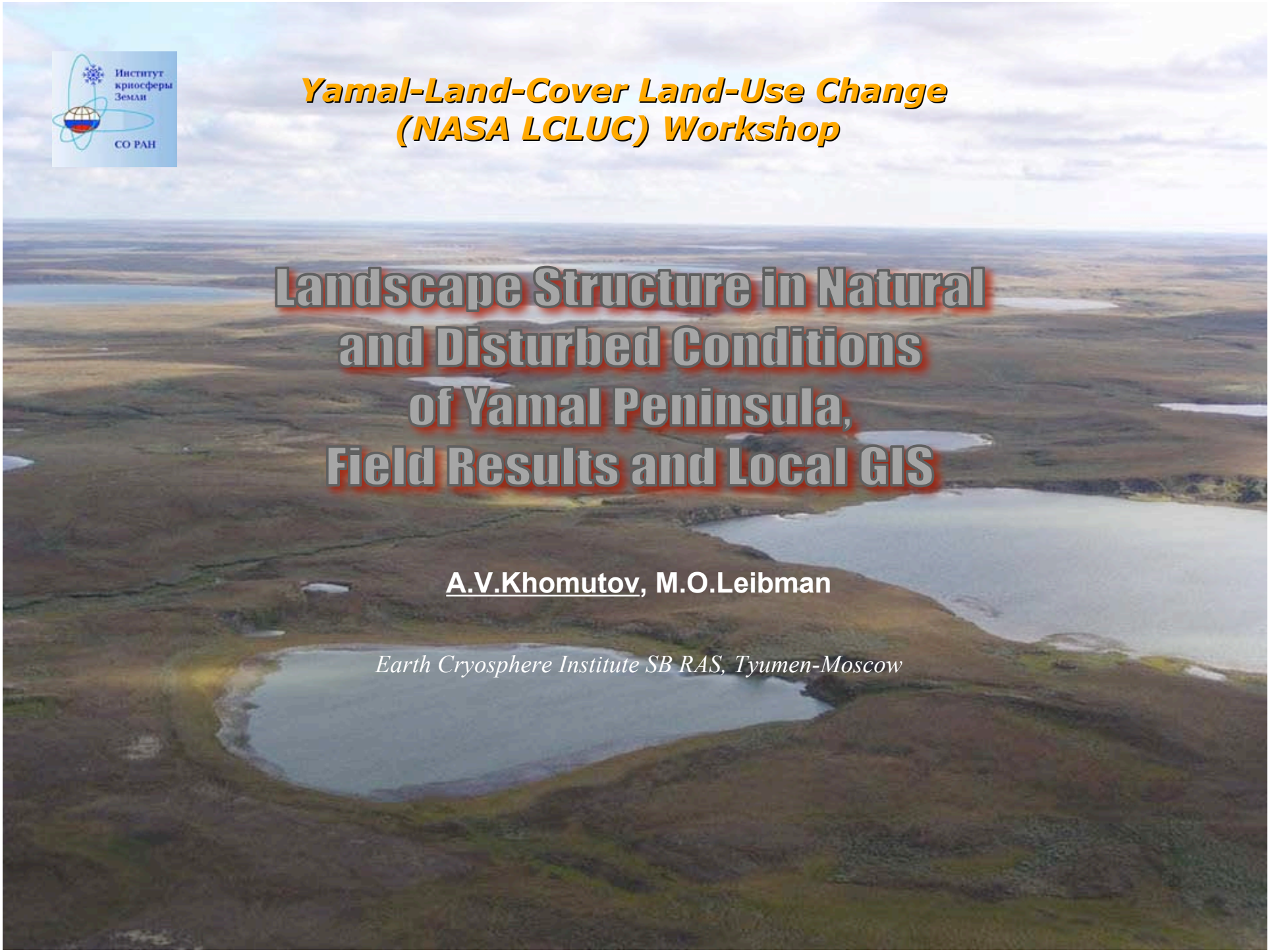
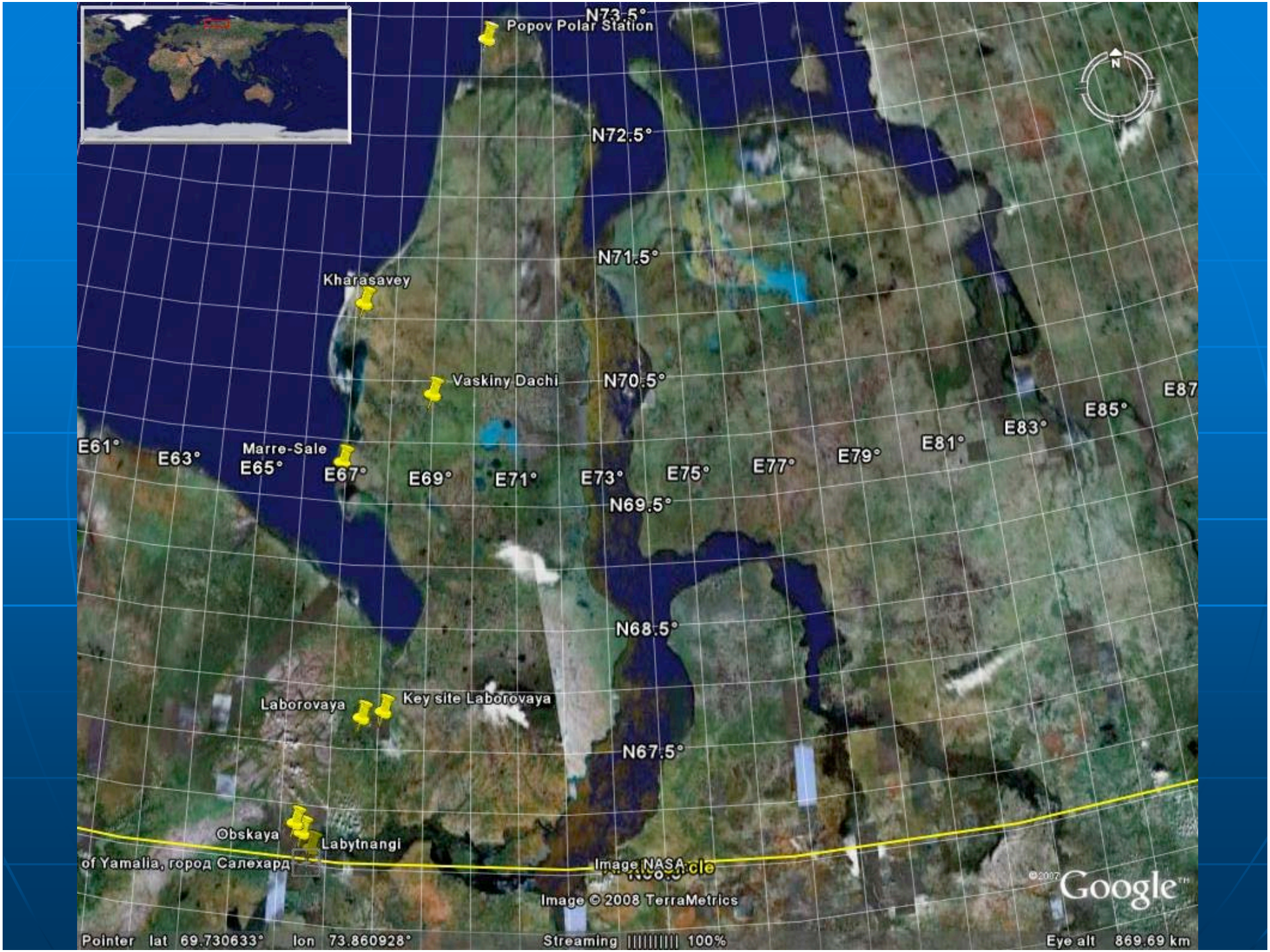


