Multi-sensor earth observation of forest distribution and forest cover change in Siberia

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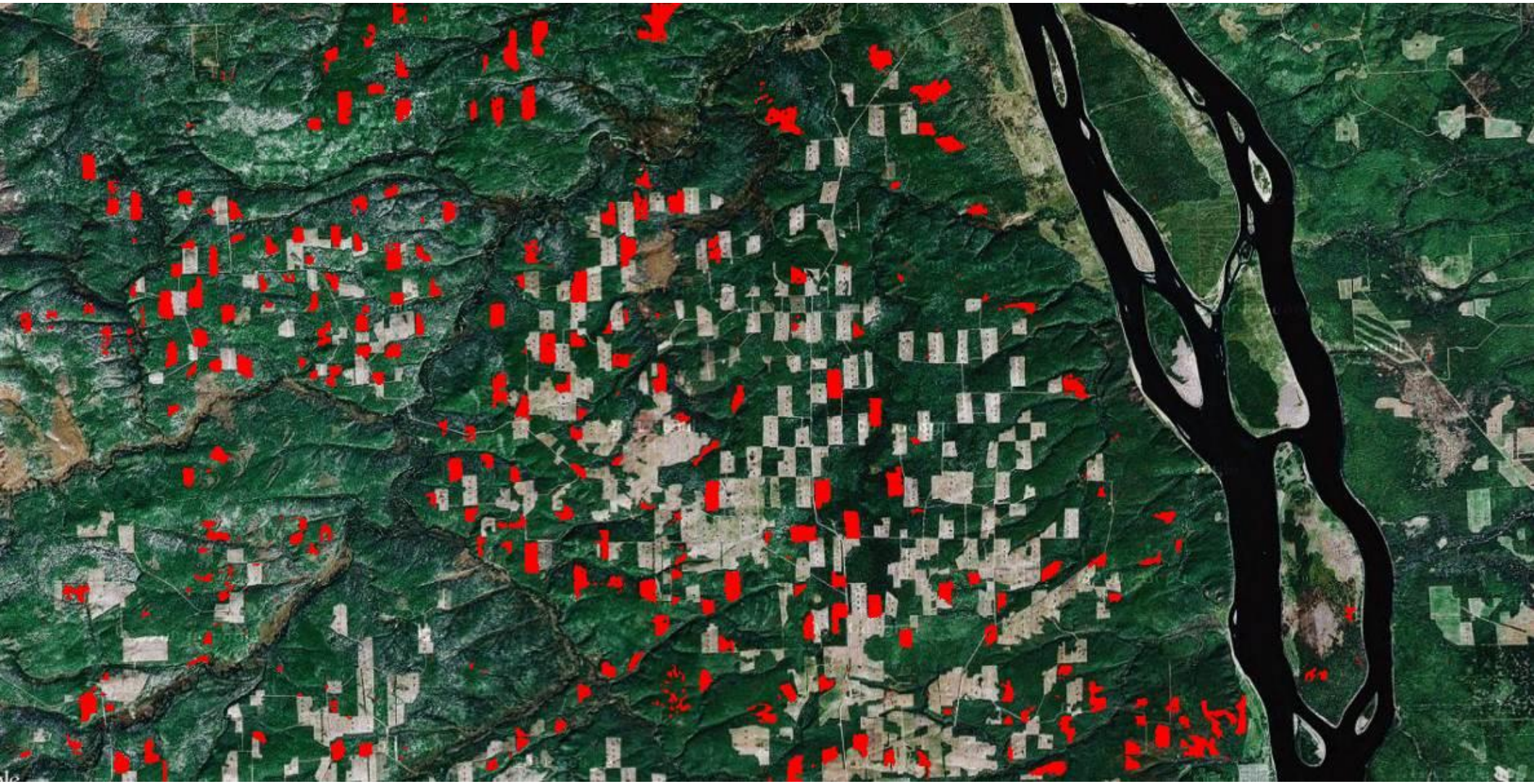
ZAPÁS

SEVENTH FRAMEWORK PROGRAMME

ZAPÁS – Assessment and Monitoring of Forest Resources in the Framework of the EU - Russia Space Dialogue

Forest cover loss in Siberia

- About 50% of Russian forests have been inventoried more than 25 years ago
- There are no **practically applicable methods** for updating growing stock volume in obsolete forest inventories (particularly for remote territories)
- We have to know GSV!
- What affects forest cover change?
- When does the change occur?



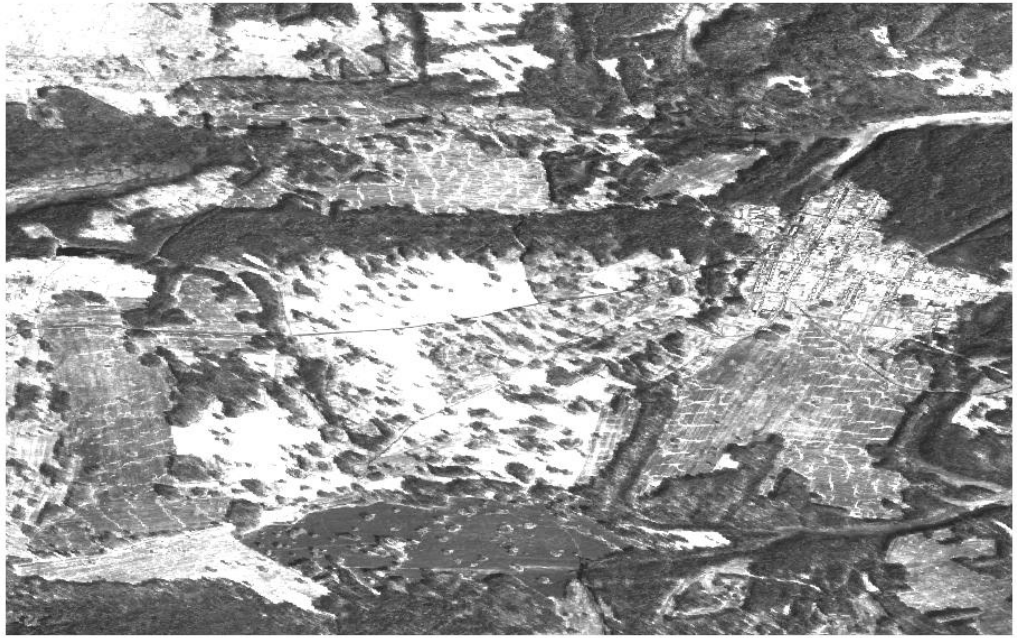
Forest cover loss 2007 - 2010, Angara River, Central Siberia

Reforestation

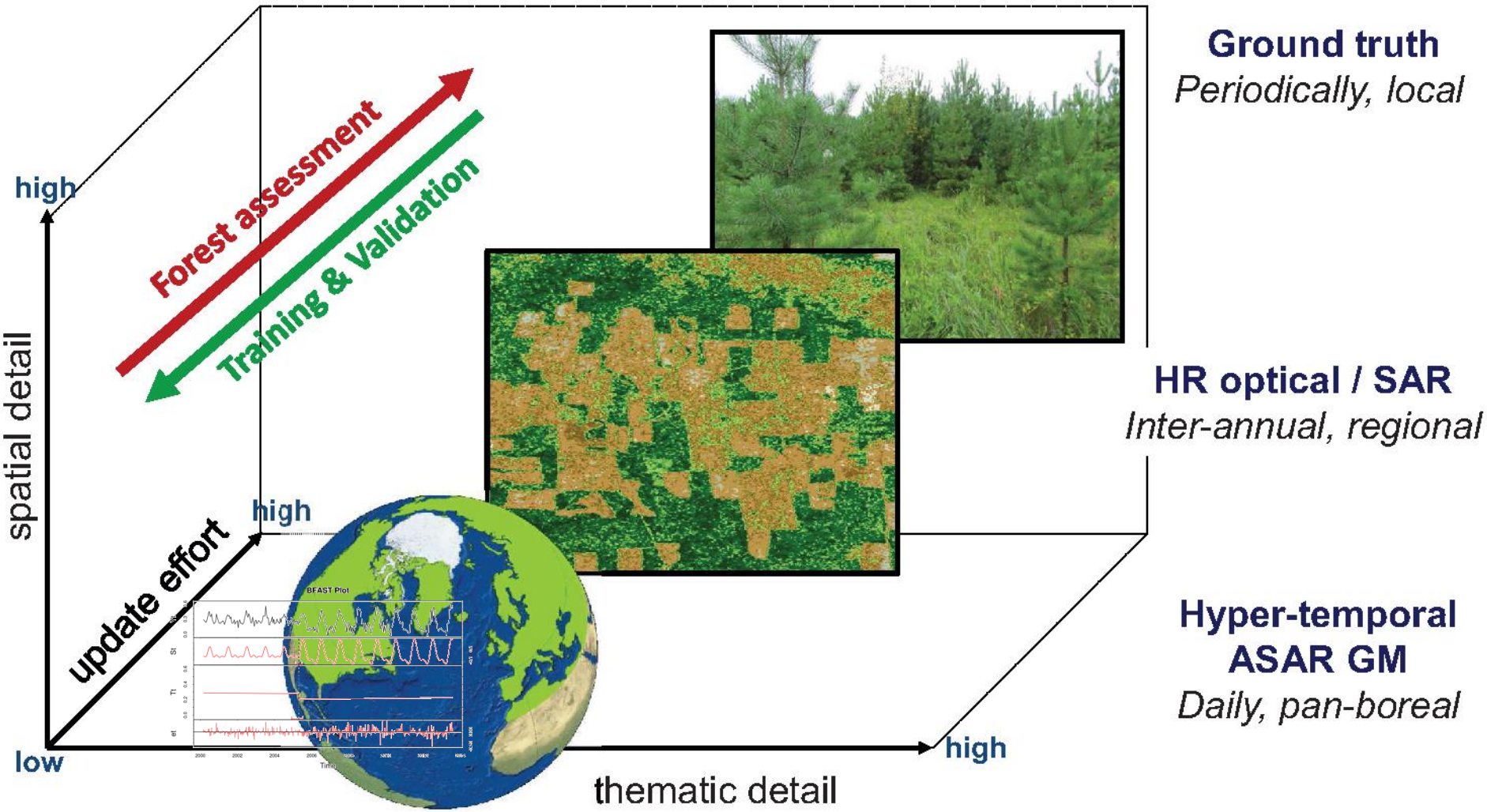
In post-Soviet Russia, more than 40 million hectares of arable land was abandoned within 20 years (Rosstat 2010).

