



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DAGRI
DIPARTIMENTO DI SCIENZE
E TECNOLOGIE AGRARIE,
ALIMENTARI, AMBIENTALI E FORESTALI



Stime spazialmente esplicite di volume e biomassa

Mappatura dei disturbi forestali con dati satellitari

Giovanni D'Amico

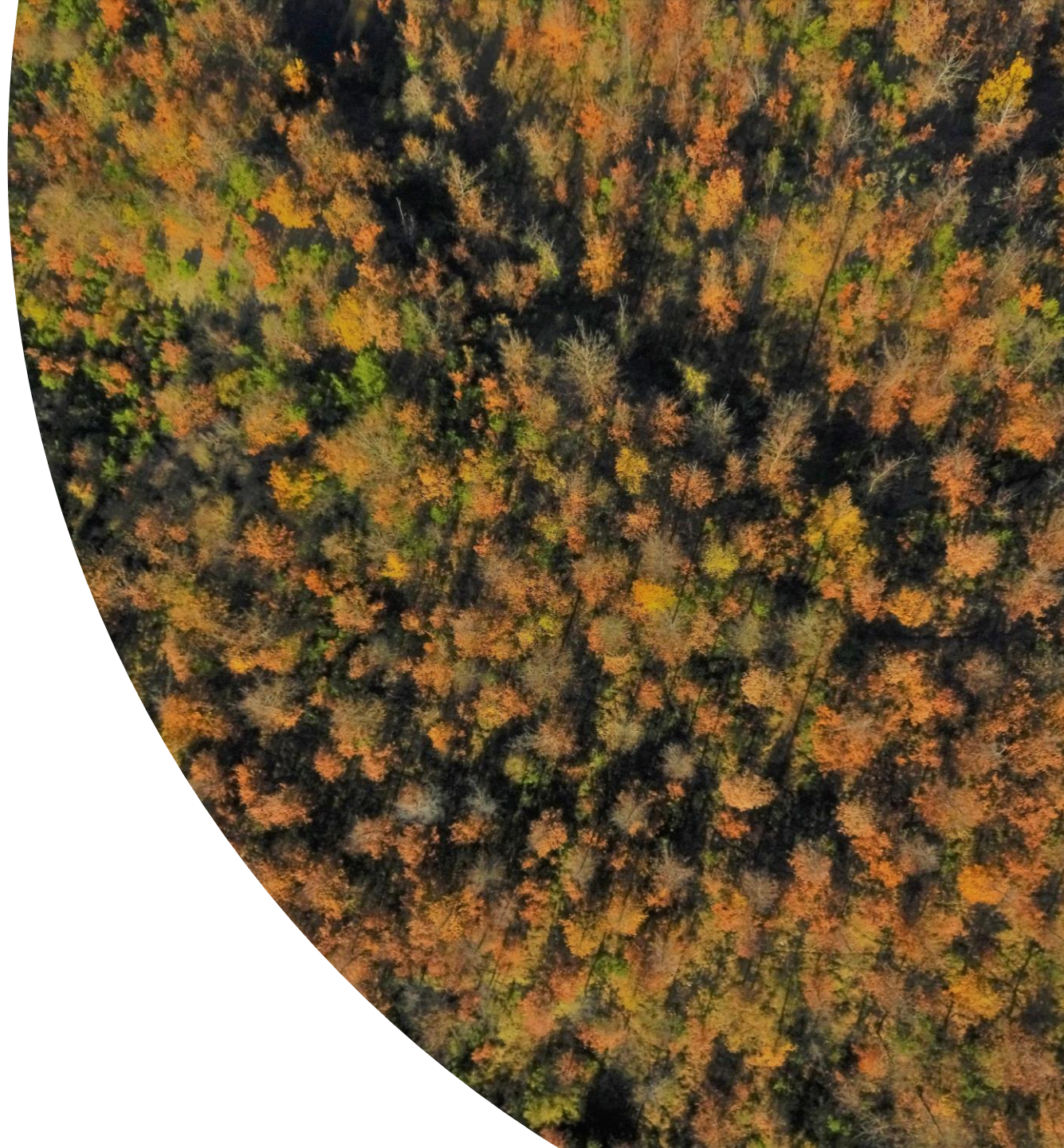
Sassalbo di Fivizzano (MS)
19 gennaio 2024



Stime spazialmente esplicitate di
volume e biomassa

Materiali

- Dati Inventario Forestale Nazionale 2015
- Dati satellitari telerilevati Sentinel-2
- Variabili ausiliare (clima, suolo,)
- Serie temporali Sentinel-2 2016-2023



Stime spazialmente esplicite di volume e biomassa

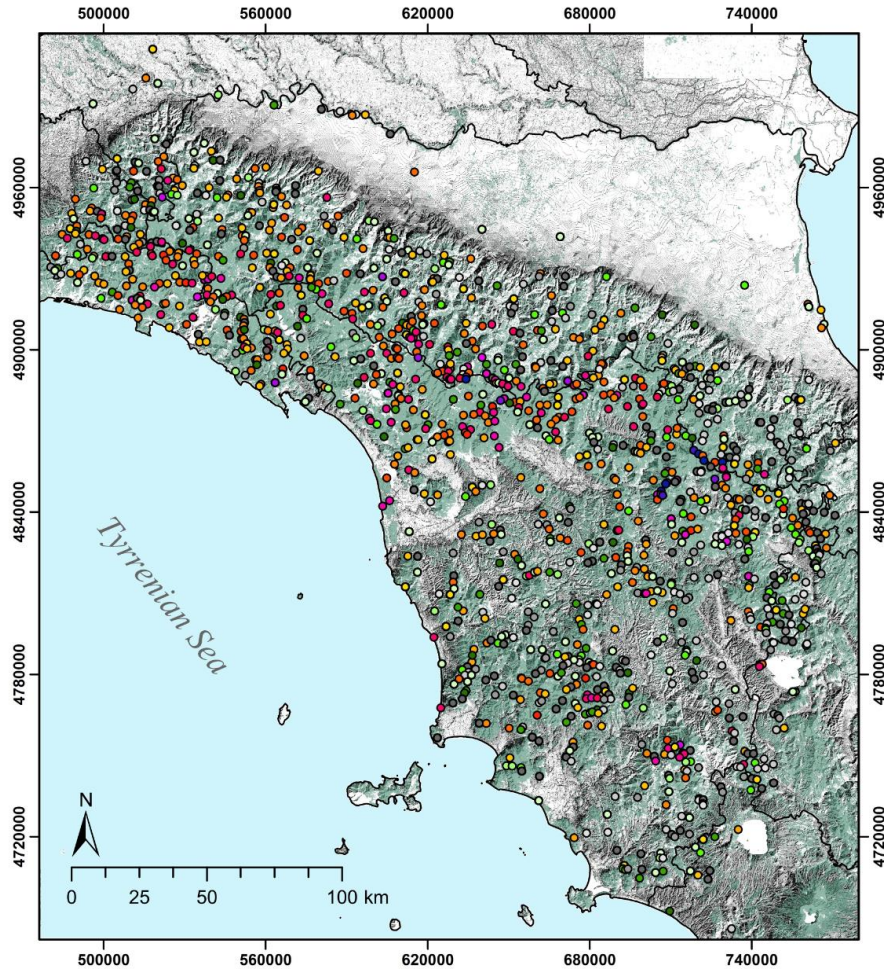
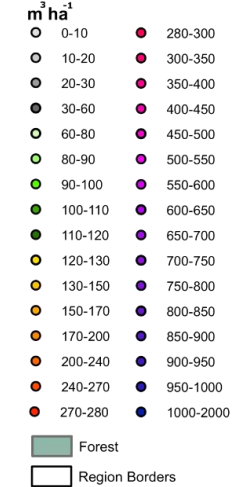
<https://www.inventarioforestale.org/it/>