Yamal-Land-Cover Land-Use Change (NASA LCLUC) Workshop

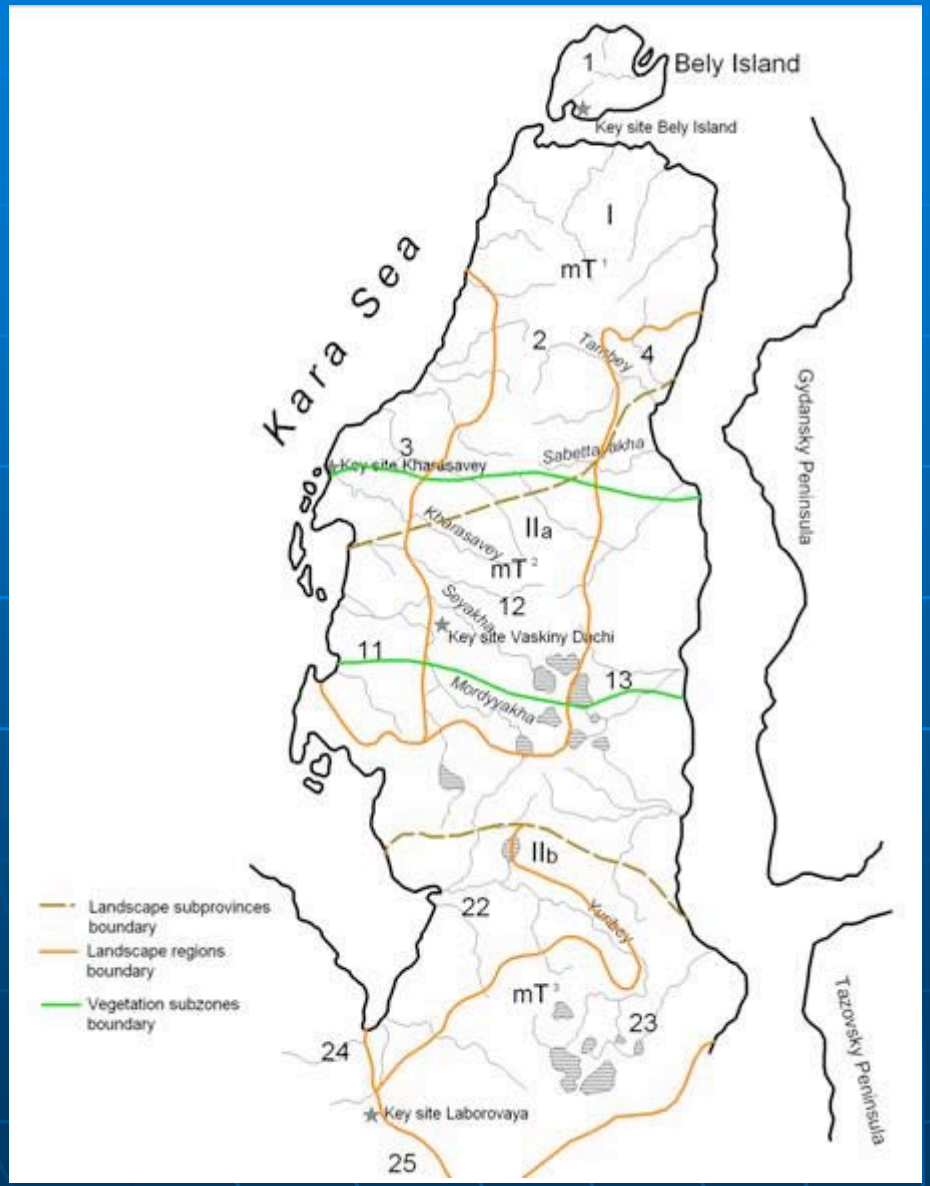
Landscape Structure in Natural and Disturbed Conditions of Yamal Peninsula, Field Results and Local GIS

A.V.Khomutov, M.O.Leibman

Earth Cryosphere Institute SB RAS, Tyumen-Moscow


Popov Polar Station
N73.5°
N72.5°
N71.5°
Kharasavey
Vaskiny Dachi
N70.5°
E87
E85°
E83°
E81°
E79°
E77°
E75°
E73°
E71°
E69°
E67°
E65°
E63°
E61°
Marre-Sale
N69.5°
N68.5°
Laborovaya
Key site Laborovaya
N67.5°
Obskaya
Labytnangi
of Yamalia, город Салехард
Image NASA
Image © 2008 TerraMetrics
©2007 Google
Pointer lat 69.730633° lon 73.860928°
Streaming 100%
Eye alt 869.69 km

Landscape and Vegetation zoning of Yamal Peninsula



E.S.Melnikov's scheme of landscape zoning of the North of West Siberia and Melnikov et al's map of landscape complexes of Western Siberia oil&gas province (Landscapes... 1983, Pemafrost... 2002)

Yamal province of marine tundra plains (mT) is divided into 3 subprovinces:

-northern tundra marine plains (mT^1)

-middle tundra marine plains (mT^2)

-southern tundra marine plains (mT^3).

Each subprovince is subdivided into several landscape regions.

The scheme of zonal structure of vegetation (Il'ina et al. 1985, Nature... 1995, Monitoring... 1997)

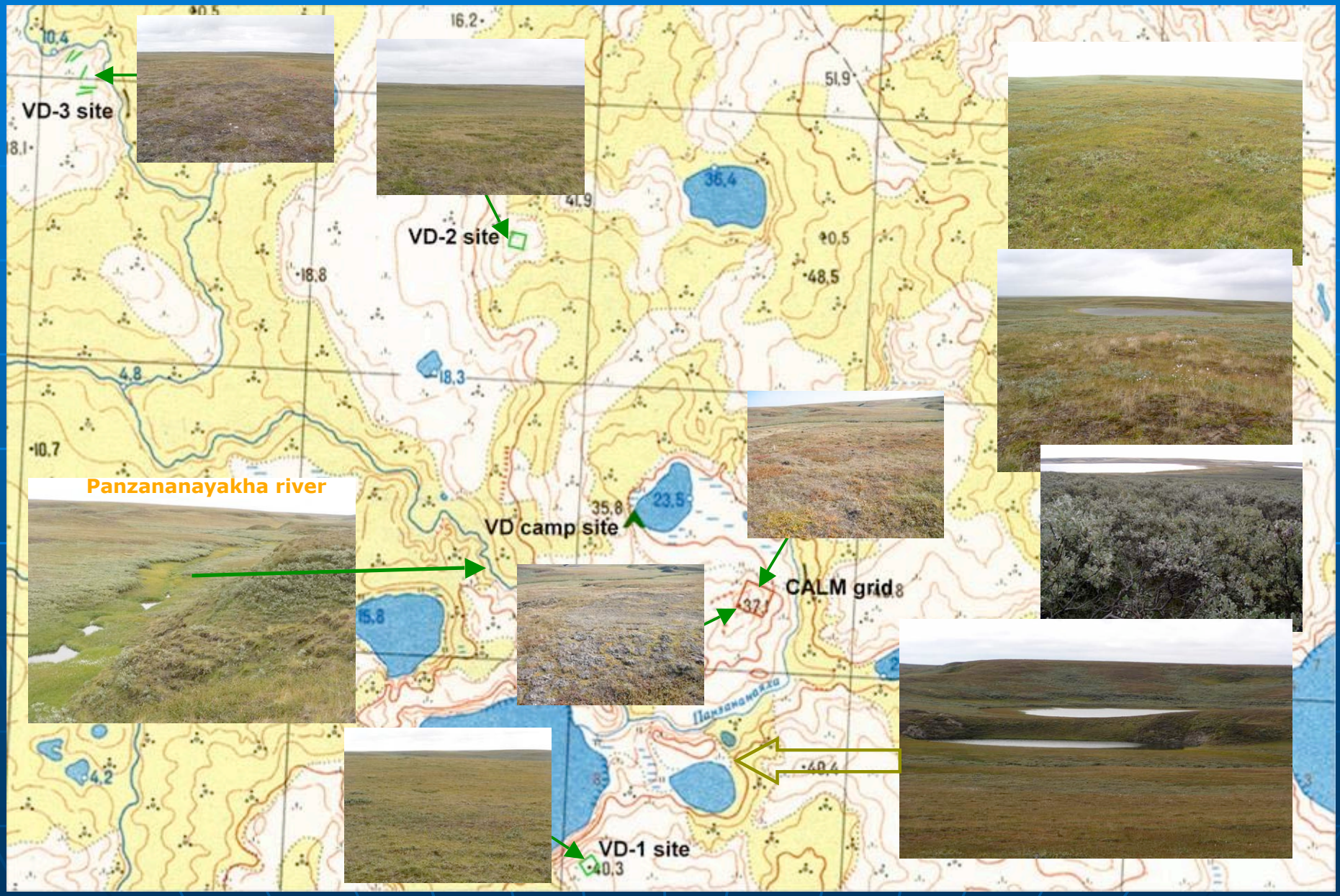
Yamal Peninsula is subdivided into:

-arctic tundra subzone (I)=bioclimate subzone C

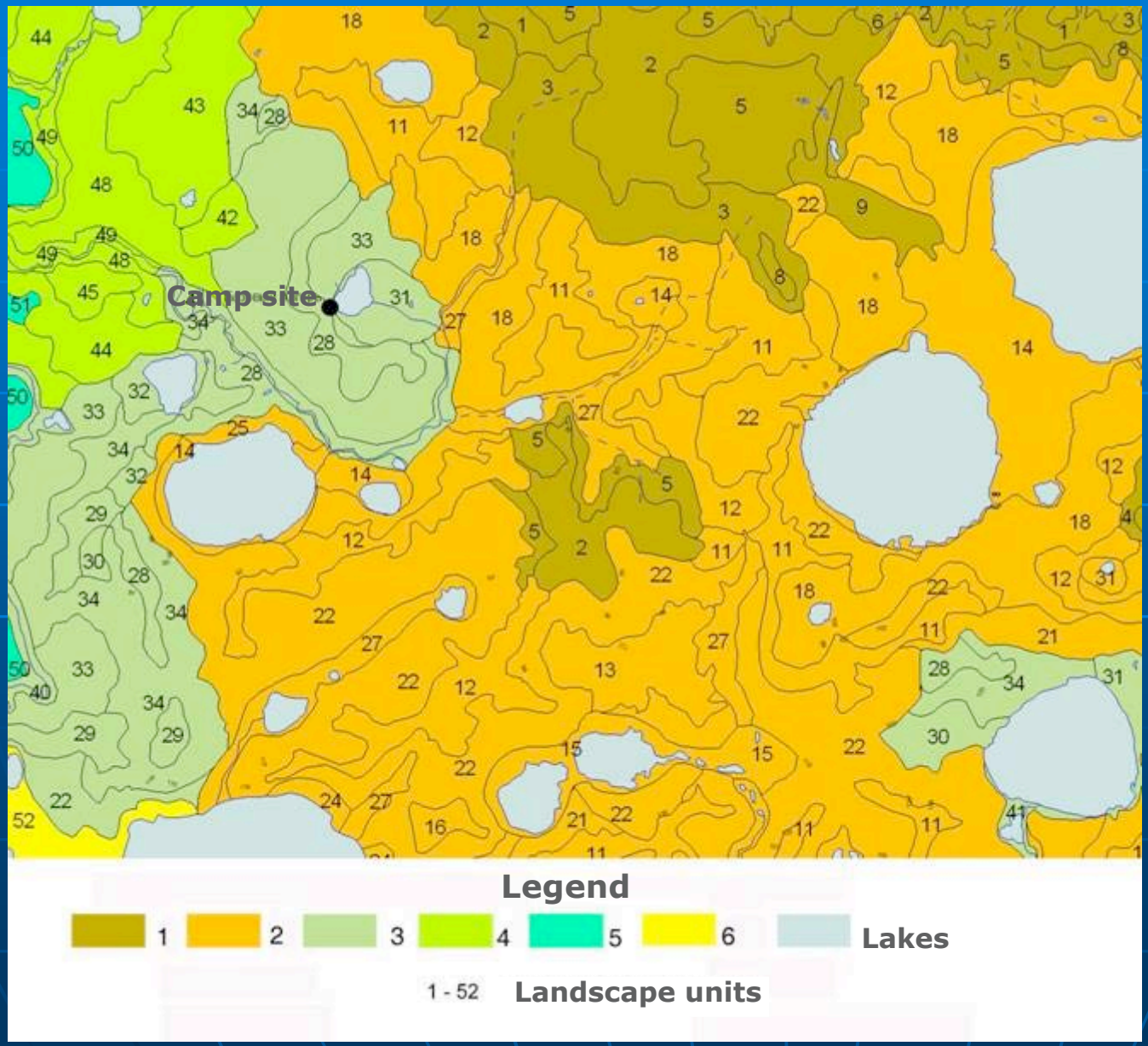
-typical tundra of subarctic tundra subzone (II_1) =bioclimate subzone D

