Vegetation Continuous Fields

Evolution through multiple spatial and temporal resolutions
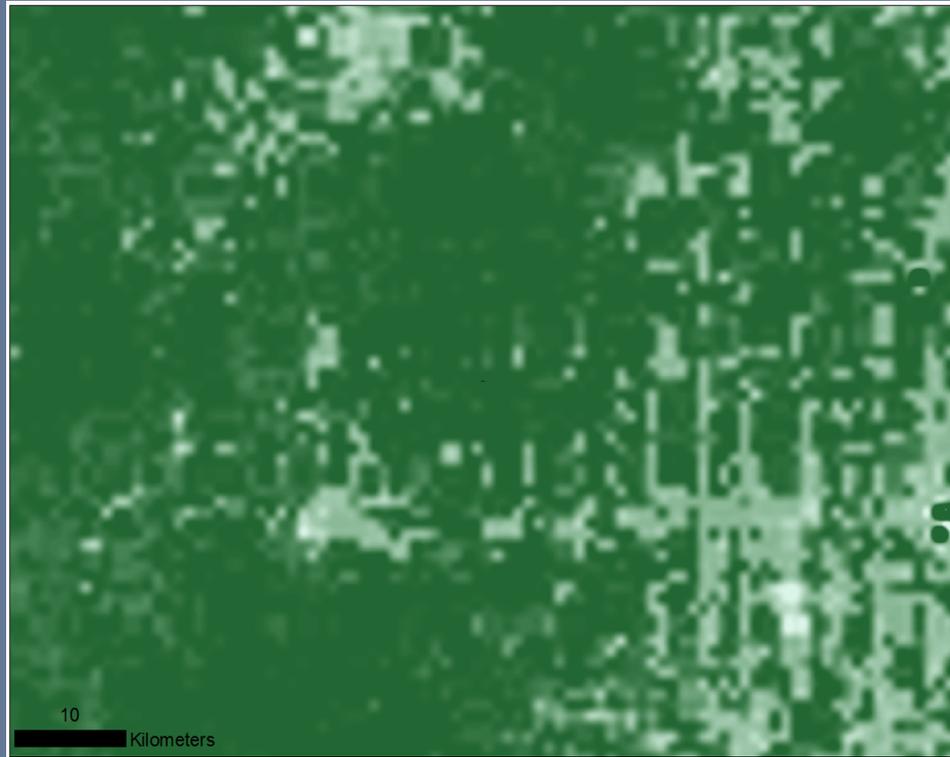
John R. Townshend[1], Charlene M. DiMiceli[1], Robert Sohlberg[1], Mark Carroll[2], Do-Hyung Kim[1]

