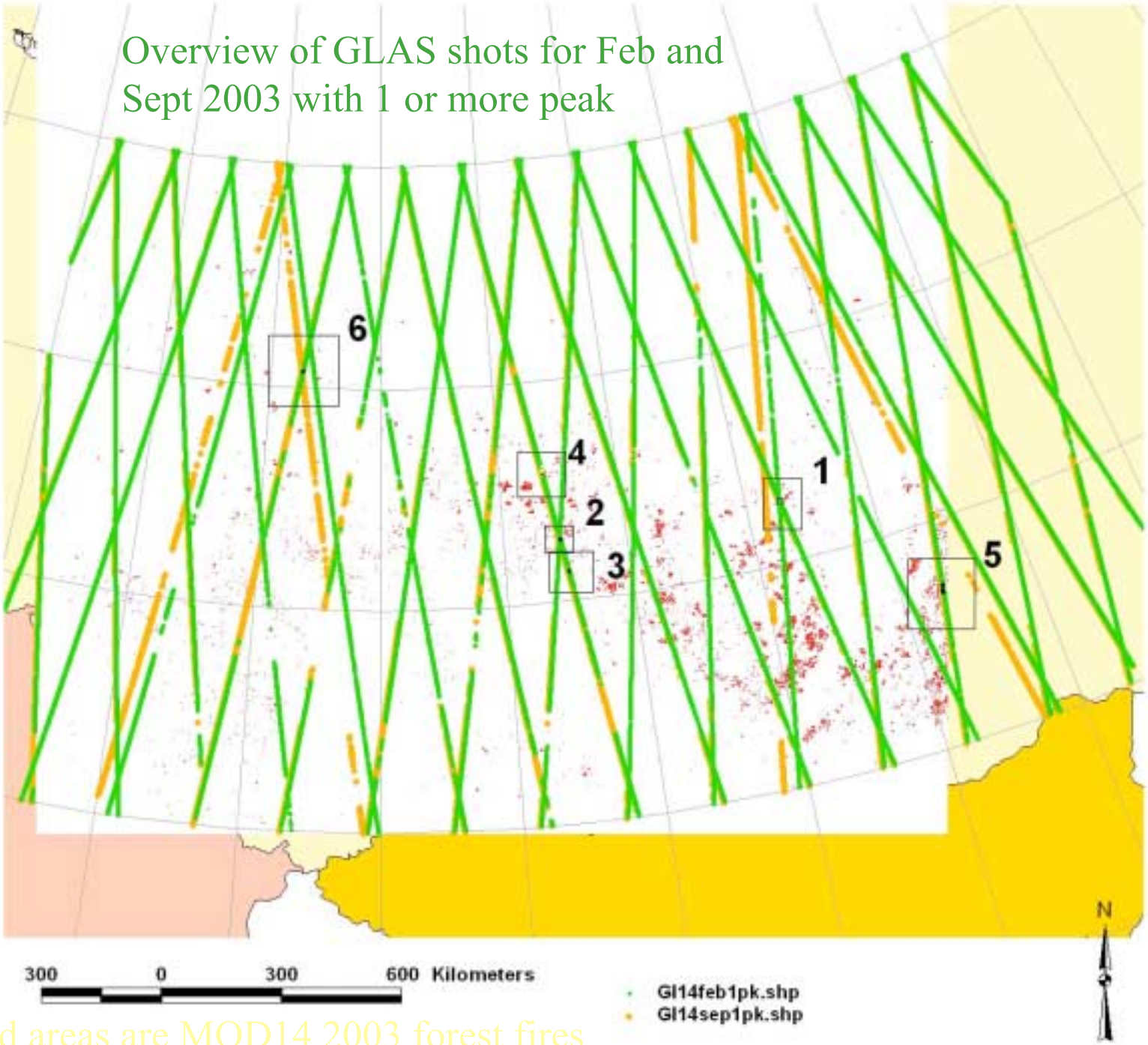
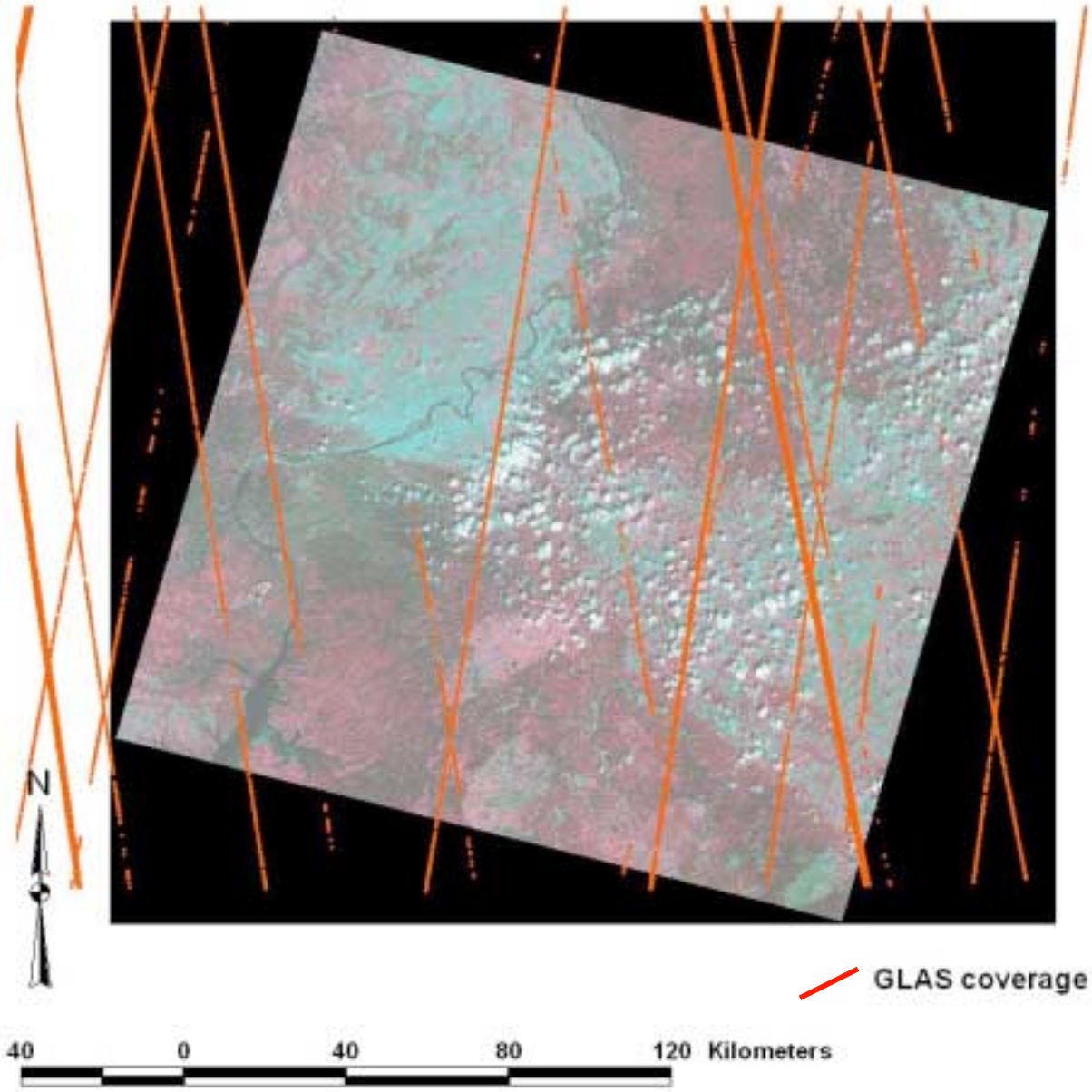
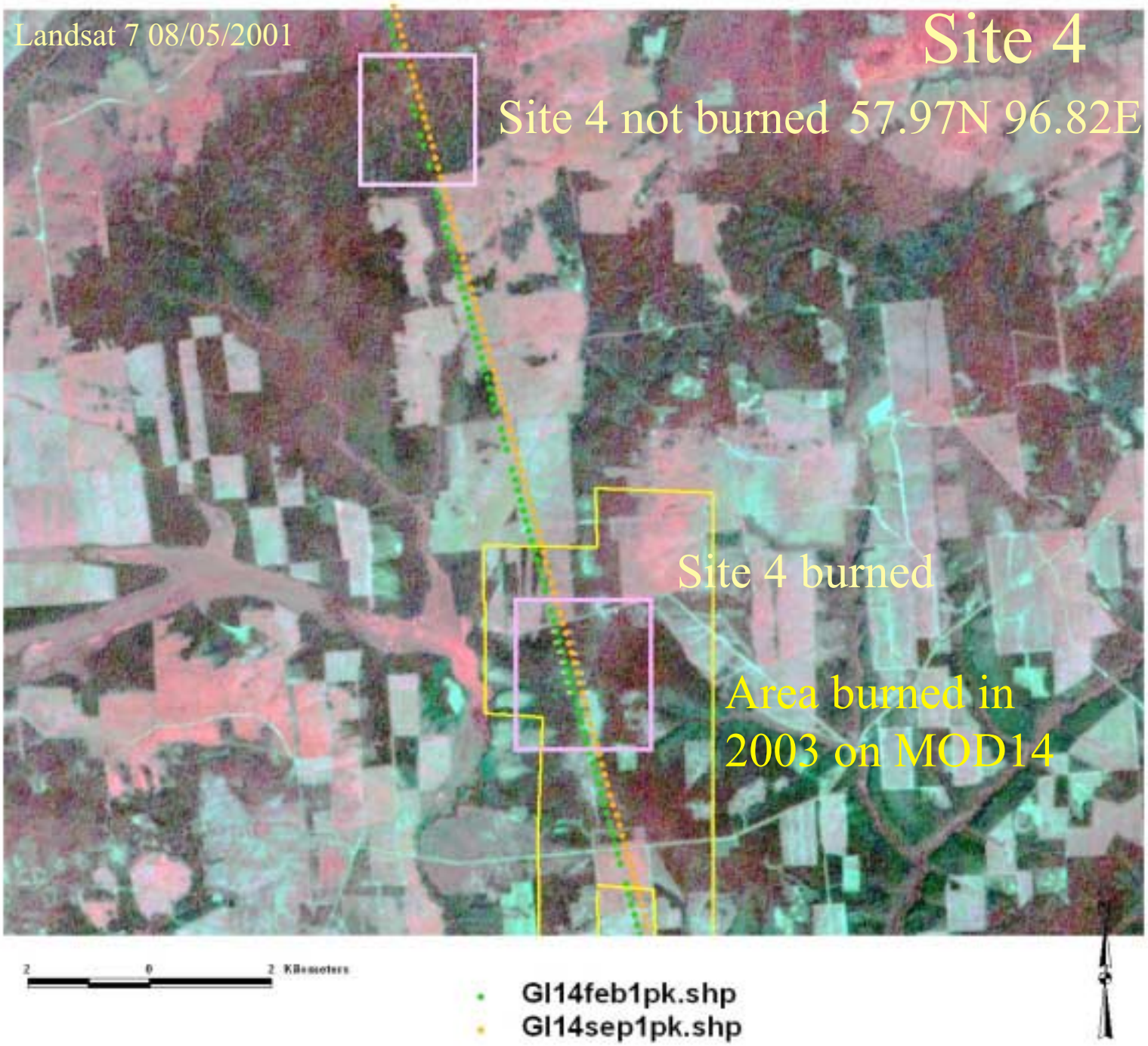
Overview of GLAS shots for Feb and Sept 2003 with 1 or more peak

