

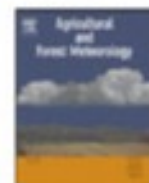
Observed NDVI change in poplar plantation based on LANDSAT 8 images

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University of Novi Sad



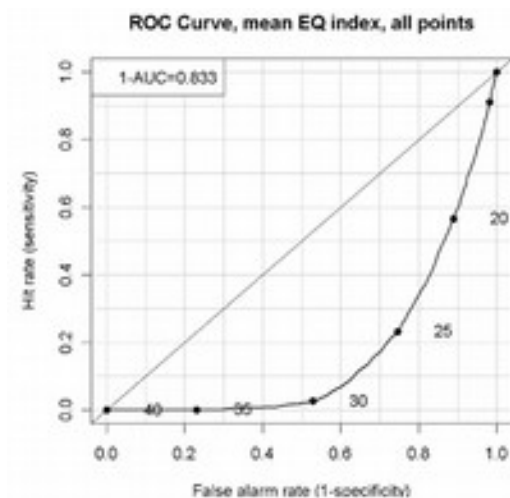
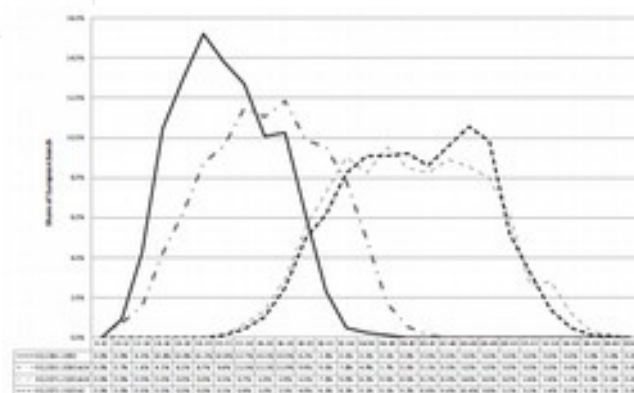
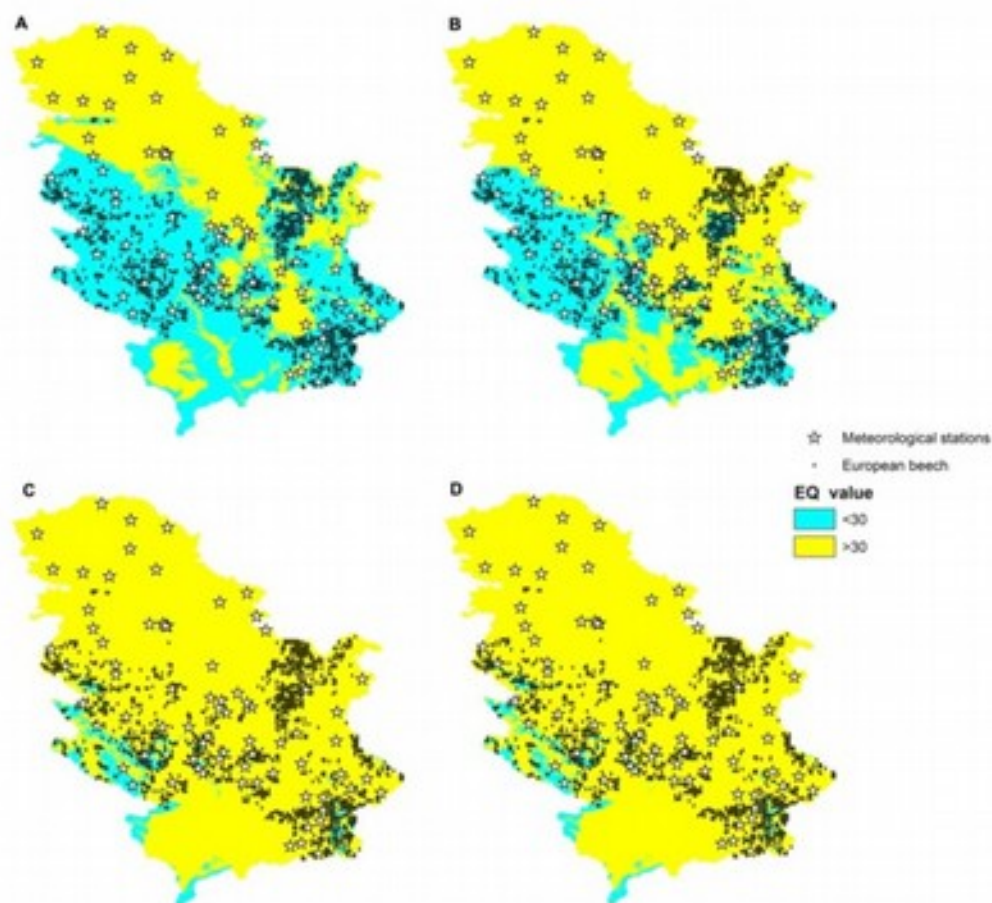


