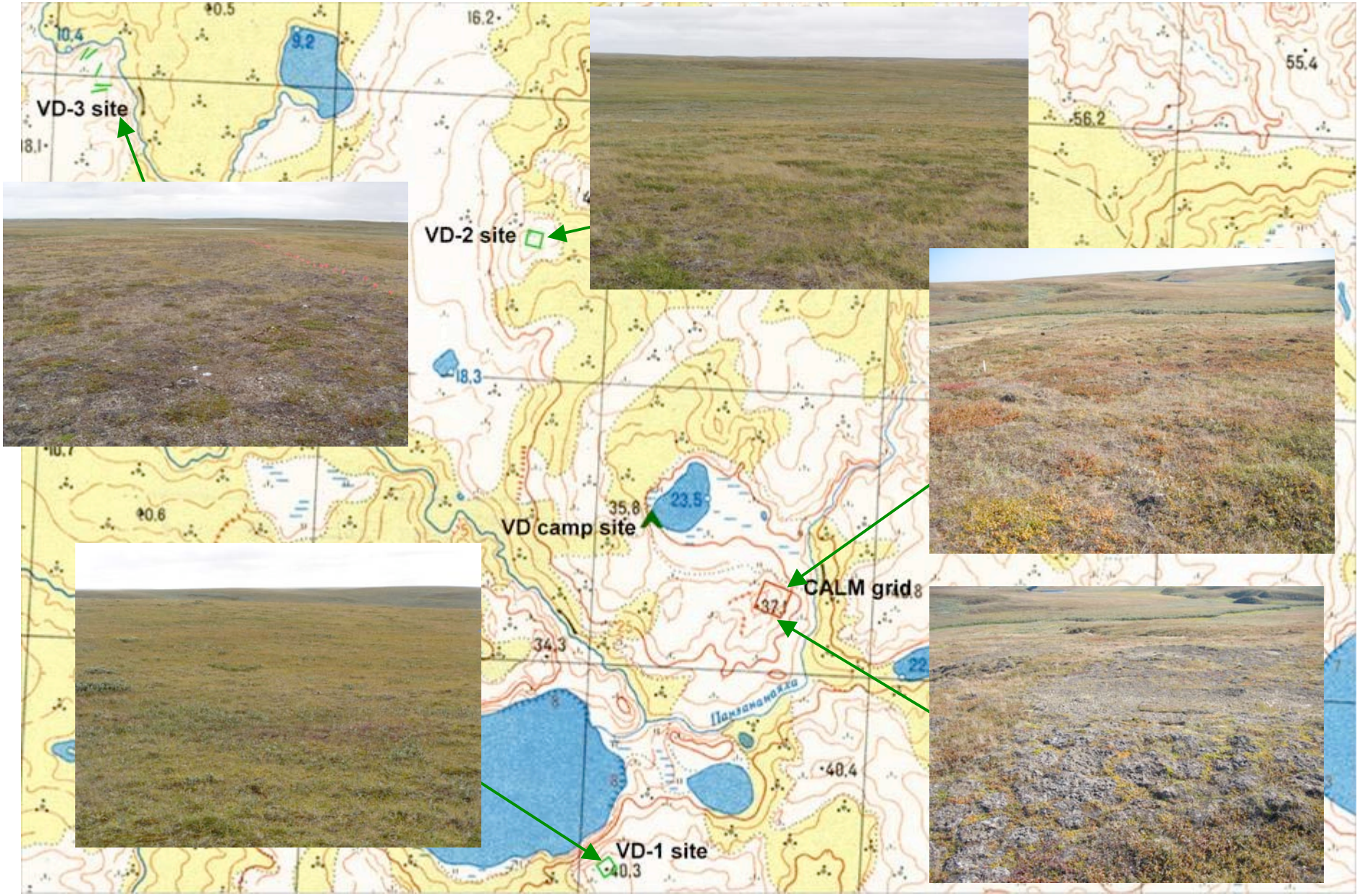
Laborovaya

Laborovaya

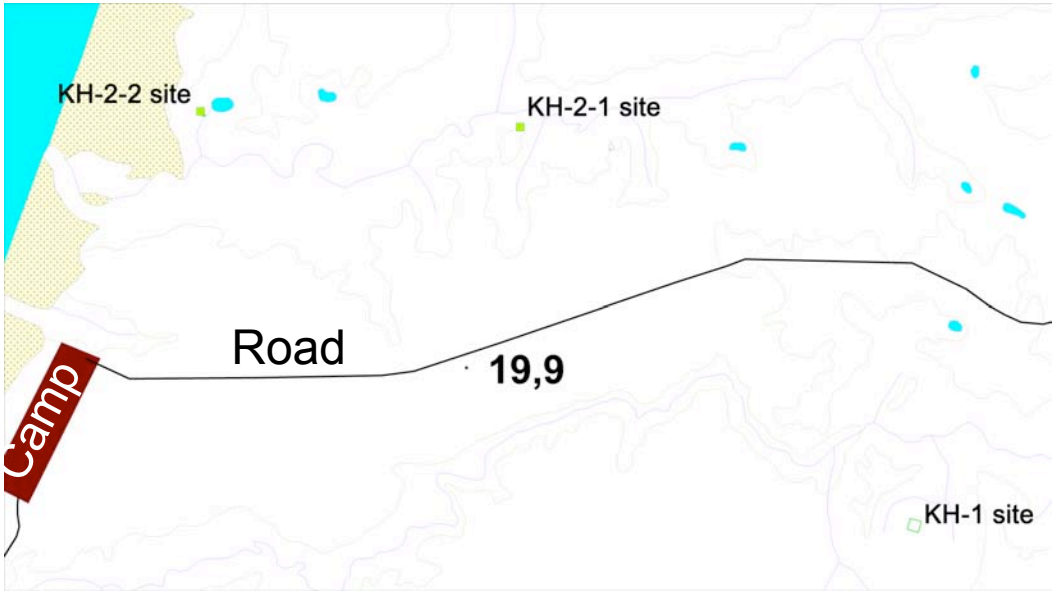
LAB-1 site (clayey)