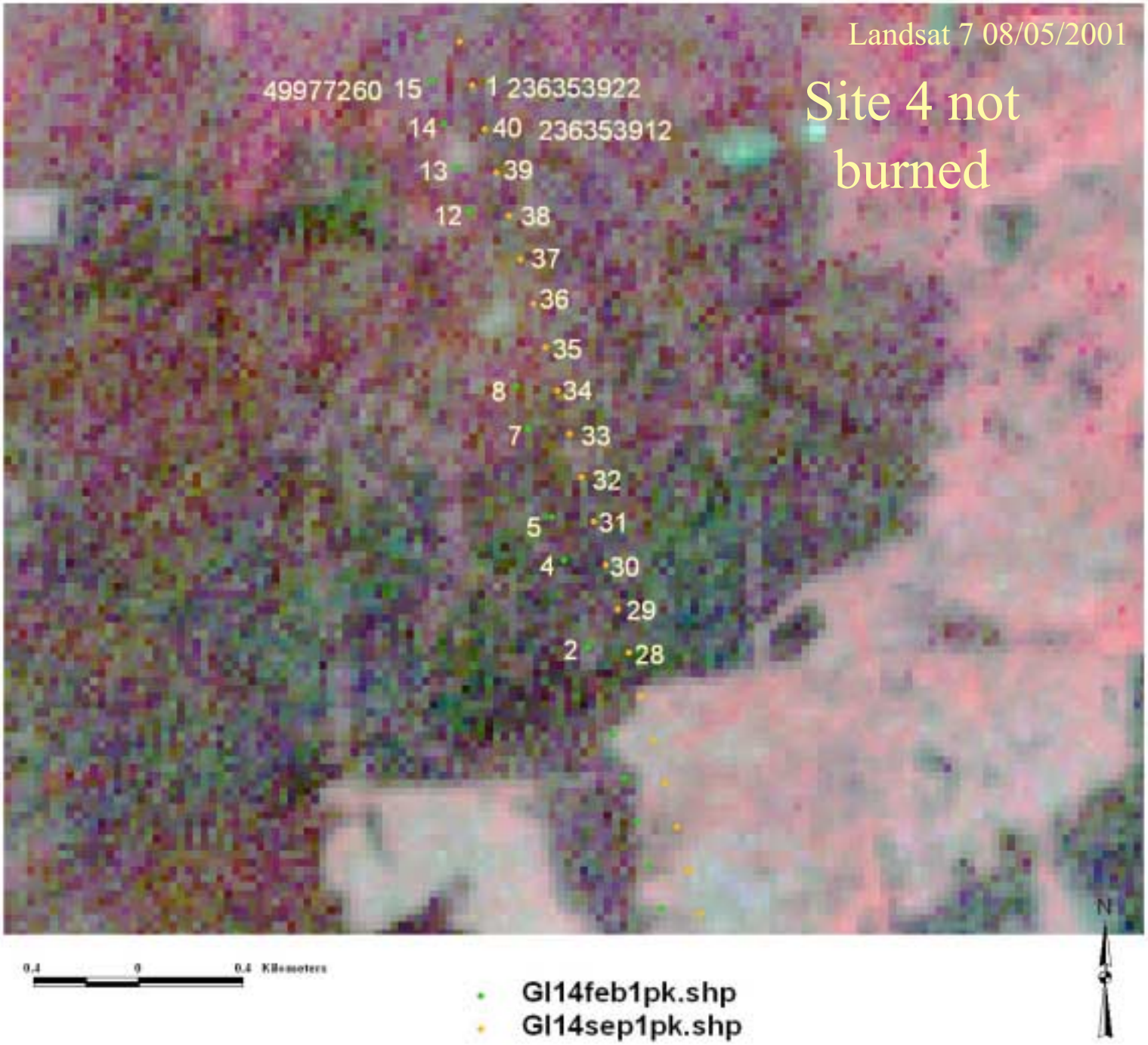


Red areas are MOD14 2003 forest fires



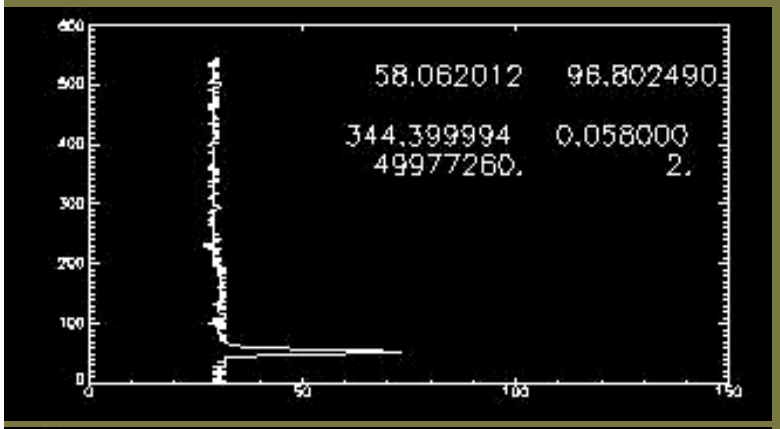
Krasnoyarsk area Landsat 7 ETM+ data June 22, 2000 Red: NIR, Green: Red, Blue: Green

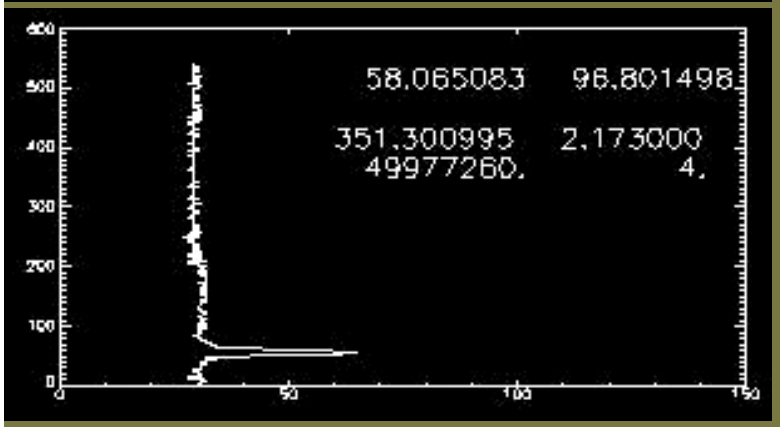

Landsat 7 08/05/2001
Site 4
Site 4 not burned 57.97N 96.82E
Site 4 burned
Area burned in
2003 on MOD14
2 0 2 Kilometers
Gl14feb1pk.shp
Gl14sep1pk.shp