INFC2015



Legend

INFC plot



Int J Appl Earth Obs Geoinformation 84 (2020) 101959



ELSEVIER

Contents lists available at ScienceDirect

Int J Appl Earth Obs Geoinformation

journal homepage: www.elsevier.com/locate/jag



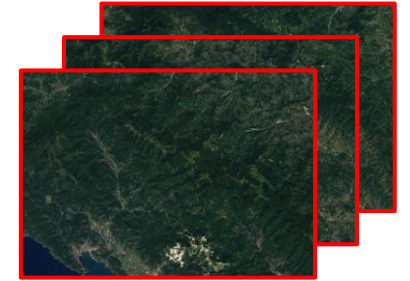
Wall-to-wall spatial prediction of growing stock volume based on Italian National Forest Inventory plots and remotely sensed data

Gherardo Chirici^a, Francesca Giannetti^a, Ronald E. McRoberts^{b,c}, Davide Travaglini^a, Matteo Pecchi^a, Fabio Maselli^d, Marta Chiesi^d, Piermaria Corona^e



Stime spazialmente esplicite di volume e biomassa

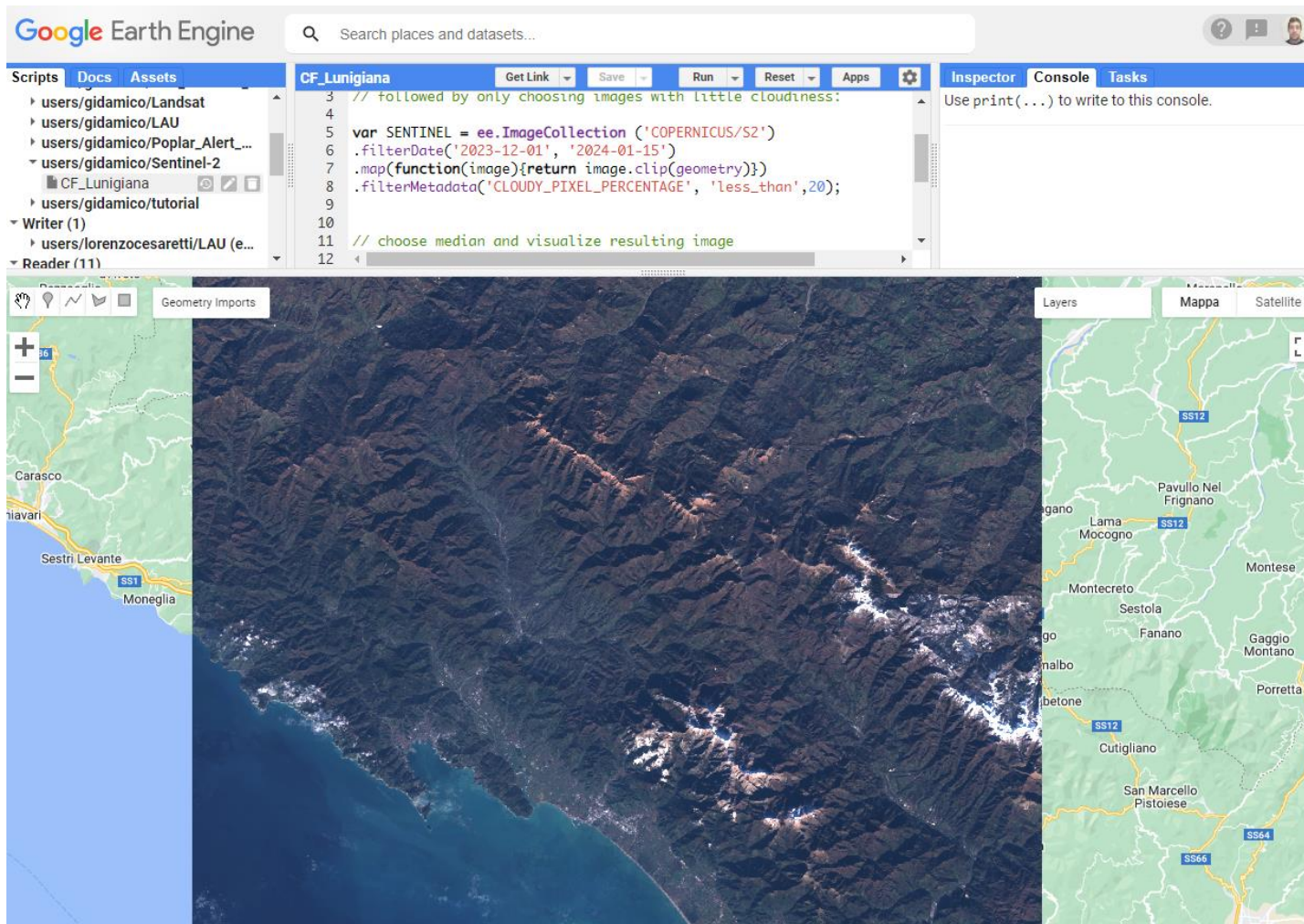
Sentinel-2



Sentinel-2 Bands	Central Wavelength (μm)	Resolution (m)
Band 1 - Coastal aerosol	0.443	60
Band 2 - Blue	0.490	10
Band 3 - Green	0.560	10
Band 4 - Red	0.665	10
Band 5 - Vegetation Red Edge	0.705	20
Band 6 - Vegetation Red Edge	0.740	20
Band 7 - Vegetation Red Edge	0.783	20
Band 8 - NIR	0.842	10
Band 8A - Vegetation Red Edge	0.865	20
Band 9 - Water vapour	0.945	60
Band 10 - SWIR - Cirrus	1.375	60
Band 11 - SWIR	1.610	20
Band 12 - SWIR	2.190	20

Stime spazialmente esplicite di volume e biomassa

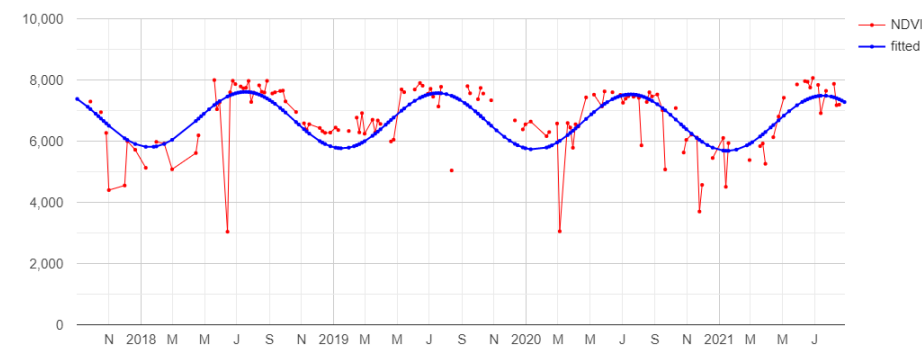
Sentinel-2



Immagini estiva cloud-free



Metriche multitemporali



Stime spazialmente esplicite di volume e biomassa

Variabili ausiliarie

DTM Tinitaly

(Tarquini and Nannipieri, 2017)



Risoluzione spaziale: 10m

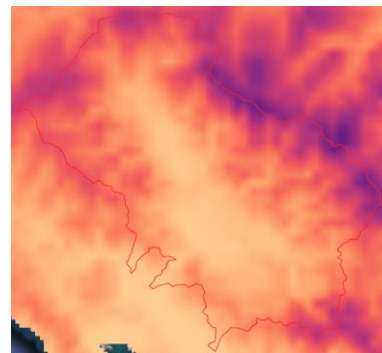


Dati climatici

(Maselli et al. 2012)

- Precipitazioni totali annue
- Temperature minime
- Temperature massime
- Temperatura media