[1] University of Maryland, Department of Geographical Sciences, [2] Sigma Space, NASA Goddard Space Flight Center
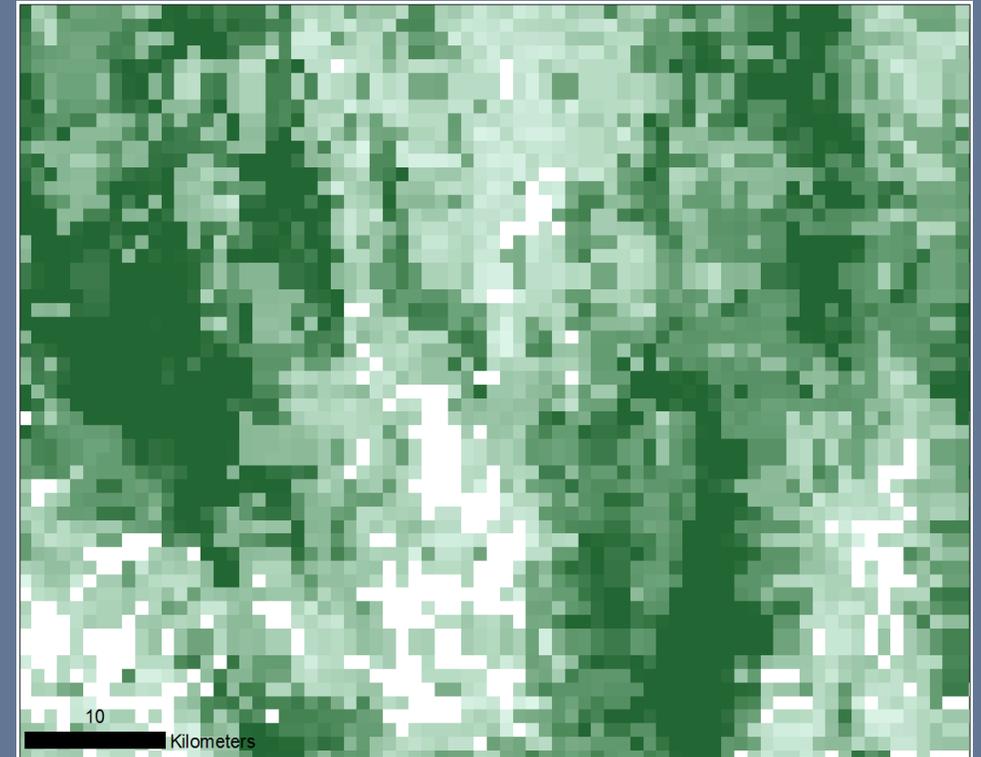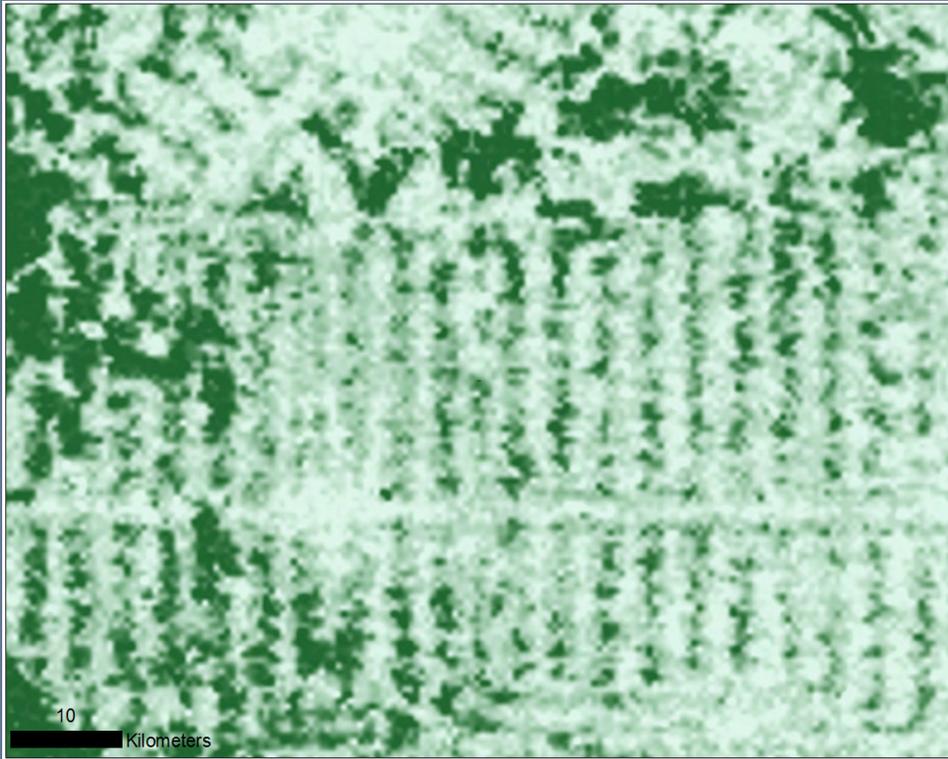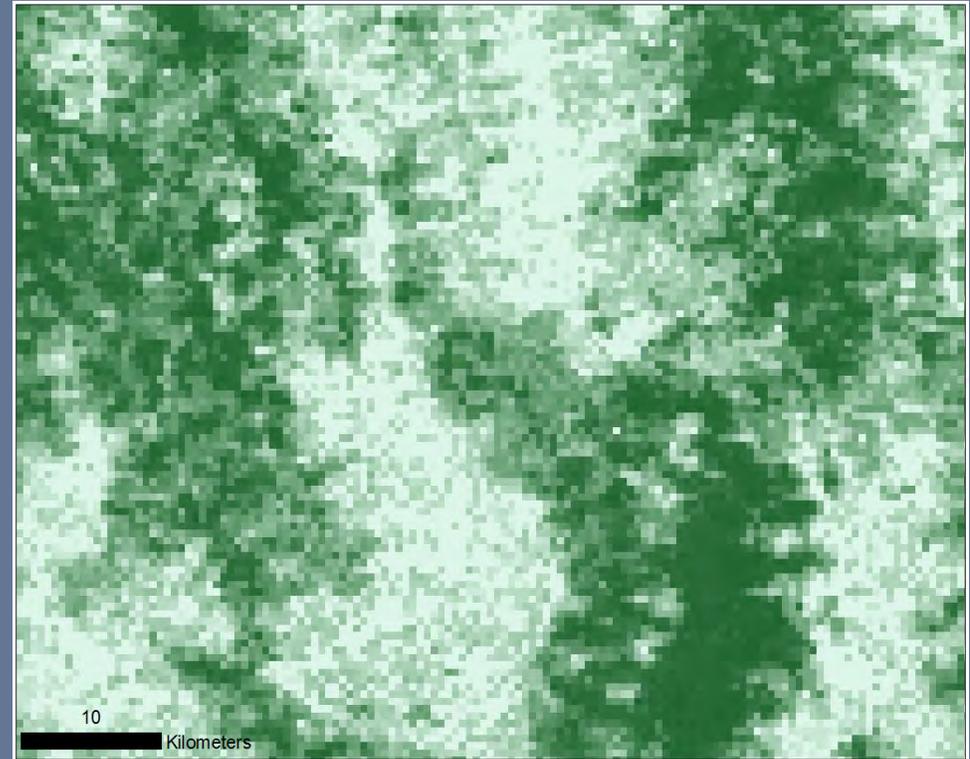
AVHRR VCF