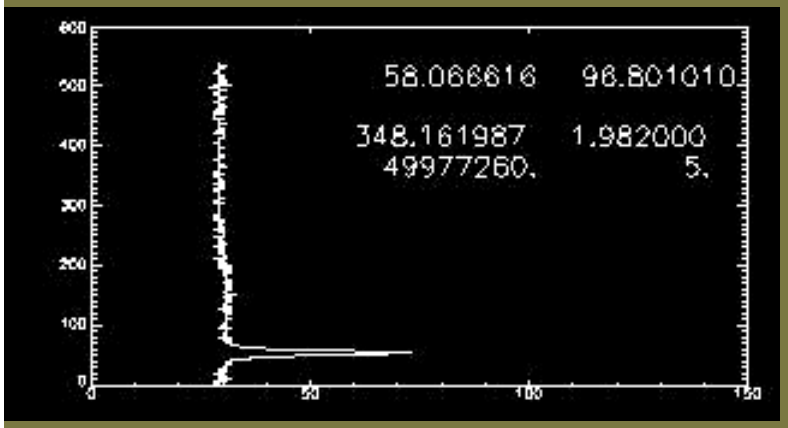

Landsat 7 08/05/2001
Site 4 not burned
49977260 15
1 236353922
14
40 236353912
13
39
12
38
37
36
35
8
34
7
33
32
5
31
4
30
29
2
28
N
0.4 0 0.4 Kilometers
Gl14feb1pk.shp
Gl14sep1pk.shp

Seasonal variation in wave form

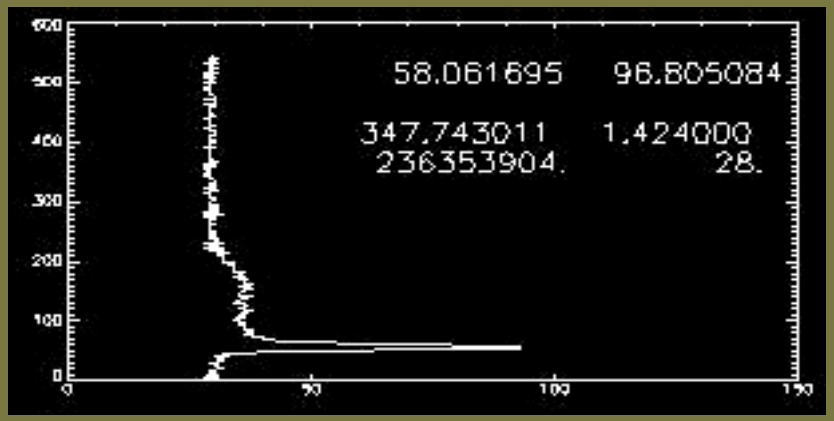
Feb 2003 Forest no burn

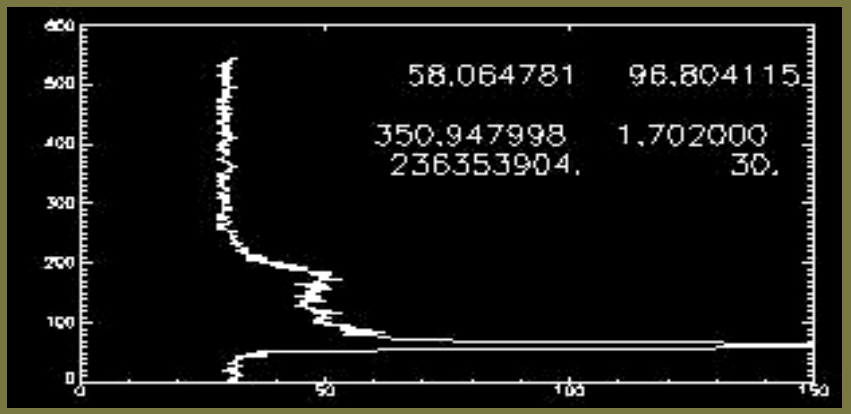


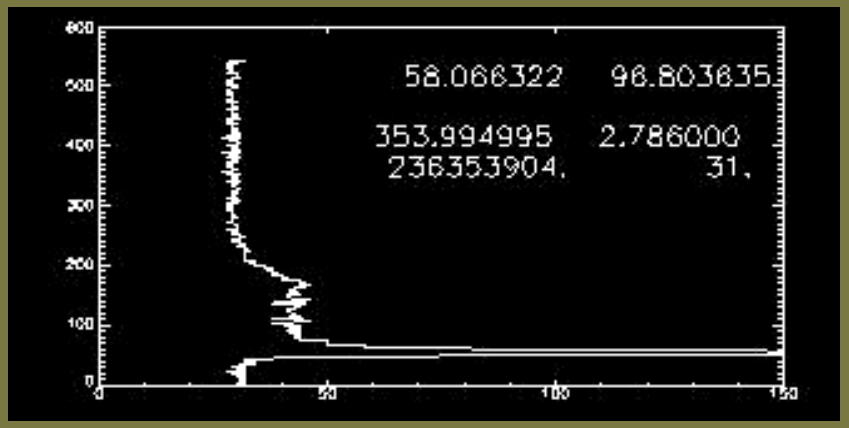




Sep 2003 Forest no burn



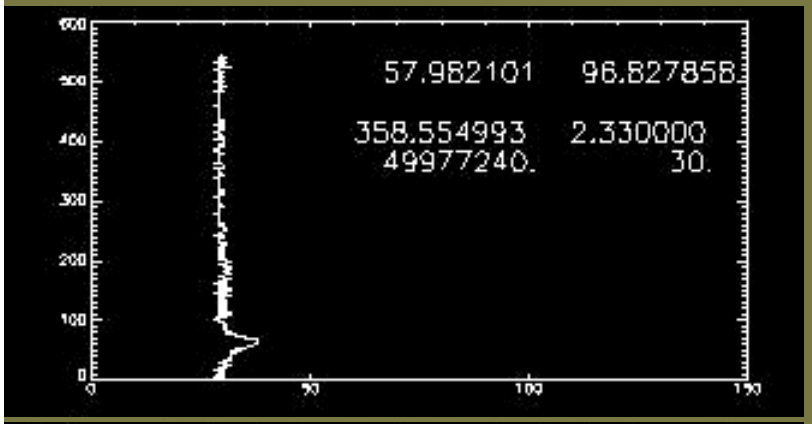


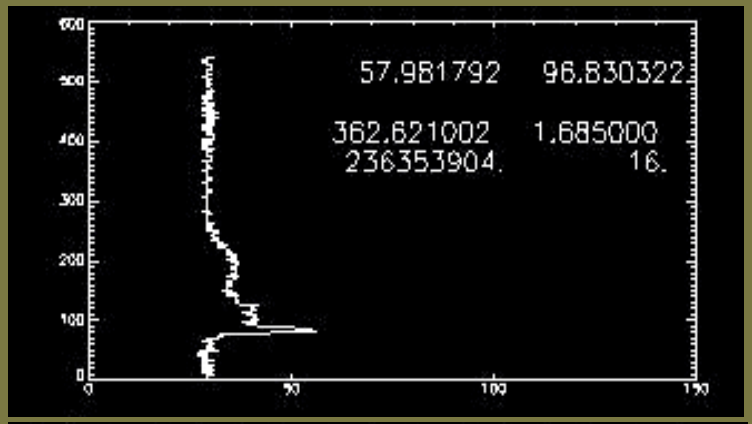


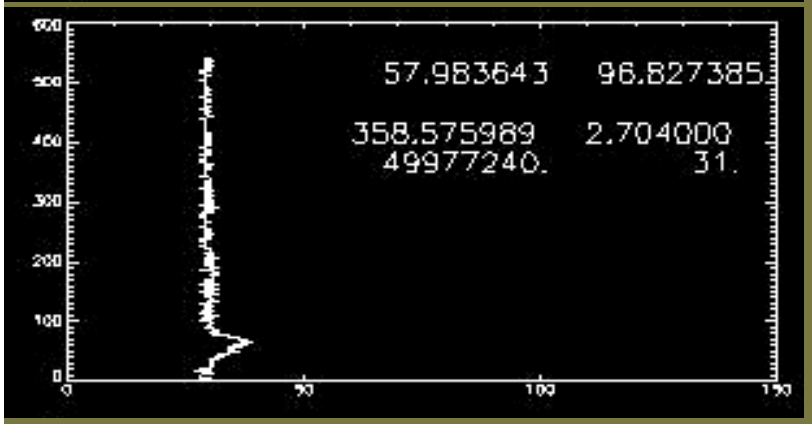
Seasonal variation + burn change in wave form

