РОССИЙСКАЯ АКАДЕМИЯ НАУК
СИБИРСКОЕ ОТДЕЛЕНИЕ

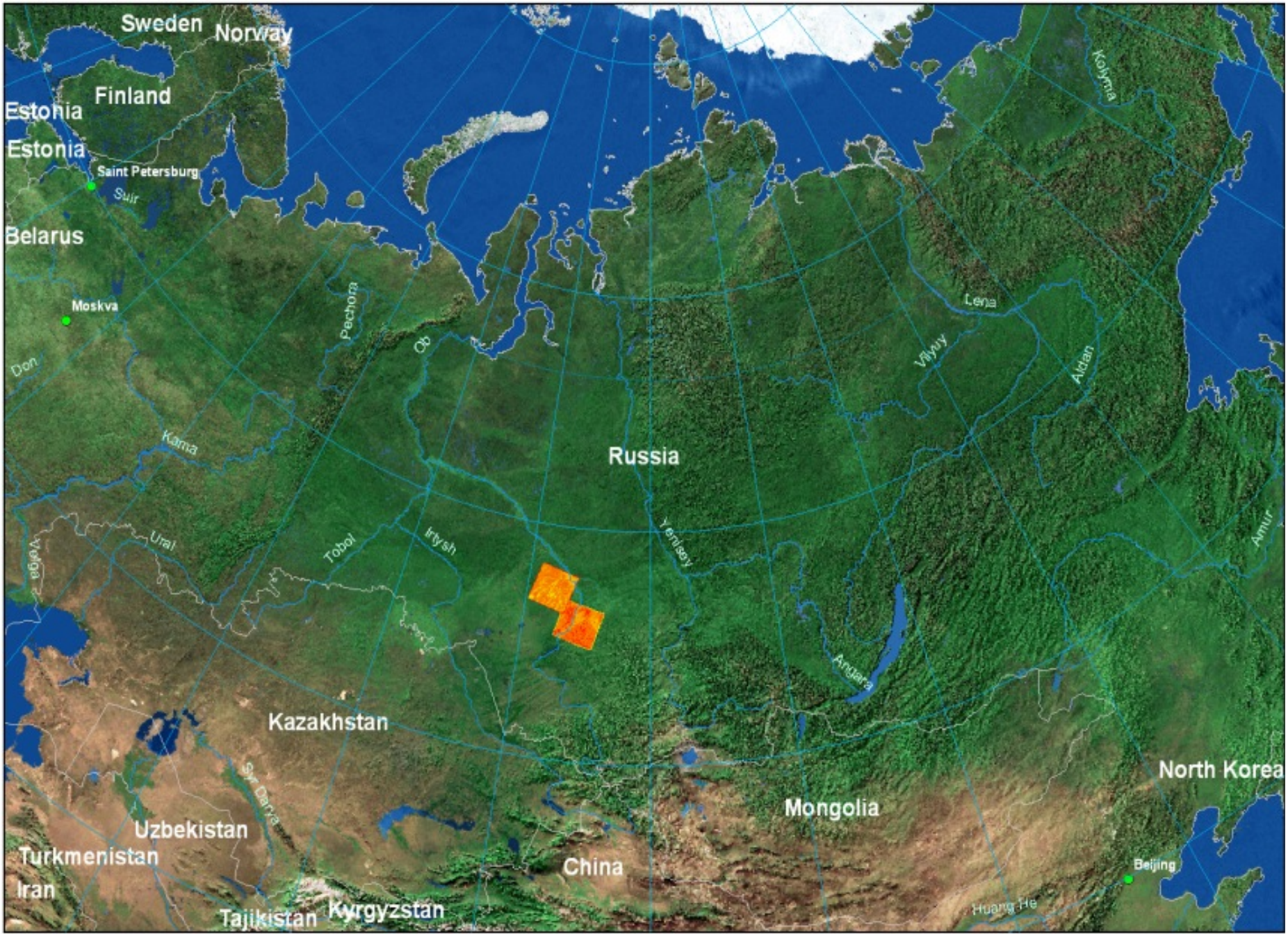
ИНСТИТУТ МОНИТОРИНГА КЛИМАТИЧЕСКИХ И ЭКОЛОГИЧЕСКИХ СИСТЕМ

Human impact on vegetation in the South and Sub-Taiga of Western Siberia

E.A. Dyukarev, N.N. Pologova, E.A. Golovatskaya

Institute of monitoring of climatic and ecological systems SB RAS, Russian Federation, Tomsk

APN Asia-Pacific Network for Global Change Research


Sweden
Norway
Finland
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Saint Petersburg
Suir
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Moskva
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Ob
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Russia
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Irtysh
Yenisey
Amur
Angara
Kazakhstan
Syr Darya
North Korea
Mongolia
Uzbekistan
Turkmenistan
Iran
China
Beijing
Tajikistan
Kyrgyzstan
Huang He

Landsat imagery

Site 1 – Bakchar Path 150 Row 20	Site 2 – Tomsk Path 148 Row 21
TM, 30 Aug 1990	TM, 16 June 1990
ETM+, 16 Sep 1999	ETM+, 18 Sep 1999
TM, 20 July 2007	TM, 14 July 2007