Temperatura massima



8

33



Dati del suolo

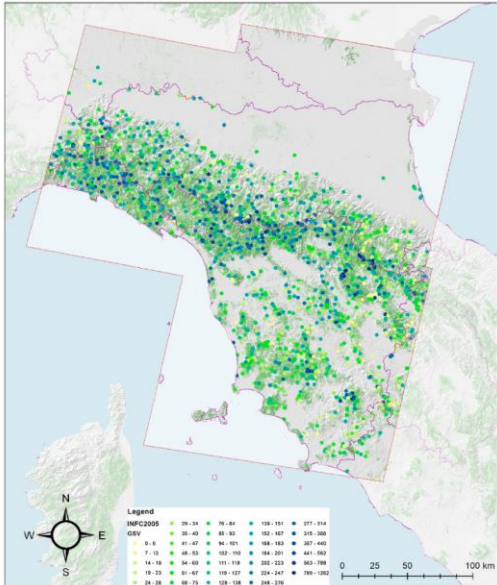
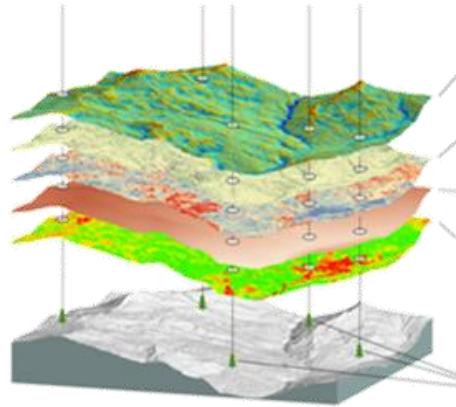
European Soil Database

- Capacità idrica disponibile del sottosuolo
- Capacità idrica disponibile del topsoil
- Rocciosità
- Profondità del suolo
- Capacità di scambio cationico del sottosuolo
- Capacità di scambio cationico del topsoil
- Capacità di scambio del suolo

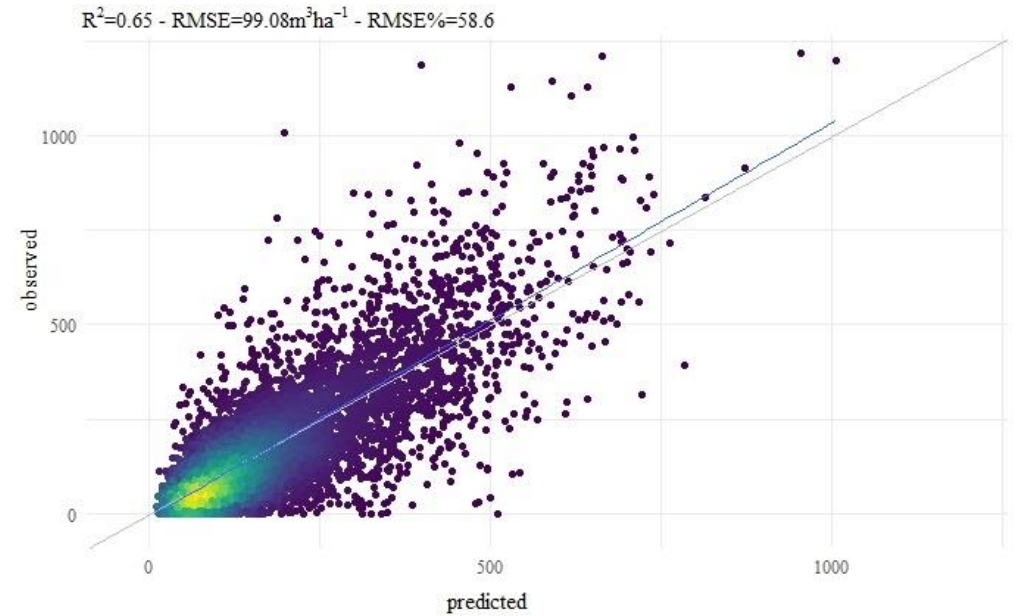
Stime spazialmente esplicite di volume e biomassa

Dati INFC 2015

- Volume legnoso
- Biomassa
- Dati Sentinel
- Dati clima
- Dati suolo
- Dati DTM
- Dati GSV 2005

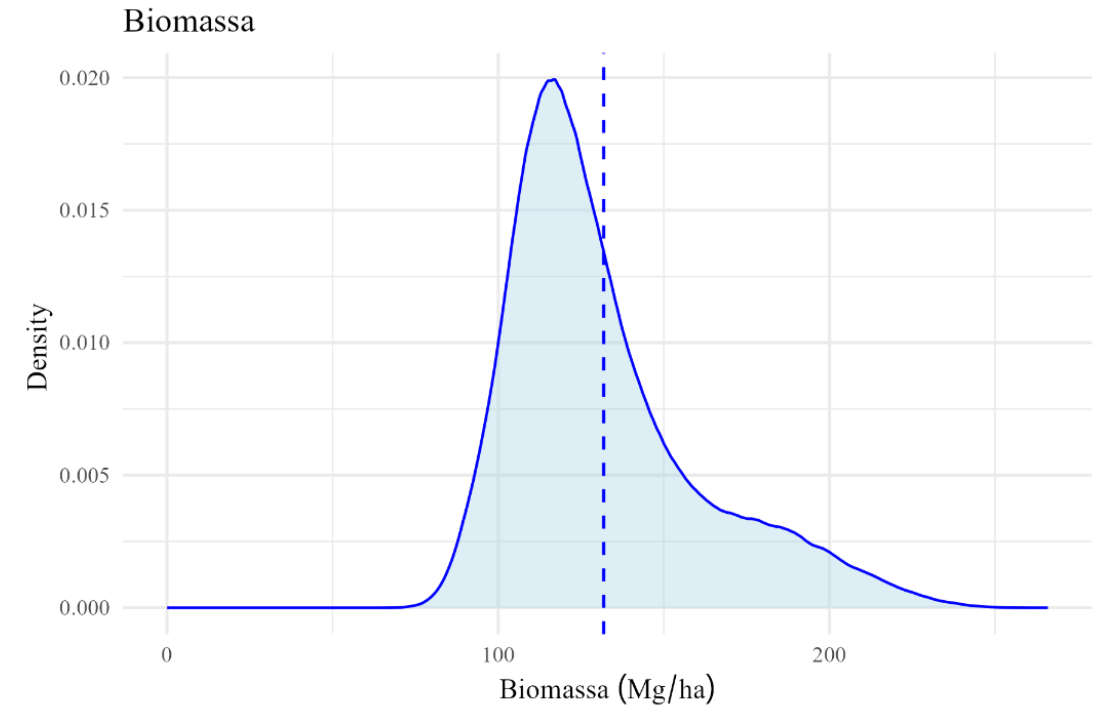
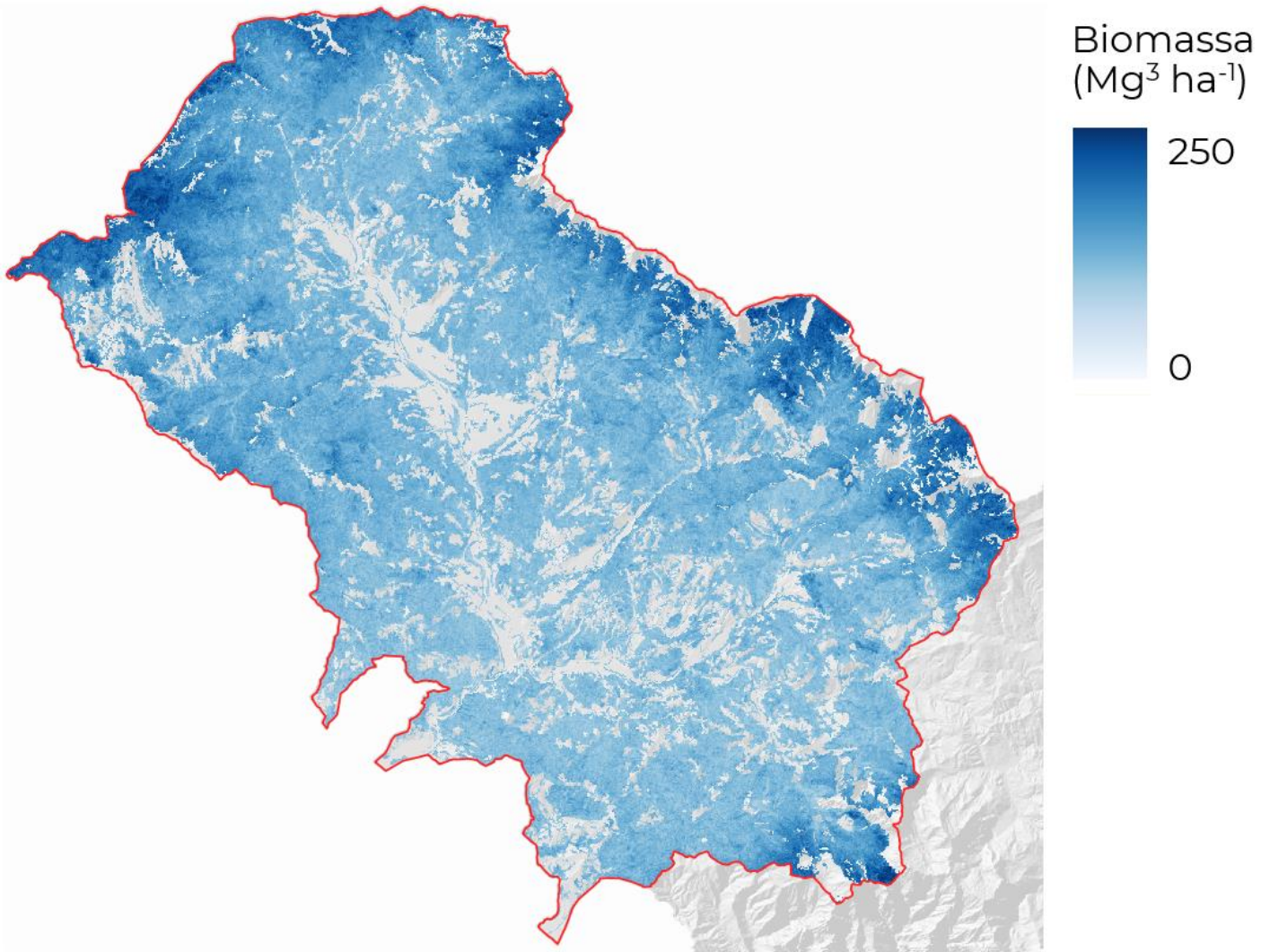