$$EQ = \left(\frac{T_{jul}}{P_{go-dra}} \right) * 1000$$



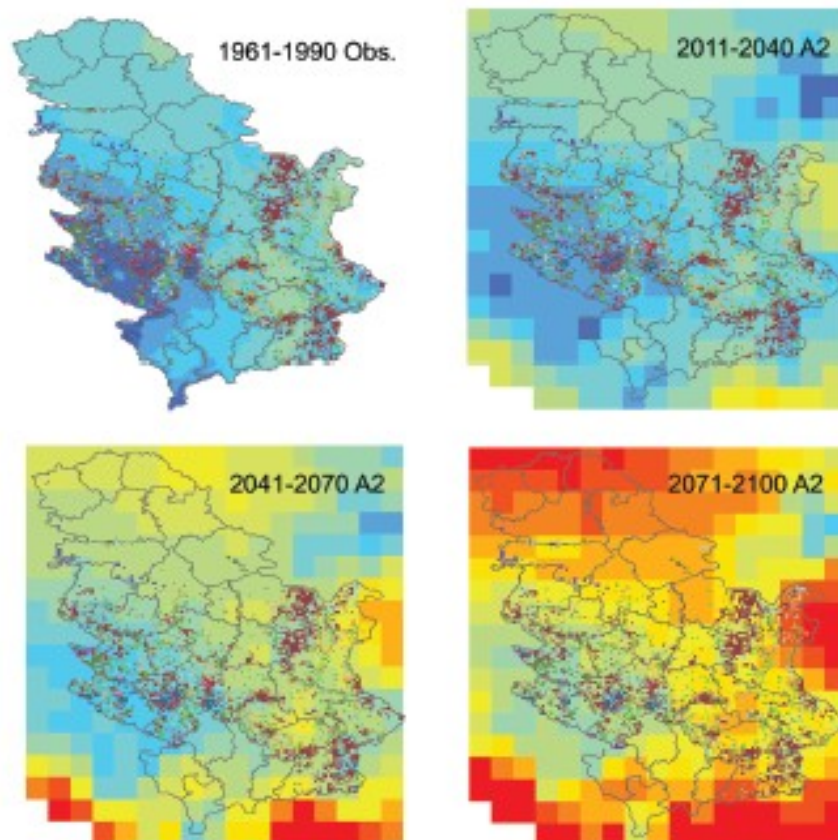
Prediction of the European beech (*Fagus sylvatica* L.) xeric limit using a regional climate model: An example from southeast Europe

Dejan B. Stojanović^{a,*}, Aleksandra Kržič^b, Bratislav Matović^a, Saša Orlović^a,
Anne Duputic^c, Vladimir Djurdjević^{b,d}, Zoran Galić^a, Srdjan Stoinić^a



Future of the Main Important Forest Tree Species in Serbia from the Climate Change Perspective

Dejan B. Stojanović ¹✉, Bratislav Matović ¹, Saša Orlović ¹, Aleksandra Kržič ²,
Branislav Trudić ¹, Zoran Galić ¹, Srđan Stojnić ¹, Saša Pekeč ¹