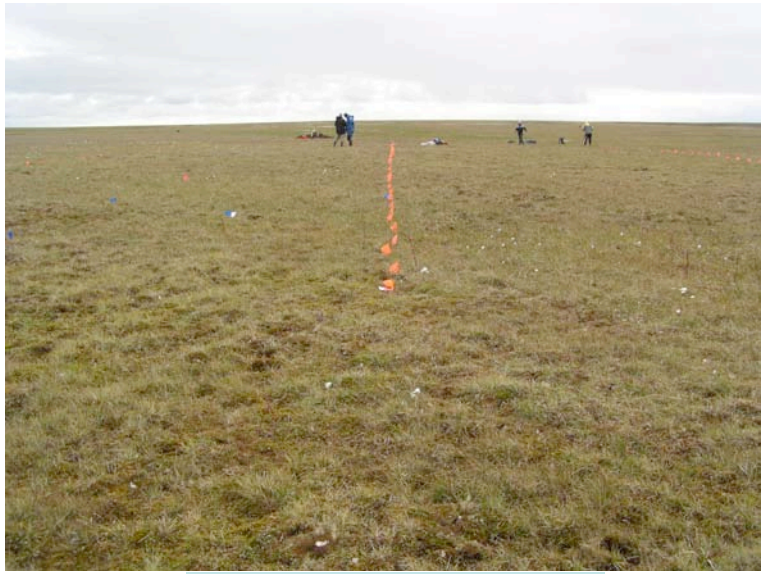
LAB-2 site (sandy)

Vaskiny Dachi



Kharasavey



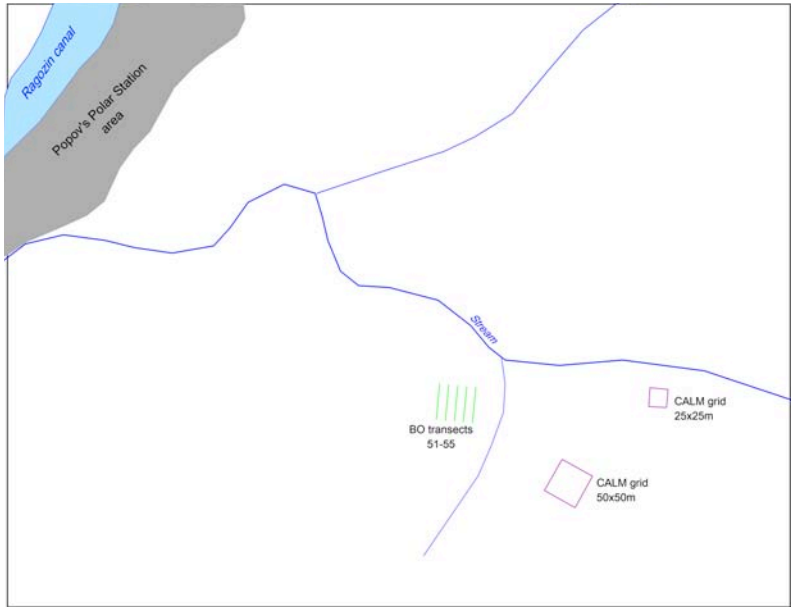


KH-1 site (clayey)

KH-2-1 10x10m (sandy)

KH-2-2 10x10m (sandy)

Bely Island



CALM grid 25x25m (sandy)

BO transects 51-55 (clayey)

CALM grid 50x50m (clayey)