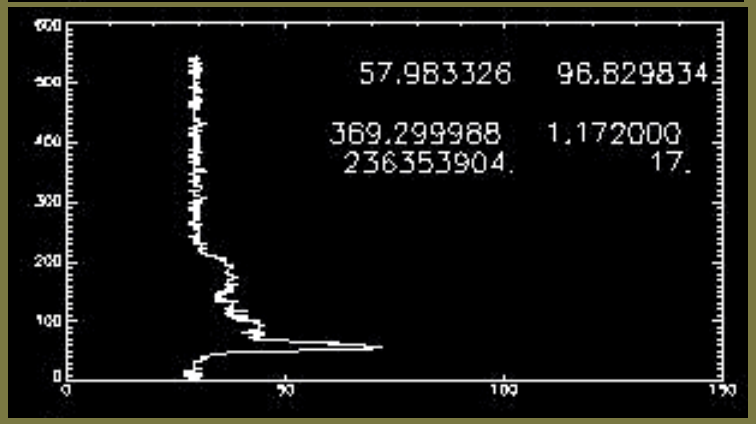
Feb 2003 Forest before burn

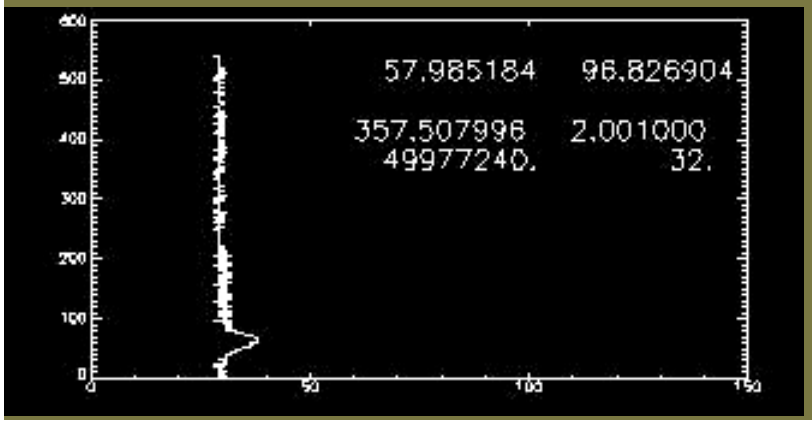
Sep 2003 Forest after burn

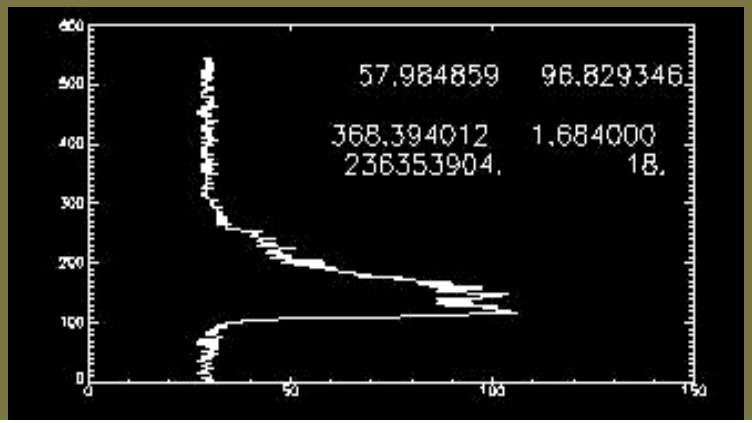




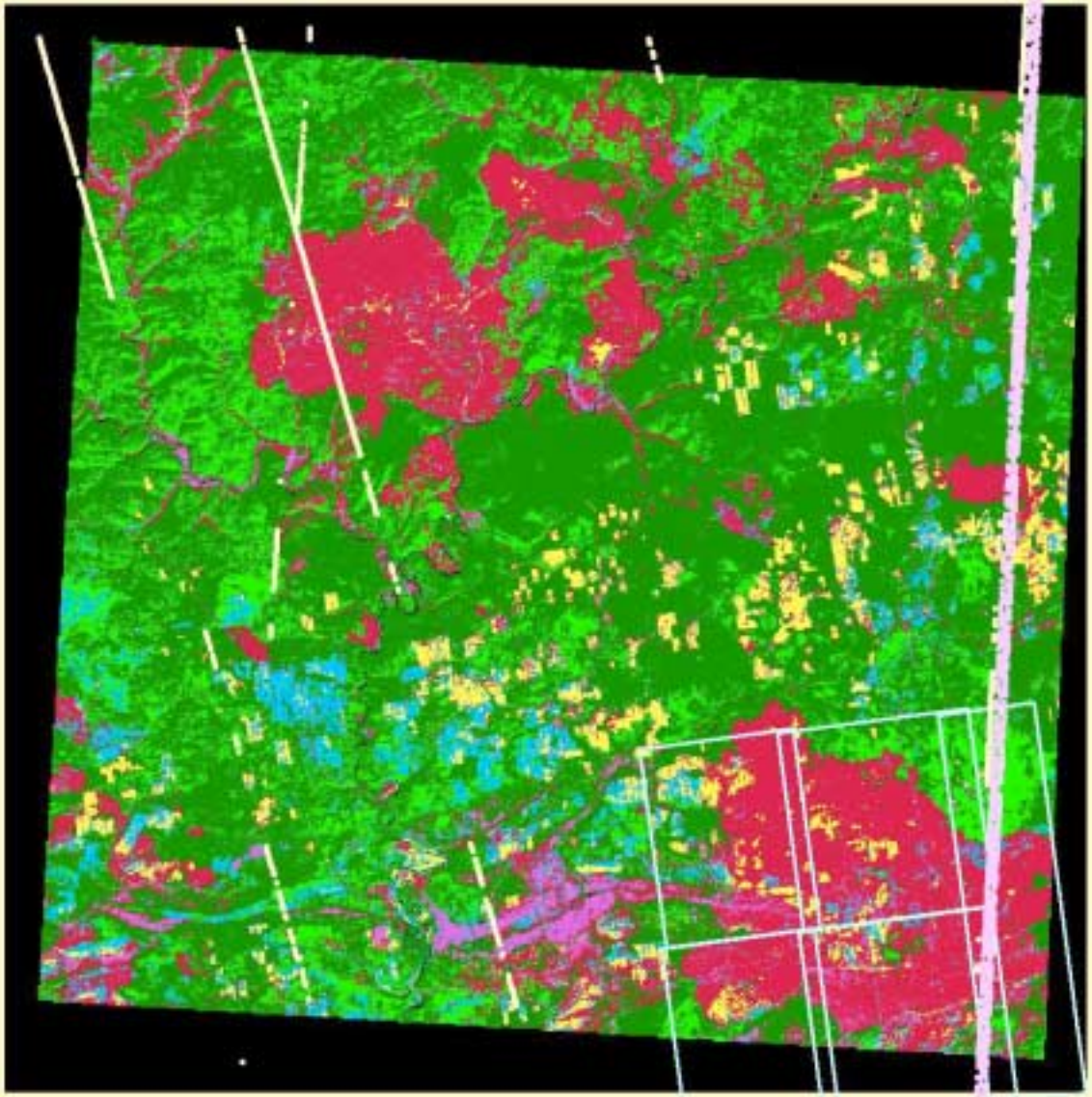








GLAS data over Boguchany all data (not just 8-day)