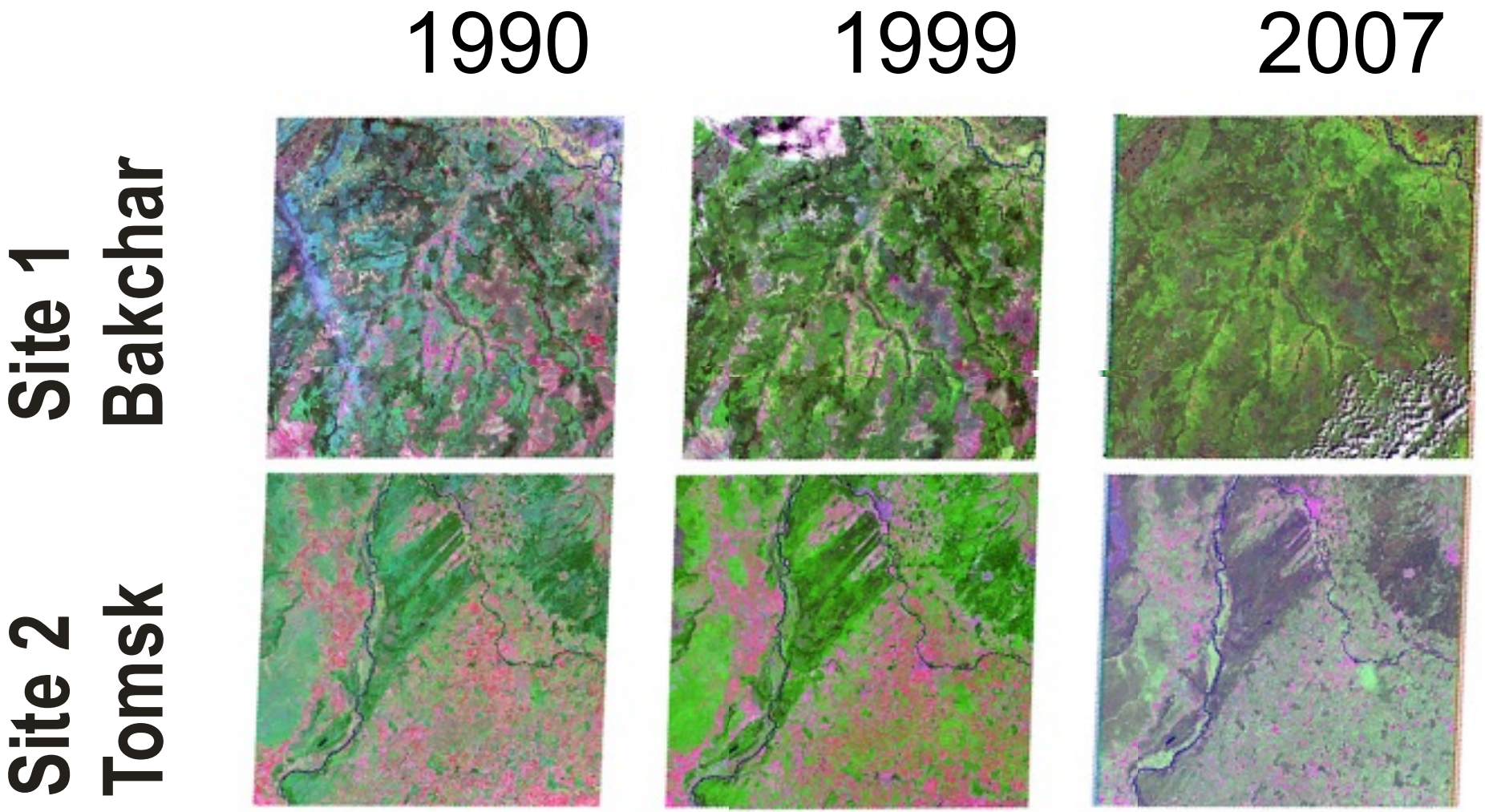
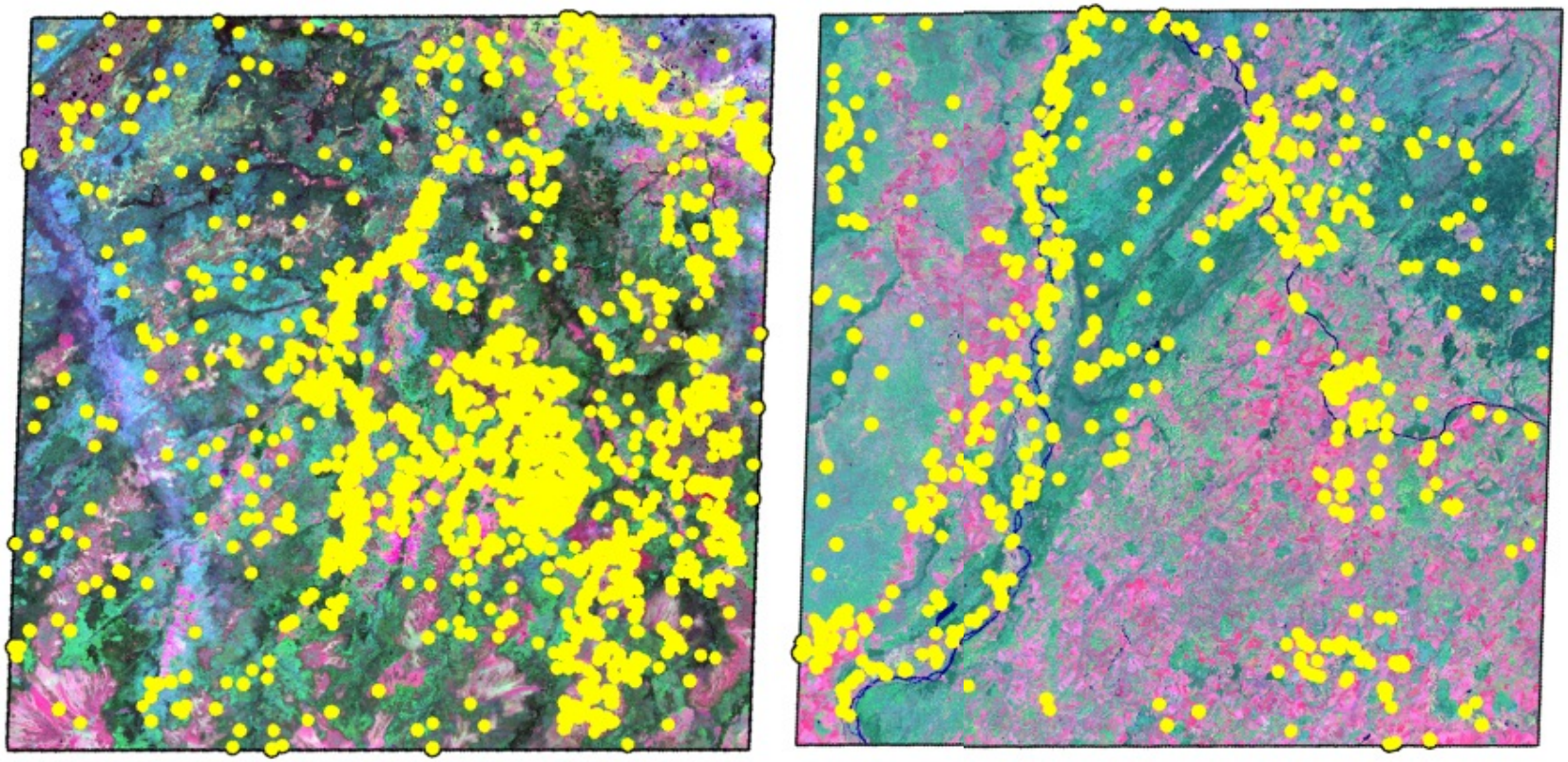