Normalized Difference Vegetation Index

&

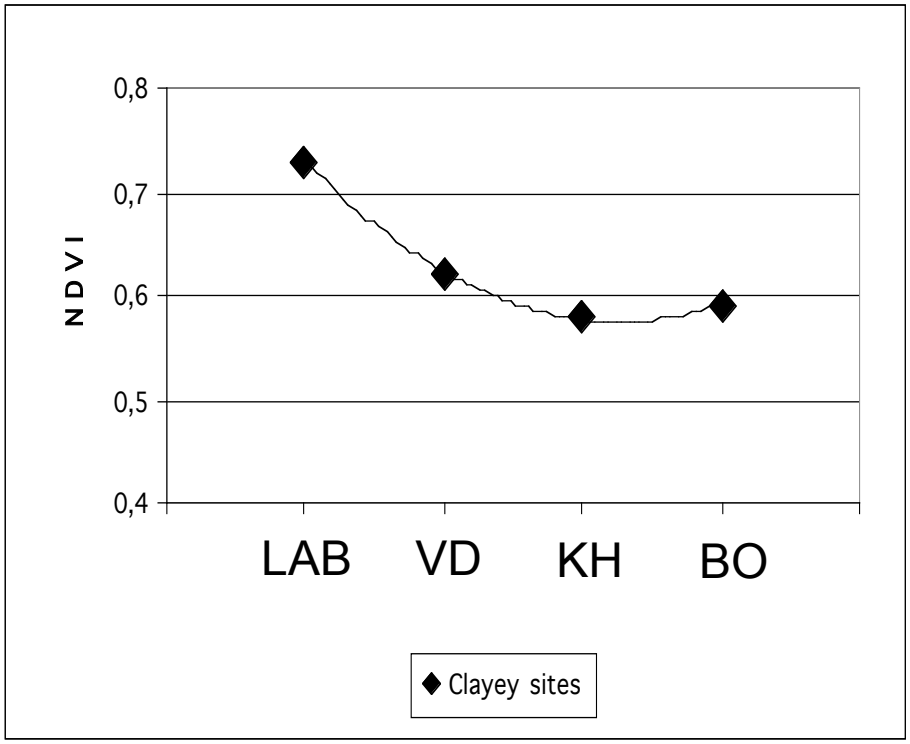
Leaf-Area Index

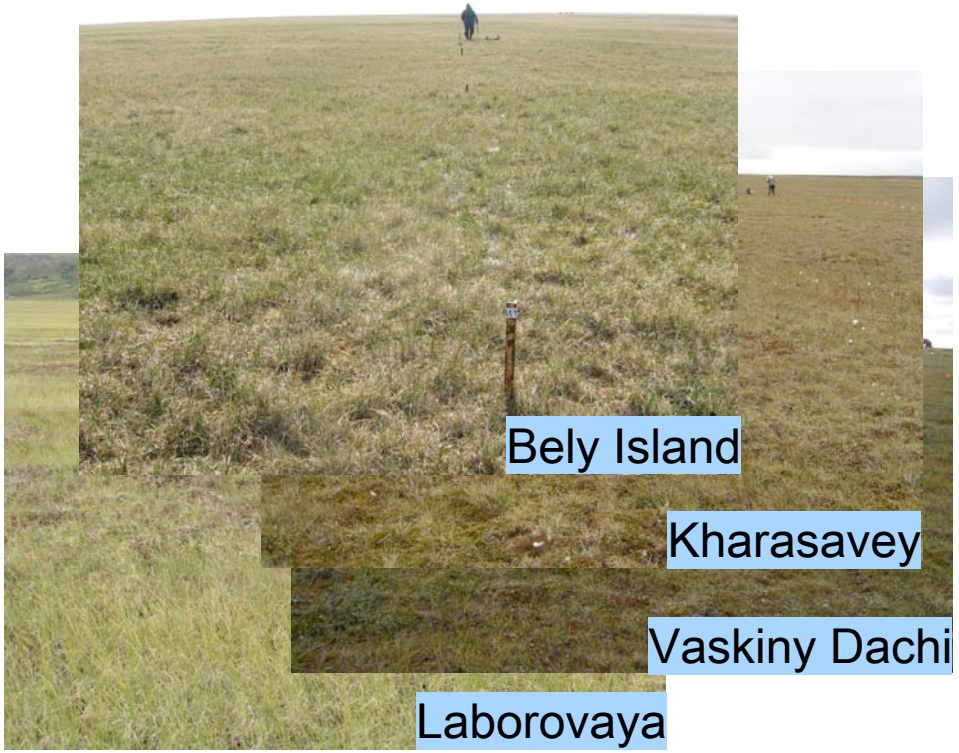
vs

Active Layer Depth

	Average value of parameter					
	Clayey plots			Sandy plots		
	NDVI	LAI	ALD, cm	NDVI	LAI	ALD, cm
Laborovaya	0,73	0,86	84	0,64	0,29	110
Vaskiny Dachi	0,62	0,46	80	0,5	0,17	123
Kharasavey	0,58	0,41	75	0,59	0,08	92
Bely Island	0,59	0,84	63	0,45	0	117

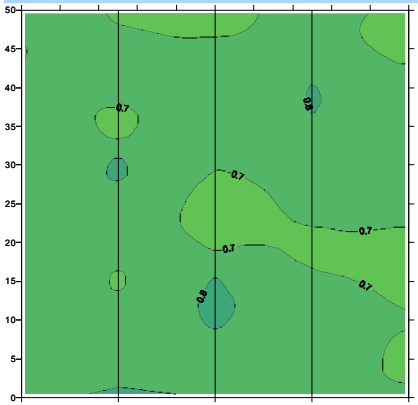
NDVI on clayey sites



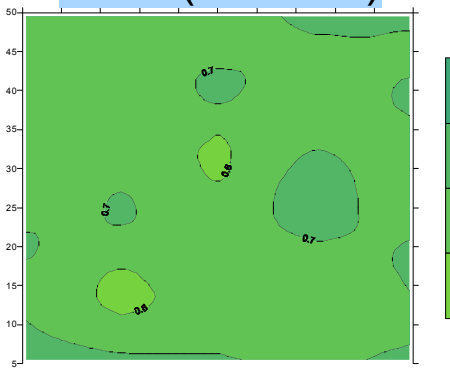


0,73 → 0,62 → 0,58 → 0,59

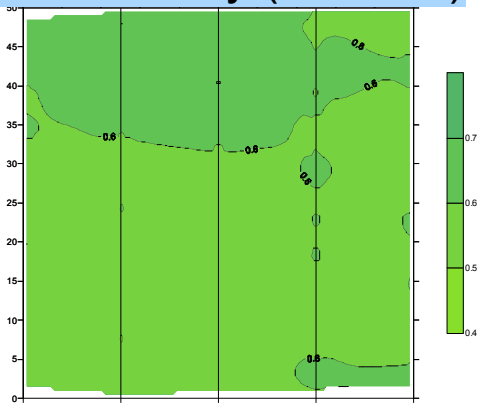
Laborovaya (50x50m)



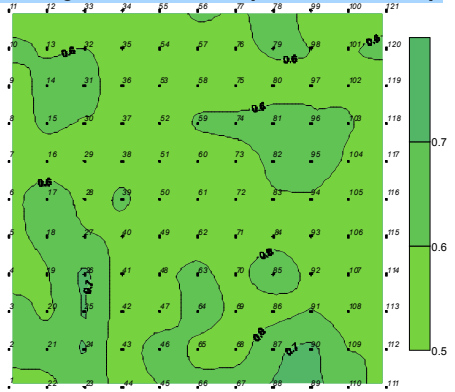
VD 2 (50x50m)



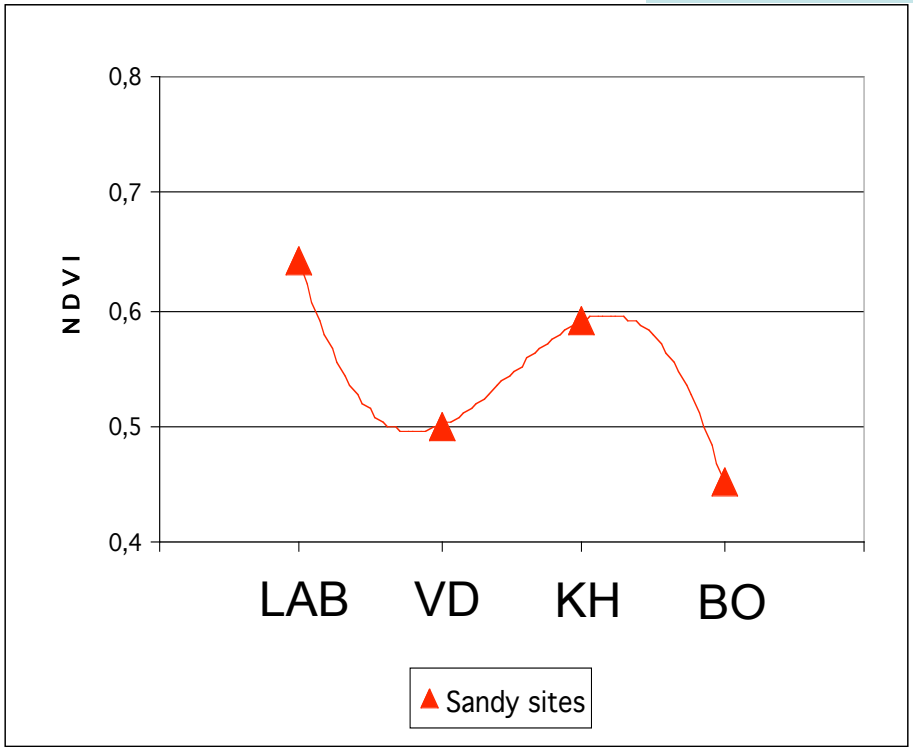
Kharasavey (50x50m)