Rondonia , Brazil

Kwango, DRC

1 km resolution   *   Mixture model algorithm

MODIS VCF C3

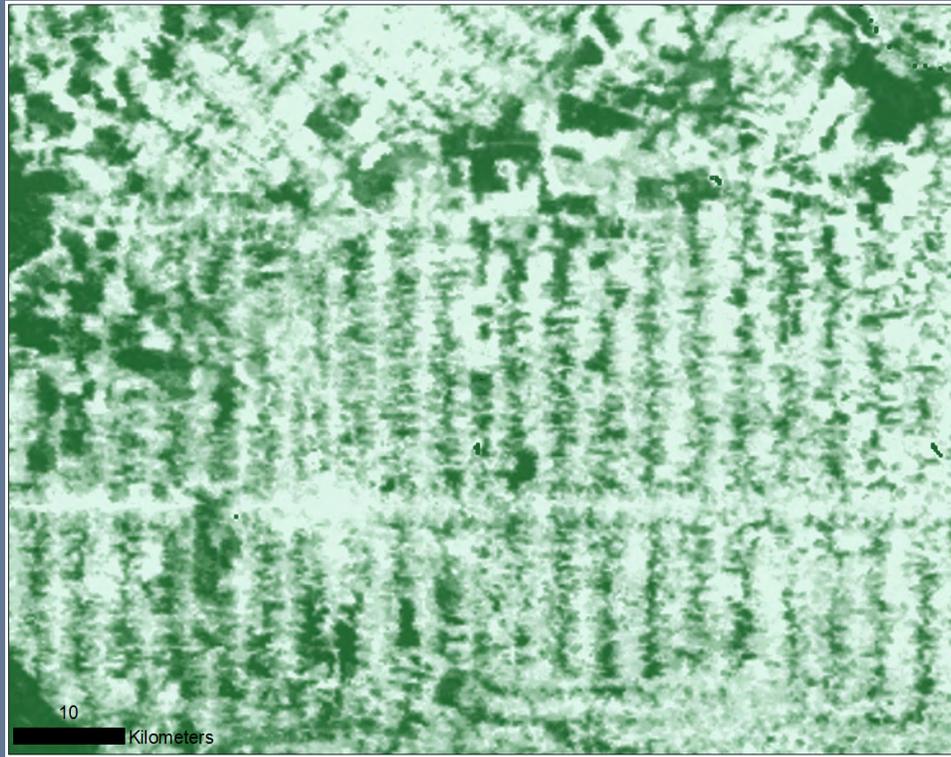**Rondonia , Brazil**

Kwango, DRC

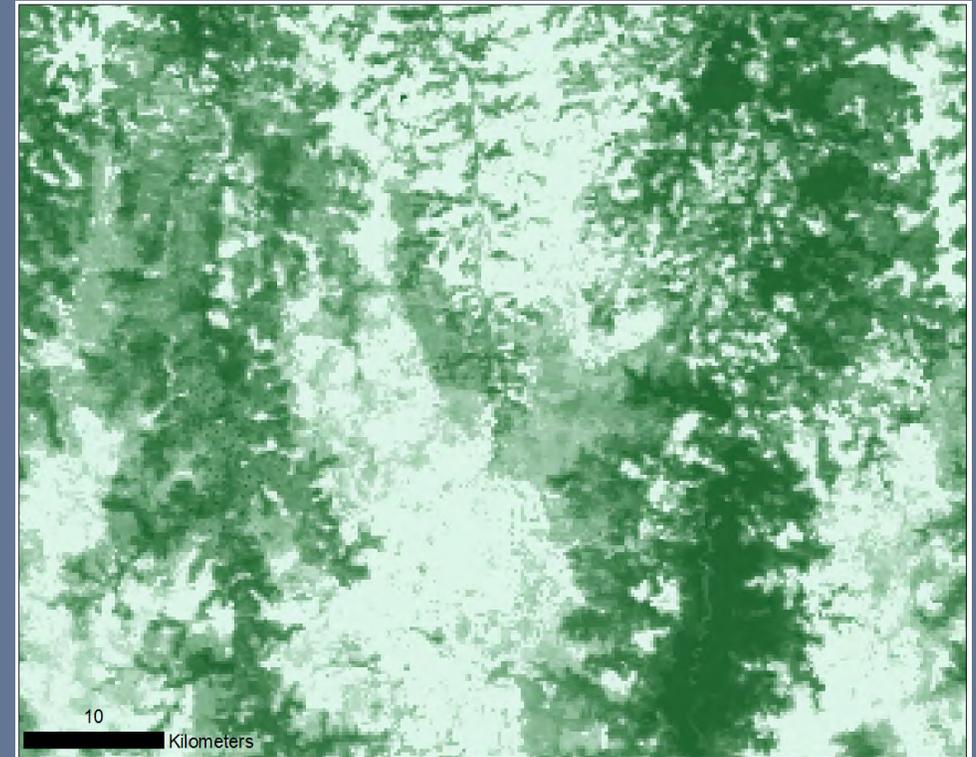500 m resolution   *   Regression tree algorithm
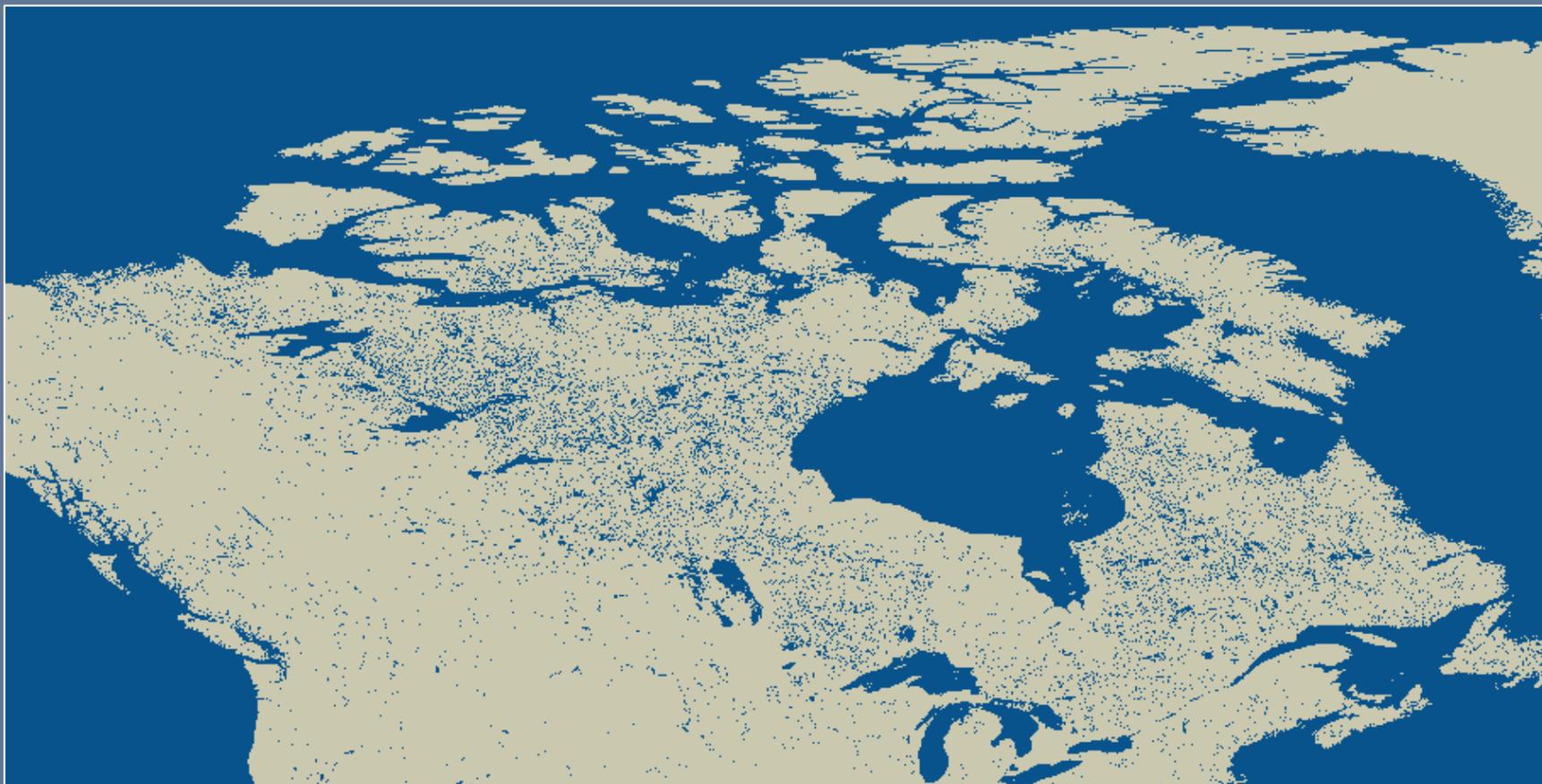Increased training