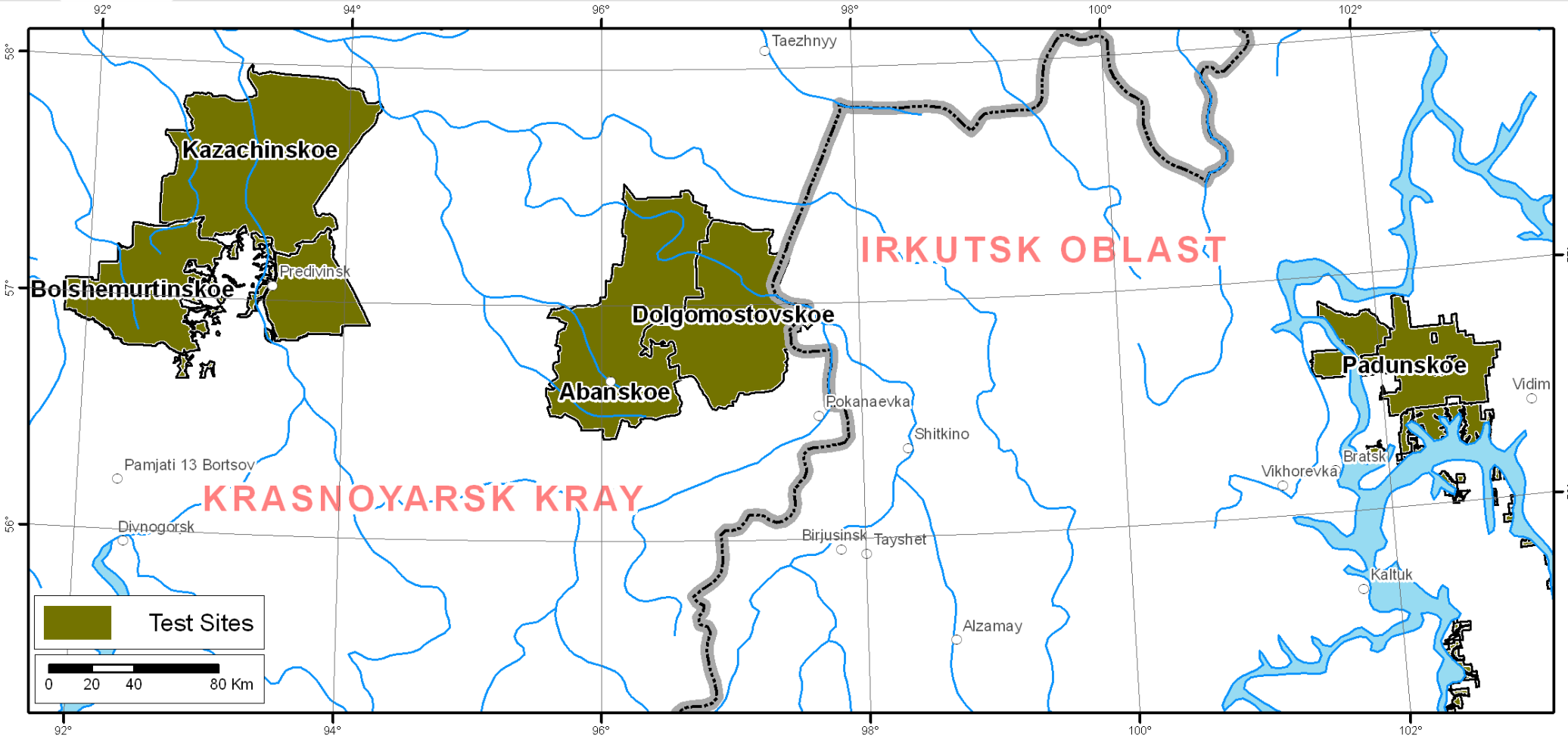
RESURS-DK1

Panchromatic image



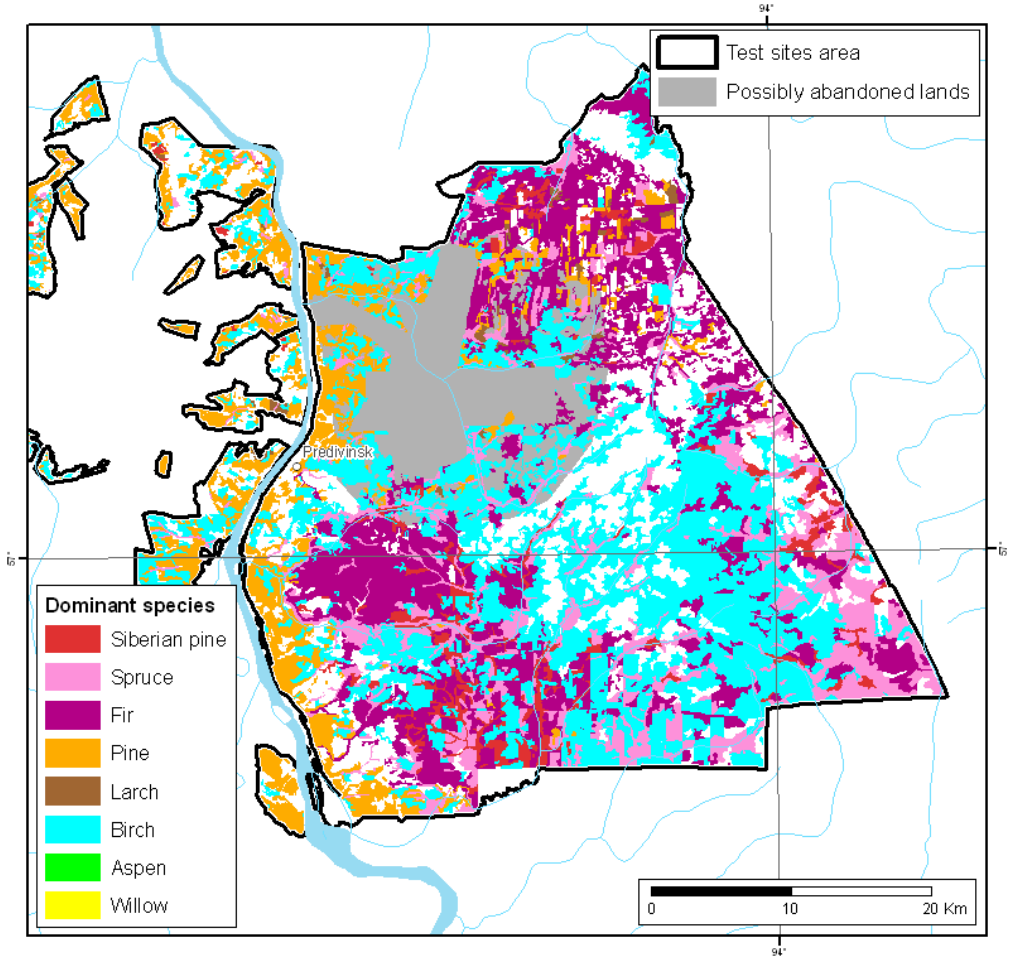
Integrated concepts for forest resource assessment



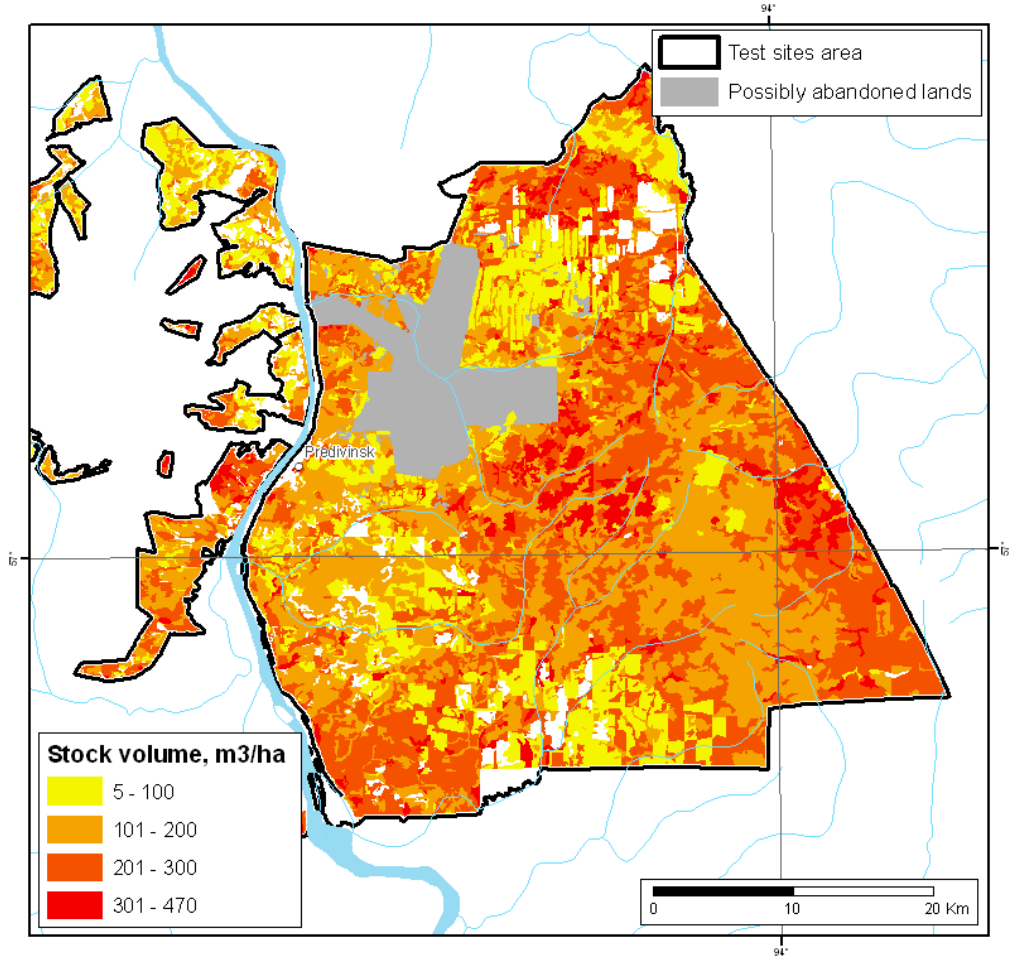


Site №	Site name (Forest Management Agency)	Area, ha	Region
1	Kazachinskoe and Bolshemurtinskoe	903.573	Krasnoyarsk kray
2	Abanskoe and Dolgomostovskoe	698.479	Krasnoyarsk kray
3	Padunskoe	366.696	Irkutsk oblast
	Total for all test sites	**1.968.748 ha**	