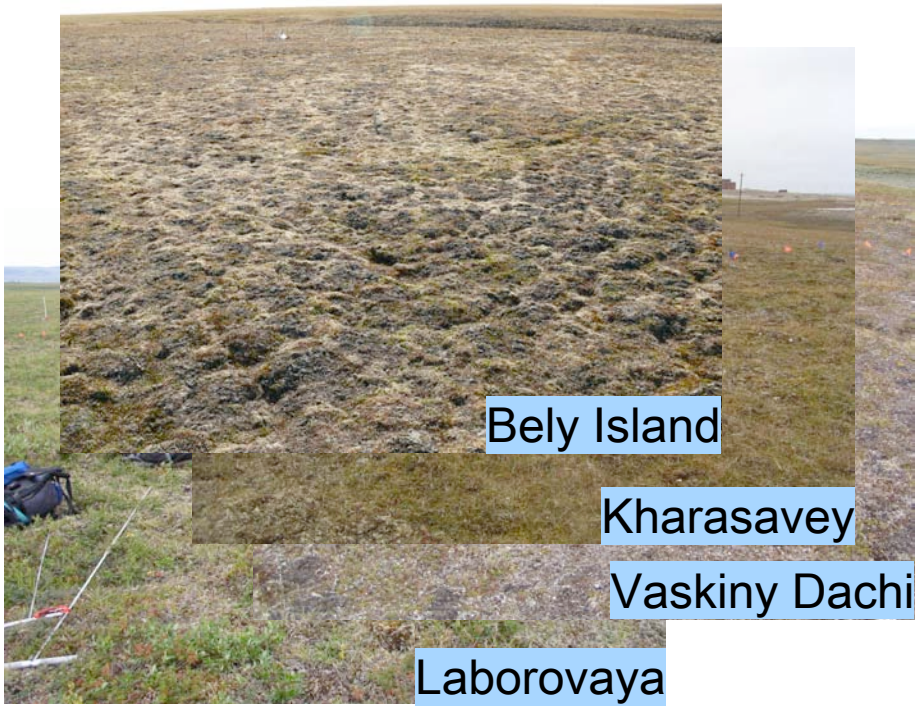


Bely Island (50x50m)



NDVI on sandy sites





0,64 → 0,50 → 0,59 → 0,45

Laborovaya

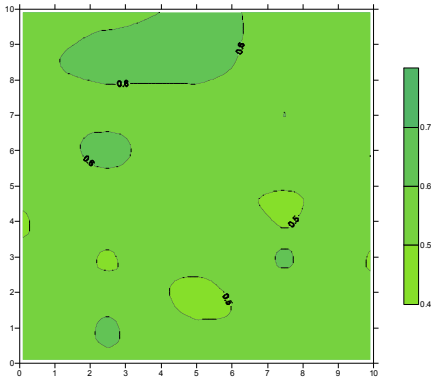
Vaskiny Dachi

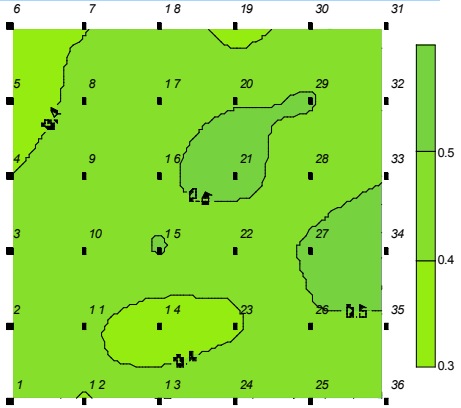
Kharasavey (10x10m)

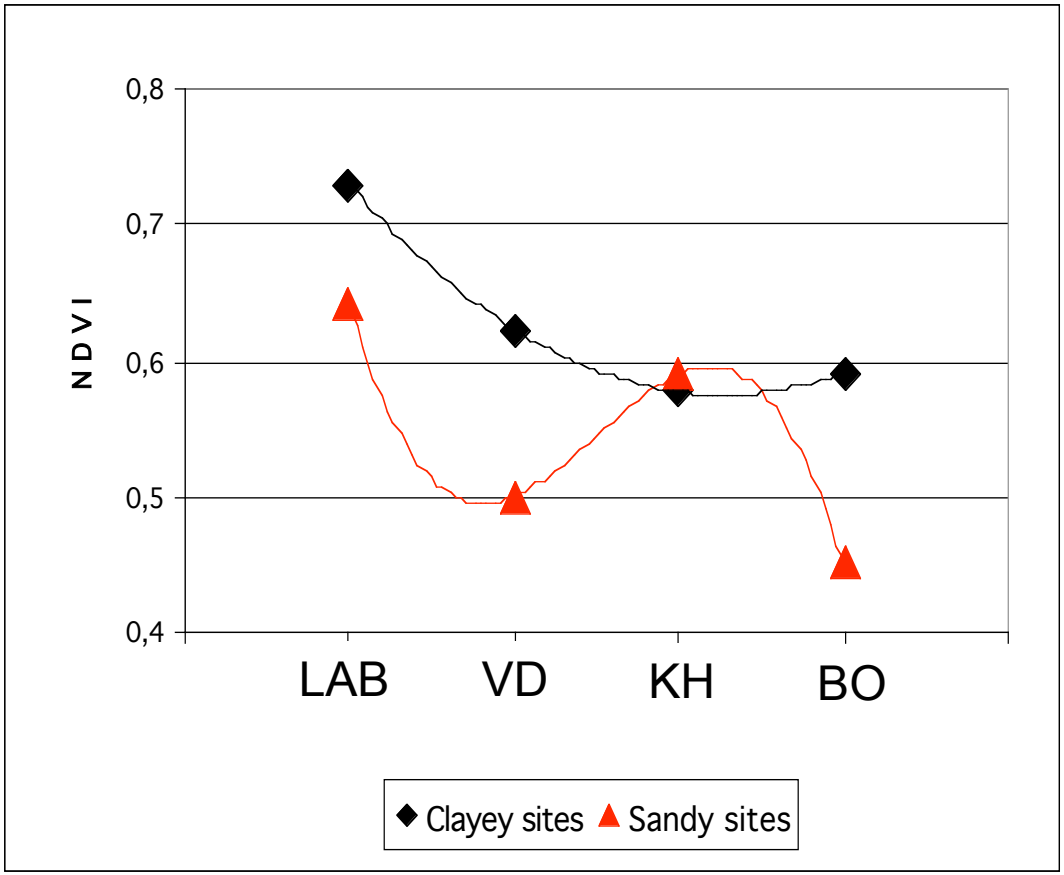
Bely Island (25x25m)