-shrub tundra of subarctic tundra subzone (II_2) =bioclimate subzone E.

Research location Vaskiny Dachi: overview map



Research location Vaskiny Dachi: landscape pattern
Map of geomorphological levels



1-V marine plain ("Salekhardskaya"), upper than 45 m above sea level (Terrace V)

2-IV coastal-marine plain ("Kazancevskaya"), upper than 35 m above sea level (Terrace IV)

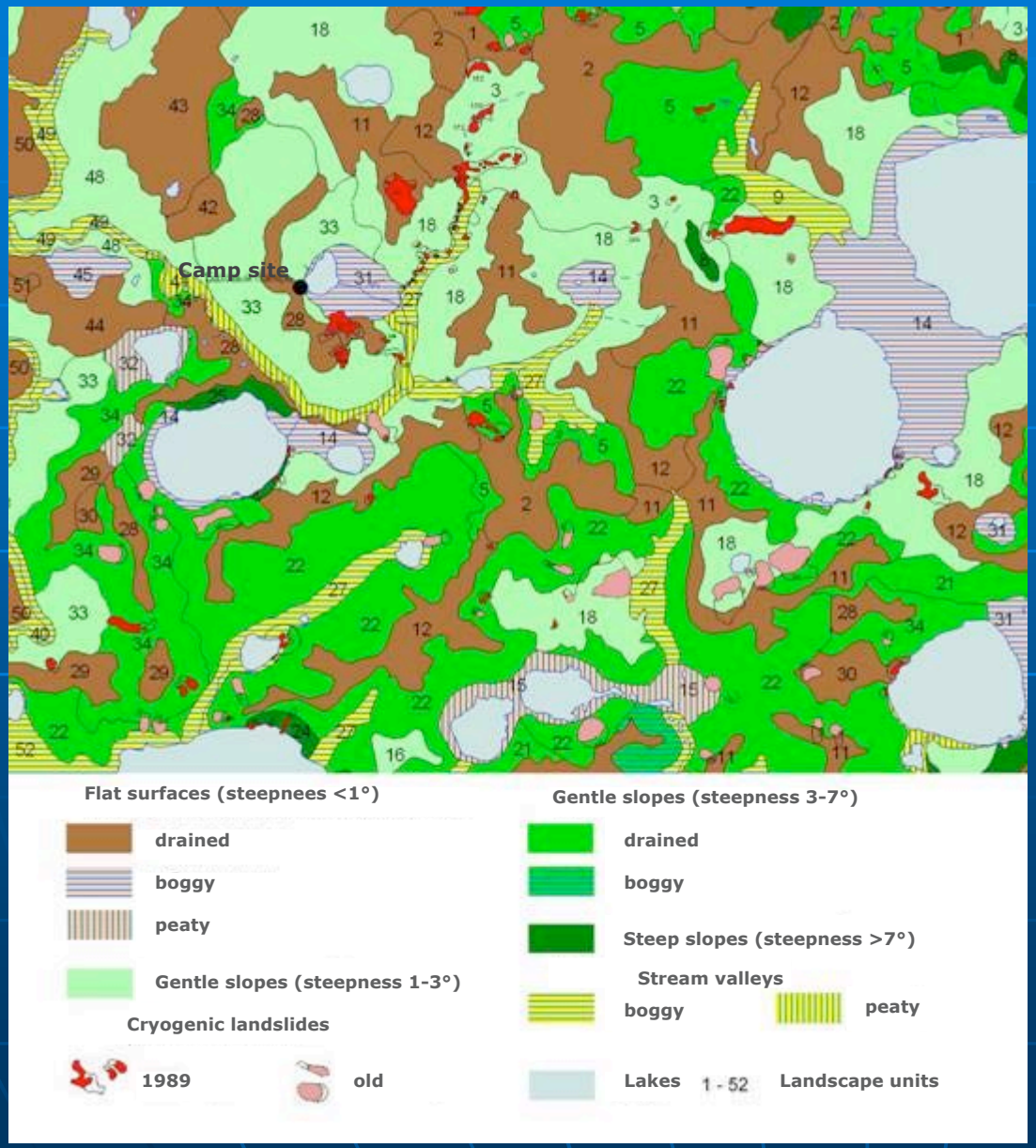
3-III fluvial-marine plain, upper than 25 m above sea level (Terrace III)

4-Terrace II

5-Terrace I

6-flood plain of Mordyyakha river

Research location Vaskiny Dachi: landscape pattern
Landscape-geomorphological map



Legend for landscape units was composed.
Based on table with data of geomorphological levels, slope steepness, active-layer deposits and vegetation.

Examples of landscape units:

1 – drained partly bare flat&convex surfaces of marine plain with unclosed grass-shrub-moss-lichen tundra on sandy&loamy-sand deposits with gruss and gravel

14 – boggy vegetated low lake terraces of costal-marine plain with herb-shrub-lichen-moss tussocky bogs on peaty loamy-sand&loam deposits with peat

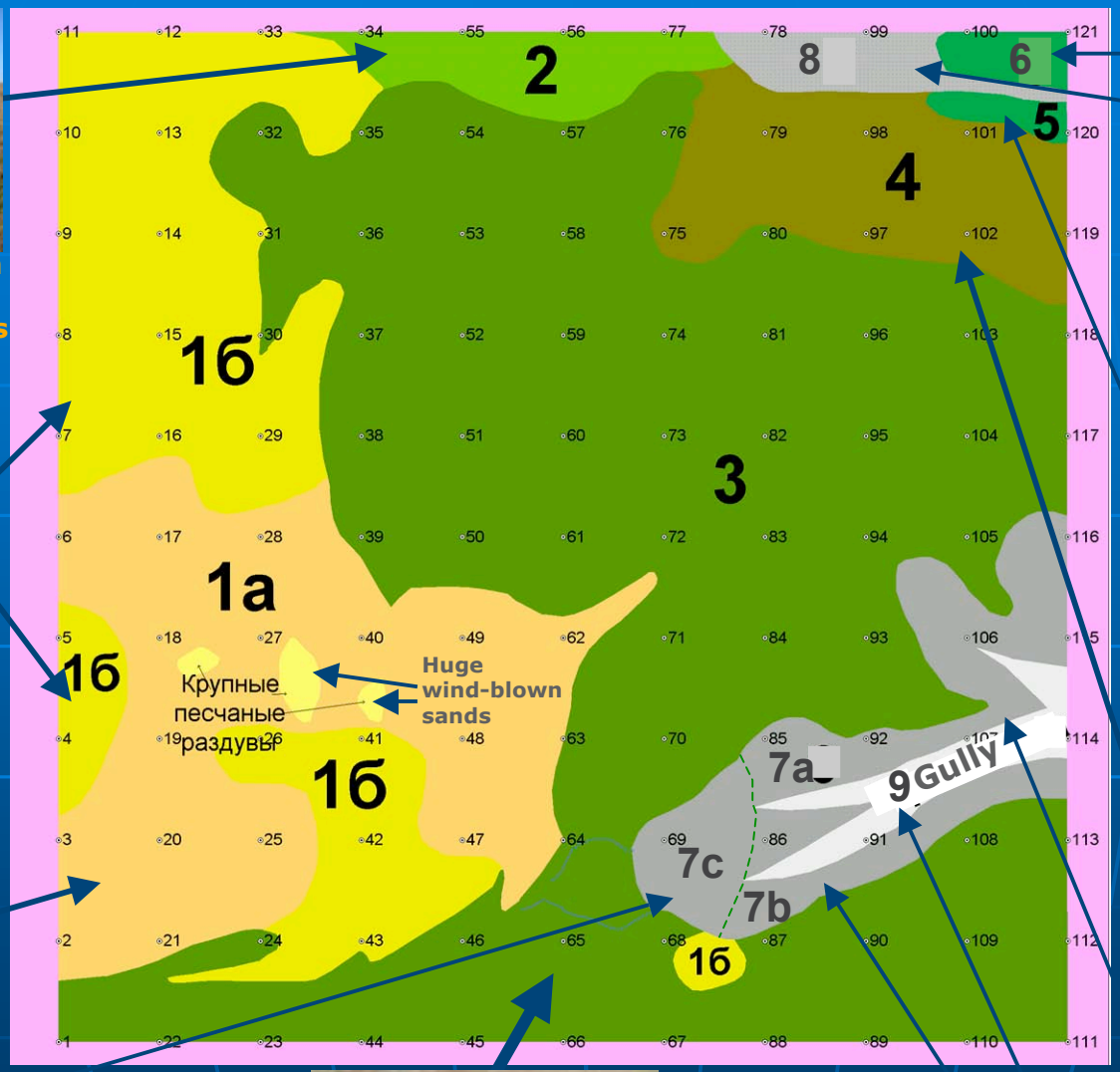
33 – irregular-drained vegetated gentle slopes of fluvial-marine plain with herb-moss-shrub tundra on loamy-clayey deposits.