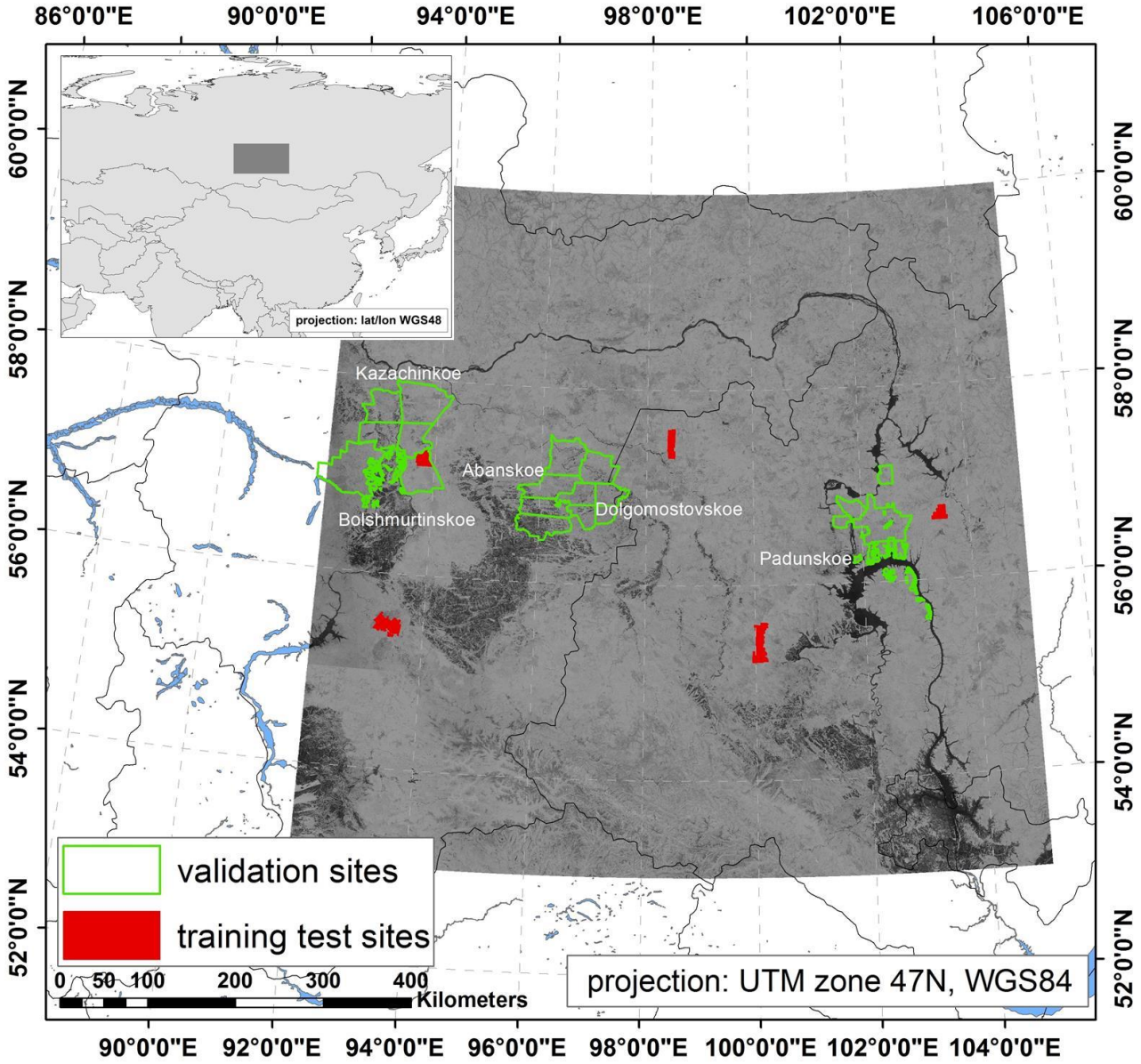
Up-to-date forest inventory



Dominant species

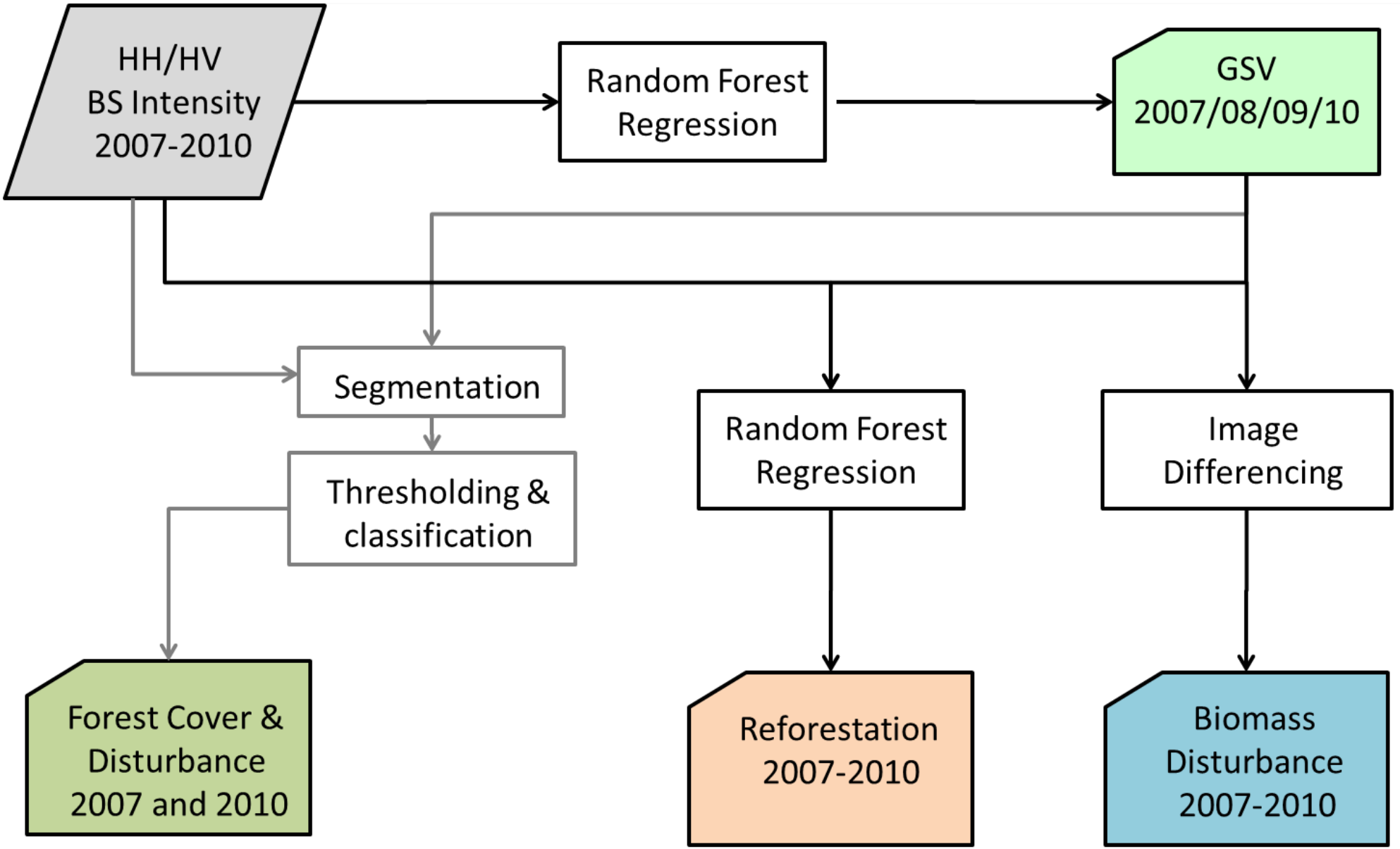


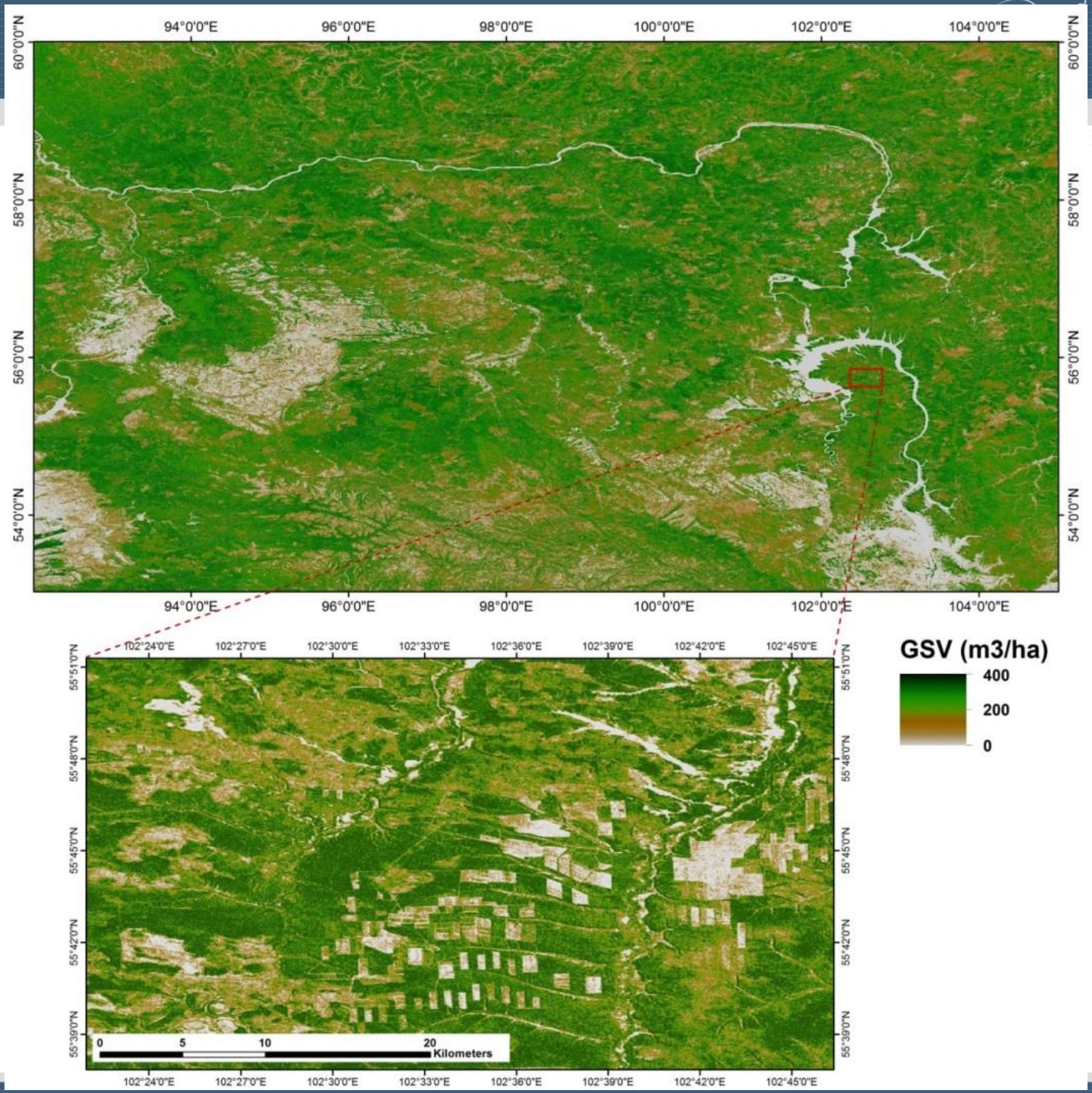
Growing stock volume



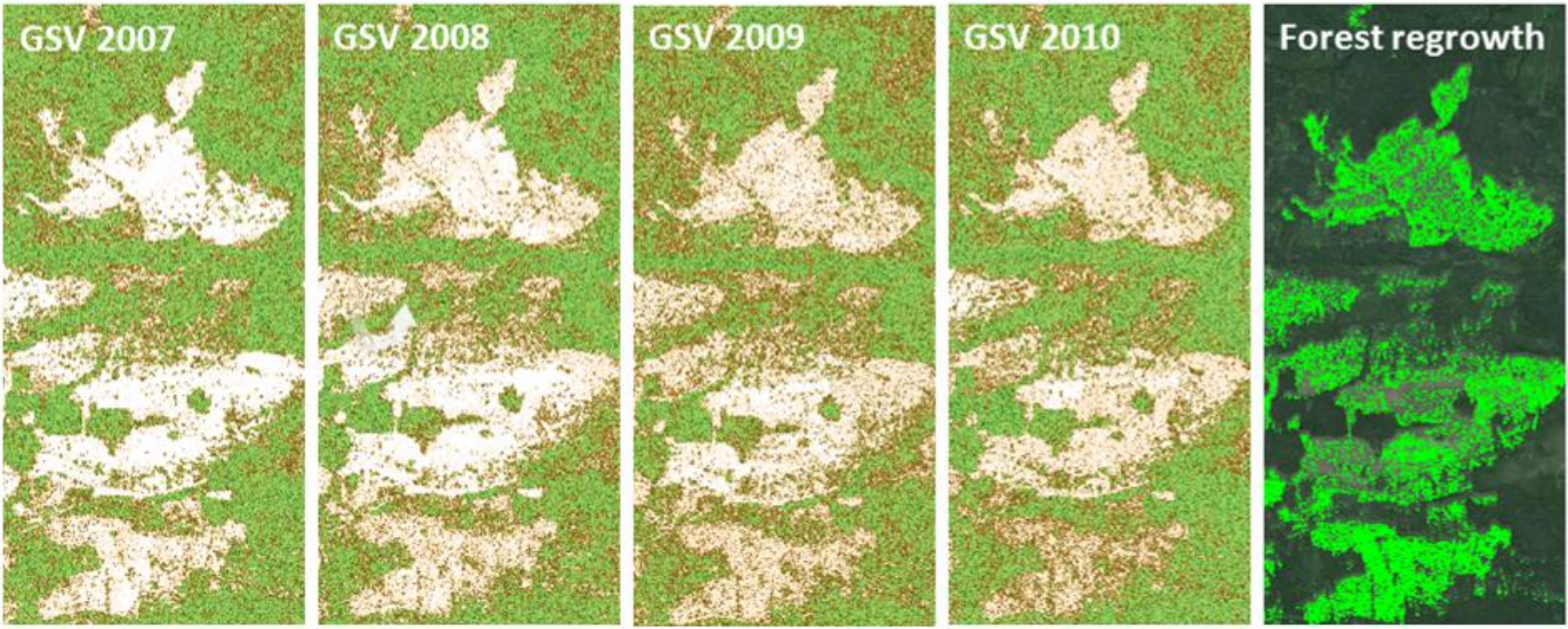
PALSAR 25 m backscatter mosaic data

- Annual HH / HV mosaic based on summer acquisitions
- 2007 – 2010
- 25 m spatial resolution
- Covers area of **569.400 km²** in Central Siberia

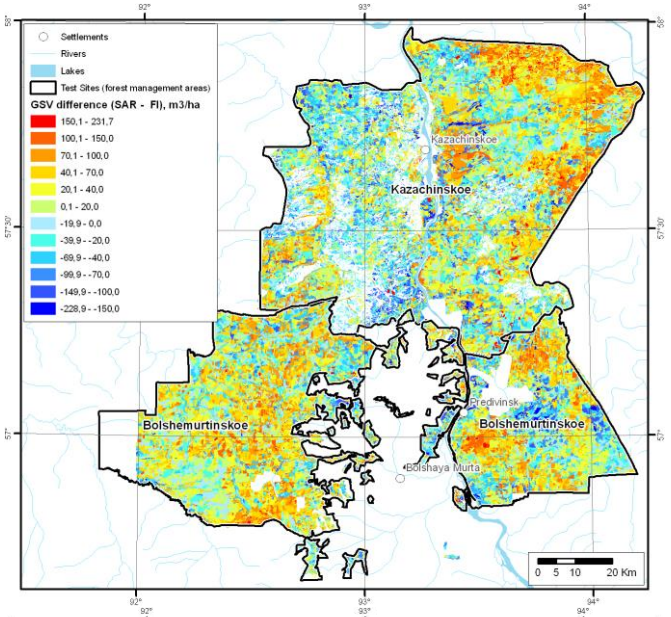

HH/HV
BS Intensity
2007-2010
Random Forest
Regression
GSV
2007/08/09/10
Segmentation