Range
0,45 – 0,78

Range
0,34 – 0,76

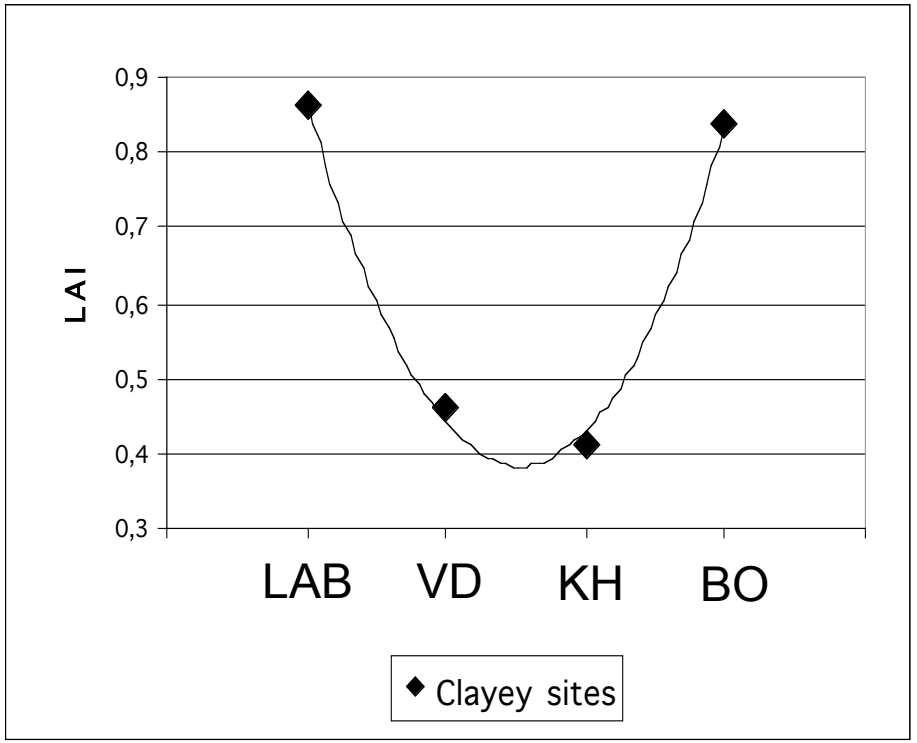






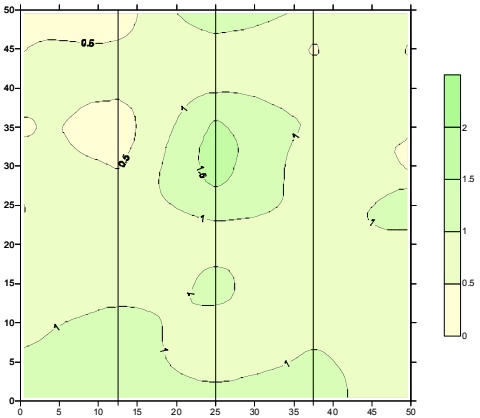
NDVI at clayey sites were in general higher than on sandy sites due to greater vegetation biomass.

LAI on clayey sites



0,86 → 0,46 → 0,41 → 0,84

Laborovaya (50x50m)



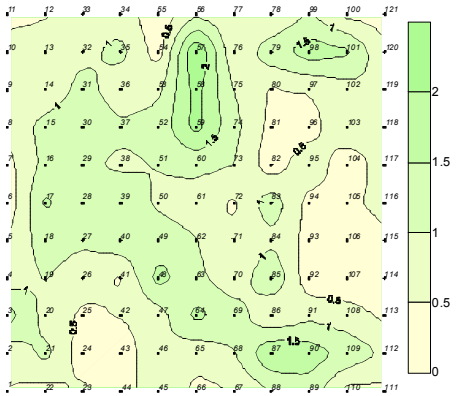
Vaskiny Dachi

Range
0,00 – 1,67

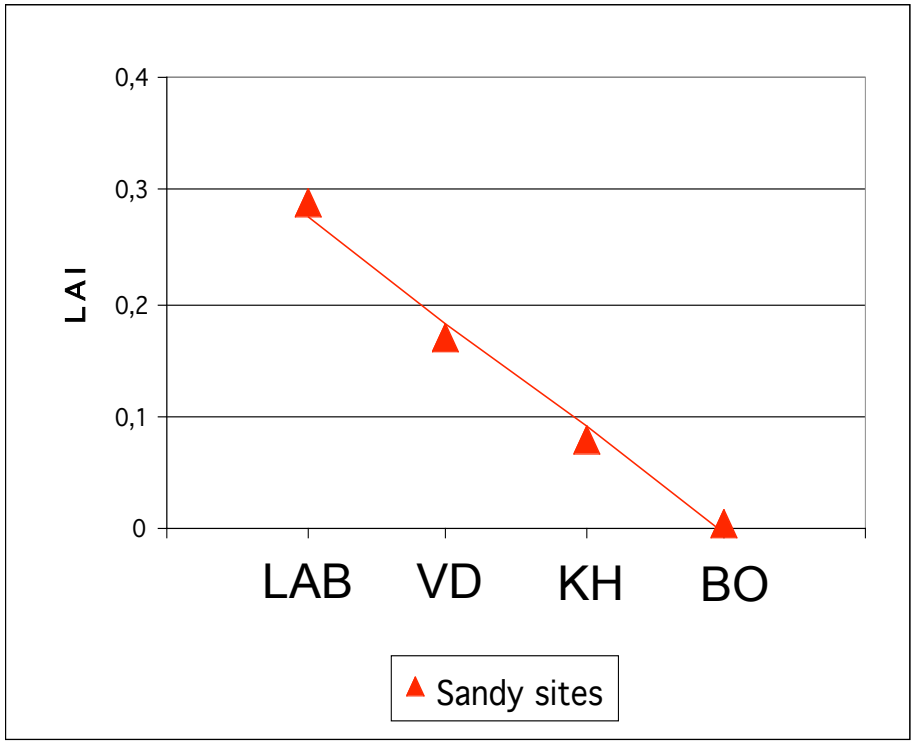
Kharasavey (25x25m)