Legend

Forest trees

- Pedunculate oak
- Turkey oak
- Hungarian oak
- Sessile oak
- European beech
- Black and Scots pine
- Silver fir
- Norway spruce

FAI index categories

- < -2
- -2 - 3
- 3 - 4
- 4 - 5
- 5 - 6
- 6 - 7
- 7 - 8
- 8 - 9
- 9 - 10
- 10 - 11
- 11 - 12
- 12 - 13
- 13 - 14
- 14 - 15
- > 15

$$FAI = \frac{100 * \frac{TVII + TVIII}{2}}{PV + PVI + 2 * PVII + PVIII}$$

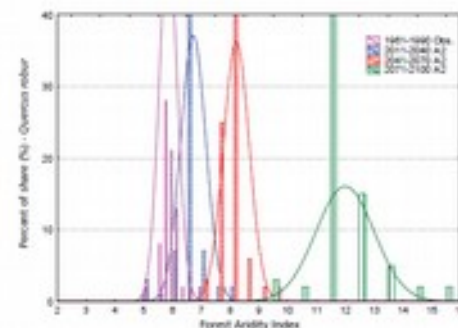
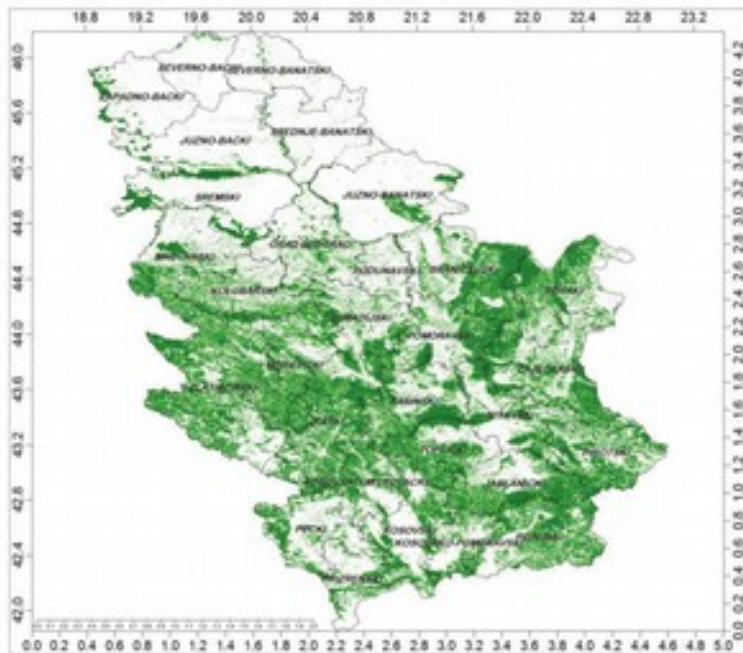


FIGURE 2. Distribution of Pedunculate oak across FAI categories in four climate periods

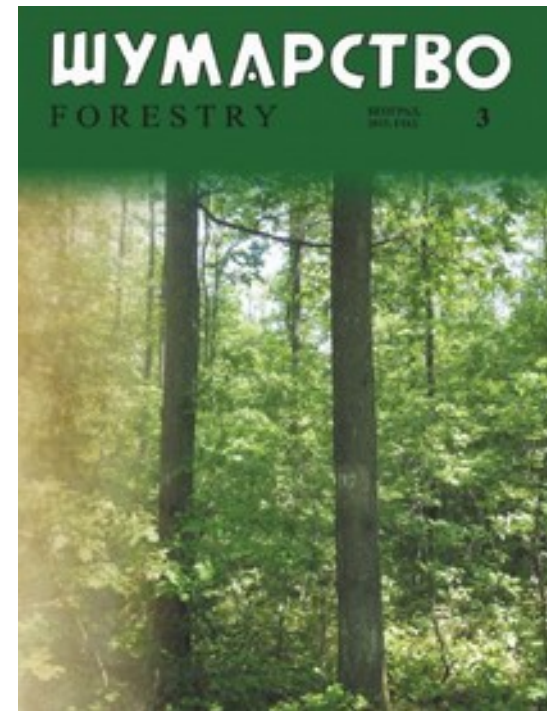
FOREST COVER CHANGE TRENDS IN THE REPUBLIC OF SERBIA

*Dejan B. Stojanović
Bratislav Matović
Saša Orlović*



Слика 1. Шумски покривач Републике Србије у 2000. години са назначеним управним окрузима