1990
1999
2007
Site 1
Bakchar
Site 2
Tomsk

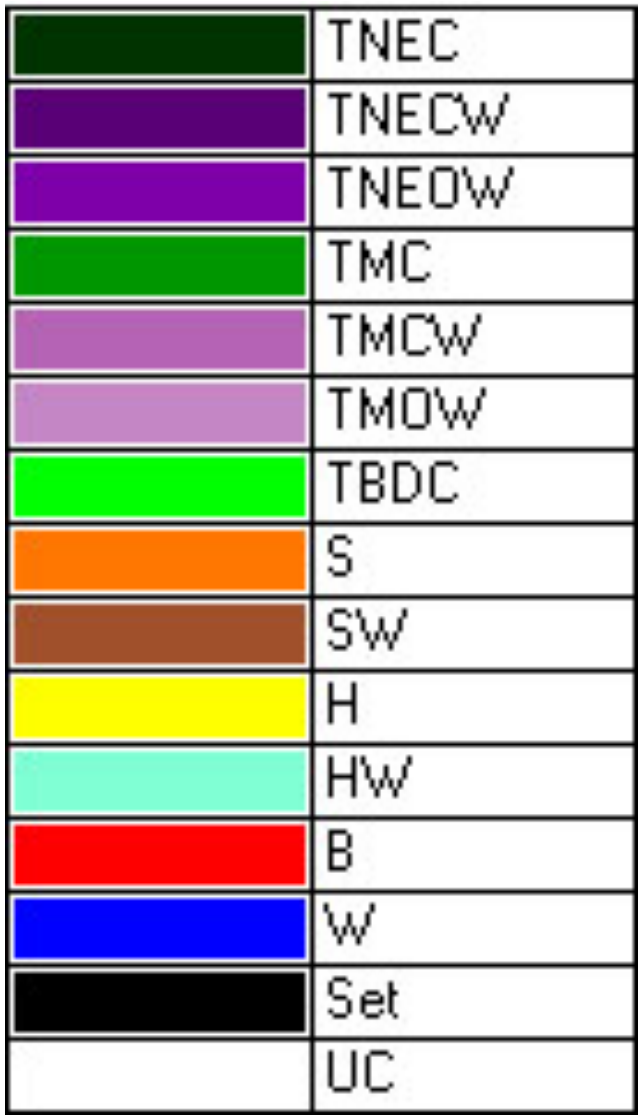
Image processing

- Cloud/haze masking
- Urban area masking
- Atmospheric correction
- Radiometric calibration
- Tasseled Cap index transformation
- Unsupervised classification
- Classes attribution
- Accuracy assessment