Modello Random Forest e spazializzazione della provvigione legnosa su tutta la superficie regionale da cui abbiamo estratto la mappa della Lunigiana



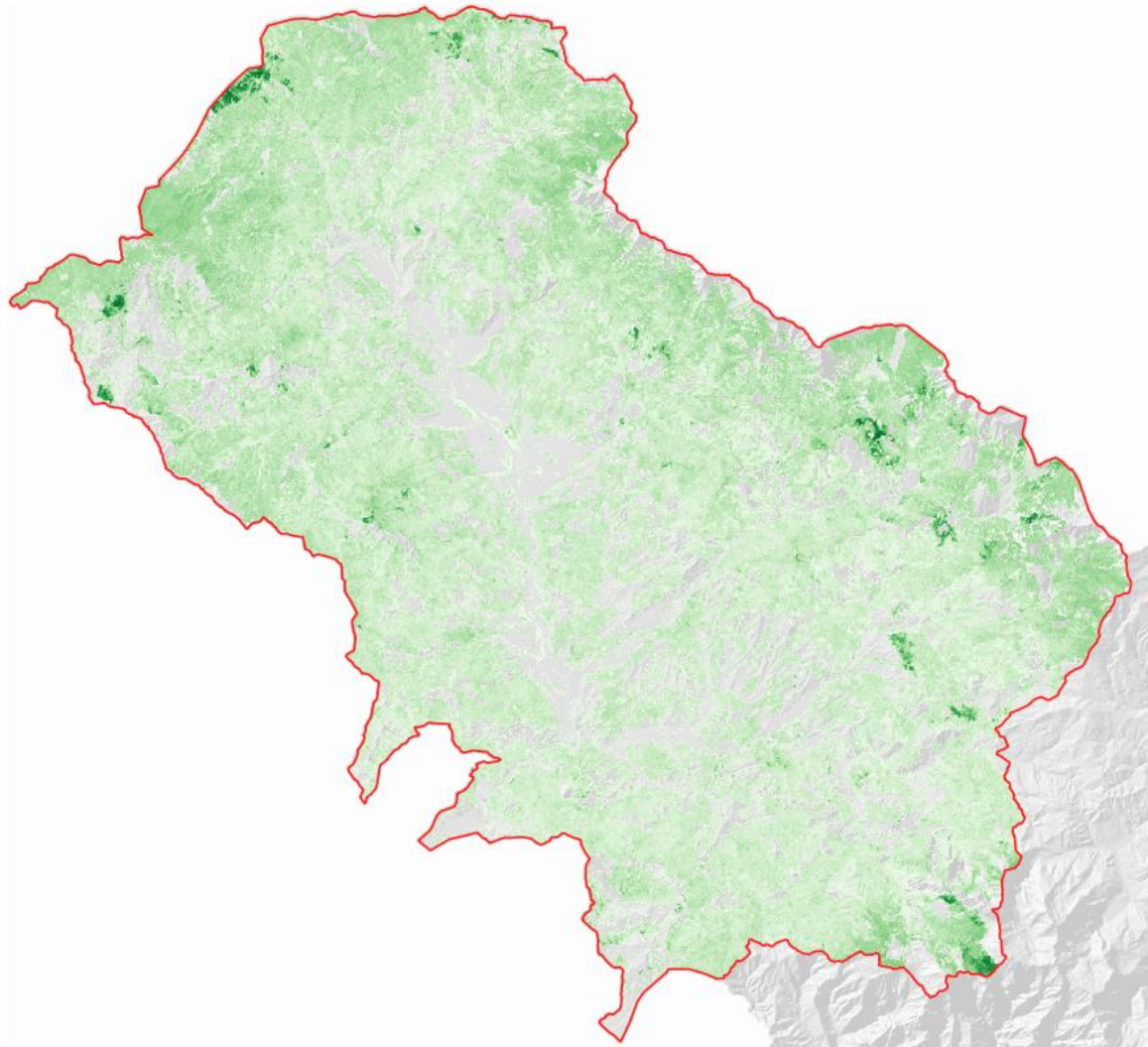
Stime spazialmente
esplicite di volume e
biomassa