Thresholding &
classification
Random Forest
Regression
Image
Differencing
Forest Cover &
Disturbance
2007 and 2010
Reforestation
2007-2010
Biomass
Disturbance
2007-2010


94°0'0"E
96°0'0"E
98°0'0"E
100°0'0"E
102°0'0"E
104°0'0"E
60°0'0"N
58°0'0"N
56°0'0"N
54°0'0"N
102°24'0"E
102°27'0"E
102°30'0"E
102°33'0"E
102°36'0"E
102°39'0"E
102°42'0"E
102°45'0"E
55°51'0"N
55°48'0"N
55°45'0"N
55°42'0"N
55°39'0"N
0
5
10
20
Kilometers
GSV (m3/ha)
400
200
0

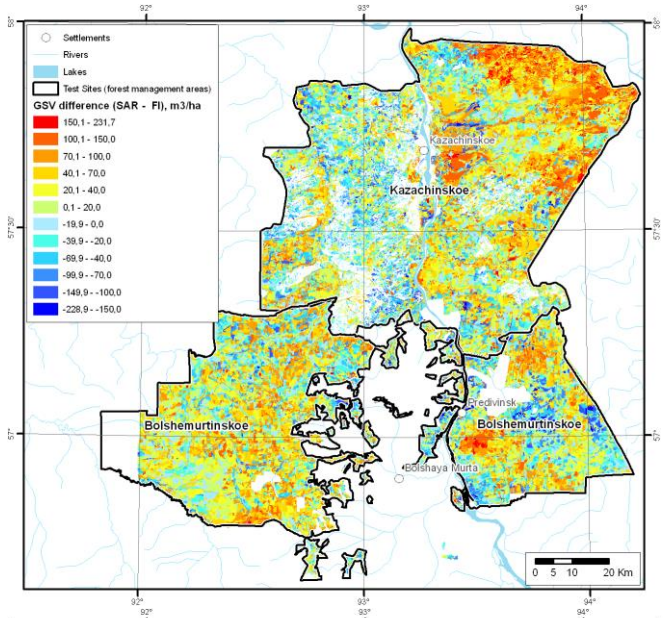
Annual GSV maps sensitive for change processes