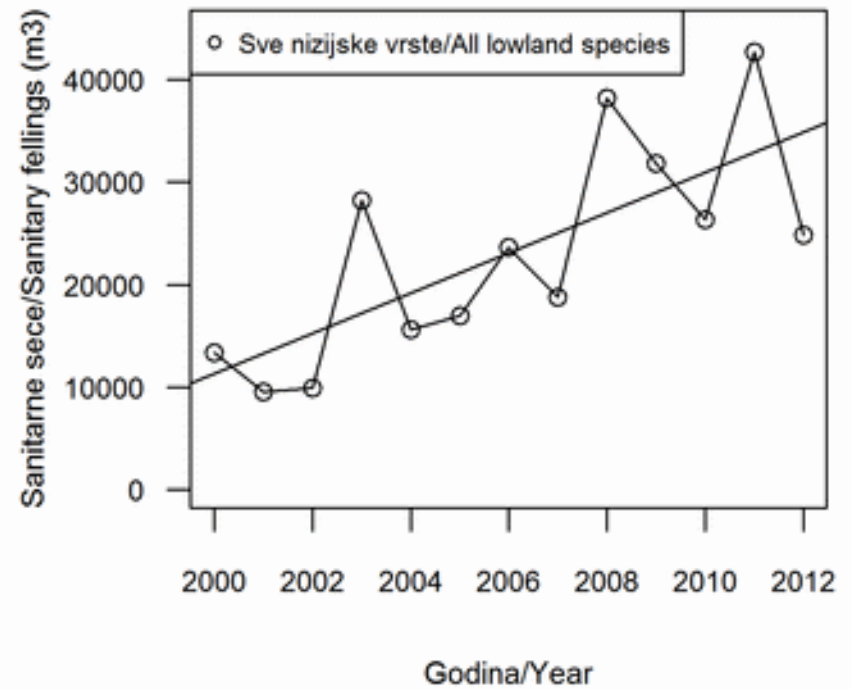
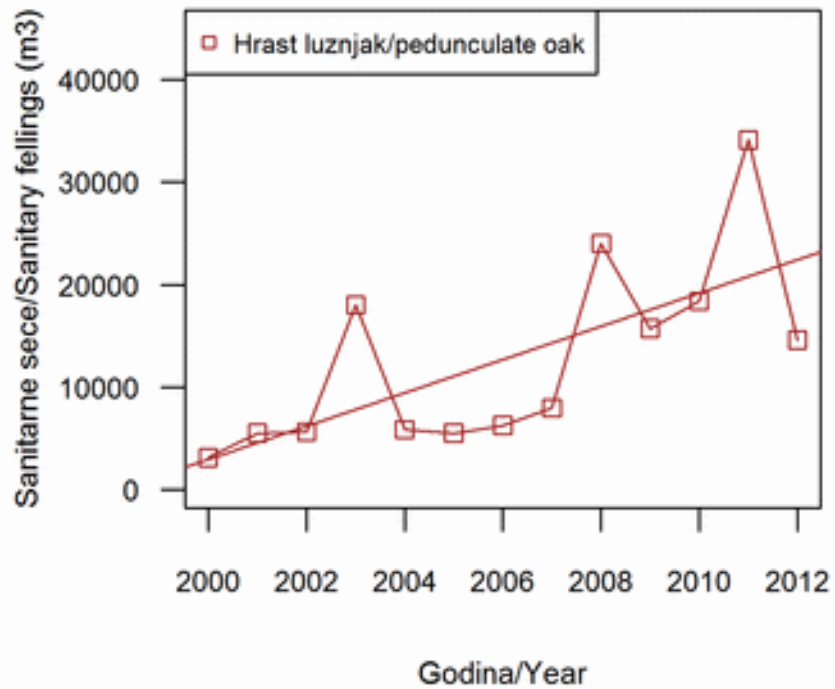
Figure 1. Forest cover of Republic of Serbia with indicated administrative districts in a year 2000