Ground data for accuracy assessment

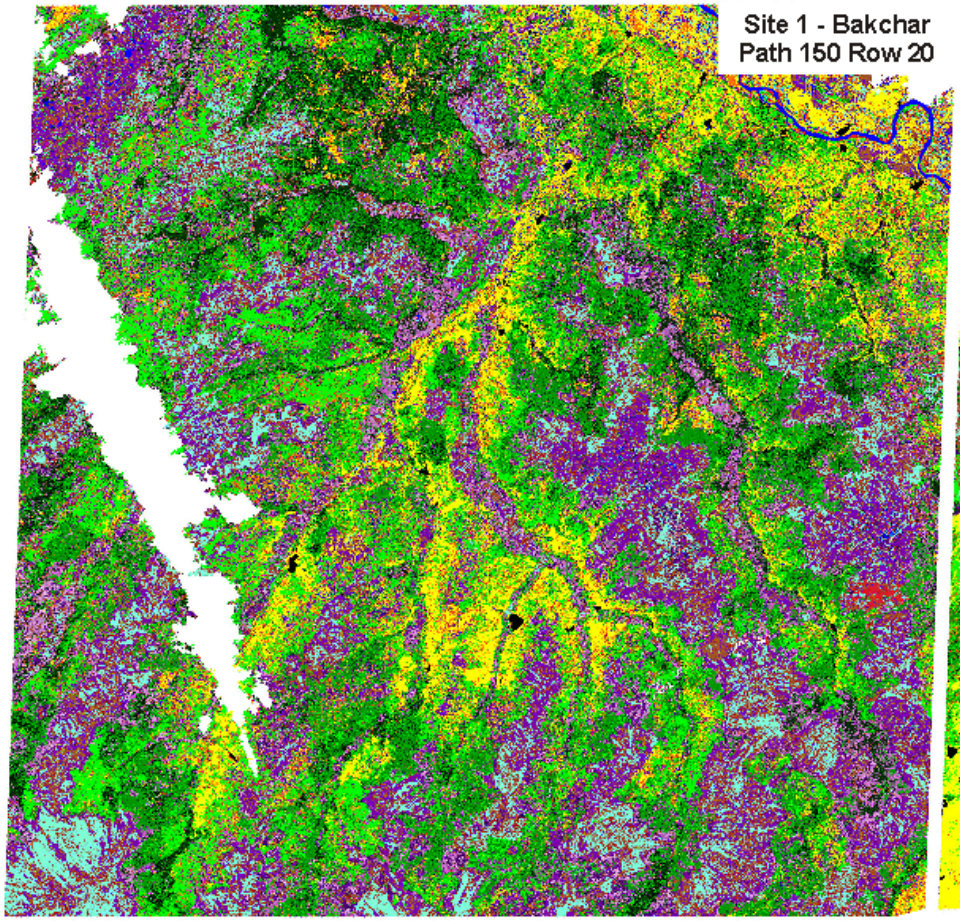


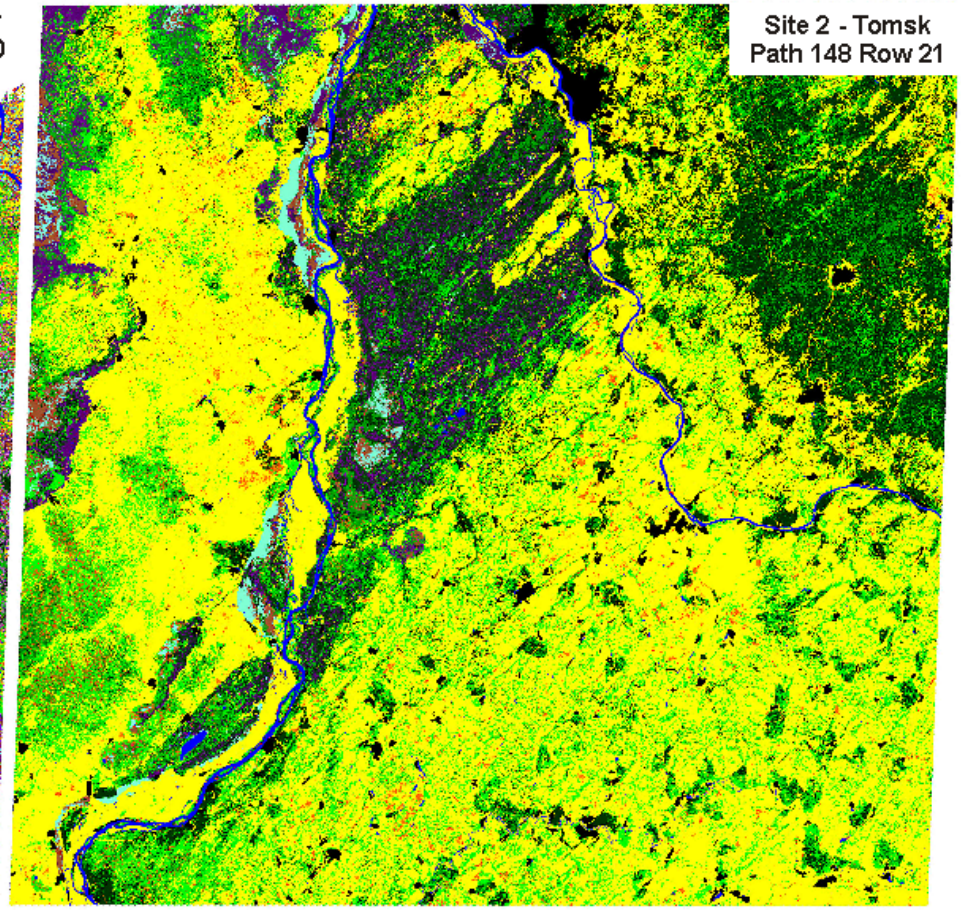
Legend (14 items)



TNEC - Tree.Needleleaved. Evergreen.Closed,
TNECW - Tree.Needleleaved. Evergreen.Closed.Wetland,
TNEOW - Tree.Needleleaved. Evergreen.Open.Wetland
TMC - Tree.Mixed.Closed,
TMCW - Tree.Mixed.Closed.Wetland,
TMOW - Tree.Mixed.Open.Wetland,
TBDC - Tree.Broadleaved. Deciduous.Closed,
S - Shrub,
SW - Shrub.Wetland,
H - Herbaceous,
HW - Herbaceous.Wetland,
B - Bare Land,
W - Water,
Set – Settlements, UC – Unclassified.