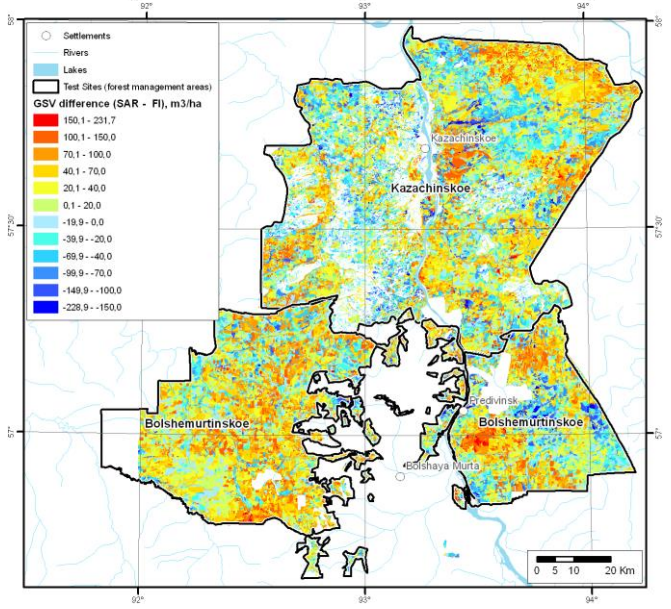
2007



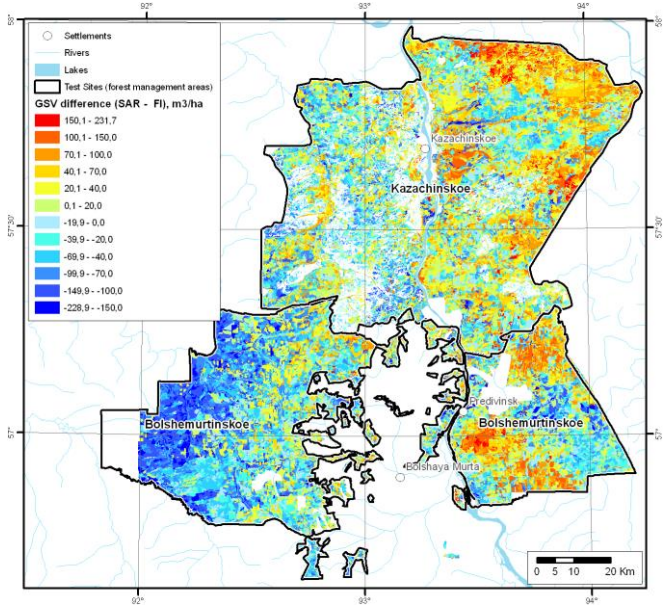
2008

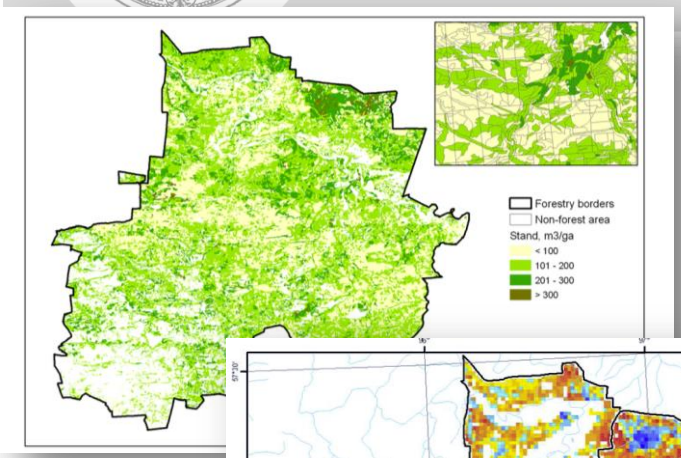


2009

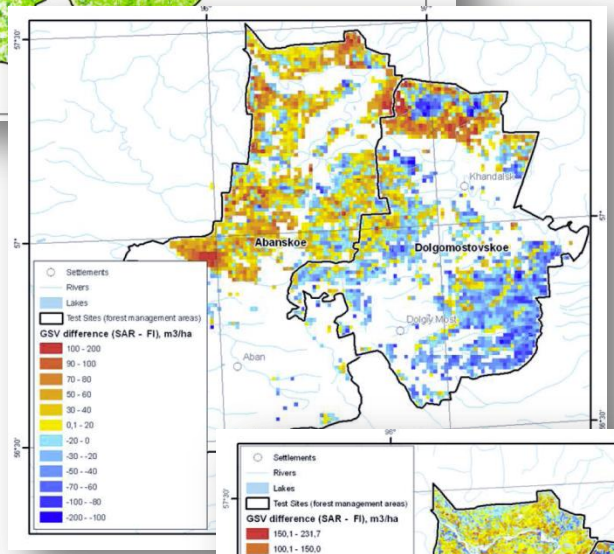


2010

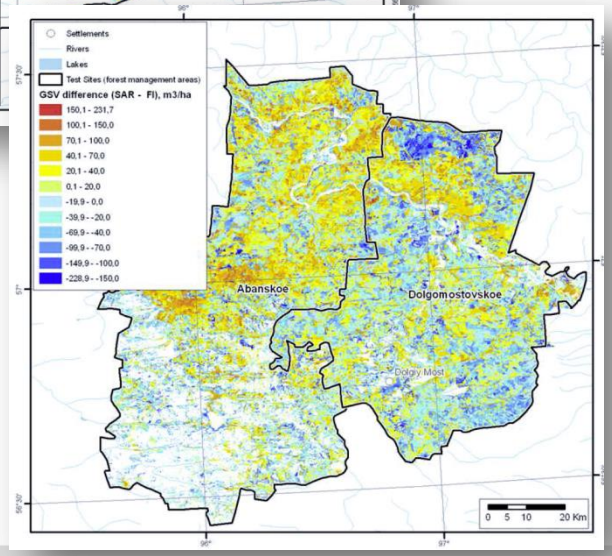




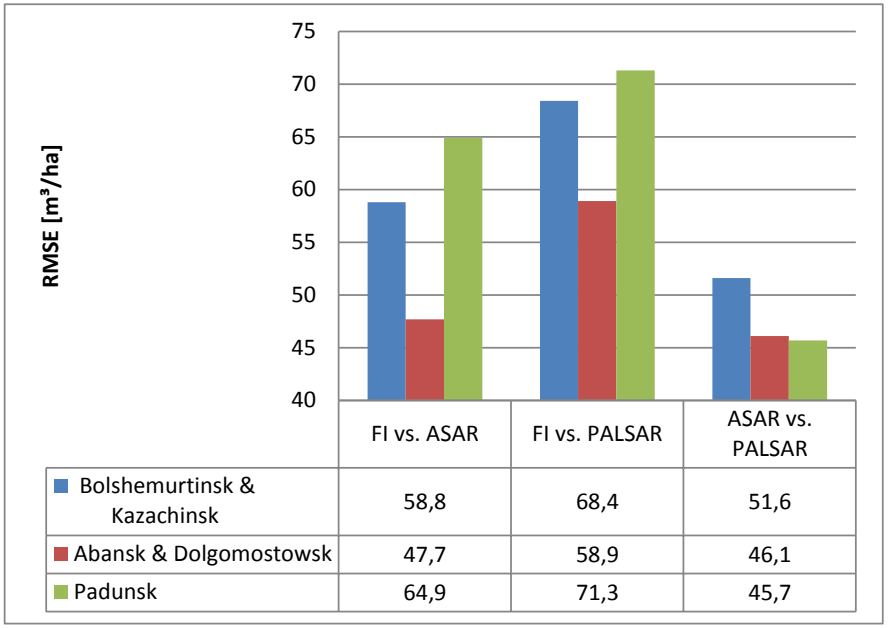
GSV from
Forest Inventory



GSV from
ENVISAT ASAR
(ESA BIOMASAR-II)