MODIS VCF C5

Rondonia , Brazil

Kwango, DRC

250 m resolution   *   Bagged regression tree algorithm
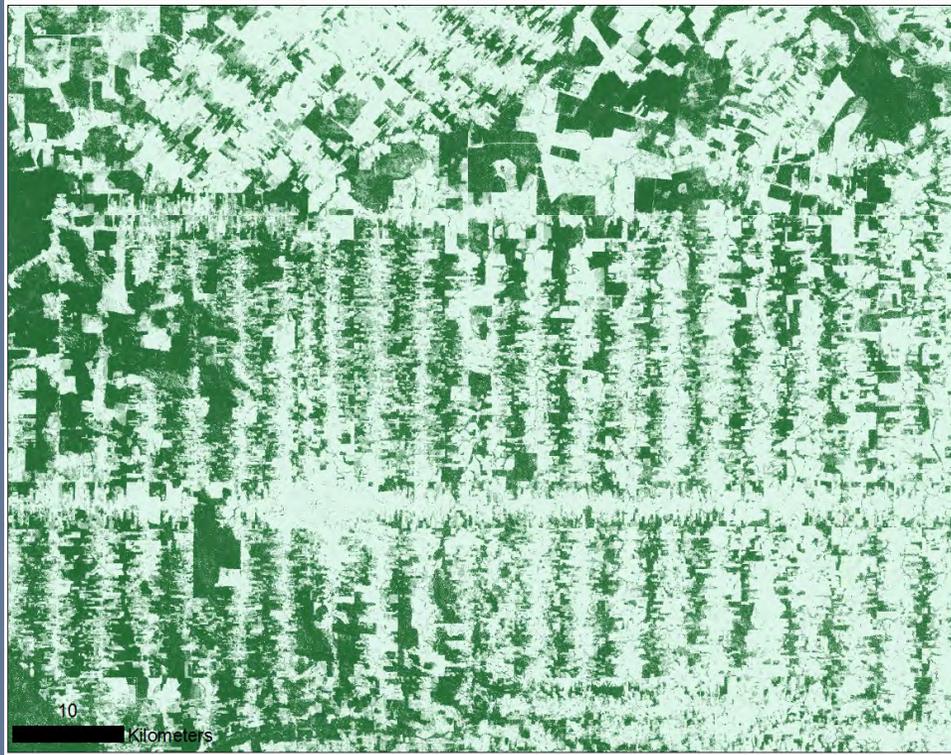
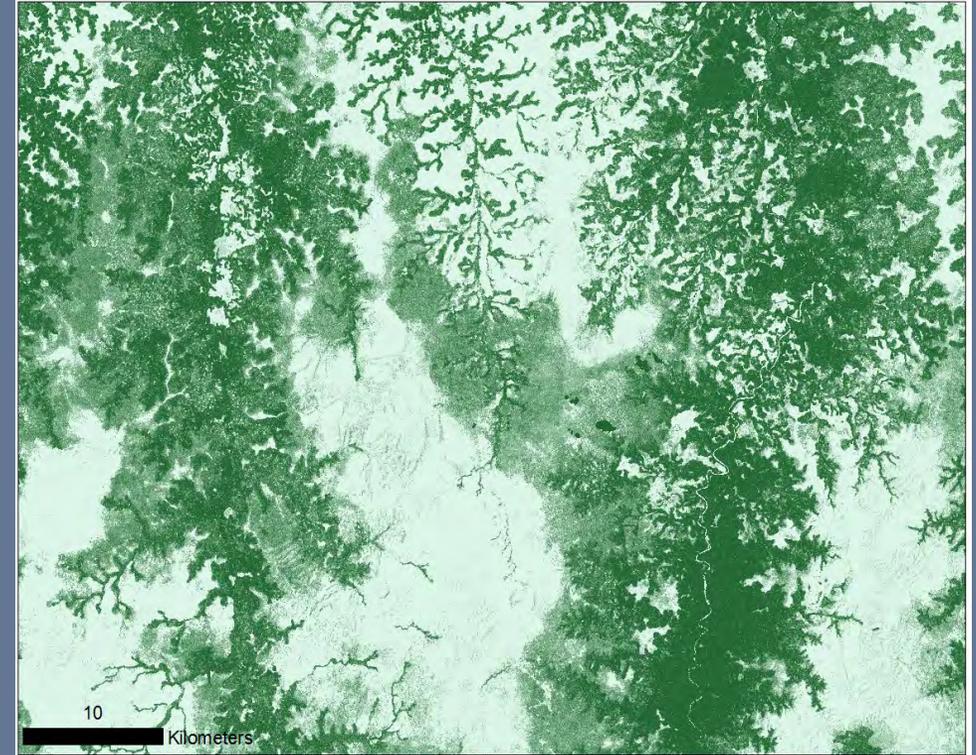Increased training * Annual * Fully automated

Water Mask

MODIS C5 * 250 m resolution
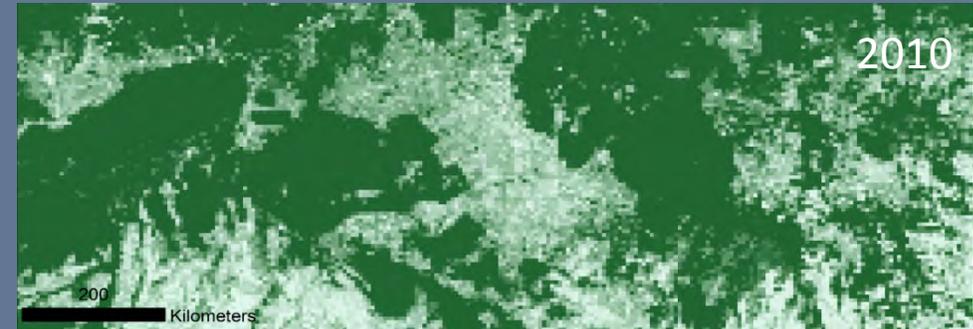
Landsat VCF

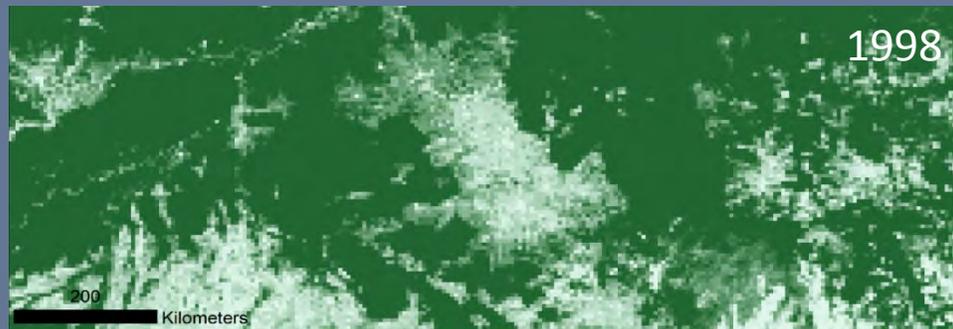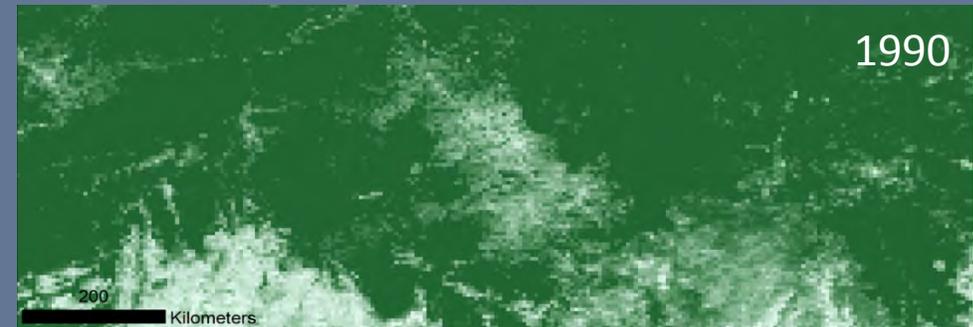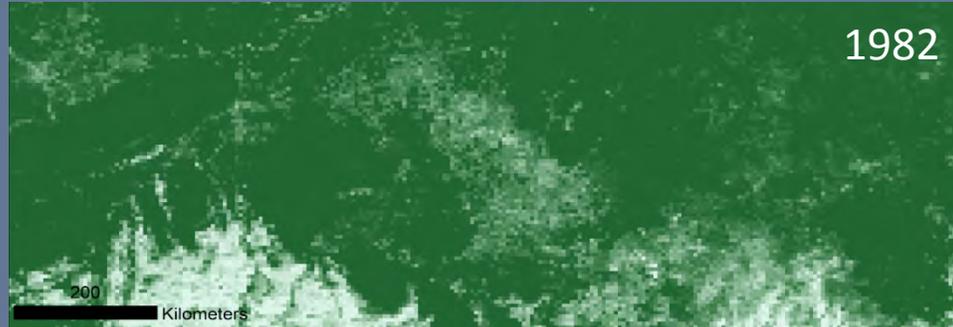**Rondonia , Brazil**