Range
0,00 – 1,36

Bely Island (50x50m)



LAI on sandy sites



0,29 → 0,17 → 0,08 → 0,00

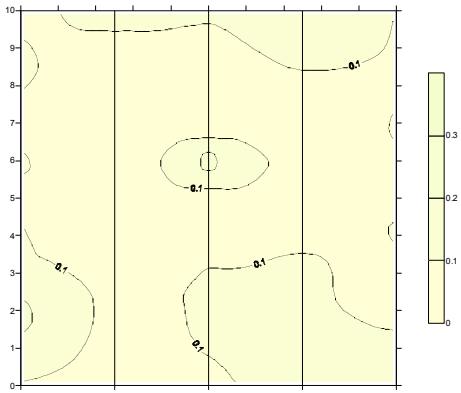
Laborovaya (50x50m)

Range
0,00 – 1,23

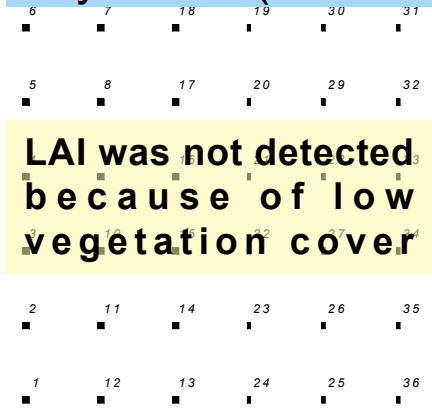
Vaskiny Dachi

Range
0,00 – 0,88

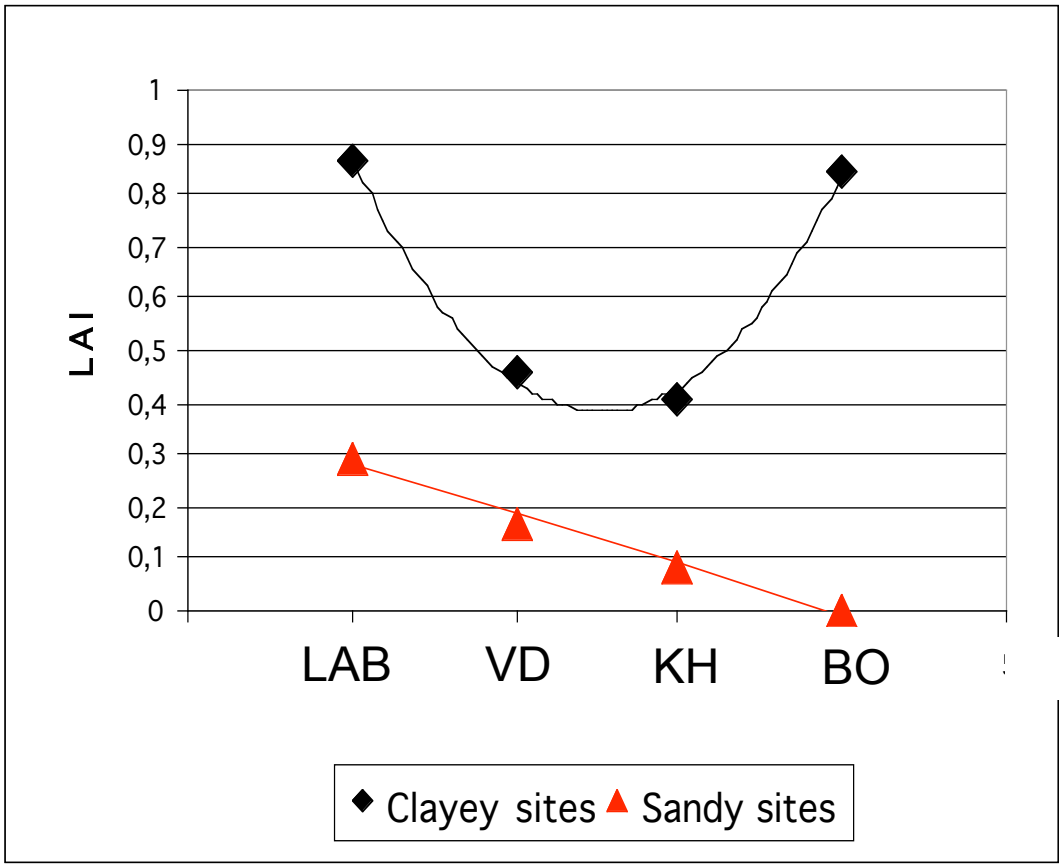
Kharasavey (10x10m)



Bely Island (25x25m)