Research location Vaskiny Dachi: landscape pattern of CALM grid

Hummocky slope with shrub-herb-moss tundra (*Betula nana* is dominant in shrubs)

Hill top with shrub-herb-moss-lichen tundra

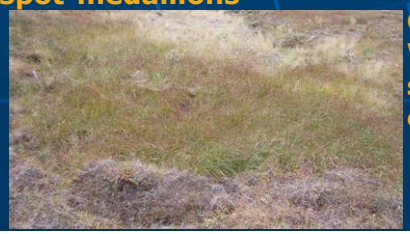
Hill top with shrub-lichen tundra with spot-medallions



6 Landslide body (partly rumpled) with rare herb-moss-willow complexes
8 Landslide share surface with pioneer vegetation

Gentle slope with herb-moss-shrub tundra (*Salix* is dominant)

Hummocky slope with herb-moss-shrub tundra (*Betula nana* is dominant)

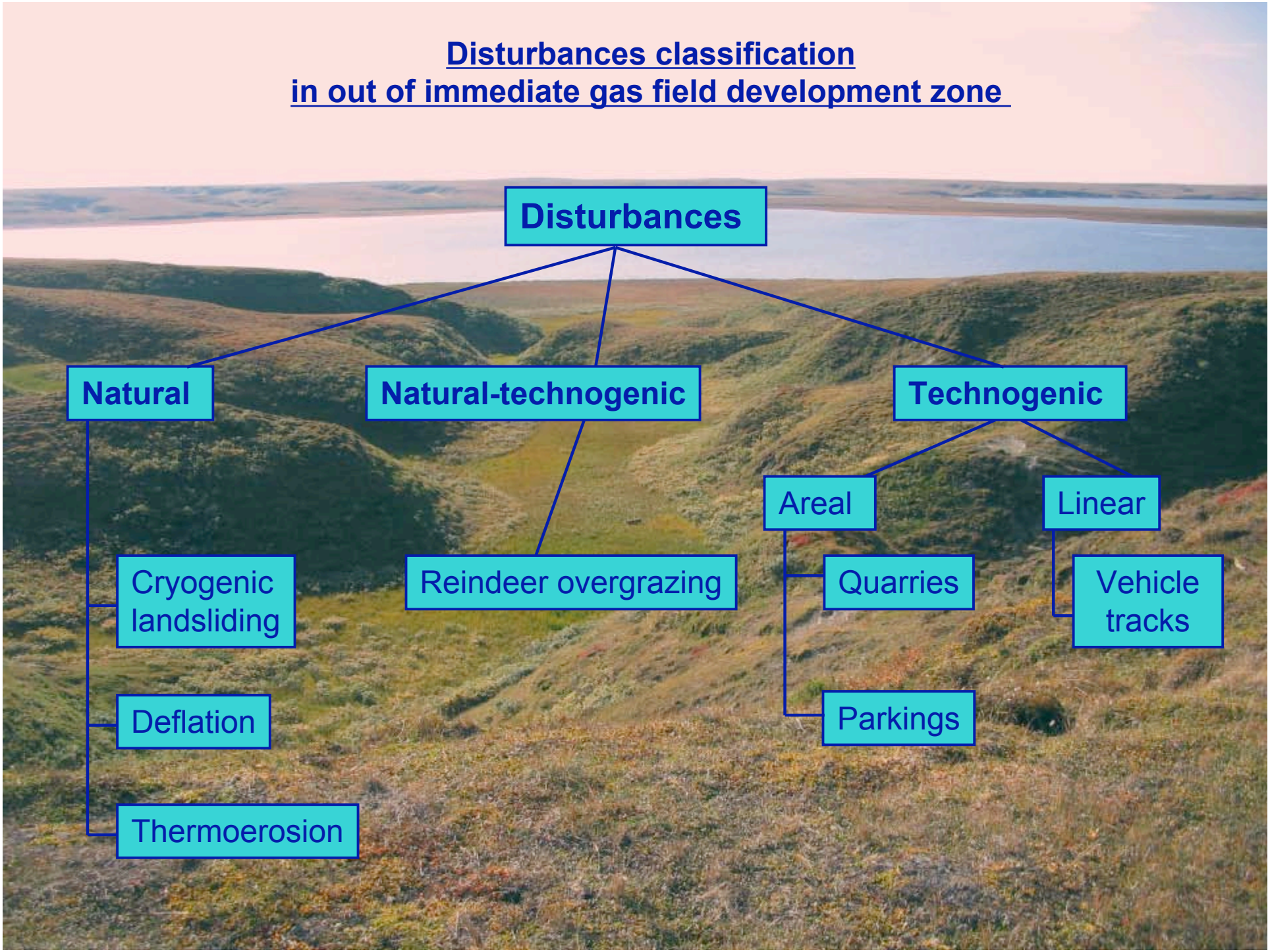


Gully branch With wet thick shrub-sedge complex

Hummocky-tussocky concave slope with herb-shrub moss tundra

7a Landslide share surface with pioneer vegetation
7b Landslide share surface with rare herb-shrub complexe
9 Gully

Disturbances classification in out of immediate gas field development zone



Cryogenic landsliding

Undisturbed slope

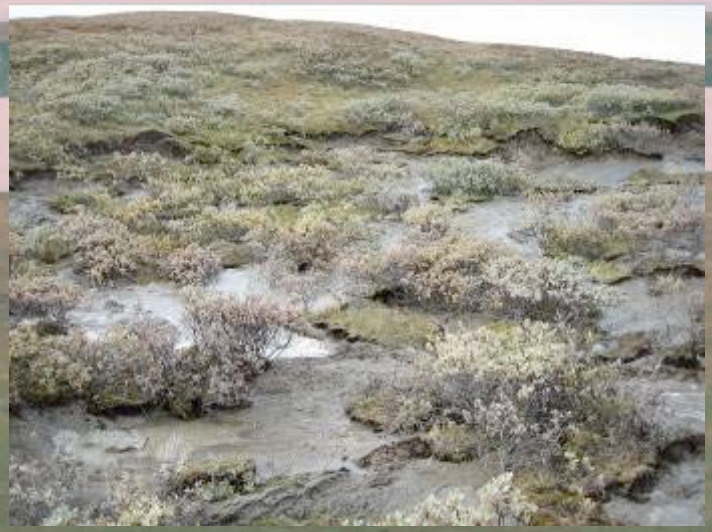
- Landslide share surface
- Landslide body
- «Frontal zone»

Thermoerosion

Catchment, river head → Valley → Valley train

Cryogenic landsliding and thermoerosion paragenesis

Flat bare surface → **Fast cutting in the share surface** → **Flattened gully slopes on landslide share surface**



1989	2007
Bare surface with vegetated landslide blocks, deep narrow gully in the center	Overgrown surface with pioneer herb complexes, deep wide gully on most of the surface,