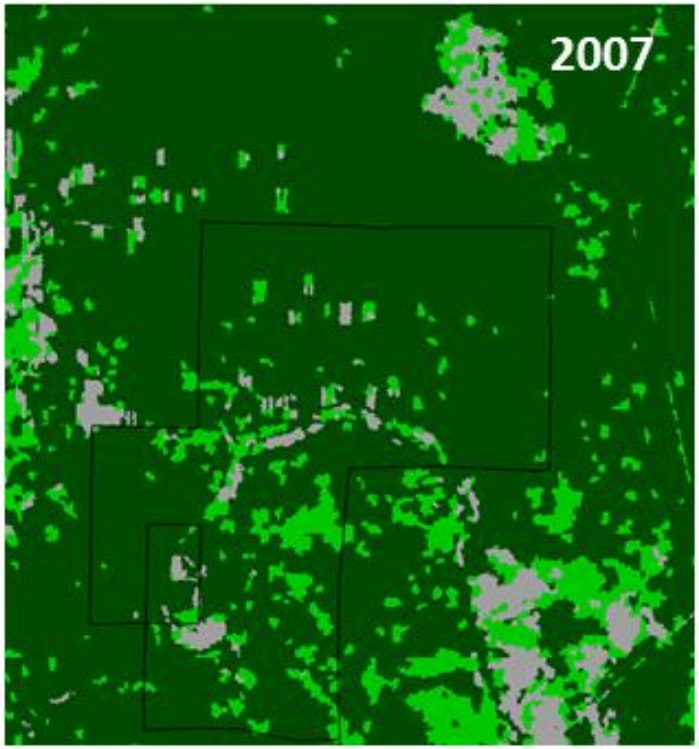


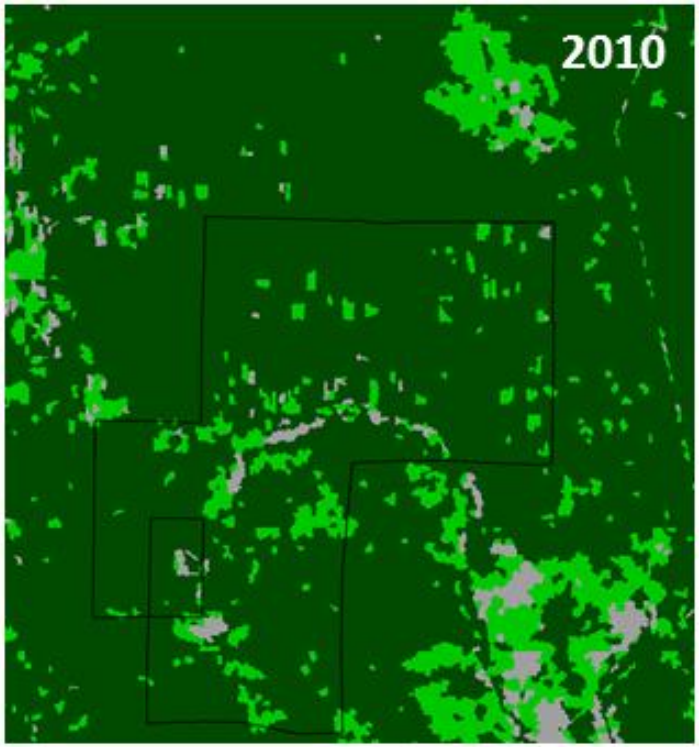
GSV from
ALOS PALSAR

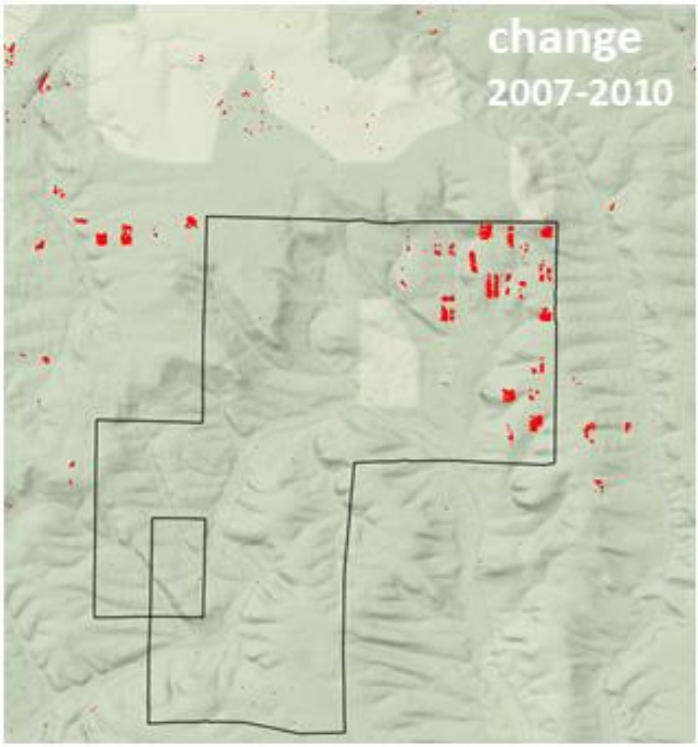


	FI vs. ASAR	FI vs. PALSAR	ASAR vs. PALSAR
Bolshemurtinsk & Kazachinsk	58,8	68,4	51,6
Abansk & Dolgomostowsk	47,7	58,9	46,1
Padunsk	64,9	71,3	45,7

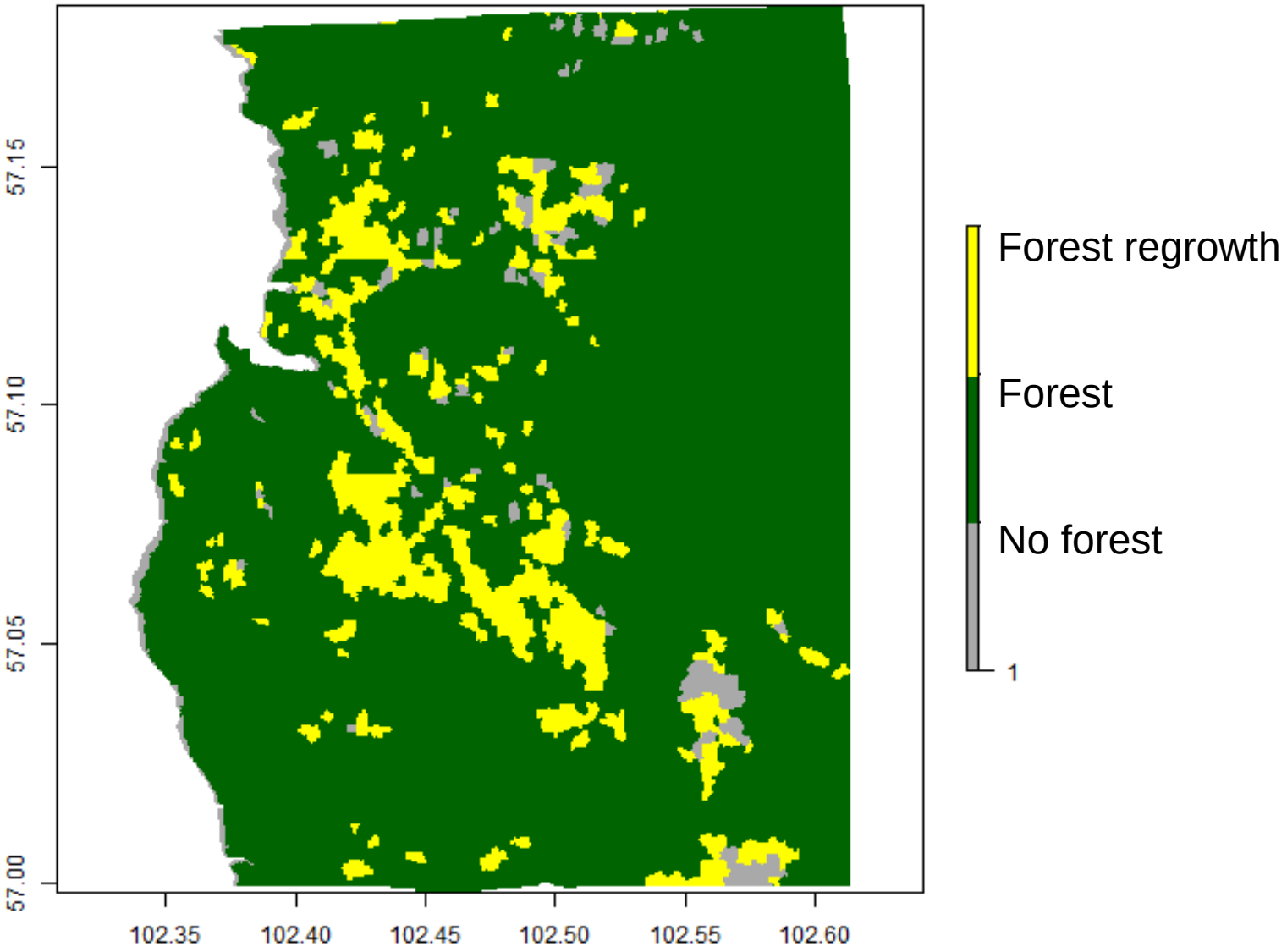
Mapping forest change using annual GSV maps