Classification results



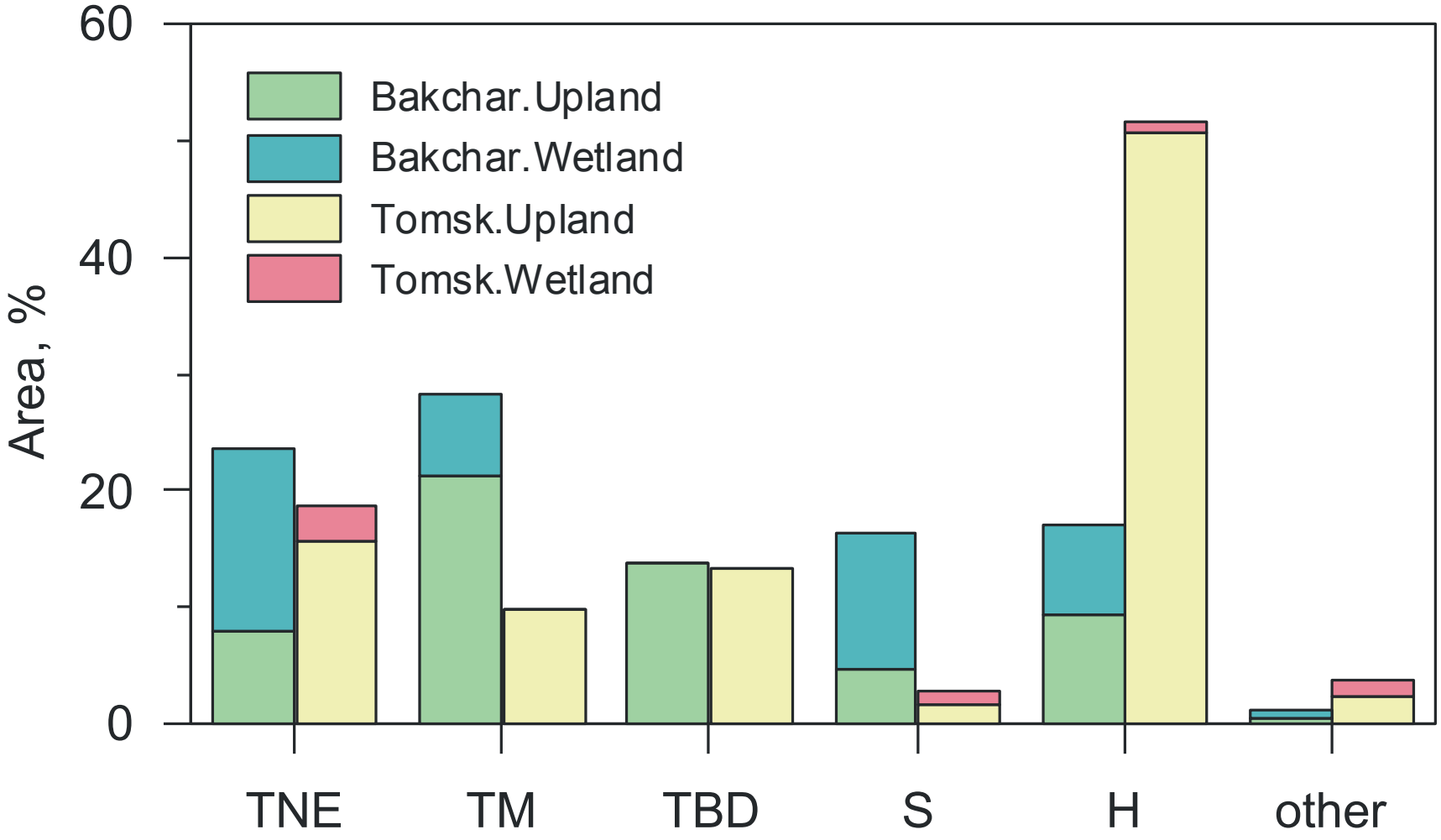


TNEC
TNECW
TNEOW
TMC
TMCW
TMOW
TBDC
S
SW
H
HW
B
W
Set
Un

Results of vegetation cover classification.

TNEC - Tree.Needleleaved. Evergreen.Closed,
TNECW - Tree.Needleleaved.Evergreen.Closed.Wetland,
TNEOW - Tree.Needleleaved.Evergreen.Open.Wetland,
TMC - Tree.Mixed.Closed,
TMCW - Tree.Mixed.Closed.Wetland,
TMOW - Tree.Mixed.Open.Wetland,
TBDC - Tree.Broadleaved.Deciduous.Closed,
S - Shrub, SW - Shrub.Wetland,
H - Herbaceous, HW - Herbaceous.Wetland,
B - Bare Land, W - Water,
Set - Settlement, Un - Unclassified