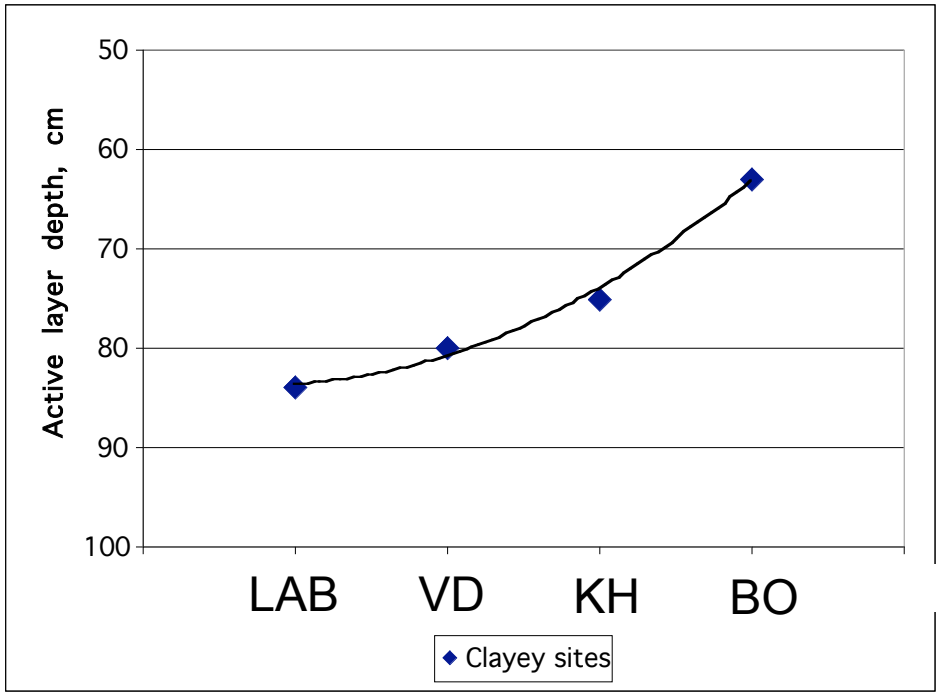


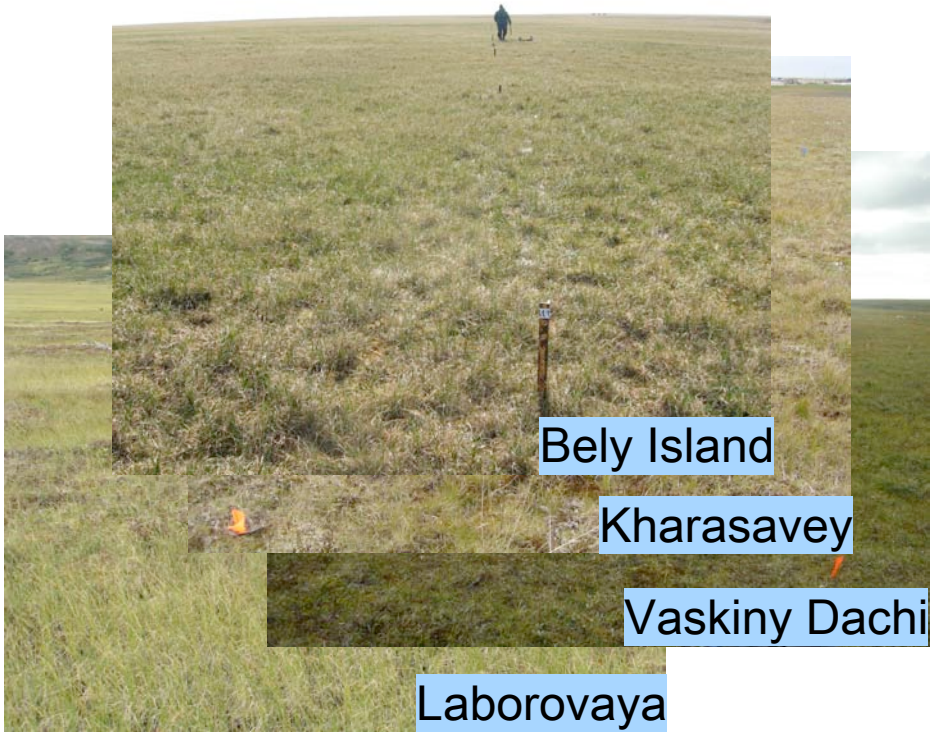
LAI was not detected because of low vegetation cover



LAI at clayey sites were also in general greater than on sandy sites due to dense and higher herbage.

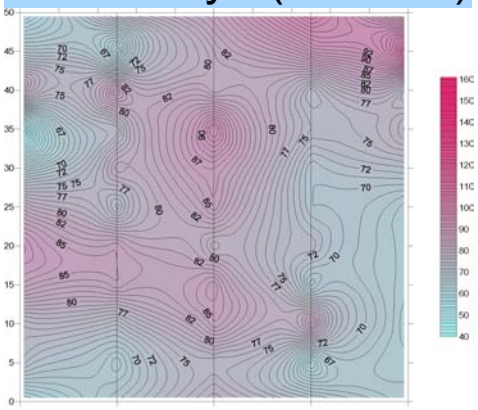
Active layer depth on clayey sites





84 cm → 80 cm → 75 cm → 63 cm

Laborovaya (50x50m)