Deflation

Convex undisturbed surfaces

Spot-medalion-hymmocky suface overgrown by lichens with initial blowout spots

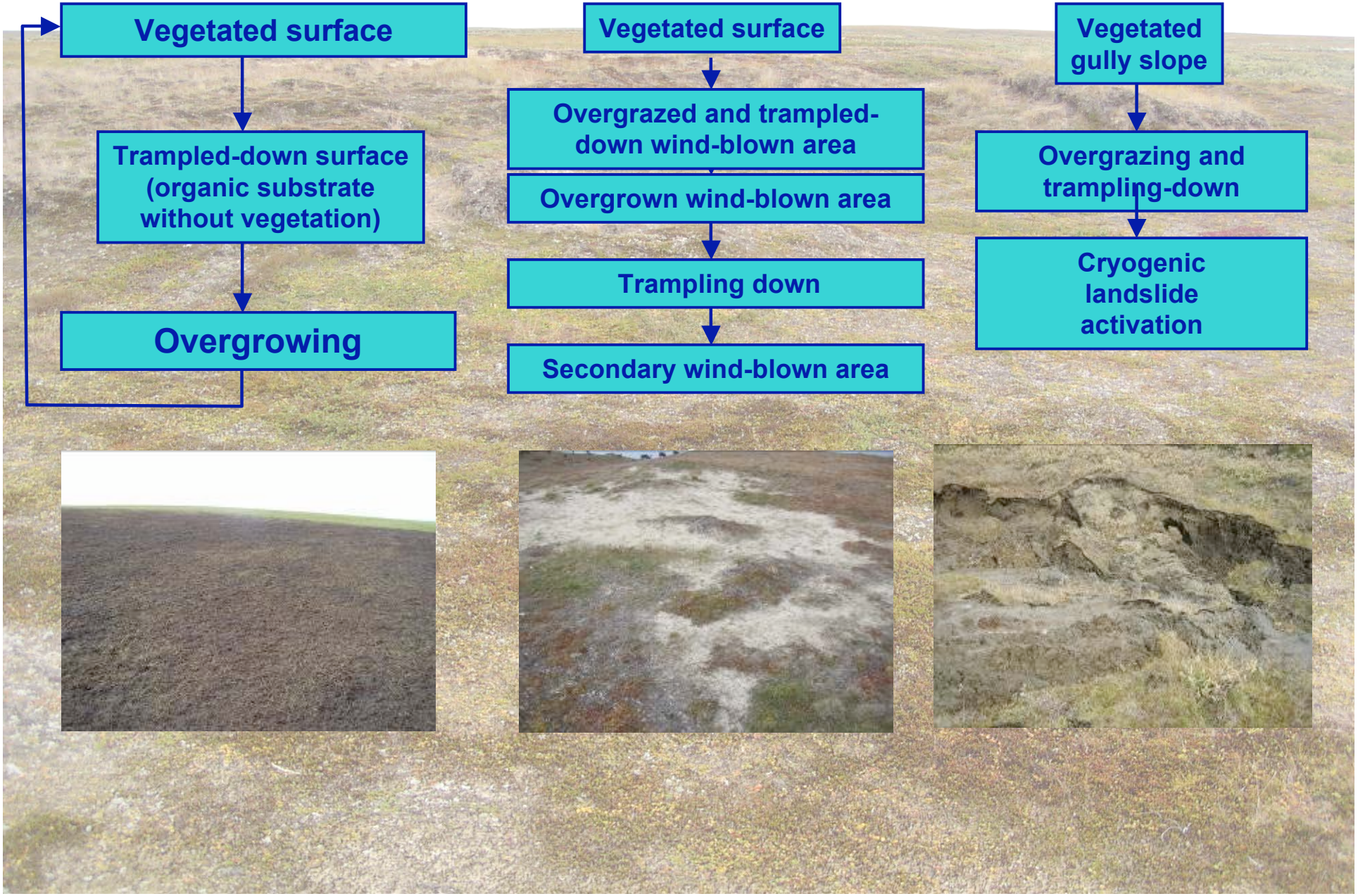
Wind-blown sands

Repeated windblow, secondary wind-blown area forming

2006

2005

Natural-technogenic disturbances: sequence of events



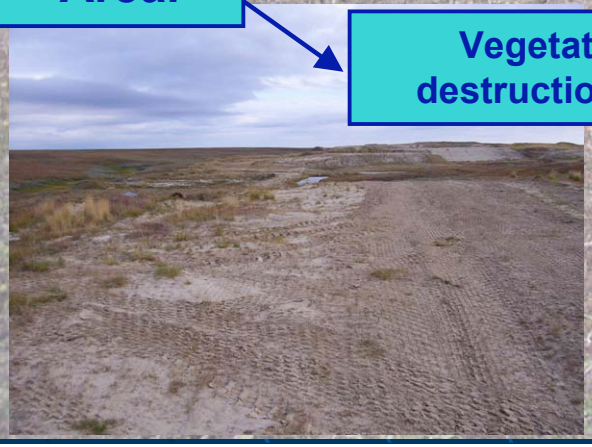
Technogenic disturbances

Linear → **Vegetation diversity changing**

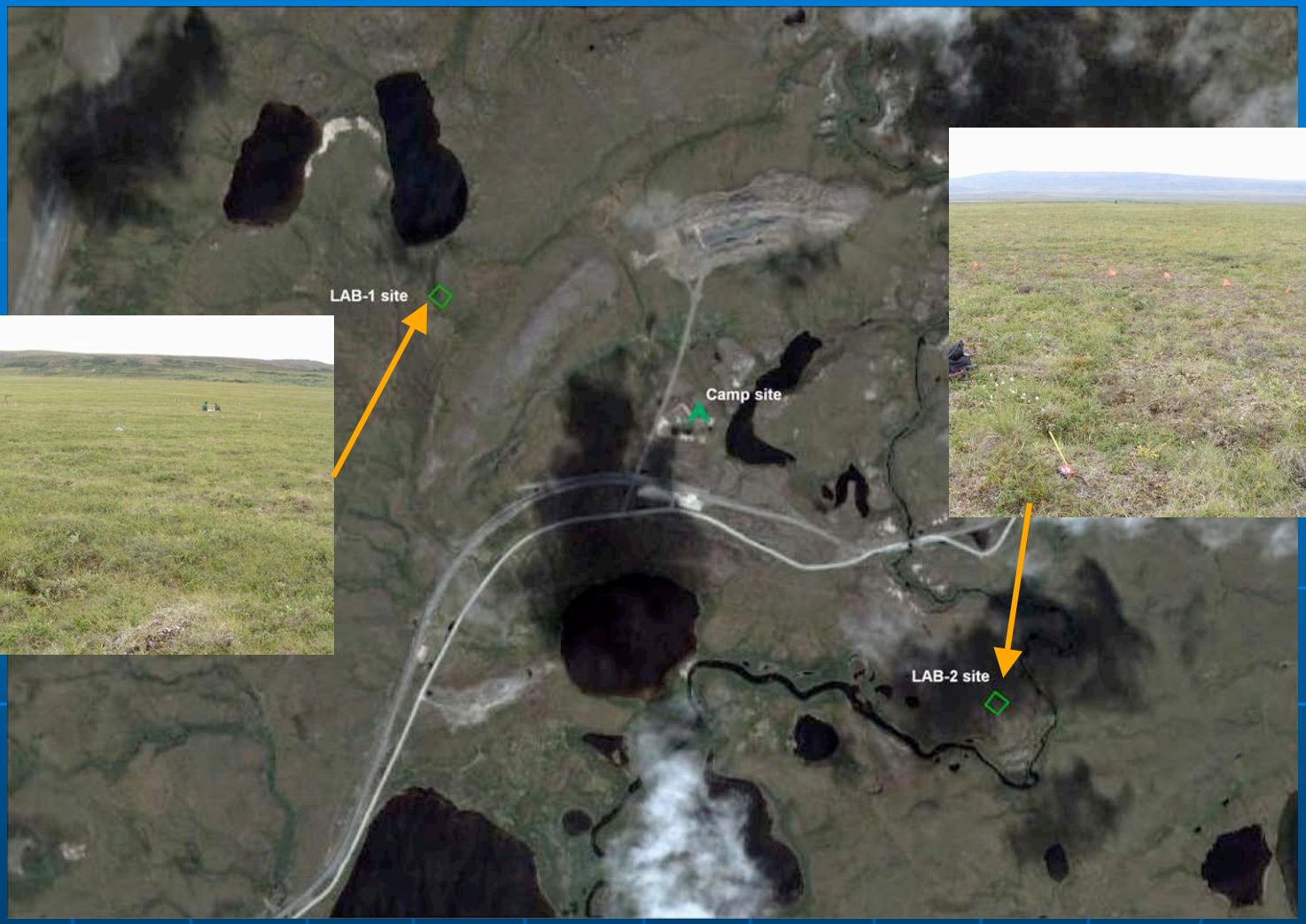
2007

Areal → **Vegetation diversity changing (parkings)**