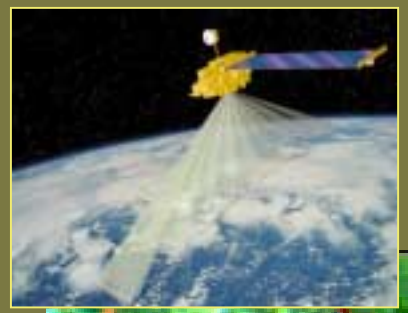


ECF
DCF
DBF

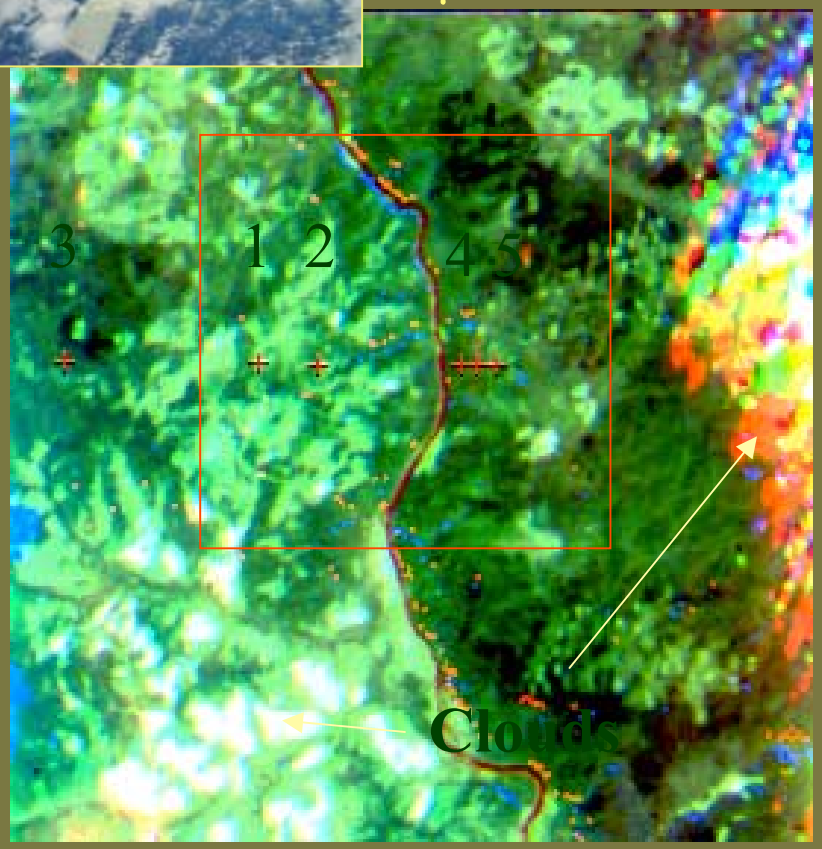
7 0 7 14 Kilometers

GLAS Feb 2003 data
GLAS Sep 2003 data
Ikonos data

N



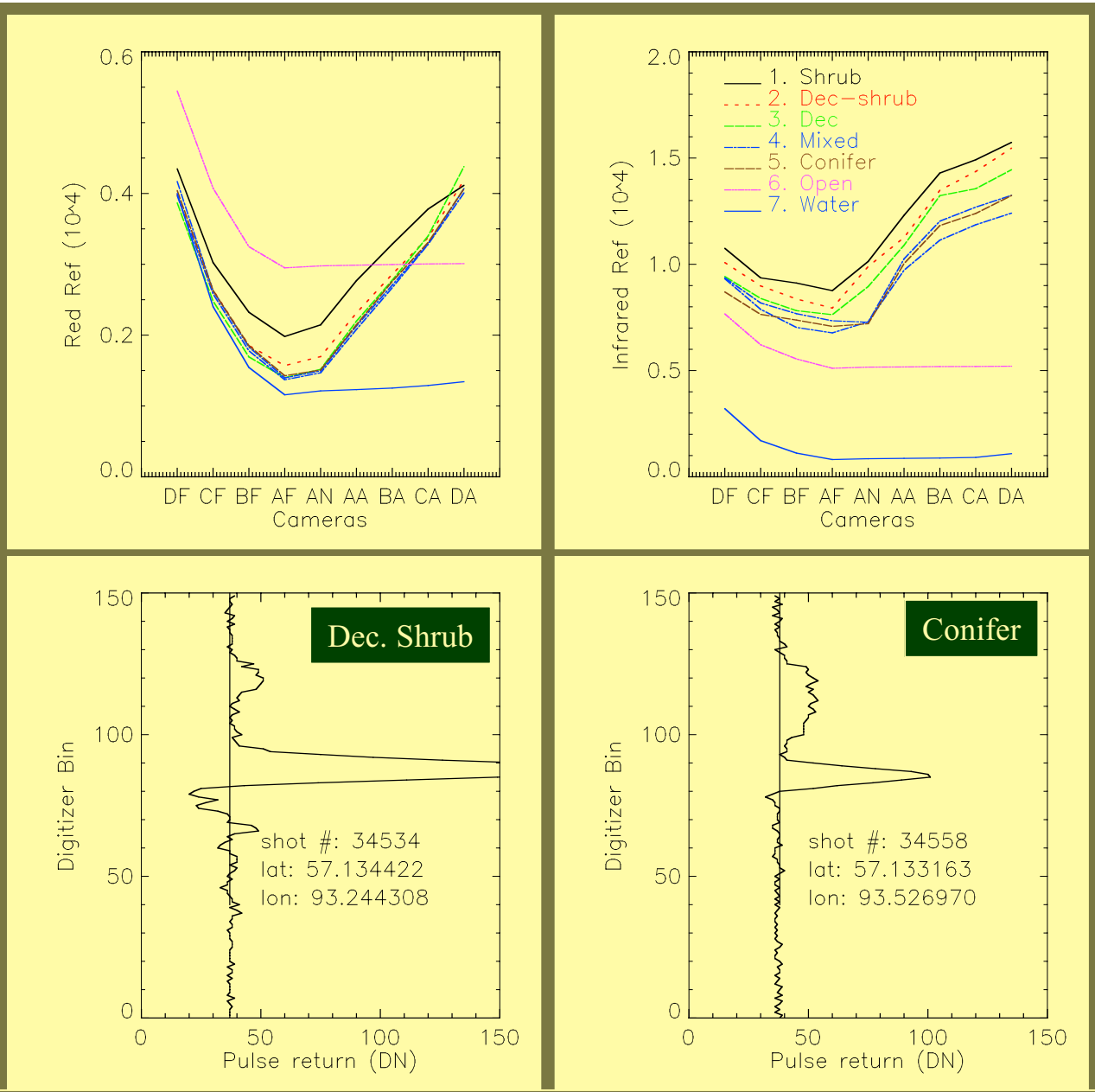
MISR Aug. 28, 2001



MISR Red band: Cameras DF(red) AN (green) and DA (blue)

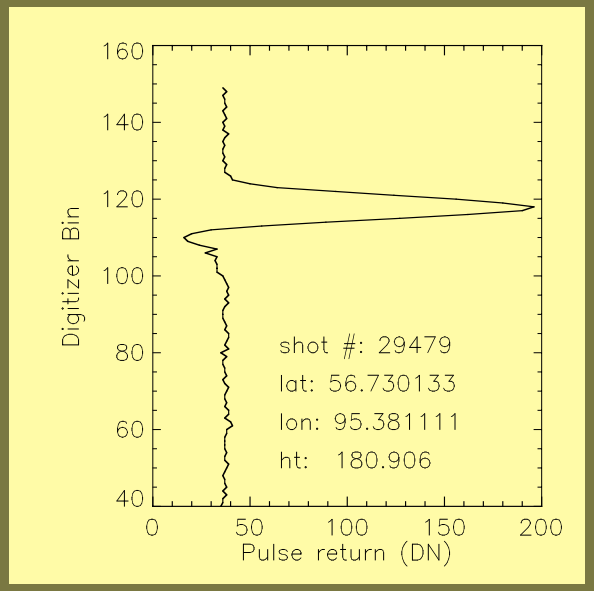
Landsat ETM+: bands 7 (red), 4(green, and 2 (blue)

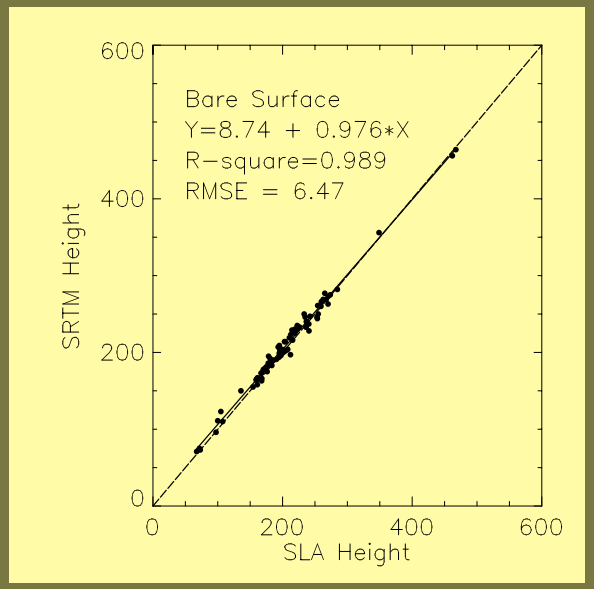
Location and SLA-02 laser footprints on MISR (left) and Landsat-7 (right) images