Mappa della biomassa forestale

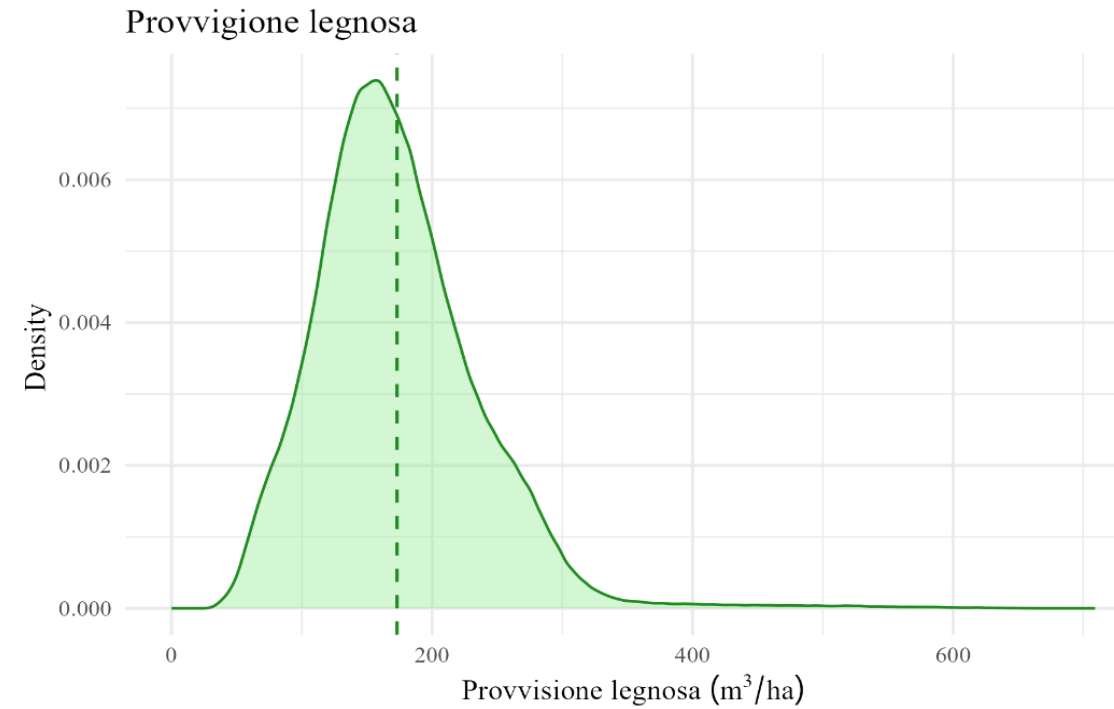


Stime spazialmente esplicite di volume e biomassa

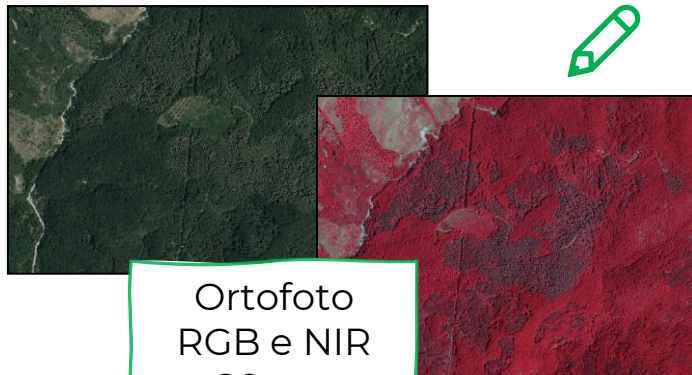
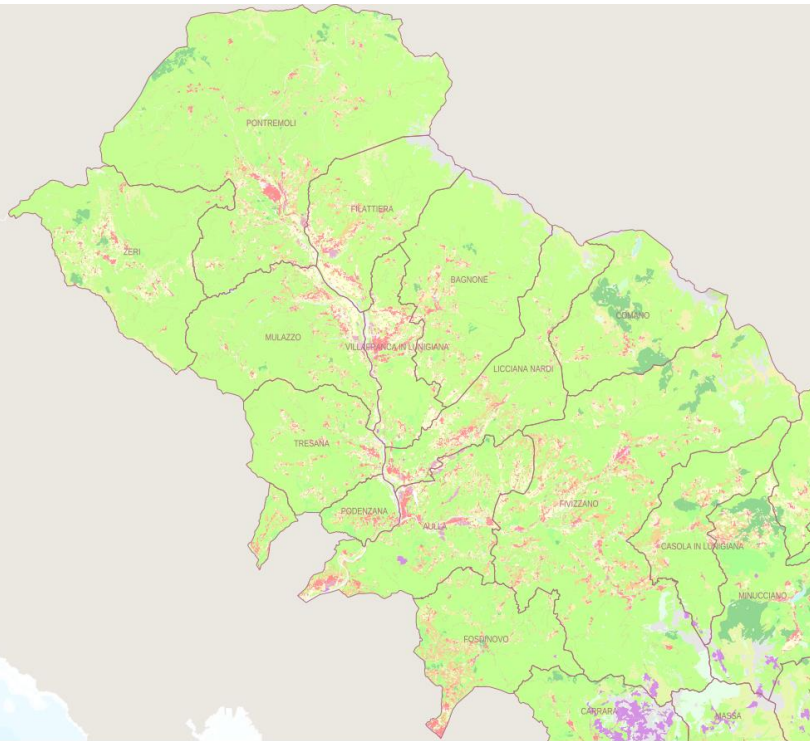
Mappa della provvigione legnosa forestale



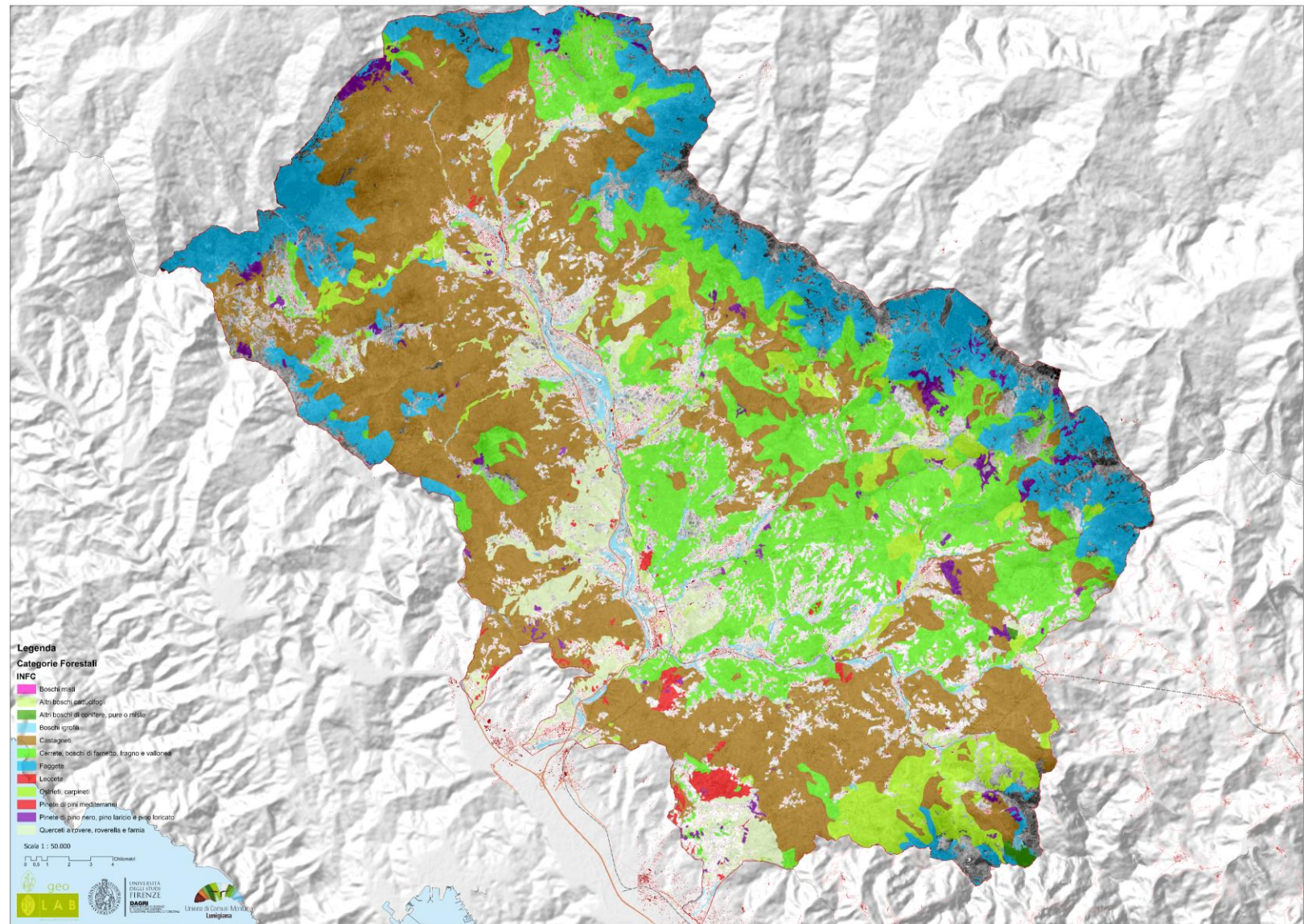
Provvigione
legnosa
($\text{m}^3 \text{ha}^{-1}$)