Areal → **Vegetation cover destruction (quarries)**



Research location Laborovaya: overview



Research location Laborovaya: landscape pattern overview

Mountain part

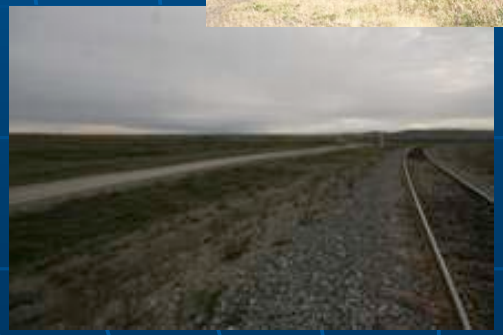
Plain part

Research location Laborovaya: overview of disturbances

Natural

Technogenic

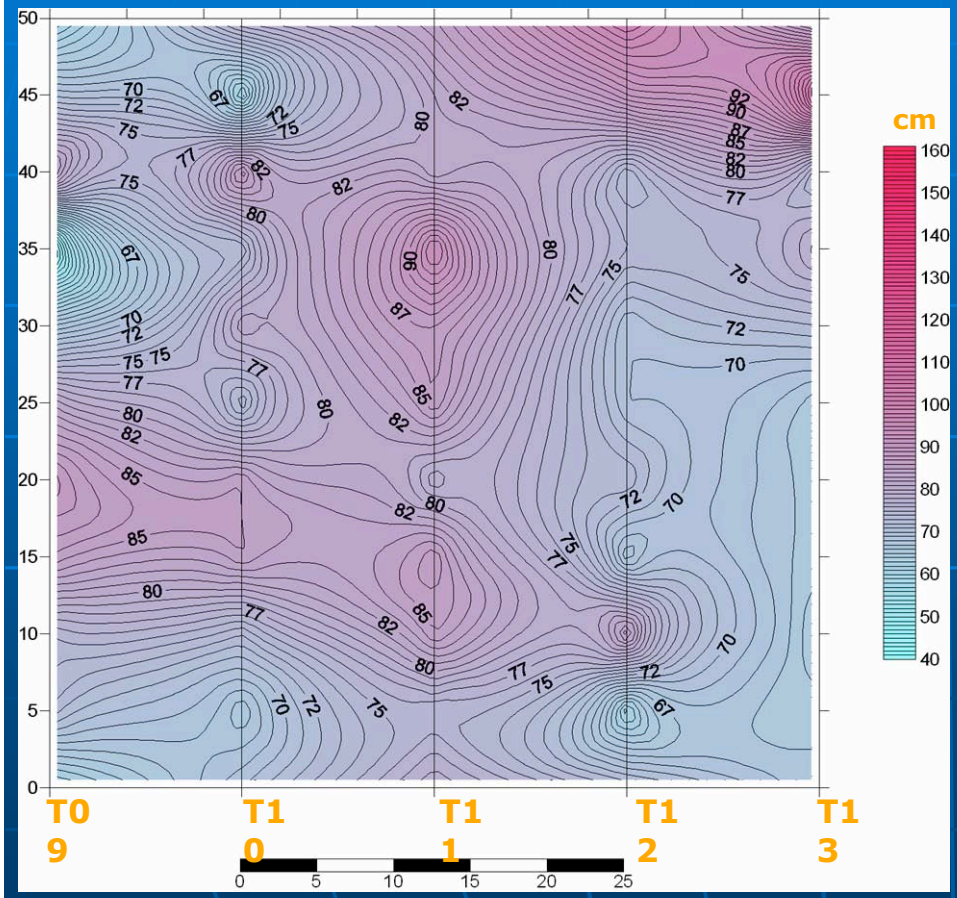
as a result of Obskaya-Bovanenkovo railway construction



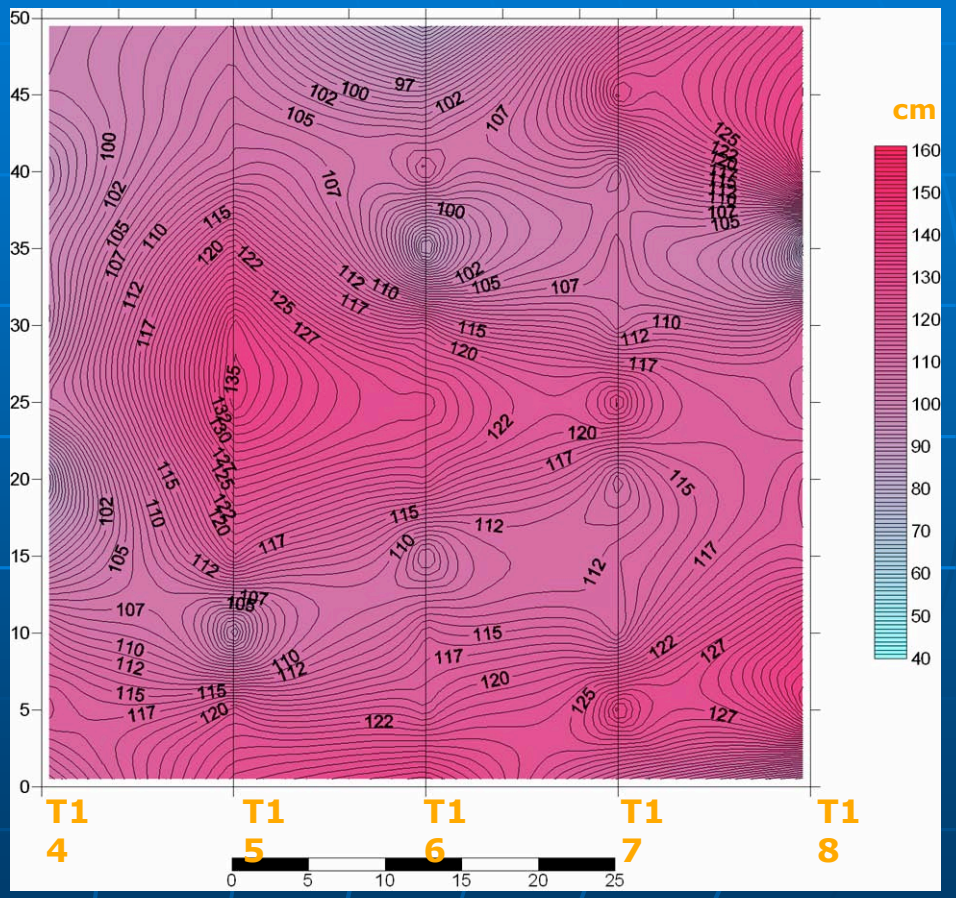
Field data 2007 within the framework of NASA-LCLUC project