РЕПУБЛИКА СРБИЈА	8.850.414	28,454	0,005	0,004	0,001	6047
АП ВОЈВОДИНА	2.160.456	6,718	0,002	0,005	-0,002	-5123
ЦЕНТРАЛНА СРБИЈА	5.598.291	37,277	0,005	0,003	0,002	13959
АП КОСОВО И МЕТОХИЈА	1.091.667	27,411	0,005	0,008	-0,002	-2668

Based on:
Hansen et al.,
High-resolution global maps of 21st-century forest cover change.
Science (2013): 850-853.

Increase of sanitary fellings (salvage logging)







Legend

rasadnik_kac_sastojinska

- bag
- bela_top
- crna_top
- crni_orah
- EA_topola
- jas
- jasike
- OTL
- vrbe
- White box

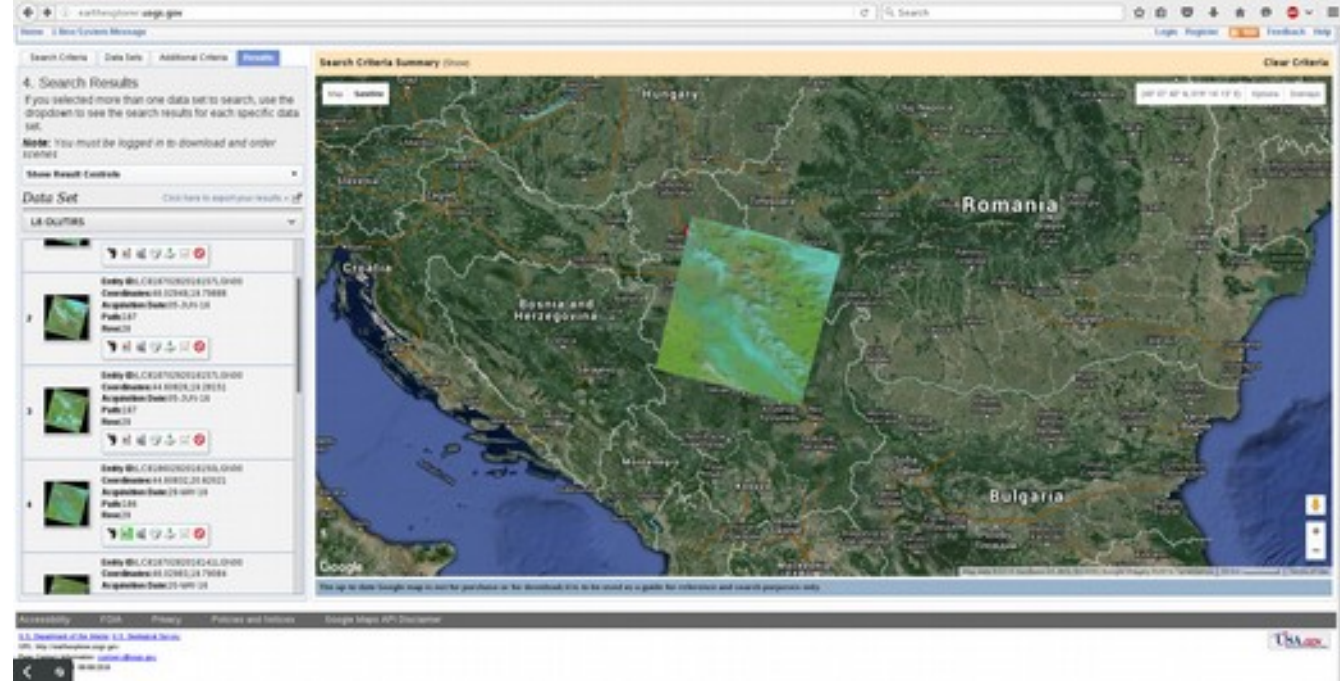
```
dstojanovic@dhcpc16:/opt/dstojanovic/Downloads
File Edit View Search Terminal Help

GRASS GIS

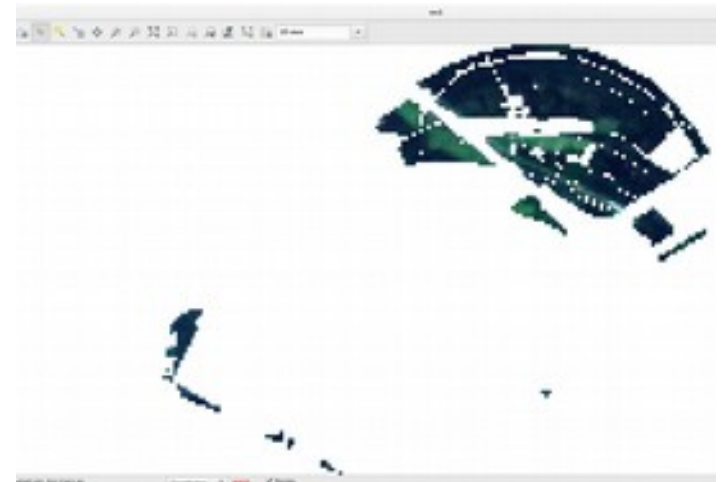
Welcome to GRASS GIS 7.3.svn (r68671)
GRASS GIS homepage: http://grass.osgeo.org
This version running through: Bash Shell (/bin/bash)
Help is available with the command: g.manual -i
See the licence terms with: g.version -c
See citation options with: g.version -x
If required, restart the GUI with: g.gui wxpython
When ready to quit enter: exit

Launching <wxpython> GUI in the background, please wait...
GRASS 7.3.svn (EPSG32634) :/opt/dstojanovic/Downloads >
```