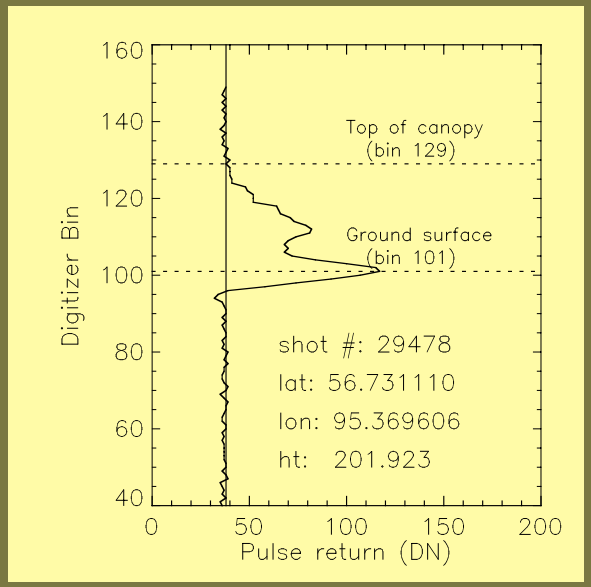


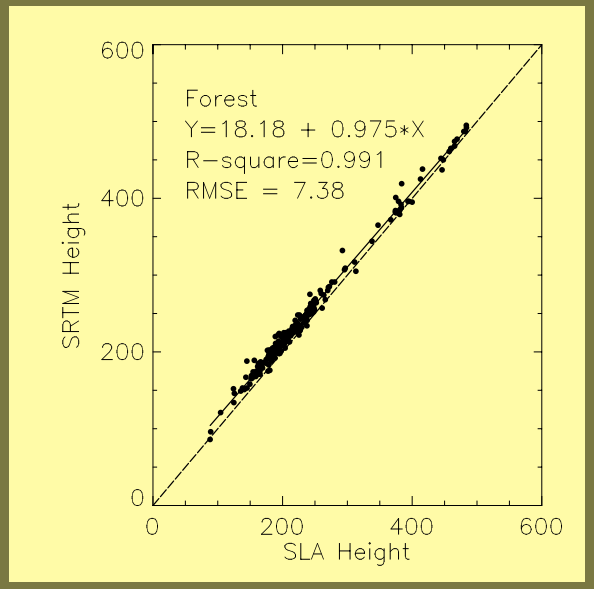
Reflectance of MISR data for red and NIR bands for 7 types, and SLA-02 lidar waveforms for two of these types (deciduous shrub and conifer).

SLA-02 in Siberia - Getting Ready for VCL , GLAS or ??









Plans

- Acquire and compile GLAS data
- Assemble MISR coverage of dense GLAS coverage
- Develop data base of forest attributes (type, Height, topography)
- Use neural networks to develop classification algorithms based on 2-D mapping and 3-D sampling.
- Field trip to Siberia summer 2004
- Continue to publish intermediate steps
- Propose North American version of work to extend to circumpolar forest.

Recent Publications

2004 Sun, G. Ranson, K.J. Kharuk, V.I. and Kovacks, K.. Validation of Surface Height From Shuttle Radar Topography Mission Using Shuttle Laser Altimeter, Remote Sensing of Environment (in press)

2004 K.J. Ranson, G. Sun, V.I. Kharuk and K.Kovacs Changes in the Taiga-Tundra Boundary Observed with Landsat. IEEE Trans. Geosci. Remote Sensing (in revision)

2004 Kharuk, V.I., K.J. Ranson, A.G. Kozuhovskaya, Y.P. Kondakov, L.A. Pestunov, NOAA/AVHRR satellite detection of Siberian silkmoth outbreaks in eastern Siberia. IJRS

2004 Kharuk, V.I, KJ Ranson and M. L. Dvinskaya. Wildfire Dynamics in Mid-Siberian Larch Dominated Communities, Int. J. Wildland Fire (submitted)

2004 Kovacs, K. Ranson, K.J. The Relationship of the Terra MODIS Fire Product and Anthropogenic features in the Central Siberian Landscape, Mapping Science and Remote Sensing (In Prep)

2004 Kovacs, K. Ranson, K.J., and Sun, G. Evaluating the effects of incidence angle on radar backscatter and comparing different methods of radiometric correction of SAR images, In prep.

2003 Ranson, K. J., K. Kovacs G. Sun, V. I. Kharuk. Disturbance recognition in the boreal forest using radar and Landsat 7, *Canadian J. Remote Sensing*, 29(2):271-285

2003 Kharuk V. I., Ranson K. J., Kuz'michev V. V., Im S. T. Landsat based analysis of insect outbreaks in southern Siberia, *Canadian J. Remote Sensing*, 29(2):286-297.

2003 Bergen, K.,. Conard, S , Houghton, R , Kasischke, E., Kharuk, V., Krankina,O., Ranson, J. Shugart, H., Sukhinen, A. and Treyfield, R. Nasa and Russian scientists observe land-cover/land-use change and carbon in Russian forests, Journal of Forestry 101 (4): 34-41 JUN 2003 .

2003 Kharuk V.I., Ranson K.J., Burenina T.A., Fedotova E.V. NOAA/AVHRR data in mapping of Siberian forest landscapes along the Yenisey transect, International J. Remote Sensing, 24 (1): 23-37 JAN 10 2003

Recent Publications, cont.

2002 Sun, G., K.J. Ranson and V.I. Kharuk. Radiometric slope correction for forest biomass estimation from SAR data in the Western Sayani Mountains, Siberia. Remote Sensing of Environment, 79: 279-287.

2002 Kharuk V. I., K. J. Ranson, S. T. Im, and E. V. Fedotova. Impact of Gold Mining on Middle Siberian Taiga Landscapes from Landsat 7 Data, Mapping Sciences and Remote Sensing 39(2) 139-156

2002 Kharuk V.I., Ranson K.J., S.T. Im, Burenina T.A. Monitoring the oil-and gas reconnaissance and exploitation impact on the taiga forests based on the data in the microwave and optical regions. Geography and Natural Resources (in Russian) (accepted).

2001 Ranson, K. J., K. Kovacs, G. Sun, V. I. Kharuk, Characterization of forests in Western Sayani mountains, Siberia from SAR data, *Remote Sensing of Environment*, 75;188-200.

2001 Ranson, K. J, G. Sun, R.G. Knox, E.R. Levine, J. F. Weishampel and S.T. Fifer. Northern Forest Ecosystem Dynamics Using Coupled Models And Remote Sensing, Remote Sensing of Environment, 75:291-302.

2000 Sun, G., K.J. Ranson, Bufton, J. and Roth, M. "Requirement of ground tie points for InSAR DEM generation" PE&RS 66:81-85.

2000 Ranson, K.J. and Sun, G, Effects of environmental conditions on SAR forest classification and biomass estimation. IEEE Trans. Geosci. Remote Sens. 38(3):1242-1252.

2000 G. Sun and K. J. Ranson. Modeling lidar returns from forest canopies IEEE TGARS38(6):2617-2626.

Extra Slides

MOD14 fire detection

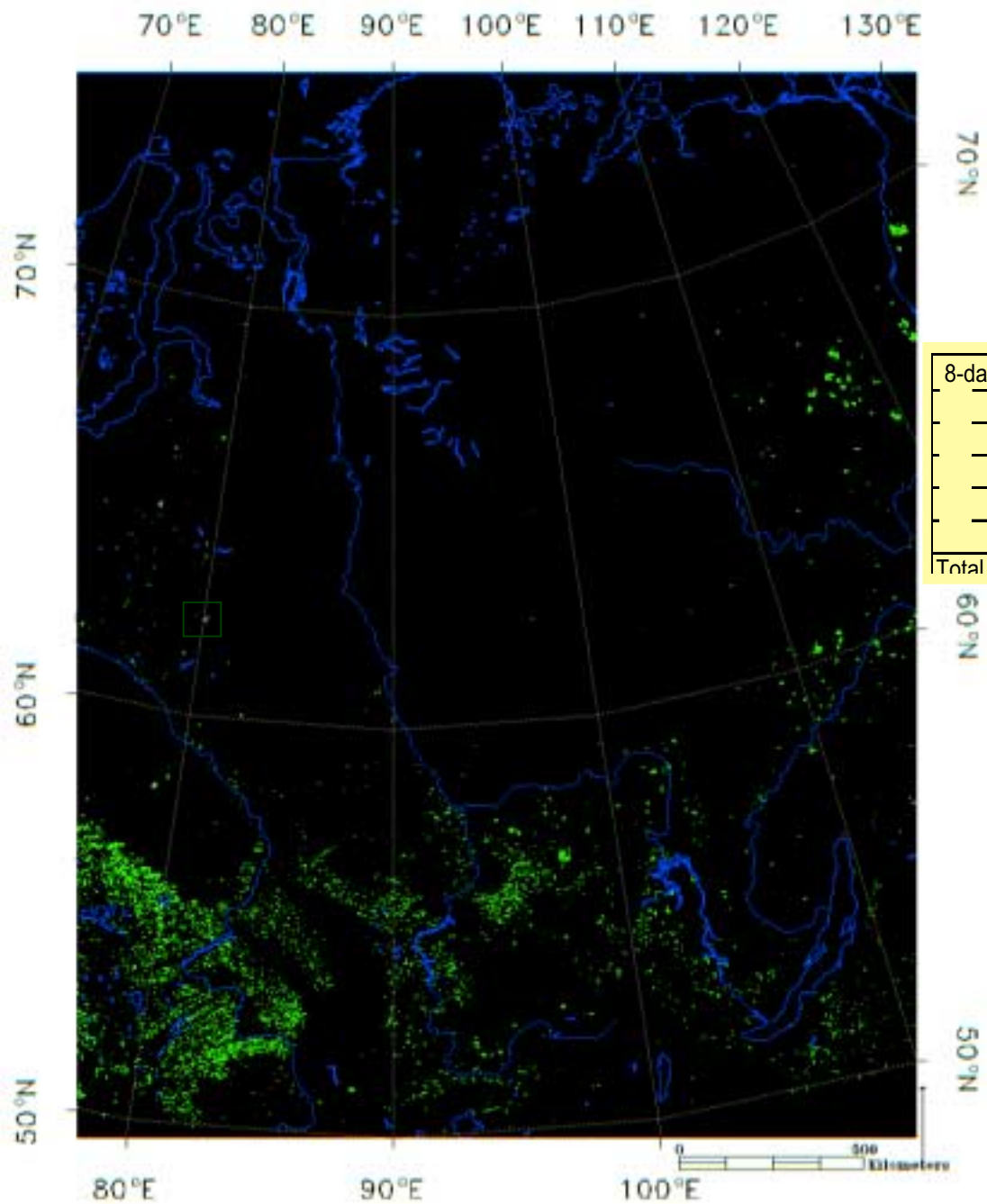
The MOD14 fire detection strategy is based on absolute detection of strong fires, and on detection relative to the background to account for variability of the surface temperature and reflection of sunlight (Justice et al, 2002). For absolute fire detection, the algorithm requires that at least one of the following conditions be satisfied:

1) T4 > 360 K (330 K at night) or

2) T4 > 320 K (315 K at night) and T4 - T11 > 20 K (10 K at night)

where T4 and T11 are MODIS channel 22 (3.29-3.989μm) and 31 (10.780-11.280μm) respectively (Justice et al, 2002).

Source: Justice C. O., Giglio L., Korontzi S., Owens J., Morisette J. T., Roy D., Descloitres J., Alleaume S., Petitcolin F., and Kaufman Y., 2002. The MODIS Fire Products. *Remote Sensing of Environment*, 83, 1-2, 244-262.



TA persistence

8-day periods	continuous TA	pixels	percent	area km^2
1	0 day<TA<=8 day	30424	96.91%	26123.10
2	8 day<TA<=16 day	819	2.61%	703.22
3	16 day<TA<=24 day	59	0.19%	50.66
4	24 day<TA<=32 day	23	0.07%	19.75
5+	32 day<TA	68	0.22%	58.39
Total		31393	100.00%	26955.12

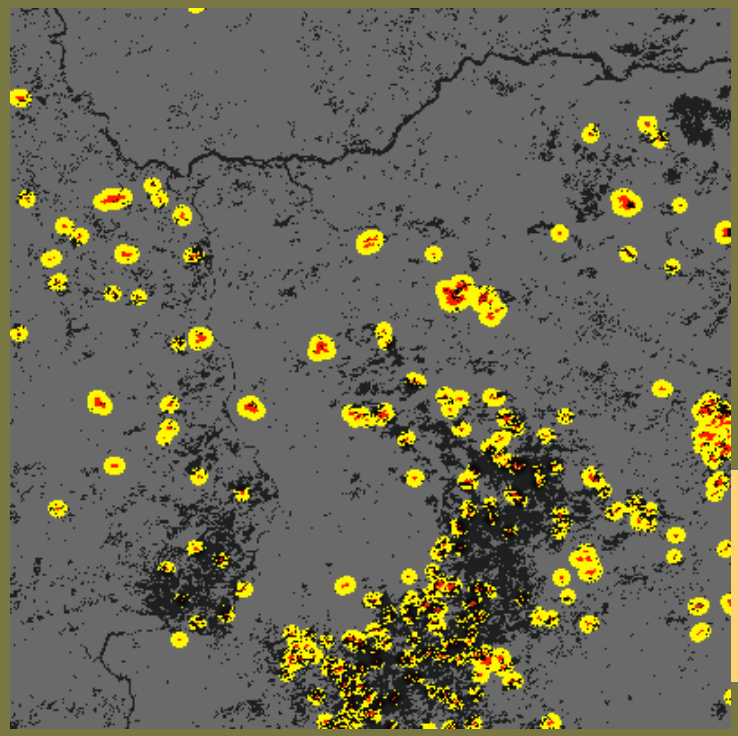
2001 Fire Locations and $\Delta NDVI_{s-b}$ -Forest Areas Only

	km^2	Percent
Total Area	1533835	100.0
Forested Area	1170851	76.3
Burned Area	5219	0.34
Burned Forest	2264	0.19

$$dNDVI_{bf} = (NDVI_{t2bf} - NDVI_{t0bf})/NDVI_{t0bf}$$

$$dNDVI_{sf} = (NDVI_{t2sf} - NDVI_{t0sf})/NDVI_{t0sf}$$

$$\Delta NDVI = dNDVI_{sf} - dNDVI_{b}$$

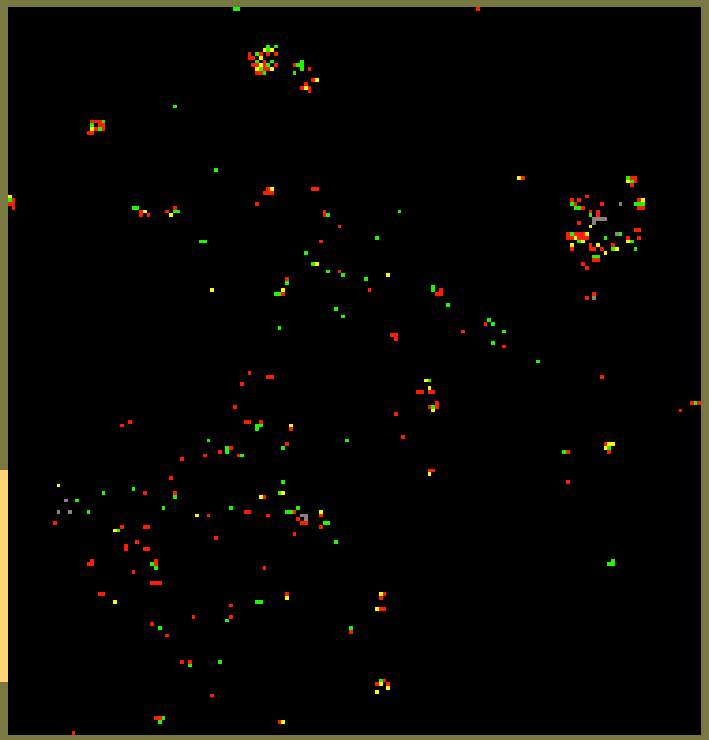


Buffer pixels

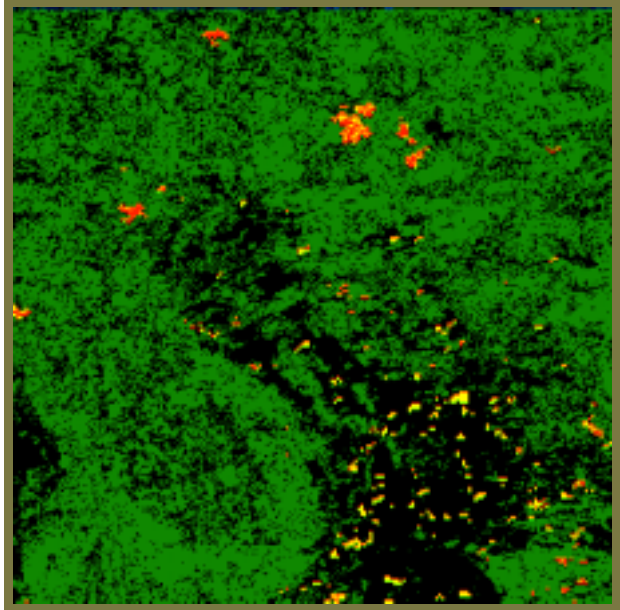
Fire Pixels

ENVI Density Slice Ranges

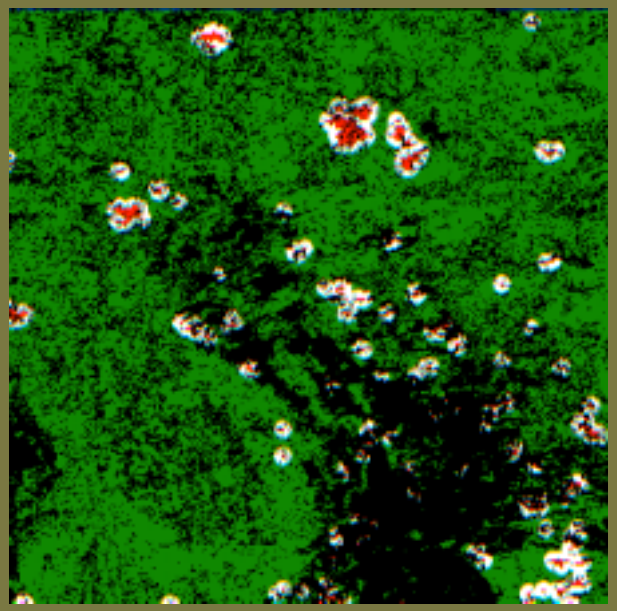
-3000.000000	-2.5100
-2.5000000	0.05000
0.0500000	0.15000
0.1500001	2.50000
2.5000010	500.00000