Aggiornamento Carta forestale

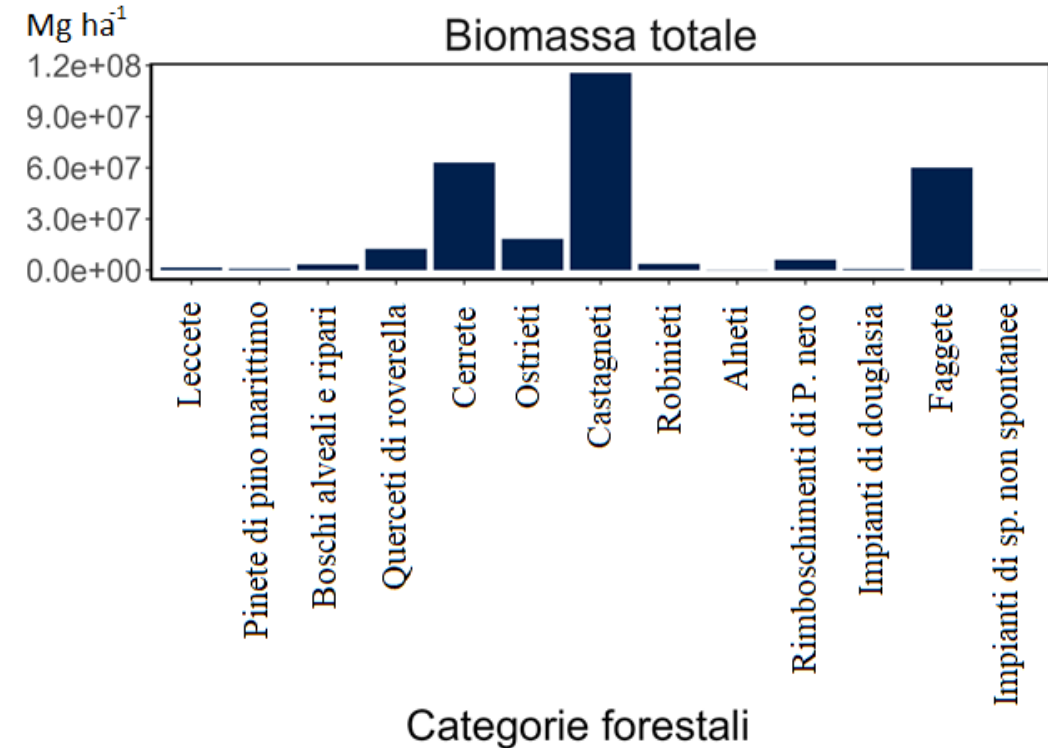
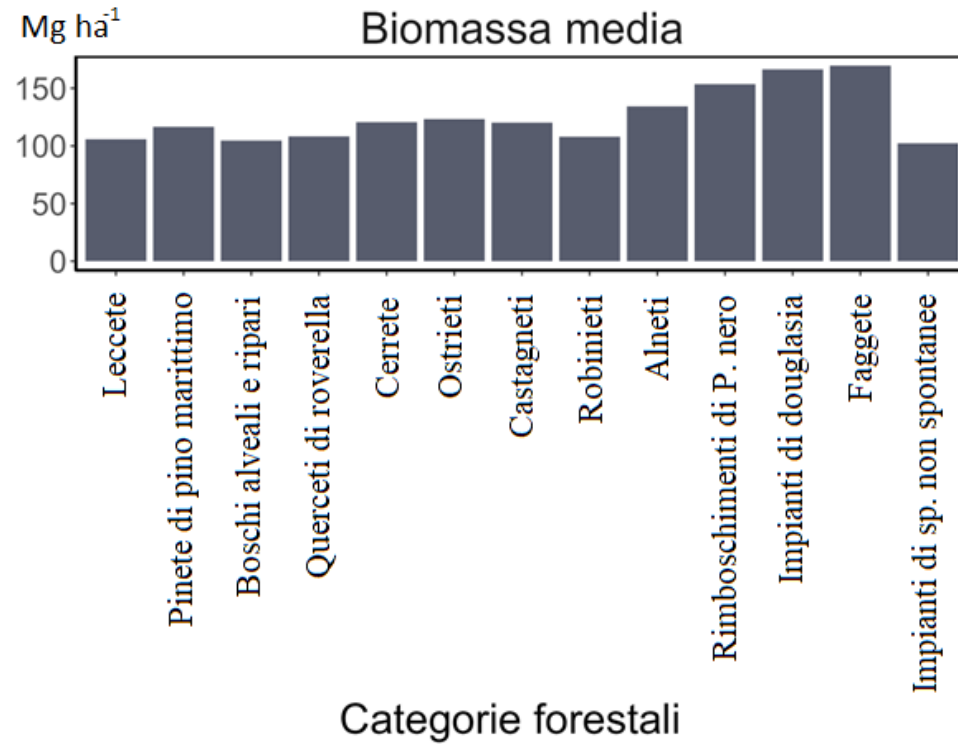
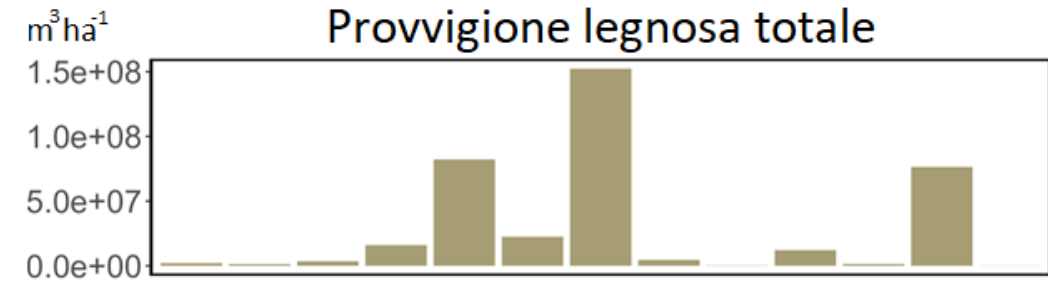
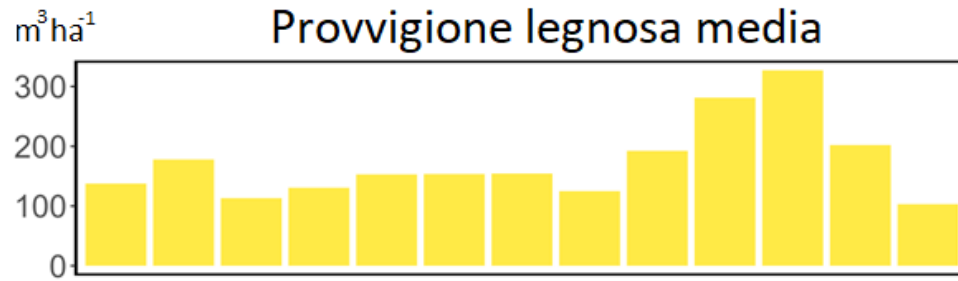


Ortofoto
RGB e NIR
20 cm



Stime spazialmente esplicite di volume e biomassa

GSV mean m ³ ha ⁻¹	GSV sum m ³ ha ⁻¹	AGB mean Mg ha ⁻¹	AGB sum Mg ha ⁻¹
167,72	375.656.041,36	123,73	286.173.742,14





Mappatura dei disturbi forestali
con dati satellitari

Stato dell'arte



Contents lists available at ScienceDirect

Remote Sensing of Environment

journal homepage: www.elsevier.com/locate/rse



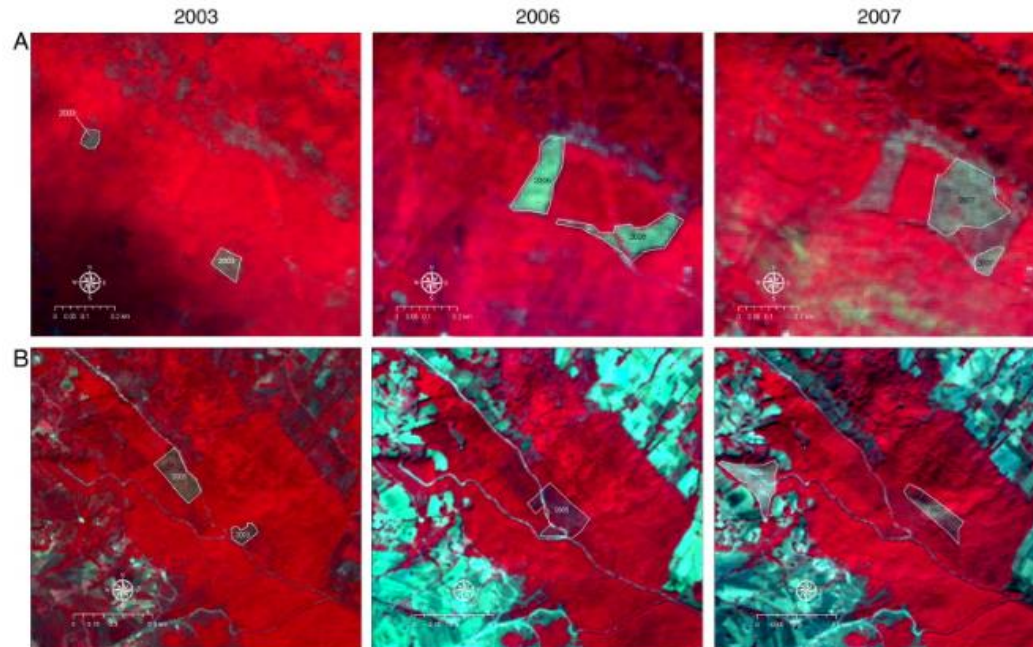
Large-scale monitoring of coppice forest clearcuts by multitemporal very high resolution satellite imagery. A case study from central Italy