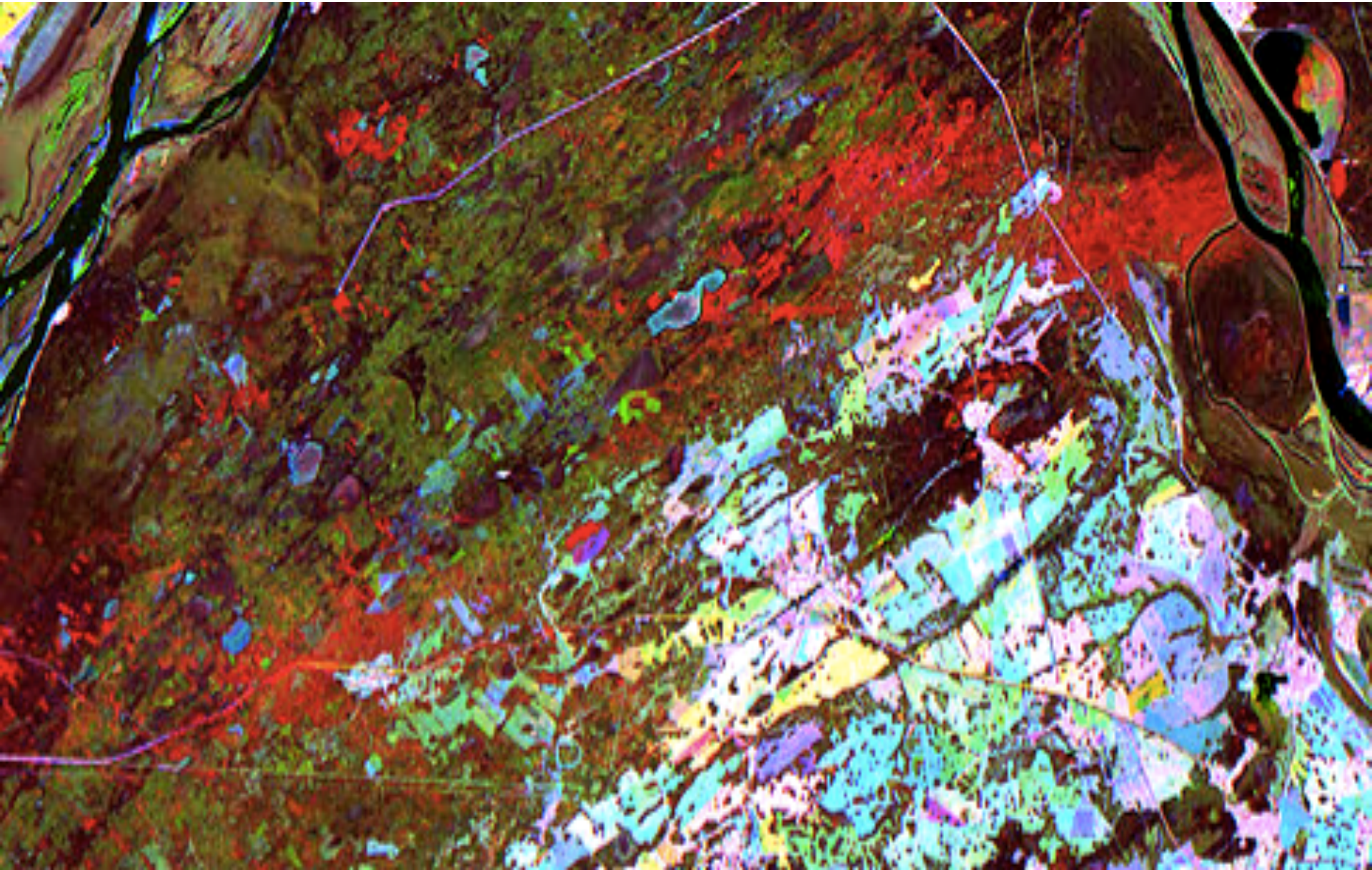
Distribution of land cover classes



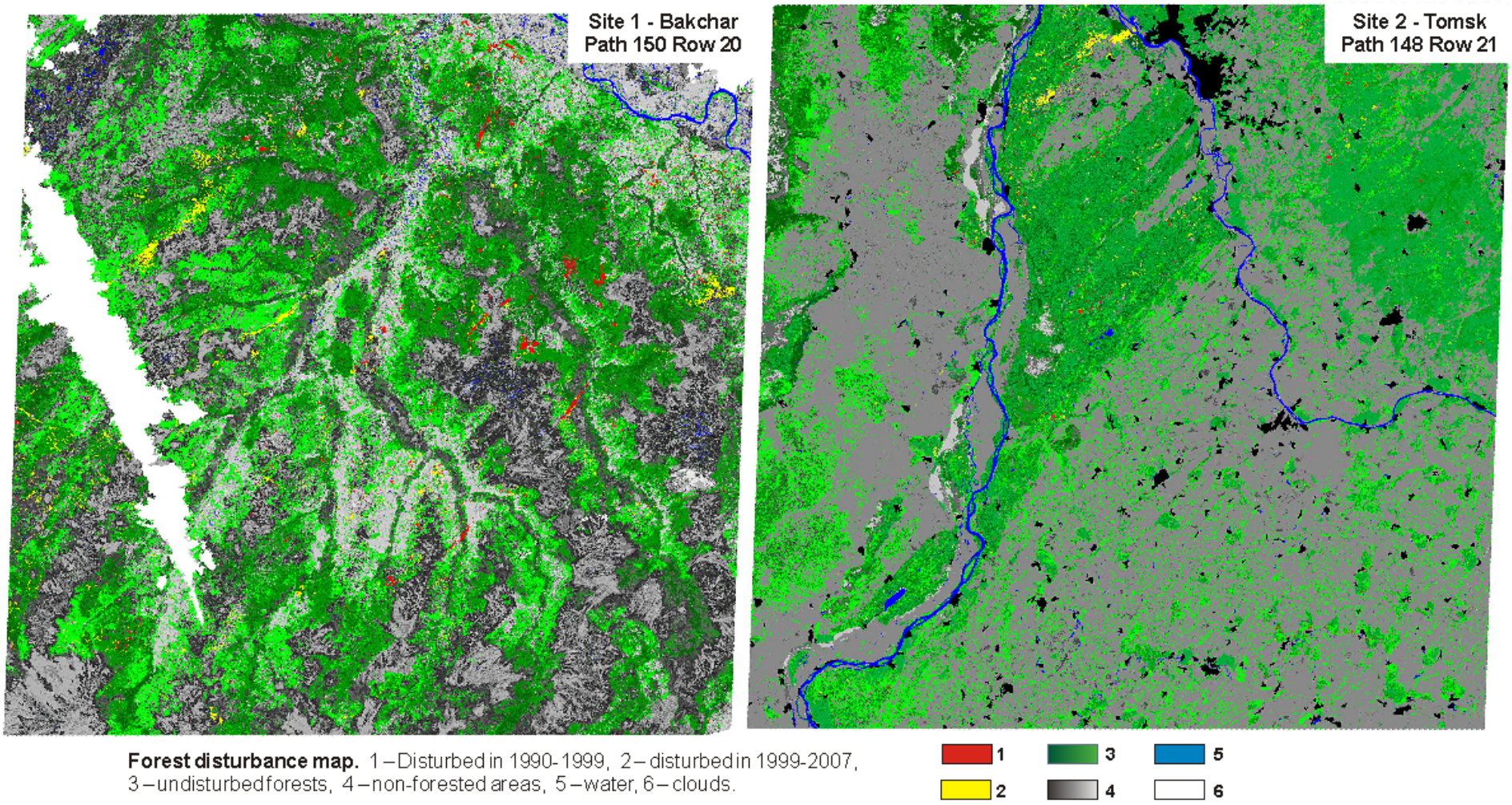
Change detection

- Different time space images were used for changed analysis. Disturbance index (DI) was calculated for each tasseled cap image normalized, as described in [Healey S.P. et al. // Remote Sensing of Environment. 2005. v. 97. #3. for forest areas.
- DI = Bn - (Gn + Wn),
- where Bn,Gn,Wn - normalized values of brightness, greenness and wetness. All disturbance index images were stacked into a one DI combined image. Unsupervised classification of the DI image was made and disturbed/undisturbed classes were revealed.