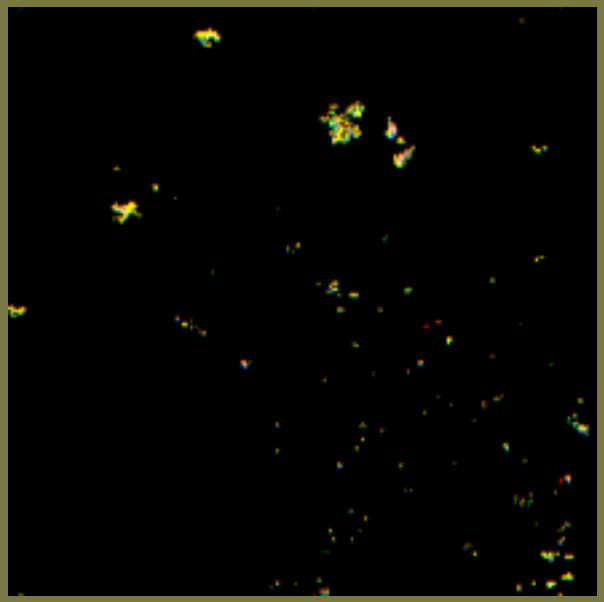
ΔNDVI



Non-Forested Land (2000cl)
Forested Land(2000cl)
Forest Fires in 2001
Non-forest Fires in 2001



Non-Forested Land (2000cl)
Forested Land(2000cl)
Forest Fires in 2001
2.5 km buffer around forest fires



-2999 to -101
-99 to -1.25
-1.25 to -0.75
-0.75 to -0.25
-0.25 to 0.25
0.25 to 0.75
0.75 to 1.25
1.25 to 10000

Methods

Remote Sensing Data Fusion approach: Terra, SPOT, Radarsat – historical AVHRR

Examine margins of forest and analyze the trends in vegetation index and disturbance patterns over the past two decades with AVHRR pathfinder data, SPOT vegetation and Terra MODIS data

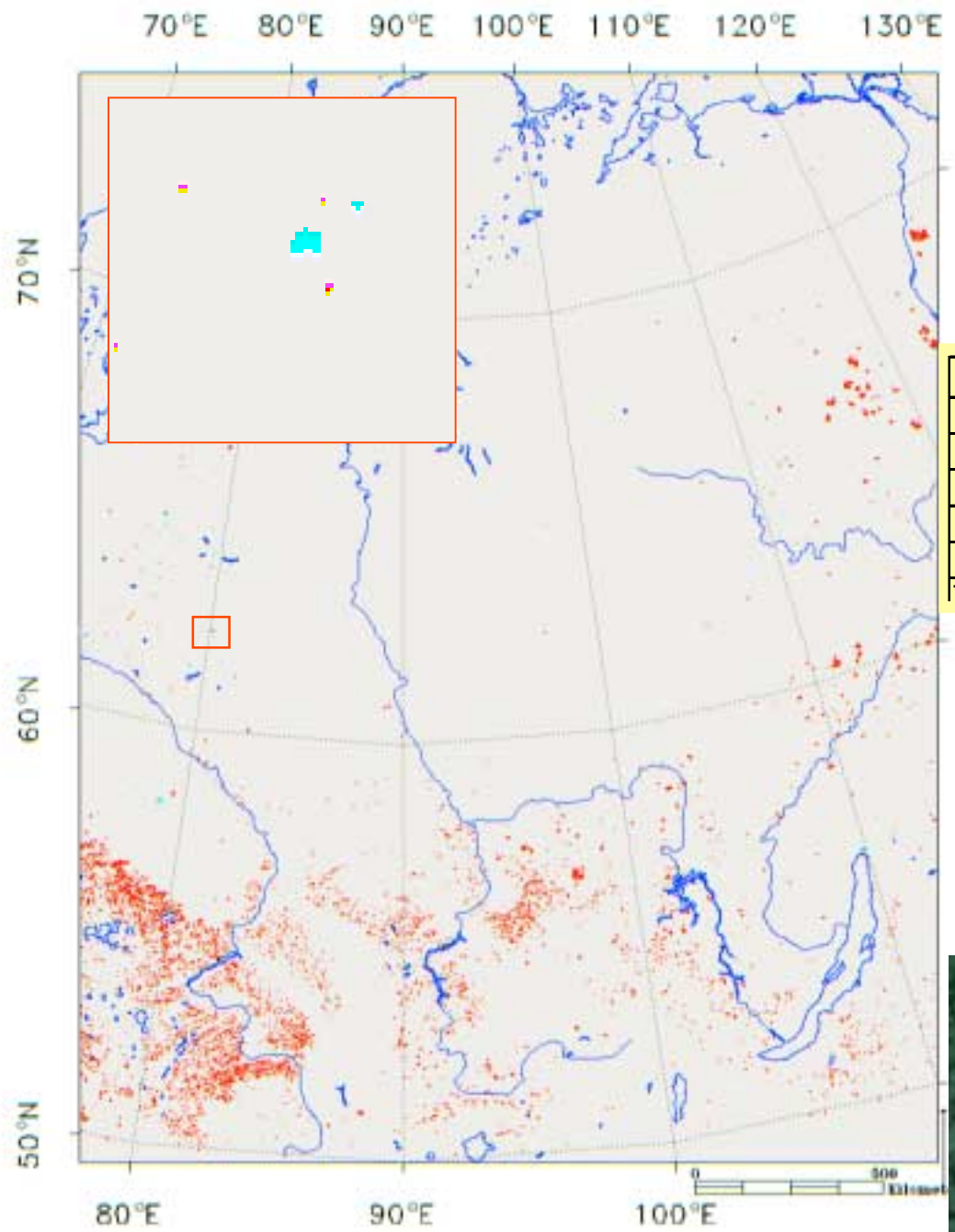
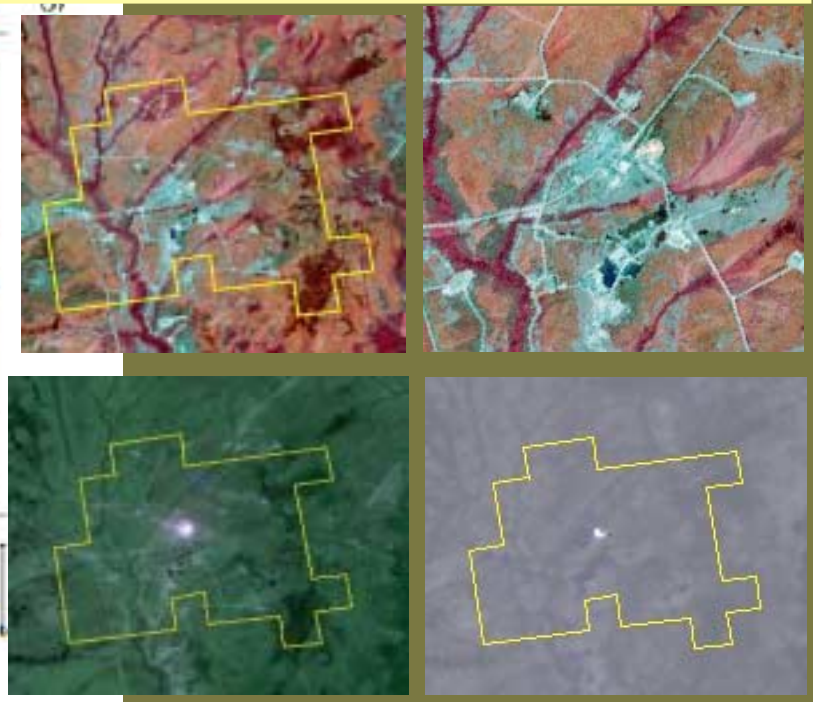
On-ground studies made to characterize succession stages, forest growth trends, disturbance type, fire periodicity and the condition of permafrost. Ground measurements are used to develop relationships between remote sensing observables and forest characteristics and provide new information for understanding forest changes with respect to environmental change.

Forest classification techniques – supervised, unsupervised, decision tree, neural nets

Temporal analyses

Spatial analysis

Calculate TA persistence from MOD14 to separate Industrial Thermal Anomalies (ITAs) from Land Cover Thermal Anomalies (LCTAs).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