Gherardo Chirici ^{a,*}, Diego Giuliarelli ^b, Daniele Biscontini ^c, Daniela Tonti ^a, Walter Mattioli ^b, Marco Marchetti ^a, Piermaria Corona ^b

^a ECOGEOFOR – Laboratorio di Ecologia e Geomatica Forestale, Dipartimento di Scienze e Tecnologie per l'Ambiente e il Territorio, University of Molise, Contrada Fonte Lappone, I-86090 Isernia, Pesche, Italy

^b DISAFRI – Dipartimento di Scienze per l'Ambiente Forestale e delle sue Risorse, University of Tuscia, Via San Camillo de' Lellis, I-01100, Viterbo, Italy

^c E-Geos spa, Roma, Italy



EUROPEAN JOURNAL OF REMOTE SENSING
2020, VOL. 53, NO. 1, 233–244
<https://doi.org/10.1080/22797254.2020.1806734>

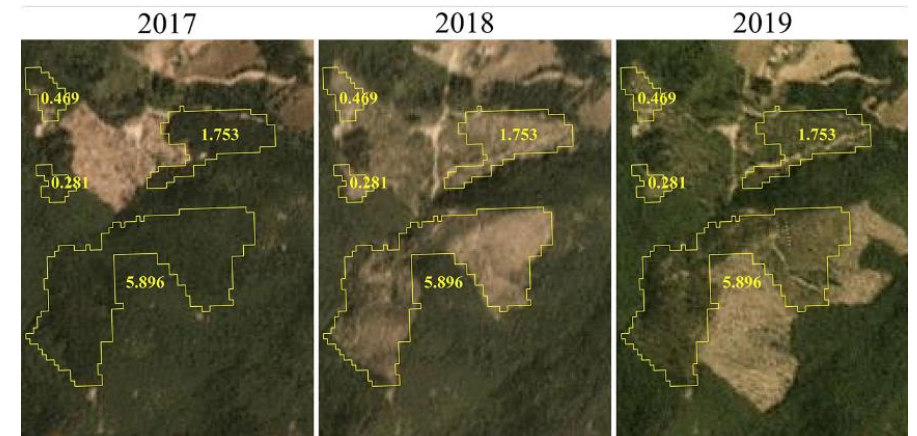


OPEN ACCESS

Near-real time forest change detection using PlanetScope imagery

Saverio Francini ^{a,b,c}, Ronald E. McRoberts ^d, Francesca Giannetti ^{id} ^a, Marco Mencucci ^e, Marco Marchetti ^b, Giuseppe Scarascia Mugnozza ^c and Gherardo Chirici ^{id} ^a

^aDepartment of Agriculture, Food, Environment and Forestry, Università degli Studi di Firenze, Firenze, Italy; ^bDipartimento di Bioscienze e Territorio, Università degli Studi del Molise, Isernia, Italy; ^cDipartimento per l'Innovazione dei Sistemi Biologici, Agroalimentari e Forestali, Università degli Studi Della Tuscia, Viterbo, Italy; ^dDepartment of Forest Resources, University of Minnesota, Saint Paul, MN, USA; ^eReparto Carabinieri Parco Nazionale Foreste Casentinesi, Arezzo, Italy



Landtrendr

Contents lists available at ScienceDirect

Remote Sensing of Environment

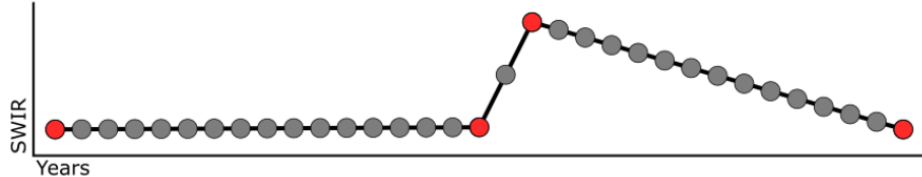
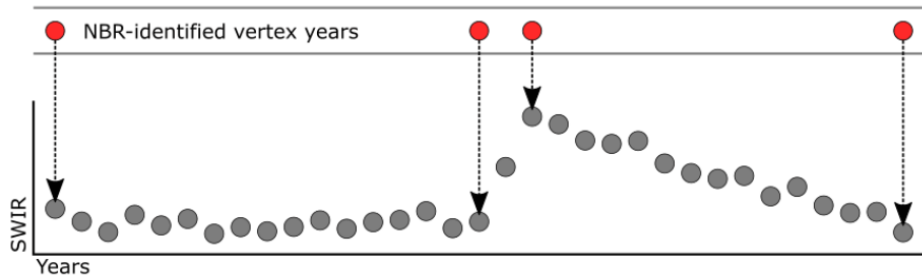
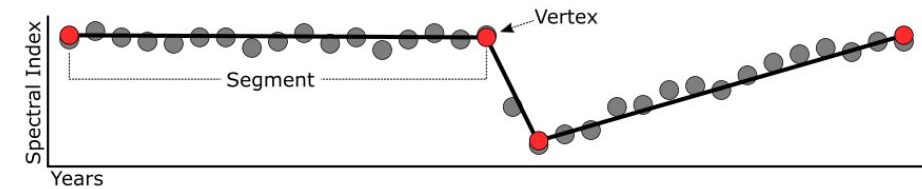
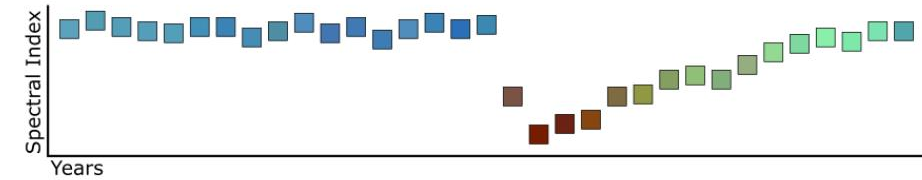
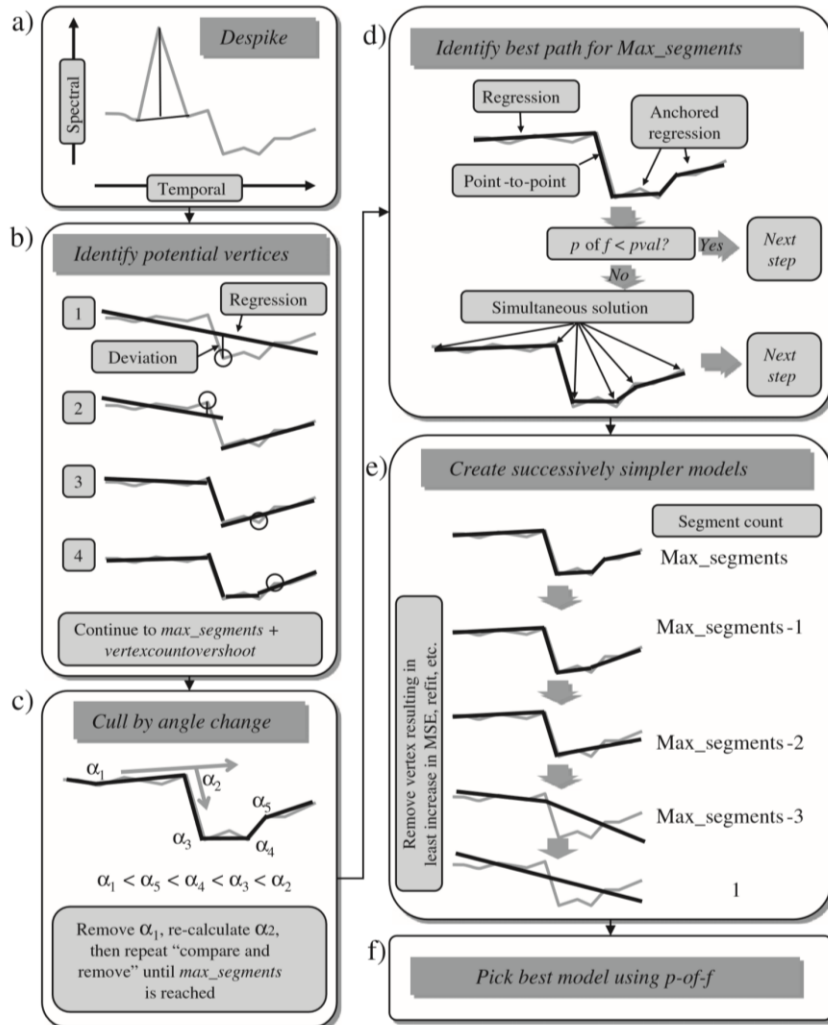
ELSEVIER