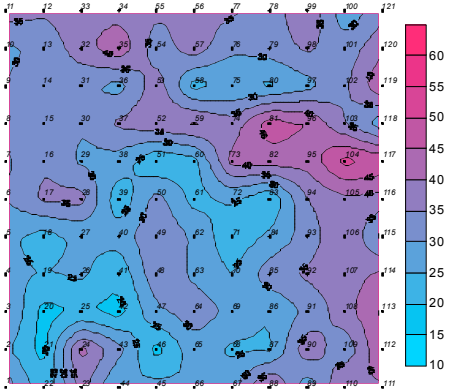


Vaskiny Dachi

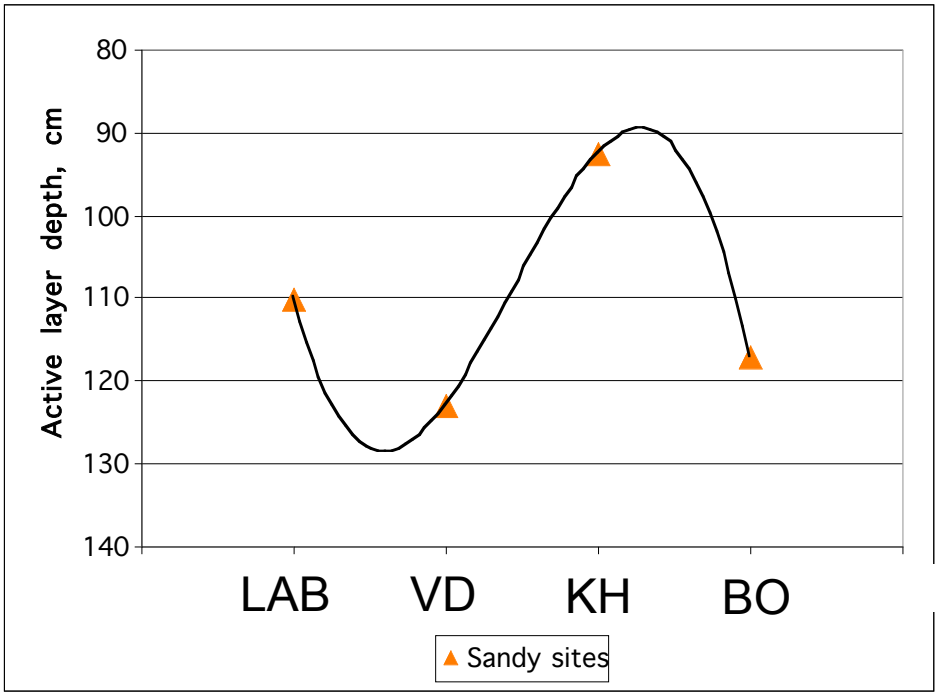
Kharasavey (50x50m)

Range
52 – 80 cm
measured

Bely Island (50x50m)

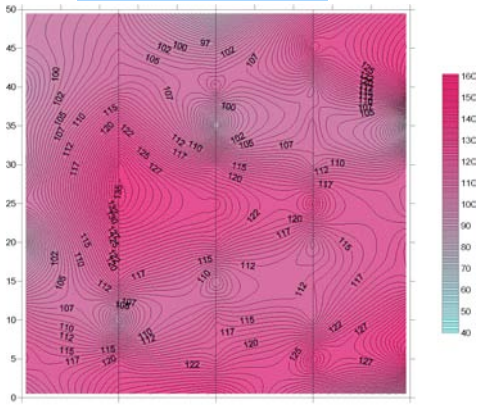


Active layer depth on sandy sites



110 cm → 123 cm → 92 cm → 117 cm

Laborovaya



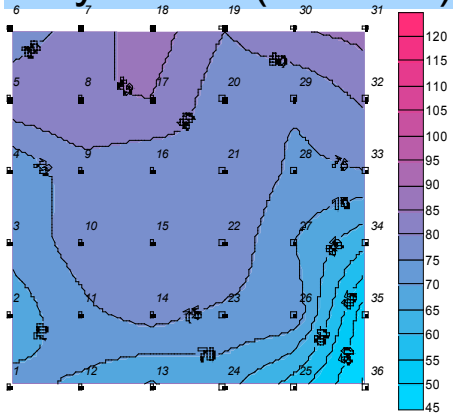
Vaskiny Dachi

Range
85 – 127 cm
measured

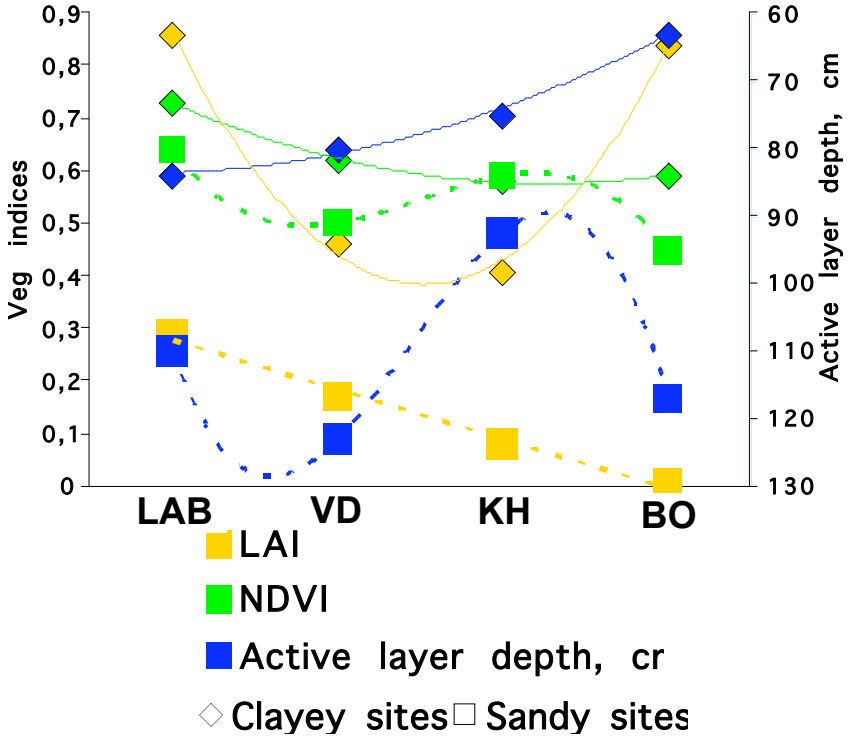
Kharasavey (10x10m)

Range
58 – 98 cm
measured

Bely Island (25x25m)



Thus,



It is well known that active layer depth mainly depends on soil composition and moisture content, vegetation mat thickness, and air temperature. In its turn, vegetation as an active layer control depends on the same zonal and local factors. In the similar soil conditions provided by separate analysis of sandy and clayey plots, variability of vegetation indices is not fully correlated to the active layer depth variability.

Nevertheless, shallow active layer on sandy plots at Kharasavey corresponds to increased NDVI. At the same time, increased values of indices on clayey plot of Bely Island did not provide small values of active layer depth. Probably, this is connected with high wetness.

Conclusion:

Generally, the zonal pattern of vegetation indices and active layer depths from south to north can be followed on both sandy and clayey sites. It depends on decrease of both vegetation biomass and proportion of high shrubs northward (on Bely Island shrubs are completely absent on all established sites).

Deviations from zonal trends are related to local features, such as lithology, drainage, and topography. Vegetation cover on sandy surfaces of flat terraces at Laborovaya and poorly-drained hilltops at Kharasavey is well developed, yielding shallower active layer compared to Vaskiny Dachi and Bely Island. At Bely Island high vegetation indices on clayey sites do not prevent deep thawing, possibly due to high soil moisture content.

Thank you for your attention