1. i.landsat.toar (conversion of digital number to reflectance)
2. r.composite (creation of RGB image)
3. r.mask (focus on specific area; based on vector of forest in this case)
4. d.rast LC81860292013205LGN00_B.toar.RGB
5. r.mapcalc "\$NDVI=float(\$nir-\$r)/(\$nir+\$r)"



6. r.mapcalc "\$NDVI_difference=float(\$NDVI1-\$NDVI2)" (calculates NDVI difference)

7. r.univar (calculates univariate statistics)

```
total null and non-null cells: 17433
total null cells: 15098

Of the non-null cells:
-----
n: 2335
minimum: -0.205305
maximum: 0.215651
range: 0.420956
mean: -0.0748723
mean of absolute values: 0.0818912
standard deviation: 0.0463915
variance: 0.00215217
variation coefficient: -61.9609 %
sum: -174.826811394167
1st quartile: -0.101694
median (odd number of cells): -0.0841146
3rd quartile: -0.0619944
90th percentile: -0.0139665
```

Looking for change threshold?!

Criteria:

- Simplicity
- Reliability
- Computational efficiency
- Working with limited data

....

$$\mu \pm n \cdot \sigma$$

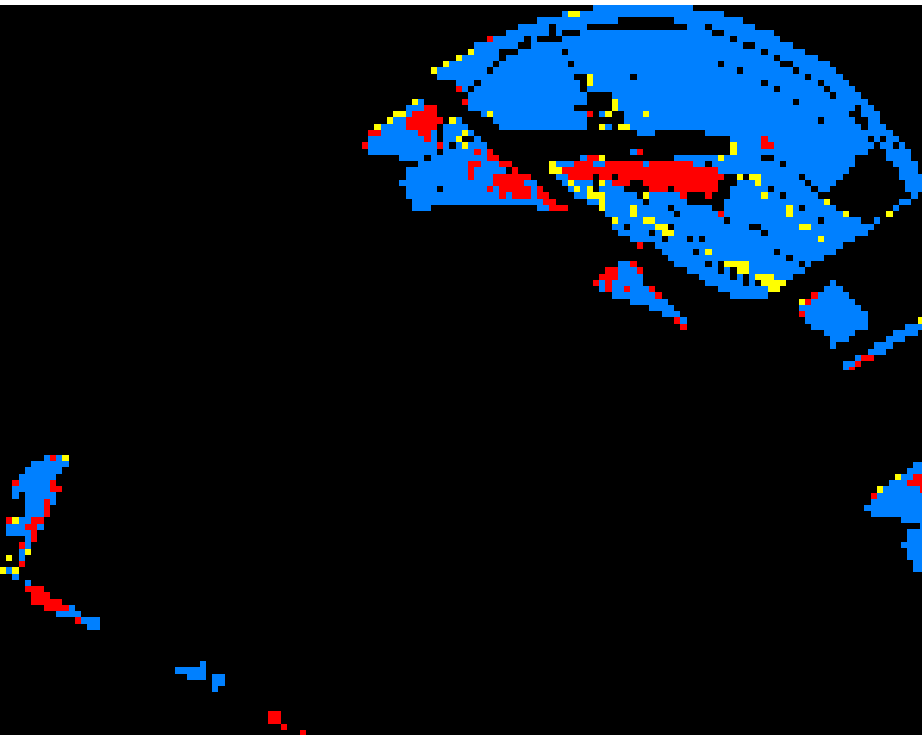
μ - MEAN

σ - STDDEV

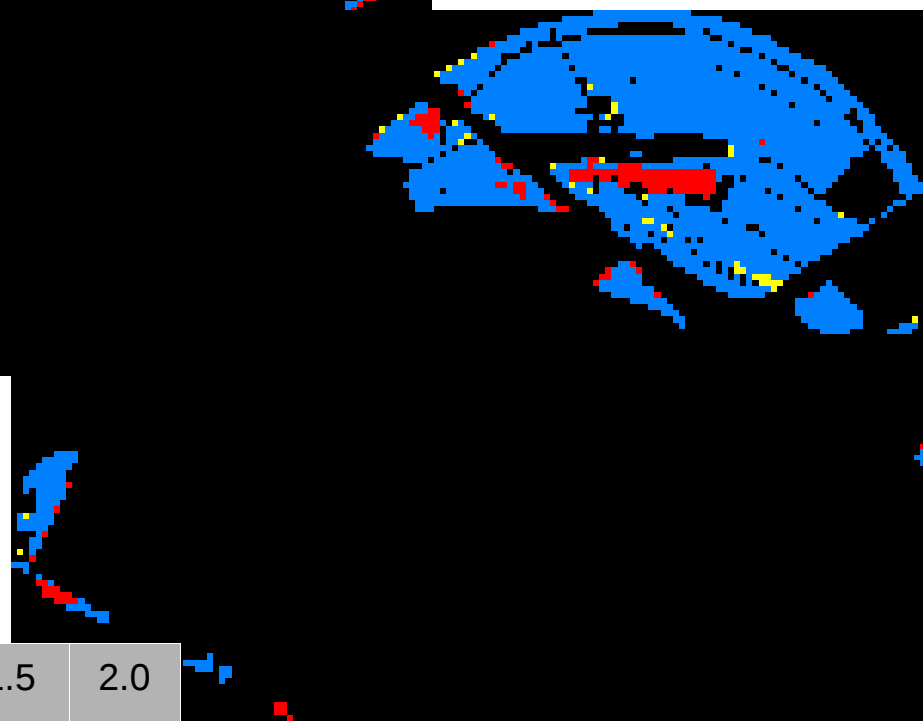
n - coefficient

Mancino, Giuseppe, et al. "Landsat TM imagery and NDVI differencing to detect vegetation change: assessing natural forest expansion in Basilicata, southern Italy." *iForest-Biogeosciences and Forestry* 7.2 (2014): 75.