Research location Laborovaya

LAB-1 site



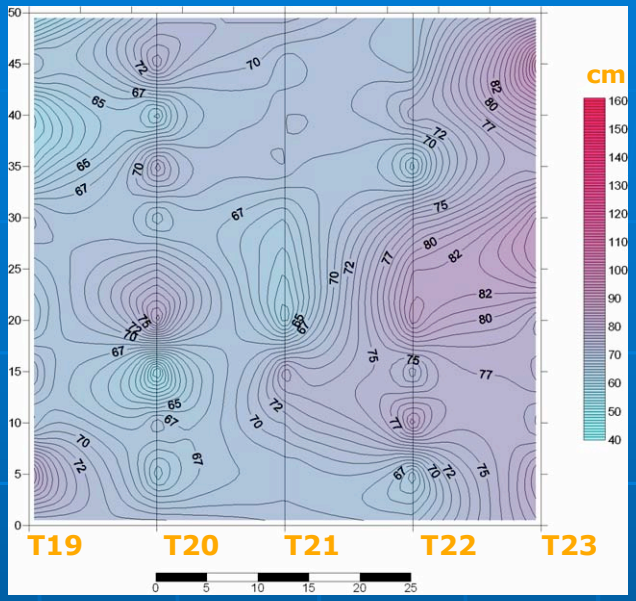
LAB-2 site



AL depth range: **56-108** cm **75-136** cm

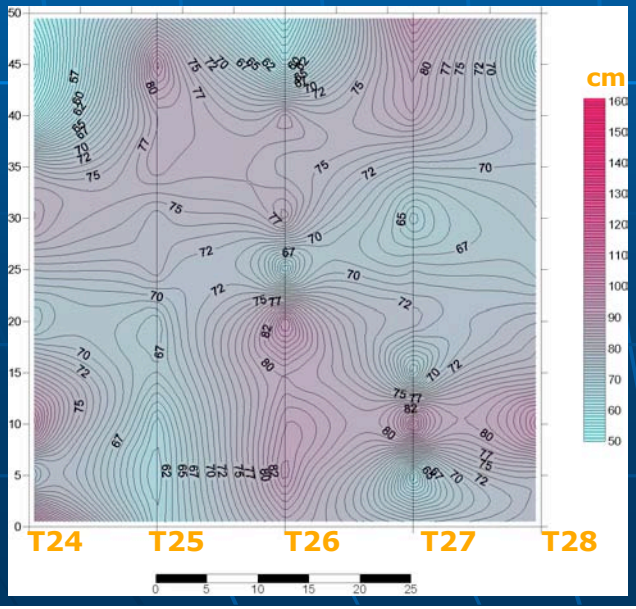
Research location Vaskiny Dachi

VD-1 site



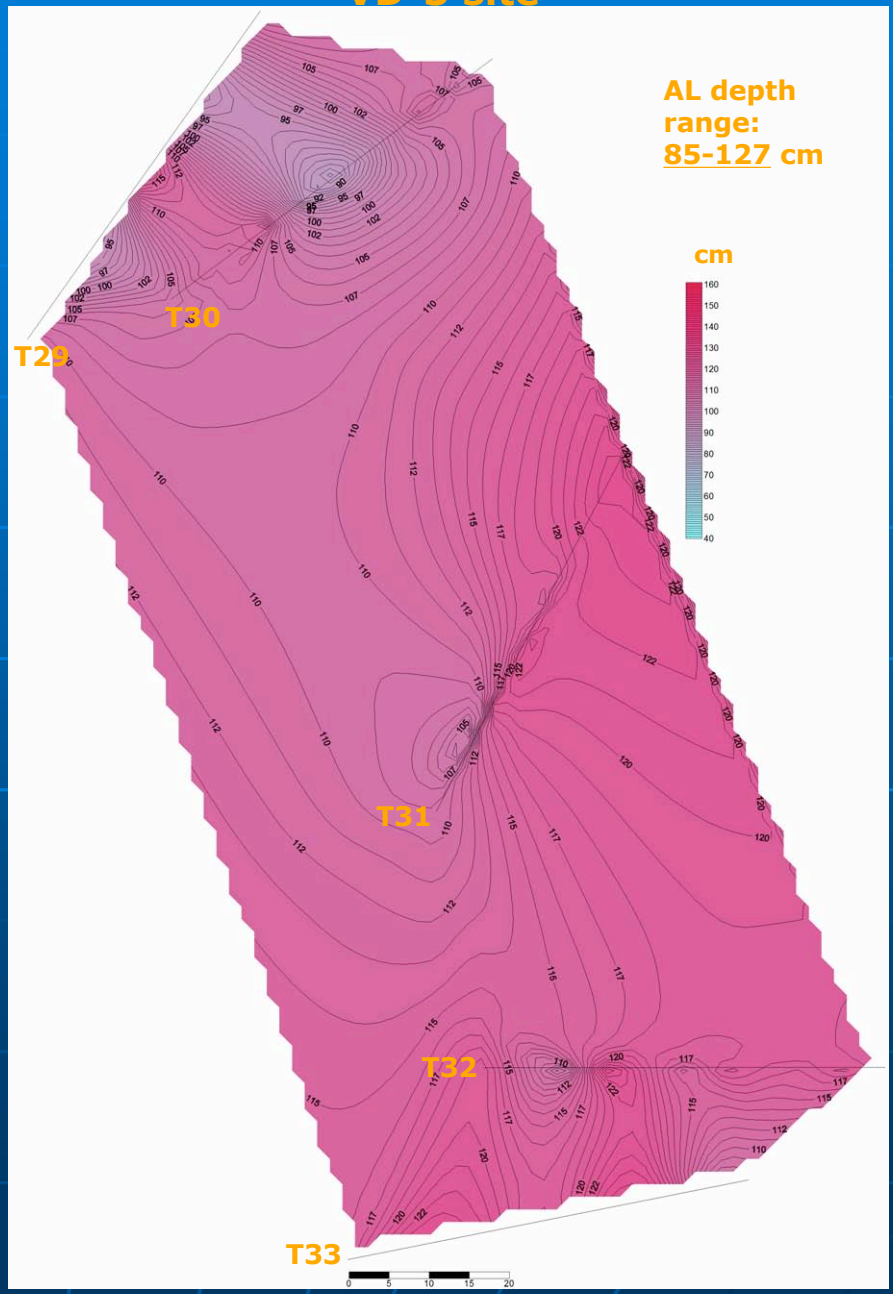
AL depth range: 55-95 cm

VD-2 site



AL depth range: 40-93 cm

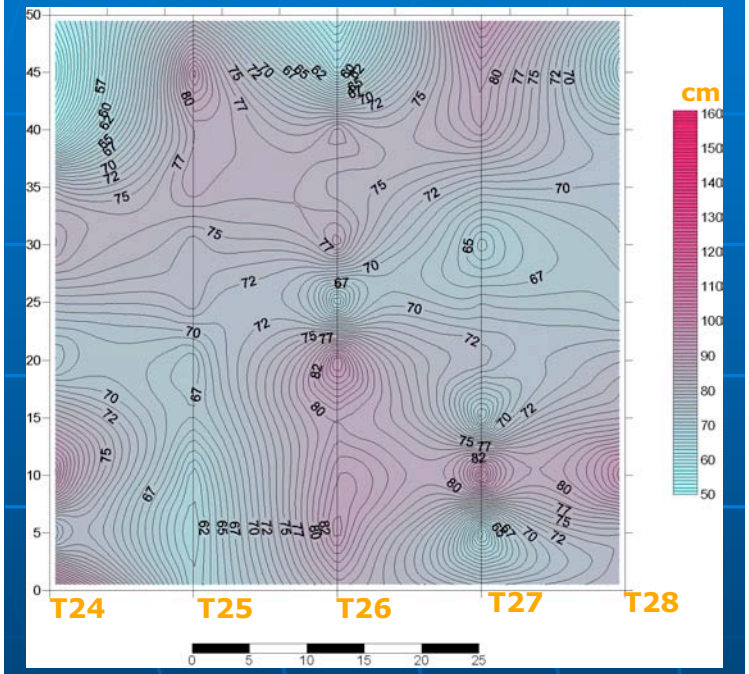
VD-3 site



AL depth range: 85-127 cm

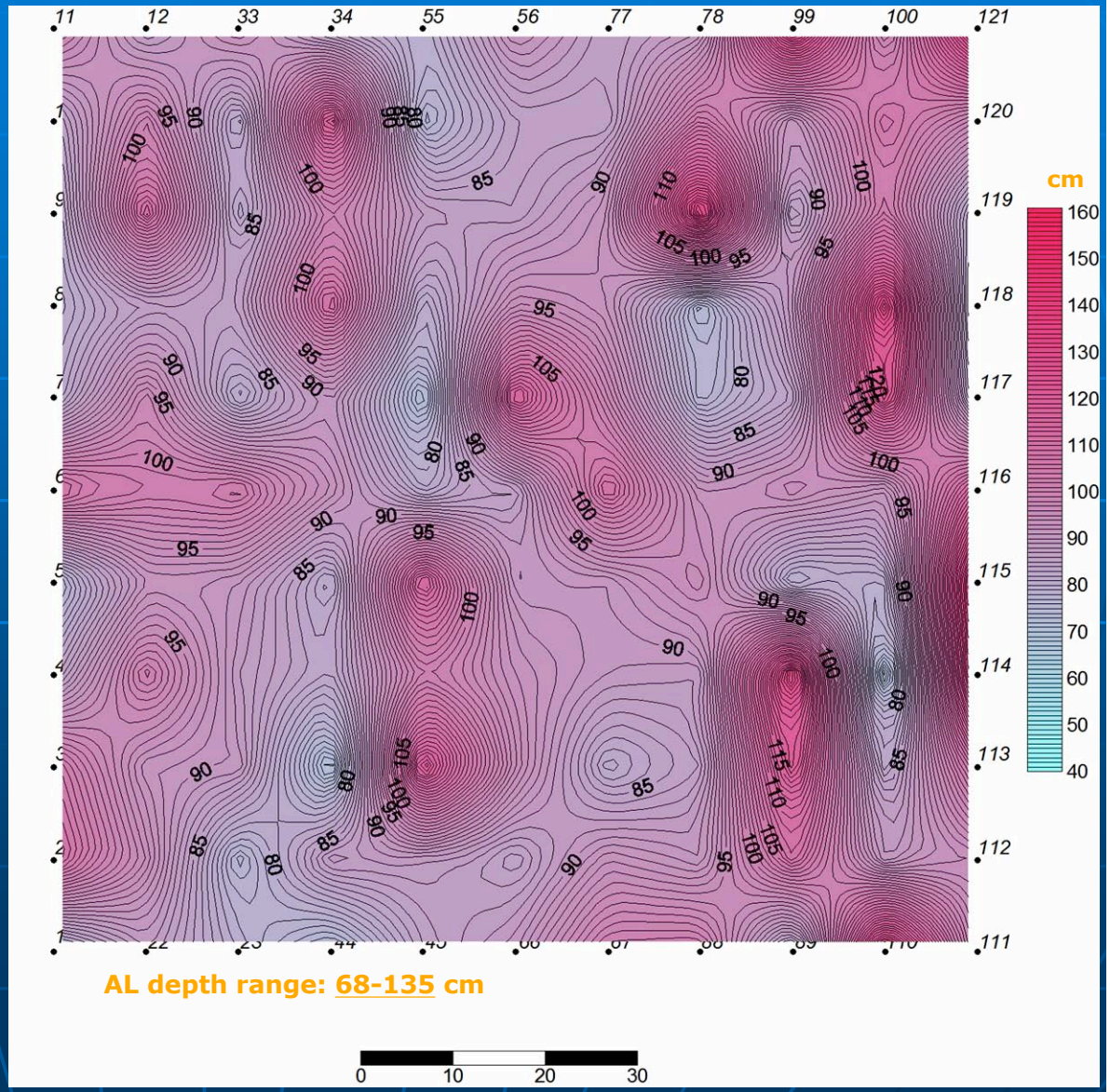
Research location Vaskiny Dachi

VD-2 site



AL depth range: 40-93 cm

VD CALM grid 2007 (for comparison)