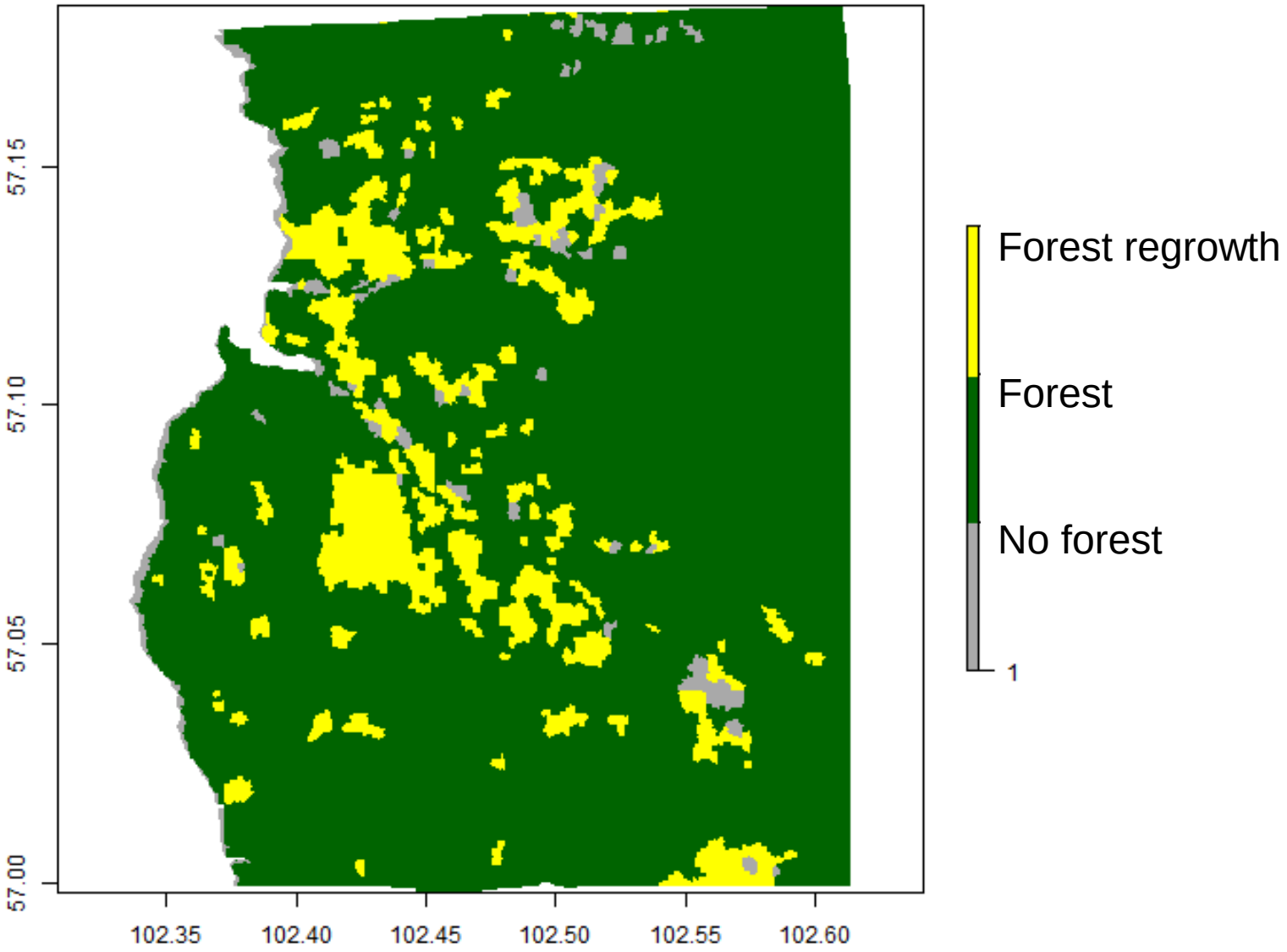




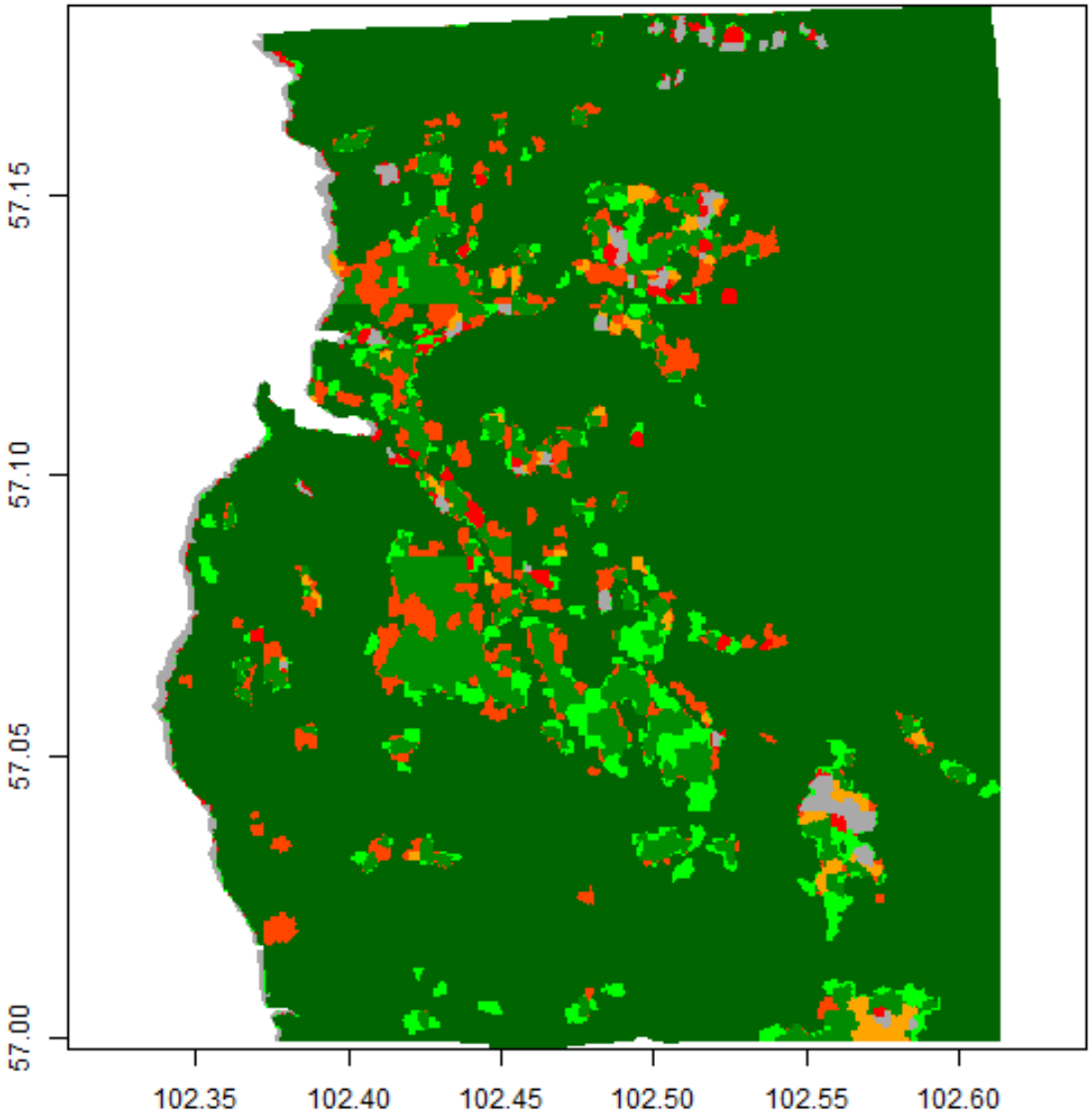
Forest Cover & Disturbance 2007

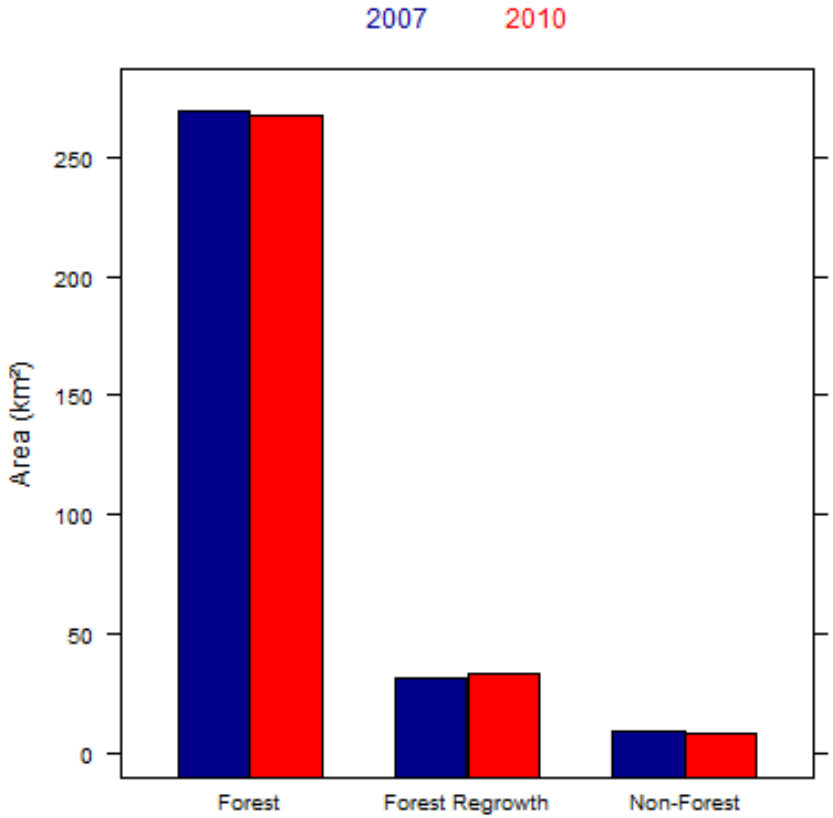


Forest Cover & Disturbance 2010



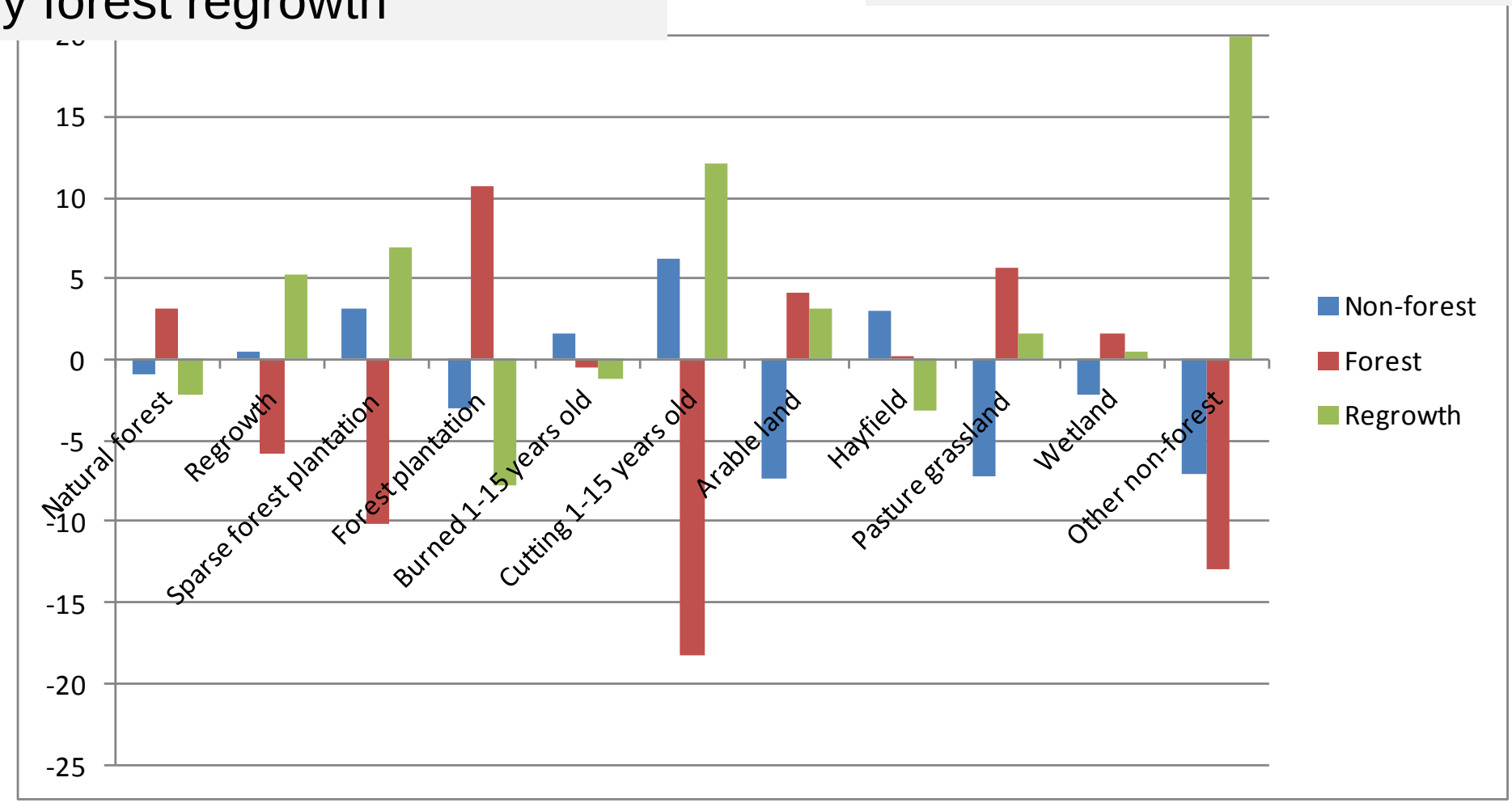
Change 2007 - 2010

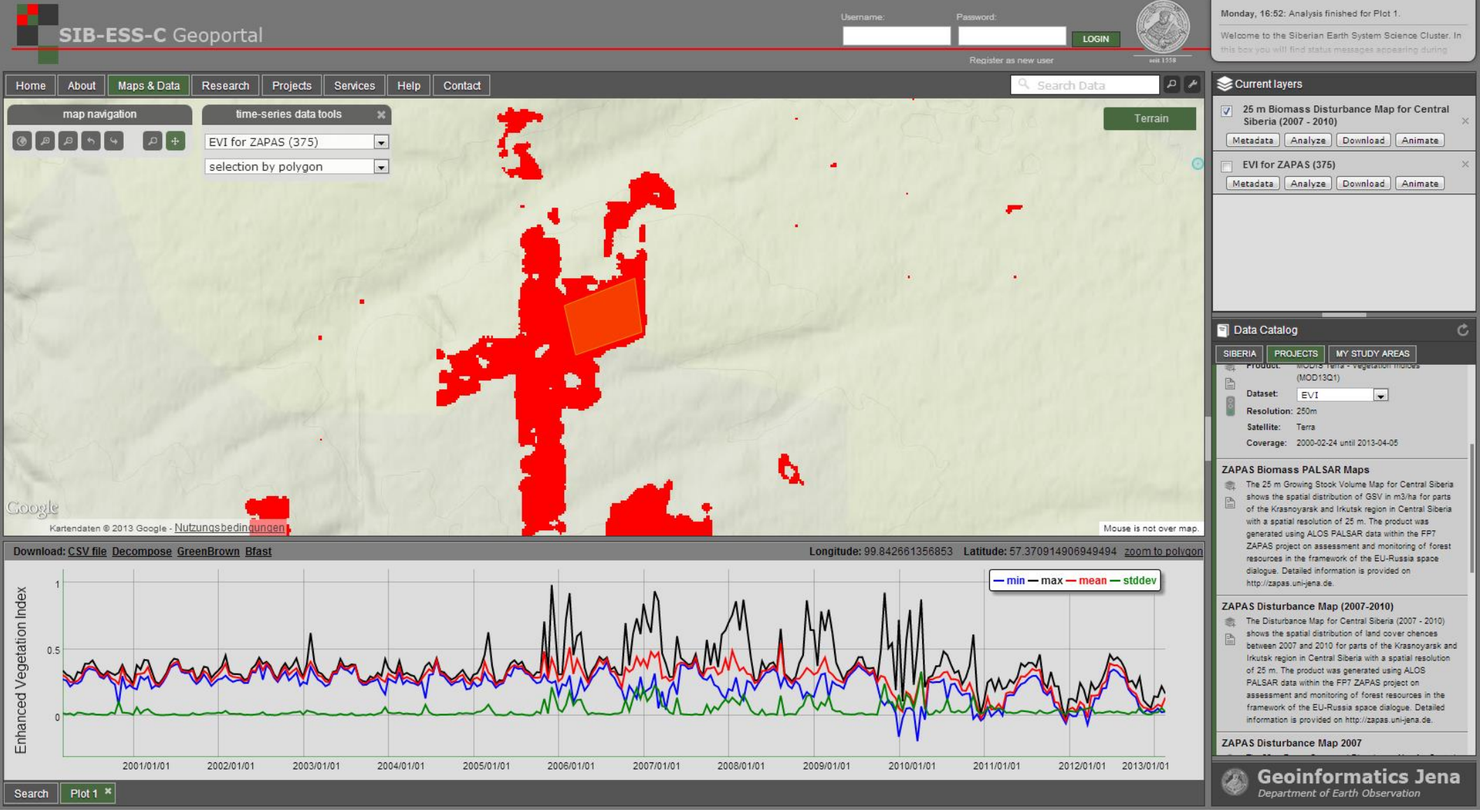




Decrease of forest cover after logging or fire followed by forest regrowth

Increase of forest cover due to agricultural land abandonment and former forest fires





Data Integration

Web-based Multi-Source Data Broker for Land Observations and Monitoring

earth-observation-monitor.net/map.php#hybrid

Home | Map | Datasets | Analyses | Research | Software | About

webEOM

Logged in as chrishuett | Logout

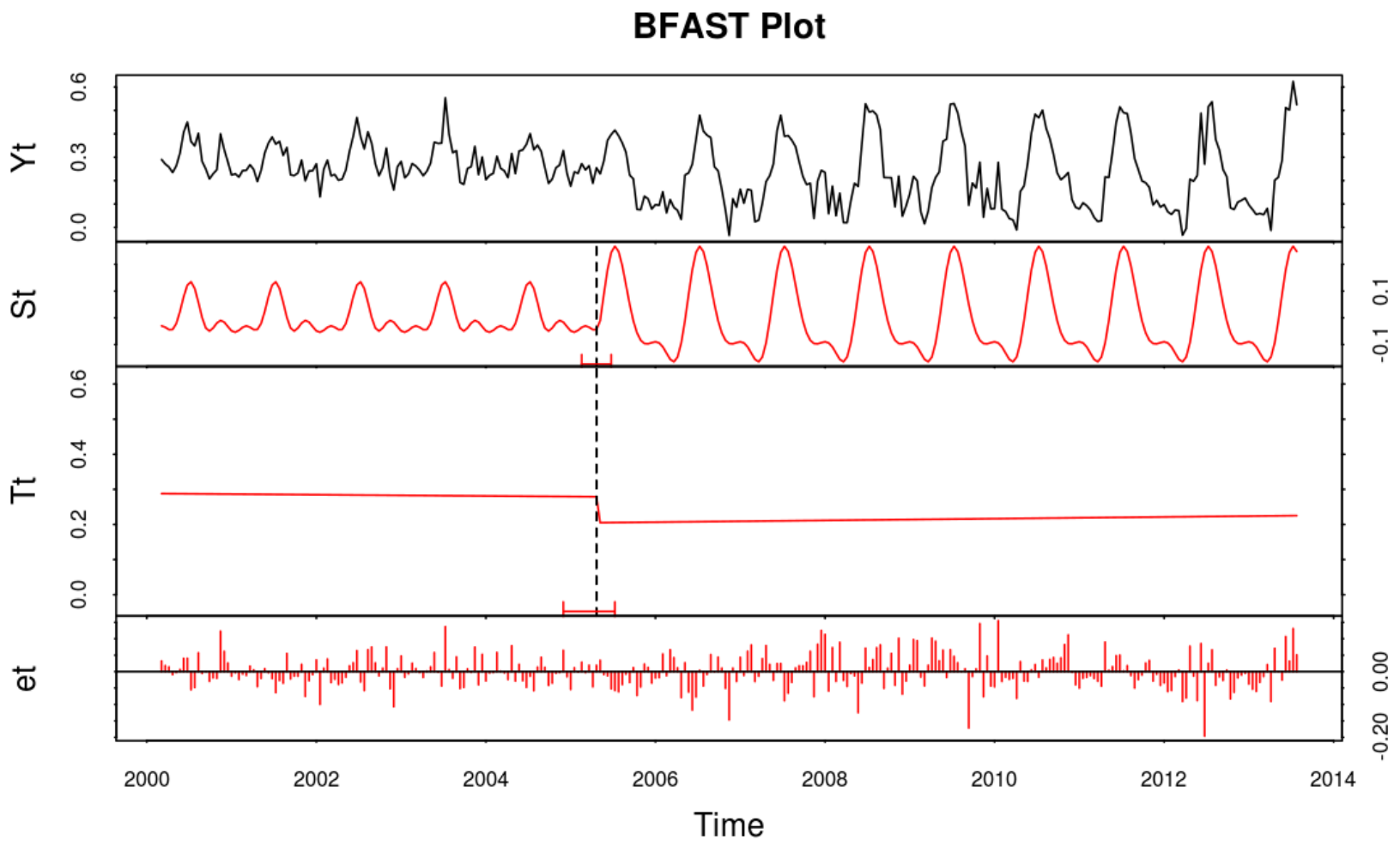
Edit your account information

Hybrid | Time-series tools:

Mouse is not over map.

Show layer availability: None

Do you have any questions?



Summary

- ALOS PALSAR 25 m SAR mosaics have the potential for operational large-scale GSV and forest cover change monitoring
- Multi-scale GSV comparisons useful for detecting inconsistencies in FI data
- PALSAR-based Forest cover and disturbance maps show general agreement with local forest inventory
- Web-based data integration of high resolution forest change maps and MODIS time series help to:
  - locate forest change events
  - Detect points in time of change events
  - Increase confidence in forest change assessment

Data and Analyses:

http://sibessc.uni-jena.de
http://zapas.uni-jena.de
http://earth-observation-monitor.net