8. r.reclass (based on MEAN +/- n*STDDEV) (for n(1.0, 1.5., 2.0))



10. r.kappa (for accuracy assessment)



9. r.report (makes report for raster)

n	1.0	1.5	2.0
Increase (ha)	8	4	1
Constant (ha)	181	192	198
Decrease (ha)	20	13	10



Perspectives regarding RS detection of forest cover change – time-series analysis?

Verbesselt, Jan, et al. "Detecting trend and seasonal changes in satellite image time series." Remote sensing of Environment 114.1 (2010): 106-115.

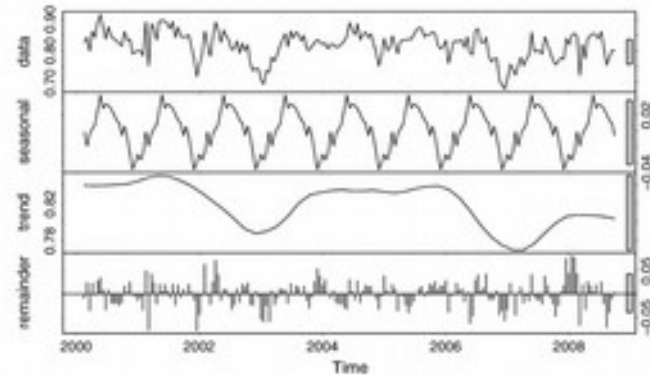


Fig. 2. The STL decomposition of a 16-day NDVI time series of a pine plantation into seasonal, trend, and remainder components. The seasonal component is estimated by taking the mean of all seasonal sub-series (e.g. for a monthly time series the first sub-series contains the January values). The sum of the seasonal, trend, and remainder components equals the data series. The solid bars on the right hand side of the plot show the same data range, to aid comparisons. The range of the seasonal amplitude is approximately 0.1 NDVI.

Zhu, Z., and C. E. Woodcock. "Continuous Change Detection and Classification (CCDC) of Land Cover Using All Available Landsat Data." AGU Fall Meeting Abstracts. Vol. 1. 2012.

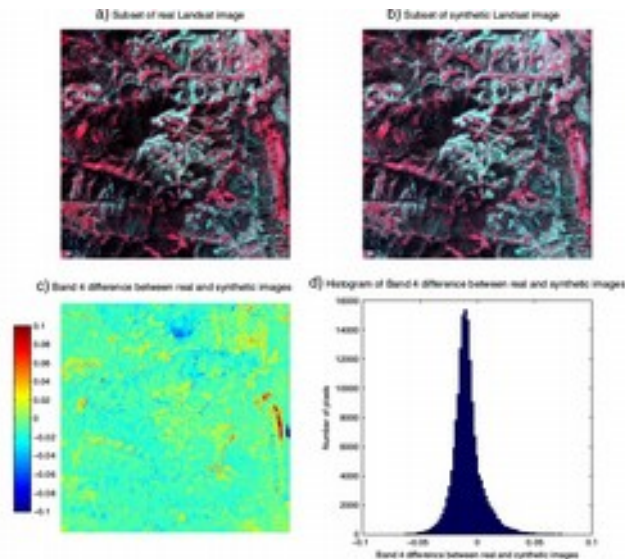


Fig. 3. a) Subset of the false color composite (Bands 4, 3, and 2) of real Landsat image acquired on Aug. 05, 1986 from Landsat cover located at 33°32' (Path-Row); b) subset of the false color composite (Bands 4, 3, and 2) of synthetic Landsat image generated on Aug. 05, 1986 for the same location; c) Band 4 difference between real and synthetic images; and d) Histogram of Band 4 difference between real and synthetic images. Note that the primary forest and the wetland are very similar between the real and synthetic Landsat images.

Thank you.

Welcome!



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