Kwango, DRC

30 m resolution   *   Regression tree algorithm

Training—MODIS VCF and high resolution data

MEaSURES VCF 1982 - 2010

Rondonia, Brazil

30 year time series * Bagged regression tree algorithm
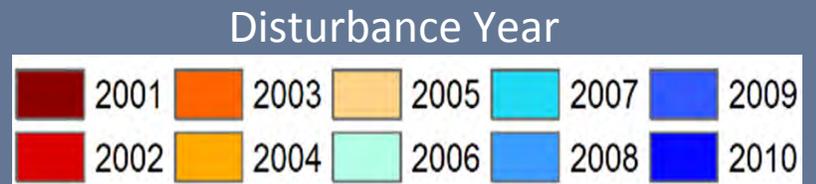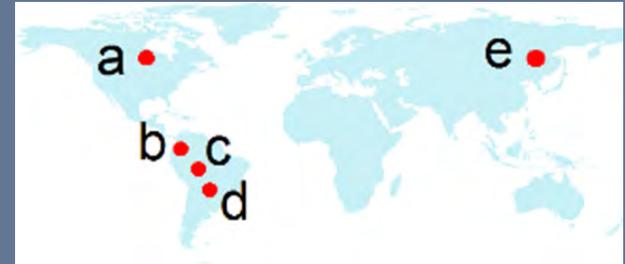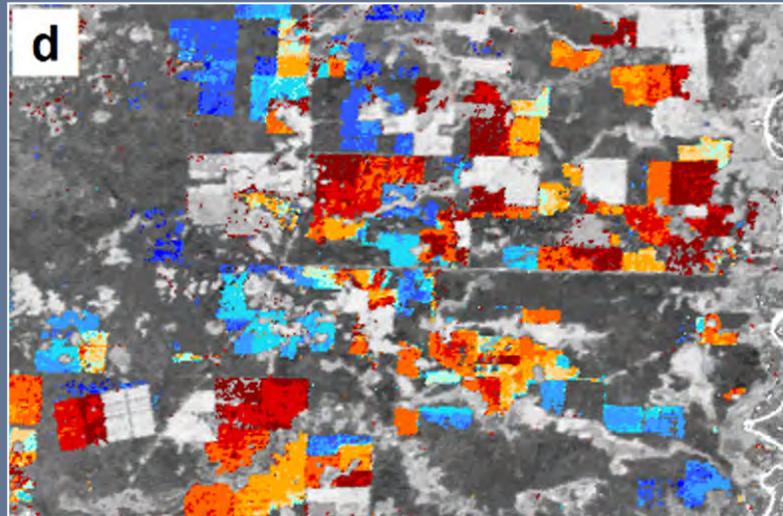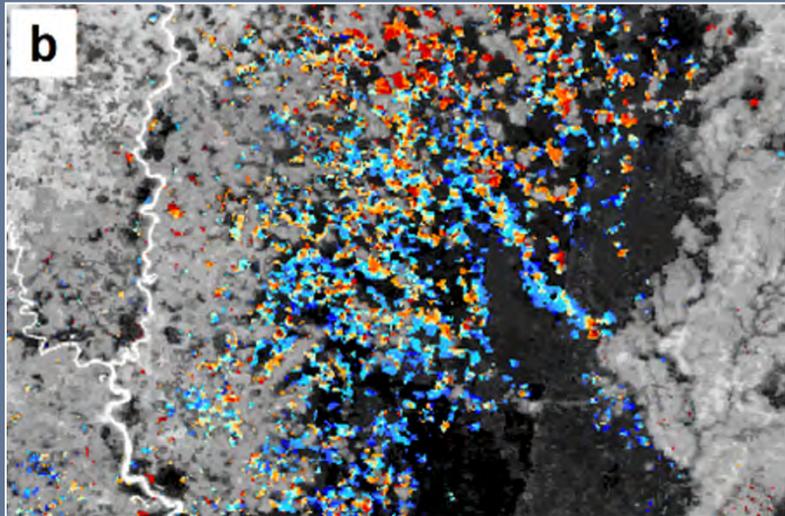
Expanded training * 1/20 degree resolution
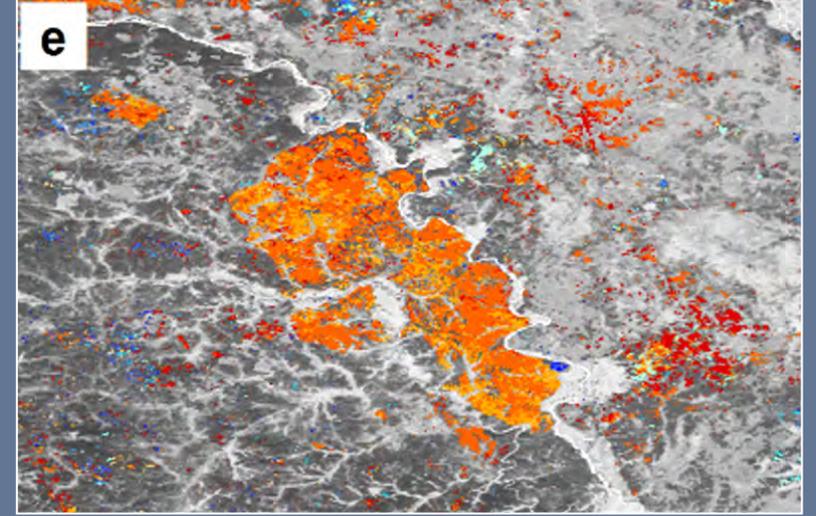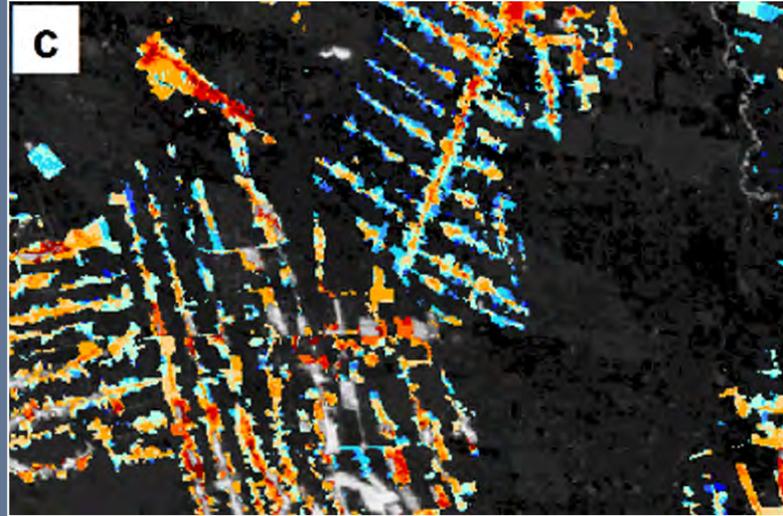
Vegetation Continuous Fields Products -- History