Disturbance index map



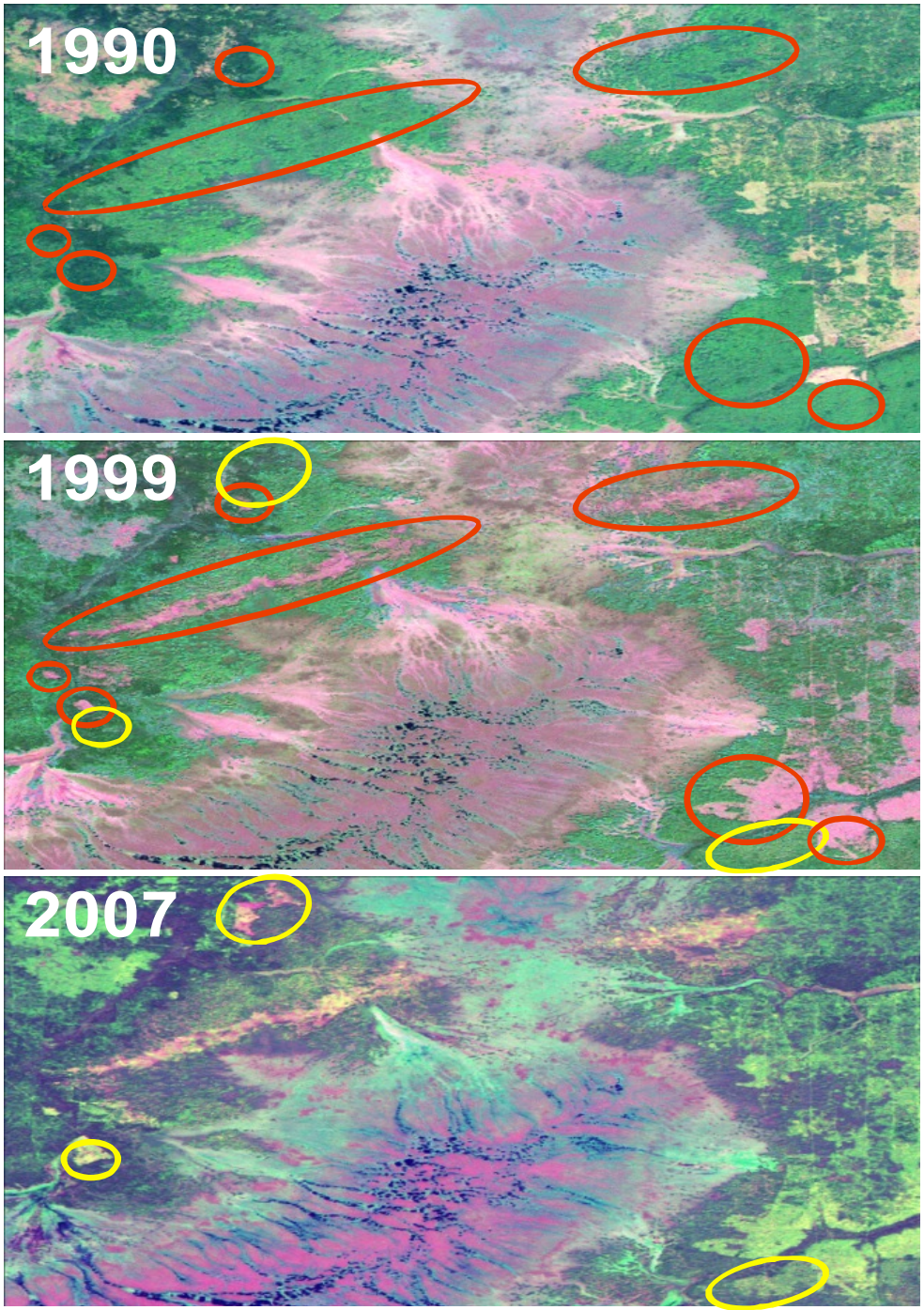
Forest disturbance map



Forest disturbance map. 1 – Disturbed in 1990-1999, 2 – disturbed in 1999-2007, 3 – undisturbed forests, 4 – non-forested areas, 5 – water, 6 – clouds.

Disturbed forest area, ha

Period	Site 1 Bakchar	Site2 Tomsk
1990 - 1999	12 711	3 213
1999 - 2007	8 148	8 149