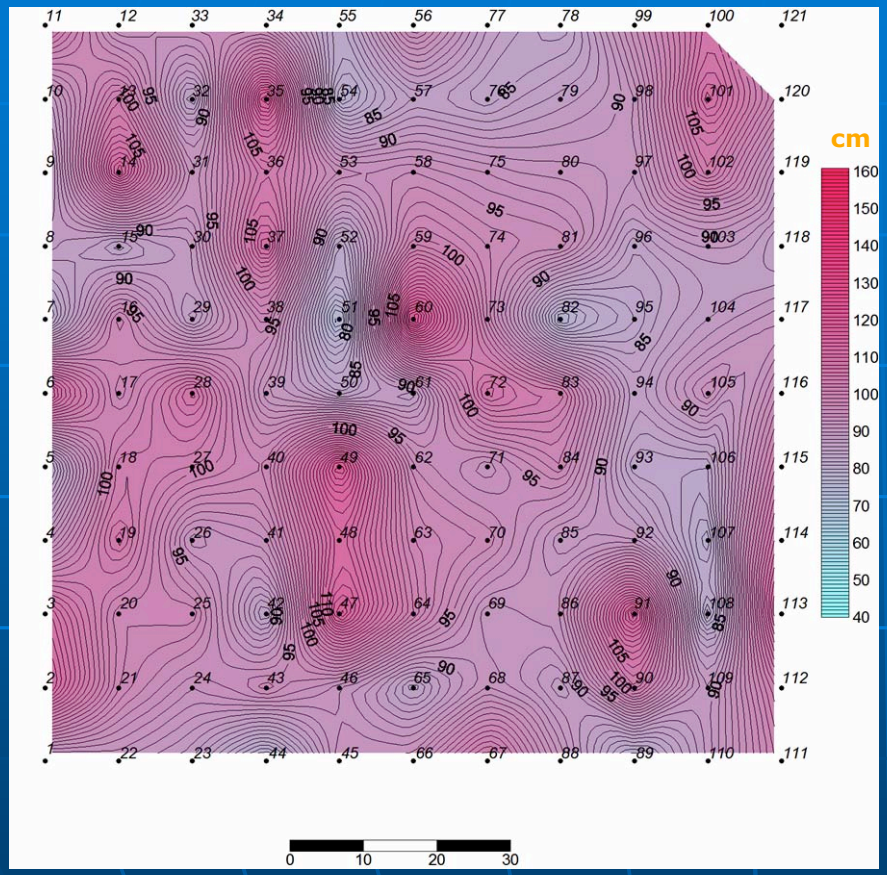


AL depth range: 68-135 cm

Research location Vaskiny Dachi

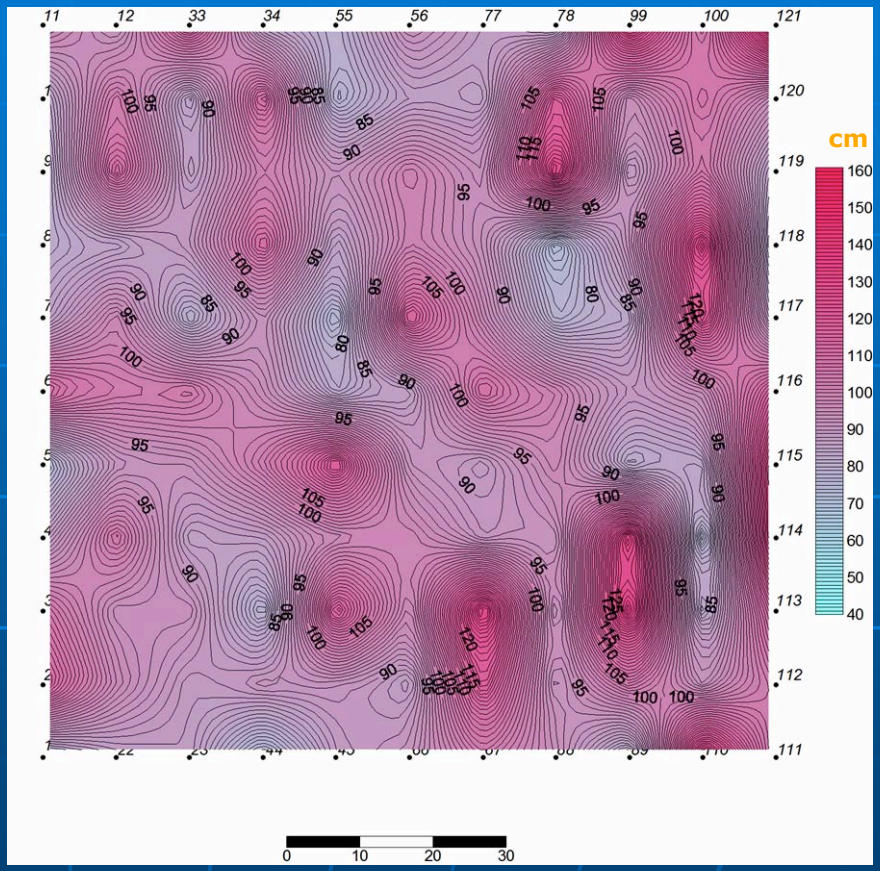
Comparison of active layer depths on VD CALM grid in 1995 and 2005

1995



AL depth range: 73-123 cm

2005

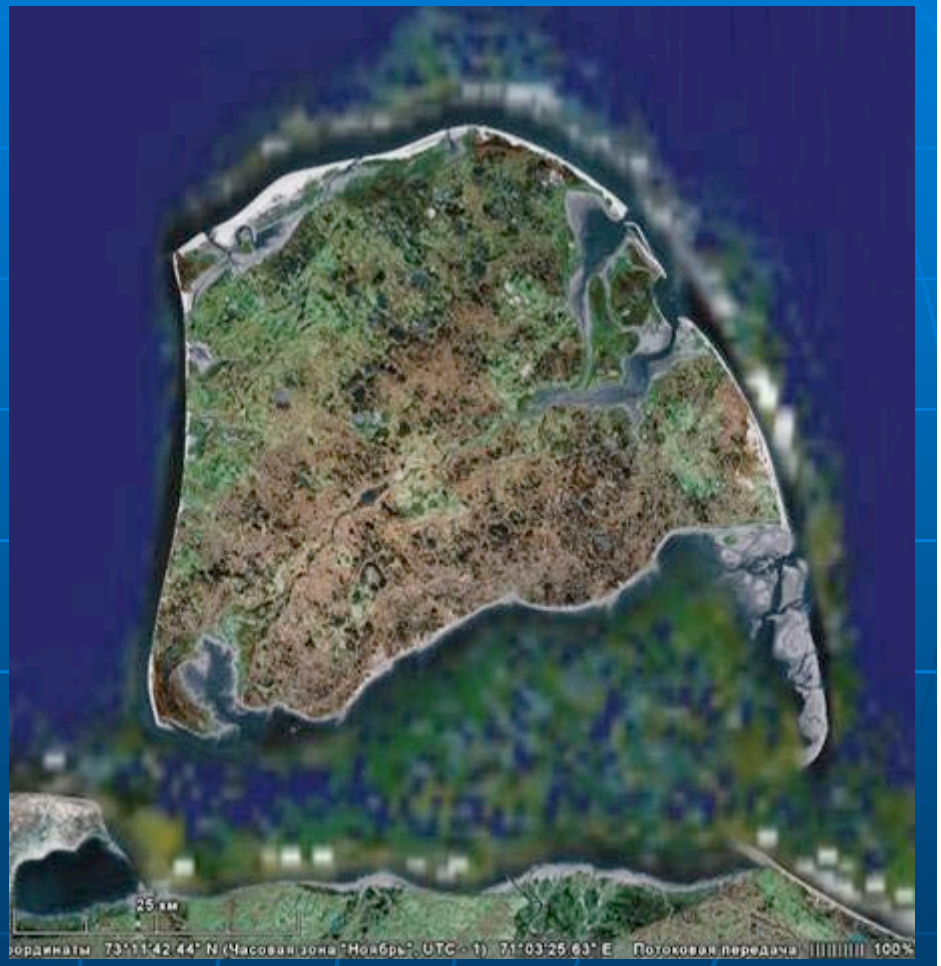


AL depth range: 71-139 cm

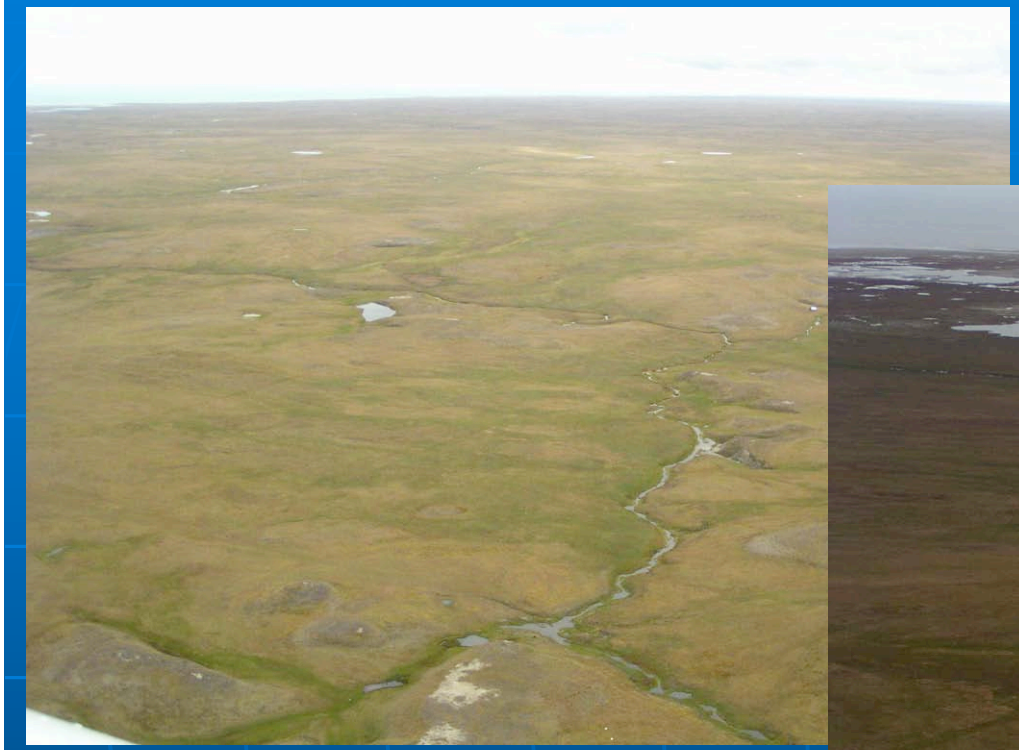
Potential Research locations

Kharasavey

Bely (White) Island



Research locations Kharasavey



Herb-moss tundra in depressions and shrub-lichen-moss tundra on watershed tops and slopes.

Meadow ecosystems in low sea coast

Bely (White) Island

Low marine plain with marine and lake-marine sandy and loamy deposits

Limited number of landscape units

Arctic lichen tundra and sites of moss tundra

Conclusions:

There is correlation between main landscape controls and active-layer dynamics, cryogenic processes and degree of landscape change under natural and technogenic disturbances.

Vegetation as one of the main landscape components is subject to severe disturbance and responds to environmental changes faster than other landscape components.

Research locations on study are representative of southern, middle and northern subzones of Yamal Peninsula when studying landscape pattern


Thank you
for
your attention