Spatial Resolution	Spatial & Temporal Extent	Instrument	References
1 degree	North America subset, 1989	**AVHRR (GVI prototype)**	DeFries et al. 1995
8 km	Central Africa, 1987	**AVHRR (Pathfinder prototype)**	DeFries et al. 1997
8 km	Global, 1982 – 1994	**AVHRR**	DeFries et al. 2000
1 km	Global, 1992-1993	**AVHRR**	DeFries et al. 2000
500 m	Global, 2001	**MODIS**	Hansen et al. 2003
250 m	Global, 2000-2010	**MODIS**	DiMiceli, et al. 2011*
1/20 degree	Global, annual, 1982-2014	**AVHRR & MODIS**	
30 m	Global, 2000, 2005	**LANDSAT**	Sexton, et al. 2013*
30 m	Global, annual, 1999-2013	**LANDSAT**	Hansen, et al. 2013**

* http://www.landcover.org , ** http://earthenginepartners.appspot.com/science-2013-global-forest

Forest Disturbance
Xiaopeng Song, 2014

Disturbance Year

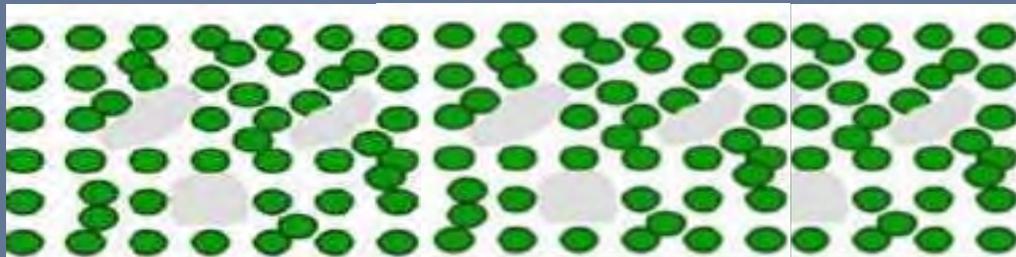| 2001 | 2003 | 2005 | 2007 | 2009 |
| 2002 | 2004 | 2006 | 2008 | 2010 |
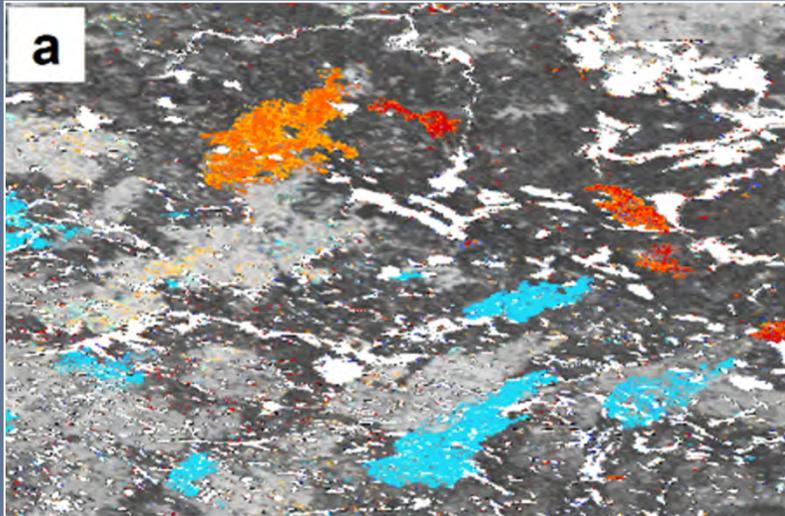
Why do we need both VCF and LAI products?

VCF

- Horizontal vegetation structure (openness, gaps)

- Subpixel spatial resolution

- Annual

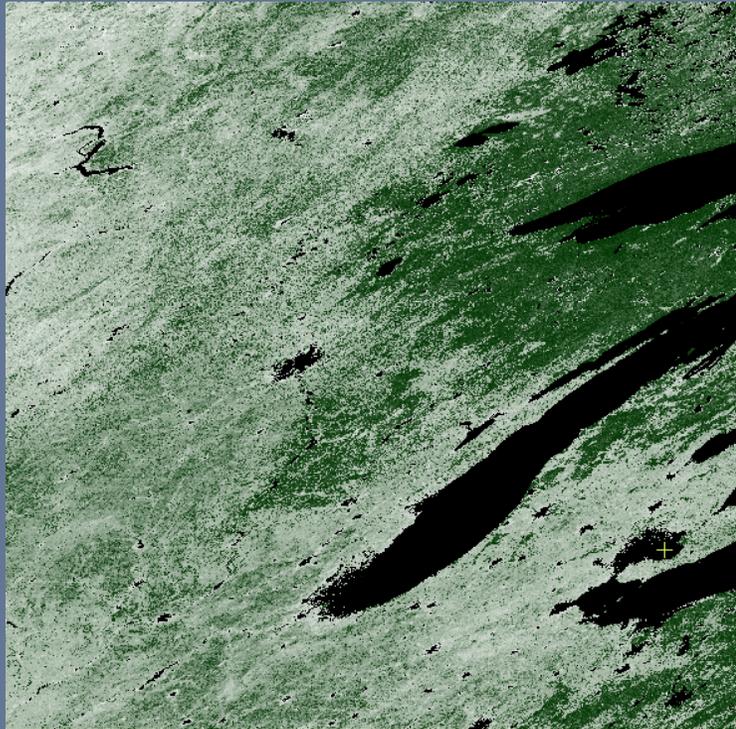- Distinguishes tree, non-tree and bare ground fractional cover

LAI

- Vertical vegetation structure (number of layers)