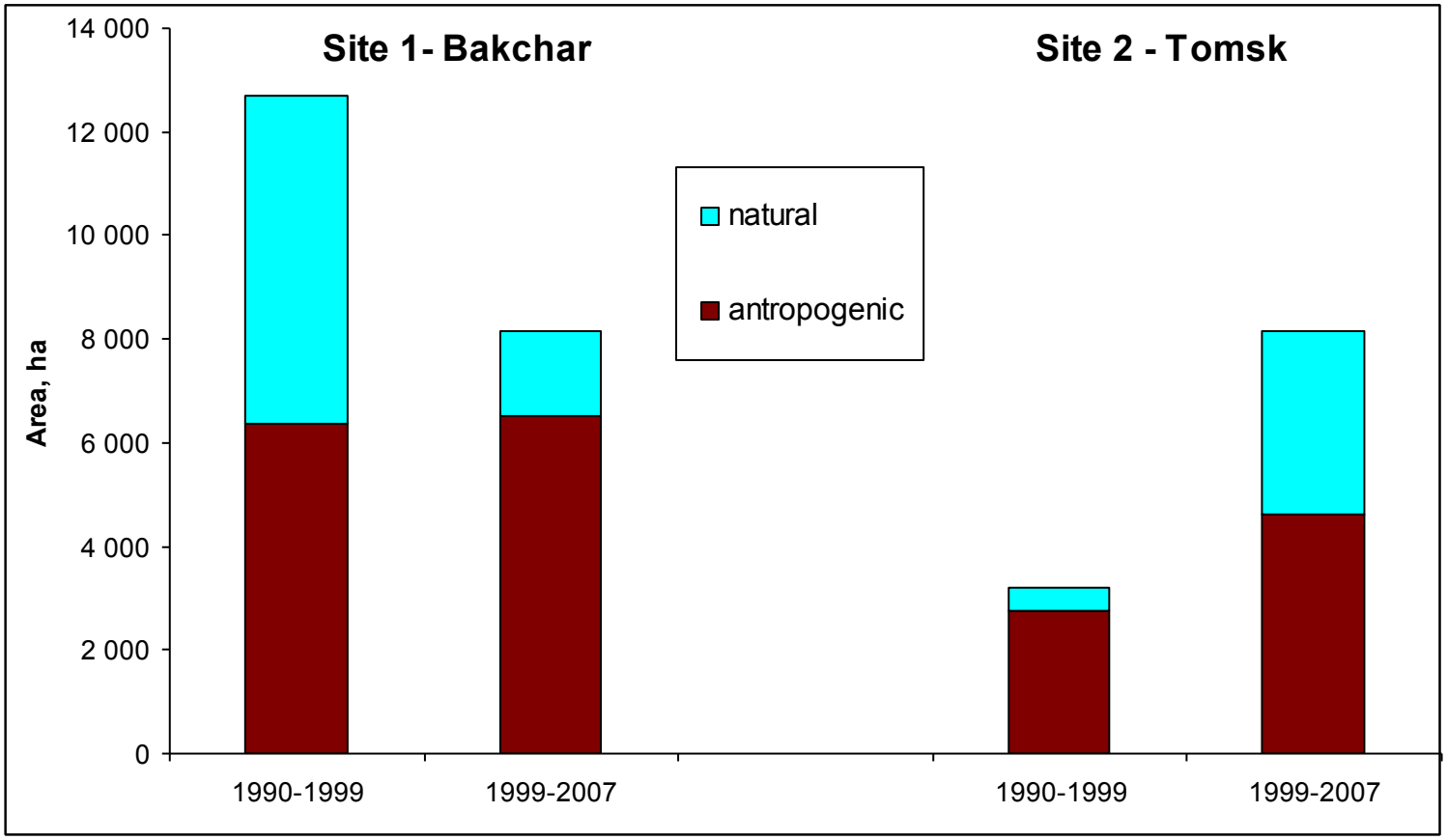


Disturbances in forest

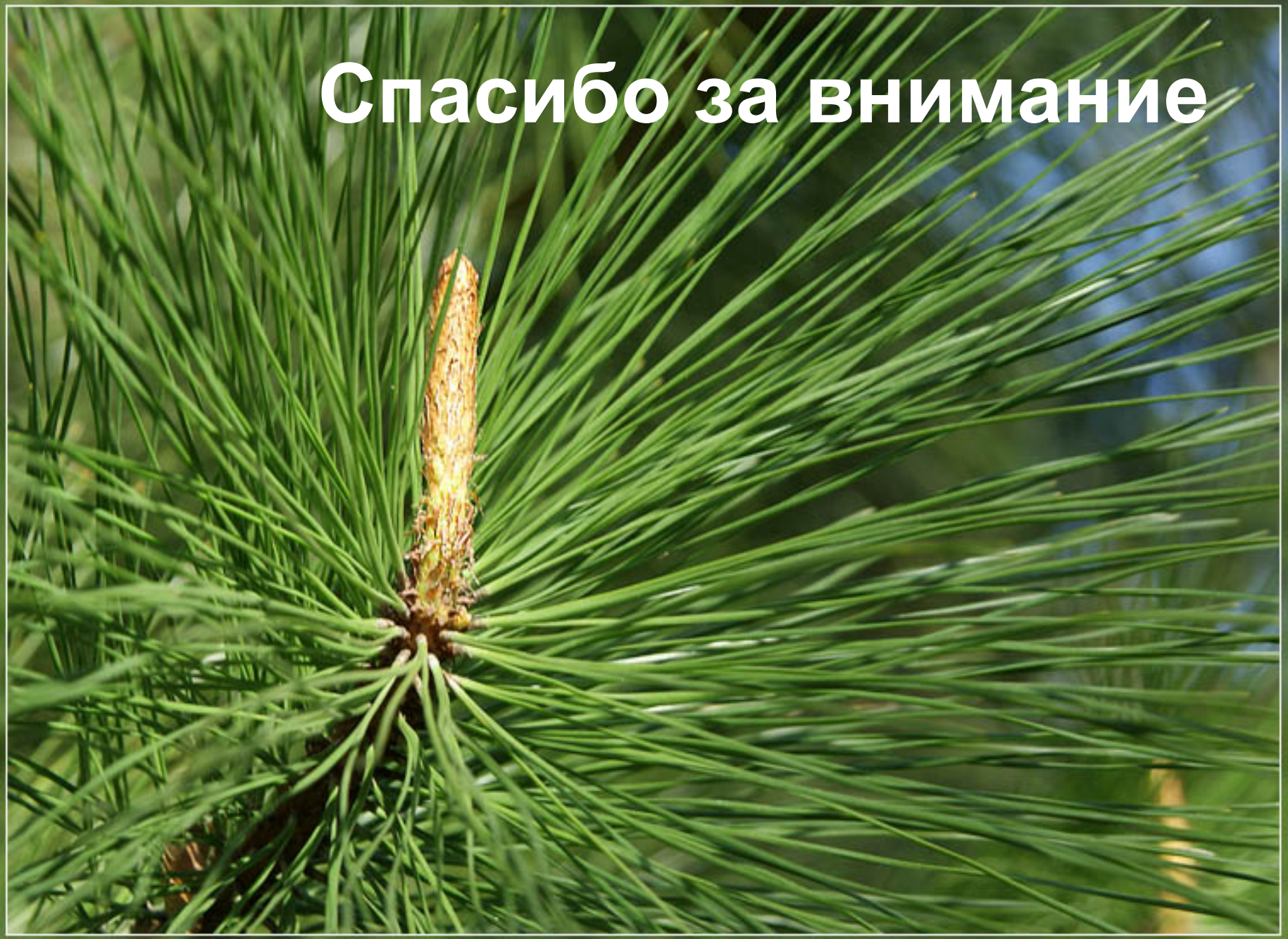
Decrease of forest area occurs due to forest cutting for timber industry and local use or impact of strong winds damaging forests over vast areas.

Windfall

Natural vs anthropogenic impact



- Comparison of space images from different years (1990, 1999 and 2007) allowed revealing dynamics in vegetation cover. Decrease of forest area in 1990-1999 at Site 1 are primary occurs due to intense forest cutting for timber industry and local use. A strong wind have damaged forests between 1990 and 1999 in stripes oriented from south-west to north -east in the prevailing wind direction. Tree cutting in 1999-2007 was significantly smaller than in previous time due to depression in economical activity.
- Mature forests cover only small part of the Site 2. Tree cutting activity at Site 2 in 1990-1999 is lower than at Site 1. Strong winds were in 2003, 2005, and 2007. It results to significant forest damages at area of 3100 ha in the northern part of Ob-Tom interfluve.
- Some invasion of young trees in to abandoned agricultural lands also can be found for both sites at comparison of 1999 and 2007 images. After 1999 many agricultural lands stopped to plug, transformed to unmanaged meadows (grassland) and now occupying by young birch. Small burned areas are exists on the studied territory primary at drainage peatlands but fires does not affect forests significantly.


Спасибо за внимание