- 1 km spatial resolution

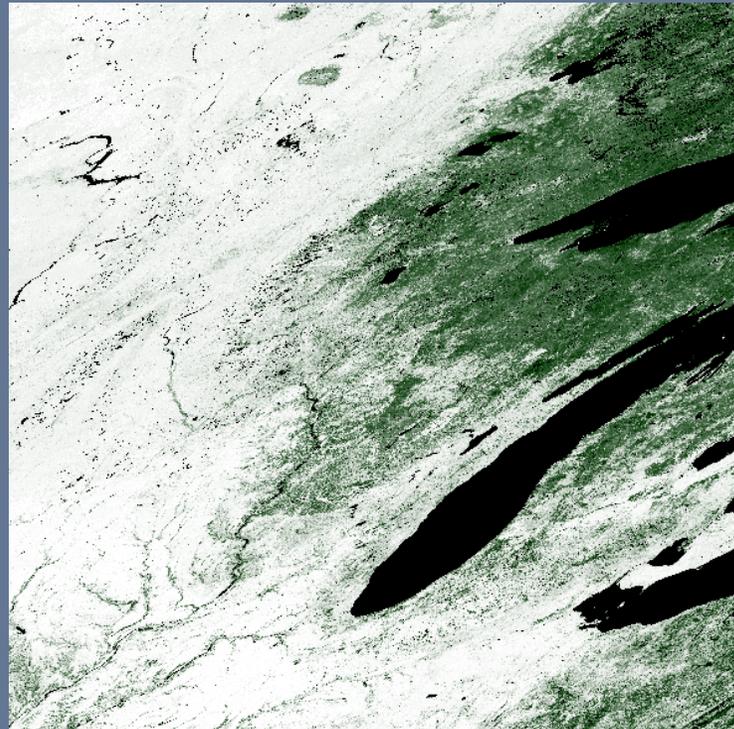- 16-day temporal resolution

- Captures phenology
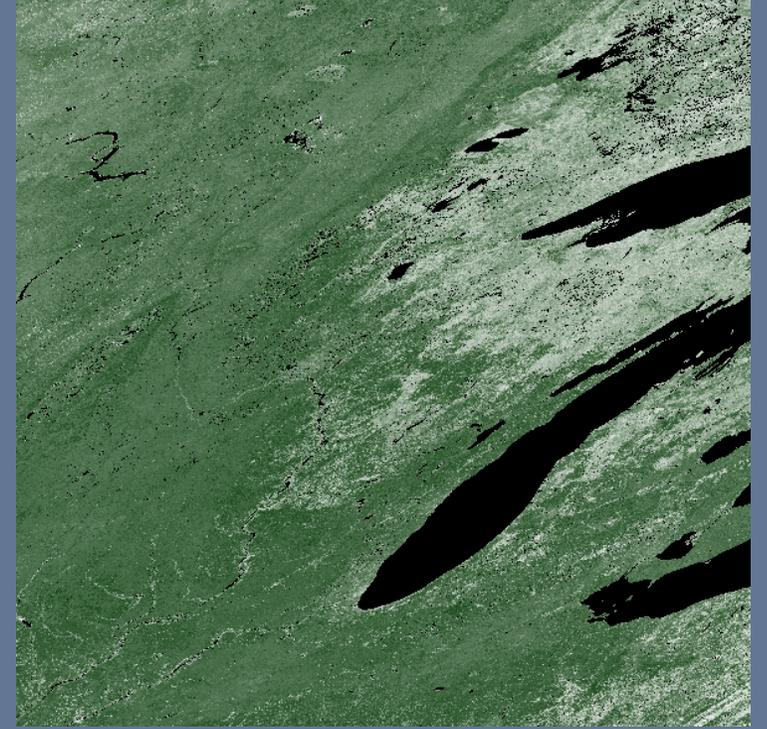
LAI and VCF

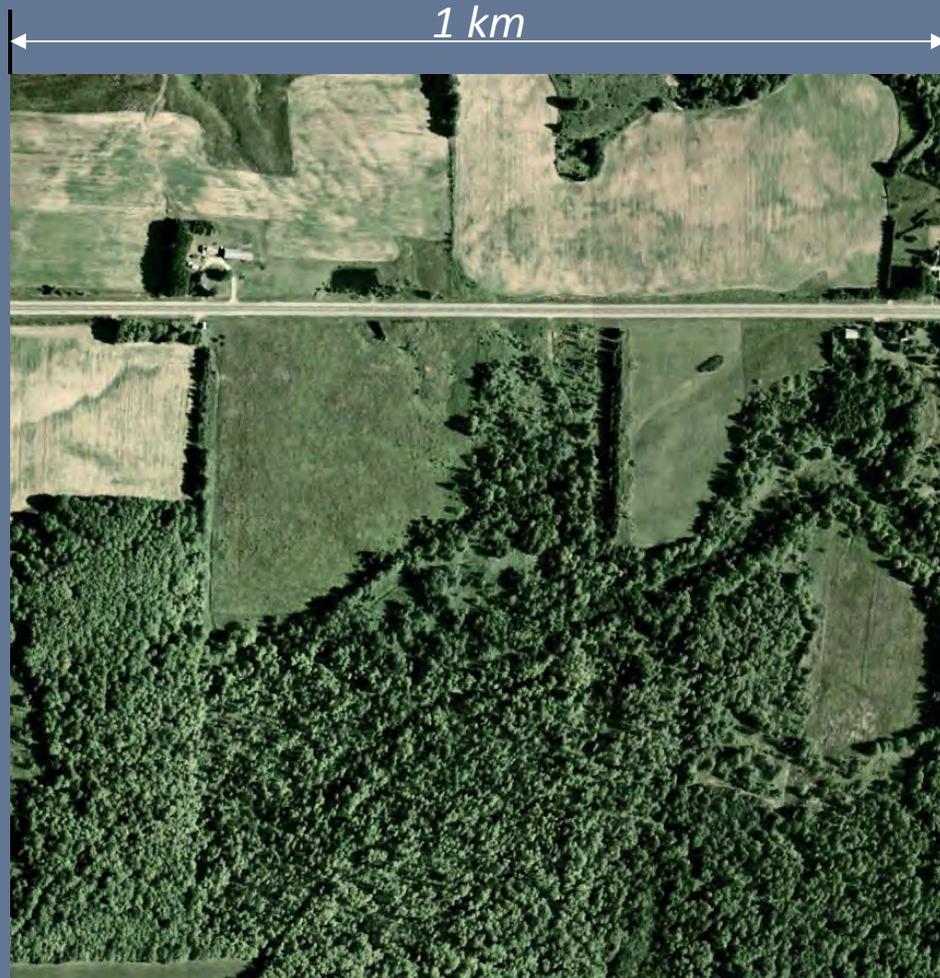Maximum Annual LAI
MOD15A2--2010

VCF Tree Cover
MOD44B--2010

VCF Non-tree Vegetation
MOD44B--2010

VCF vs LAI

1 km

USDA Farm Service Agency, Northern Michigan

	VCF	maximum annual LAI (2010, MOD15A2)
Tree cover	32%	5.0
Non-Tree vegetation	56%	
Bare ground	12%	

VCF vs LAI
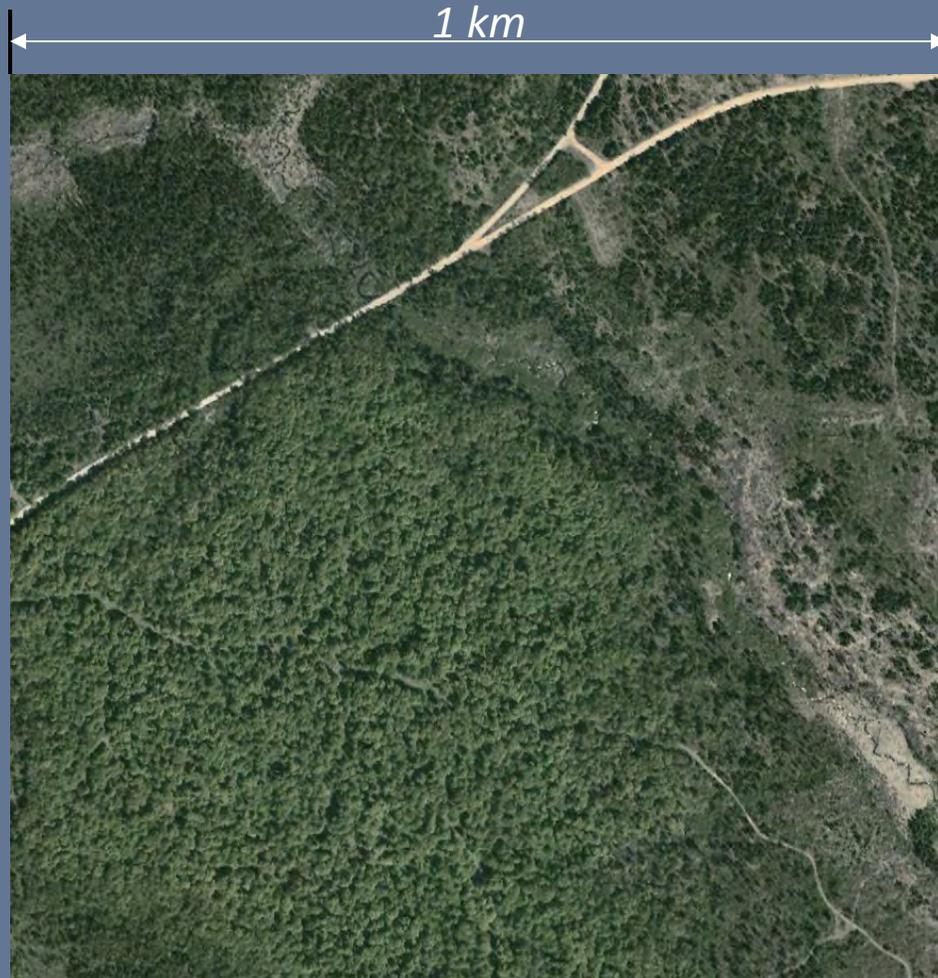
1 km

USDA Farm Service Agency, Northern Michigan

	VCF	maximum annual LAI (2010, MOD15A2)
Tree cover	52%	5.0
Non-Tree vegetation	34%	
Bare ground	14%	

VCF vs LAI
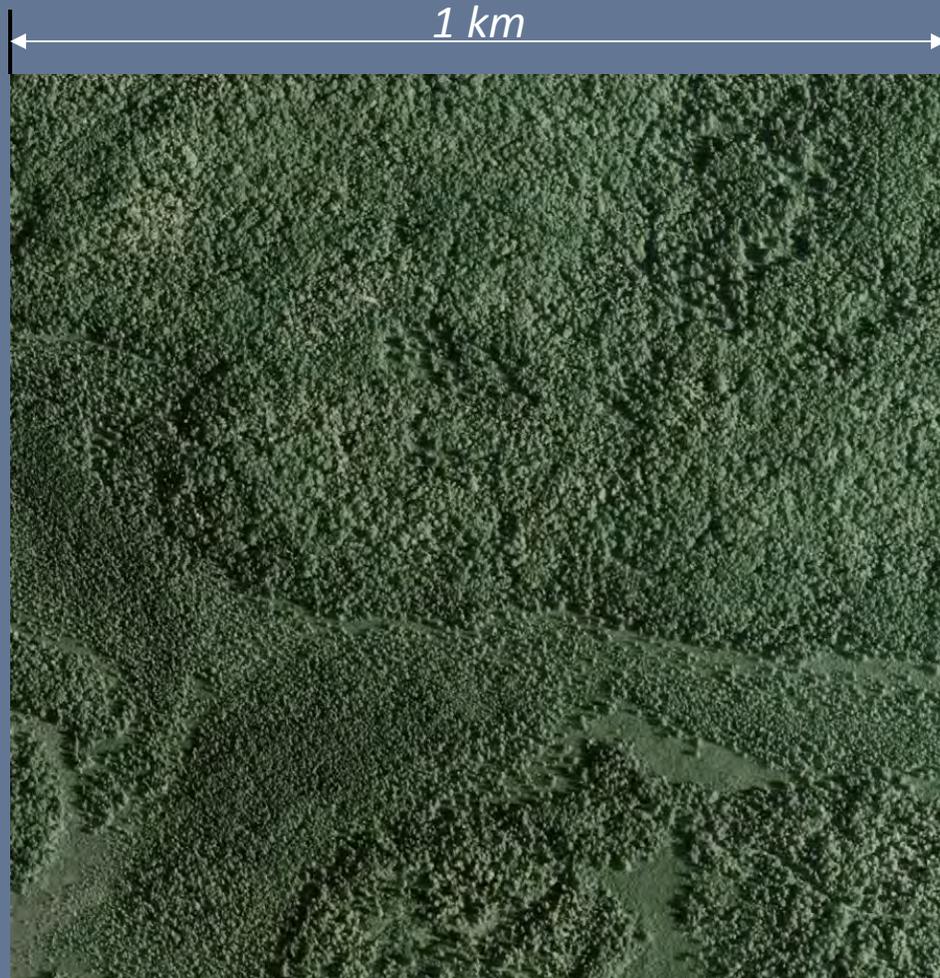
1 km

USDA Farm Service Agency, Northern Michigan

	VCF	Maximum annual LAI (2010, MOD15A2)
Tree cover	64%	5.0
Non-Tree vegetation	30%	
Bare ground	6%	

Future Plans

- Further additions to training to improve difficult regions
- Improved data mining models—Random Forest, Gradient Boosting
- Testing on C6 data
- Analysis of improvements with BRDF-corrected data
- VIIRS
- Updated error and uncertainty analysis