journal homepage: www.elsevier.com/locate/rse

Detecting trends in forest disturbance and recovery using yearly Landsat time series:
 1. LandTrendr – Temporal segmentation algorithms

Robert E. Kennedy^{a,*}, Zhiqiang Yang^a, Warren B. Cohen^b

^a Department of Forest Ecosystems and Society, Oregon State University, 321 Richardson Hall, Corvallis, OR 97331, United States
^b Pacific Northwest Research Station, USDA Forest Service, Corvallis, OR 97331, United States



High-Resolution Global Maps of 21st-Century Forest Cover Change

M. C. Hansen^{1,*}, P. V. Potapov¹, R. Moore², M. Hancher², S. A. Turubanova¹, A. Tyukavina¹, D. Thau², S. V. Stehman³, S. J. G...
 * See all authors and affiliations

Science 15 Nov 2013;
 Vol. 342, Issue 6160, pp. 850-853
 DOI: 10.1126/science.1244693

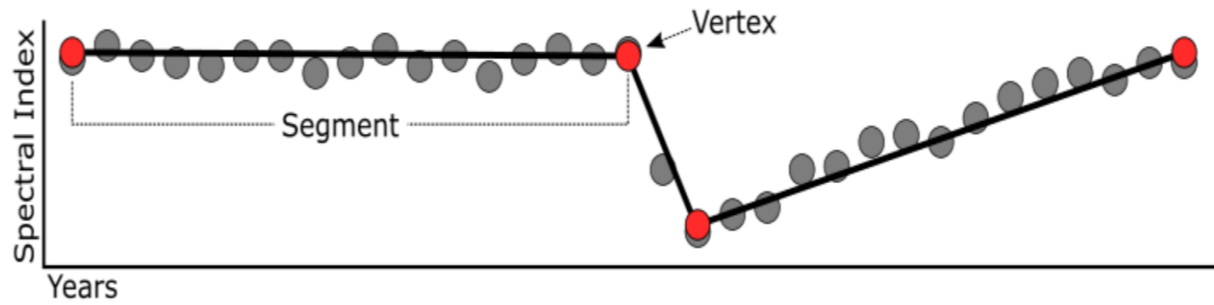
The screenshot shows a web browser window with the URL <https://earthenginepartners.appspot.com/science-2013-global-forest>. The main content is a global map of forest cover change. The legend on the right side of the map is titled 'Global Forest Change' and includes the following information:

- Published by Hansen, Potapov, Moore, Hancher et al.
- UNIVERSITY OF MARYLAND DEPARTMENT OF GEOGRAPHICAL SCIENCES
- Results from time-series analysis of Landsat images characterizing forest extent and change.
- Trees are defined as vegetation taller than 5m in height and are expressed as a percentage per output grid cell as '2000 Percent Tree Cover'. 'Forest Cover Loss' is defined as a stand-replacement disturbance, or a change from a forest to non-forest state, during the period 2000–2018. 'Forest Cover Gain' is defined as the inverse of loss, or a non-forest to forest change entirely within the period 2000–2012. 'Forest Loss Year' is a disaggregation of total 'Forest Loss' to annual time scales.
- Reference 2000 and 2018 imagery are median observations from a set of quality assessment-passed growing season observations.
- [Download the data.](#)
- [Reset to default view](#)
- Data Products
- Forest Loss Year (2018 Highlight)
- Legend: 2018 (red), 2017 (orange), 2016 (yellow), 2015 (light green), 2014 (green), 2013 (dark green), 2012 (teal), 2011 (blue), 2010 (dark blue), 2009 (black), 2008 (black), 2007 (black), 2006 (black), 2005 (black), 2004 (black), 2003 (black), 2002 (black), 2001 (black), 2000 (black), No loss (black), Water or no data (black).
- Other Data Layers
- Primary Humid Tropical Forests
- Background Imagery
- Year 2000 Bands 5/4/3
- Example Locations
- Forestry and Tornado in Alabama
- [Zoom to area](#)
- The trail of destruction from the April 27 2011

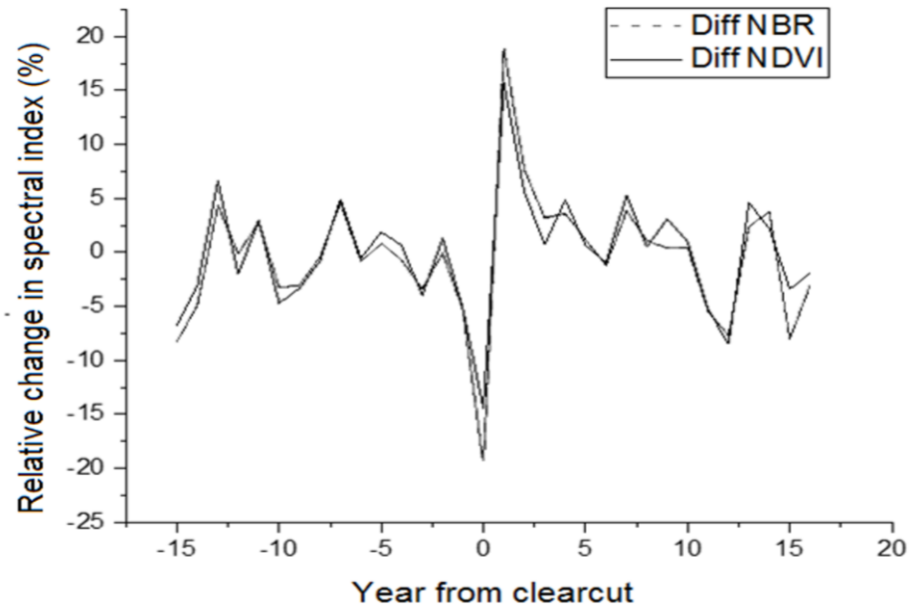
At the bottom of the browser window, there is a footer that reads: 'Published by Hansen, Potapov, Moore, Hancher et al. · Powered by Google Earth Engine · Help'.

Stato dell'arte

Taglio raso in foresta boreale



Taglio raso ceduo mediterraneo



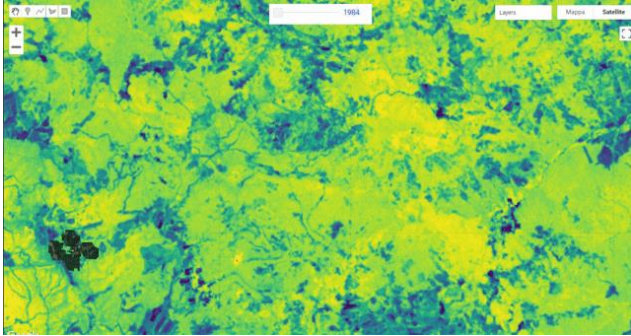
Monitoring clearcutting and subsequent rapid recovery in Mediterranean coppice forests with Landsat time series

Gherardo Chirici¹ · Francesca Giannetti¹ · Erica Mazza¹ · Saverio Francini¹ · Davide Travaglini¹ · Raffaello Pegna¹ · Joanne C. White²



Mappatura dei disturbi forestali

Serie multitemporale S2

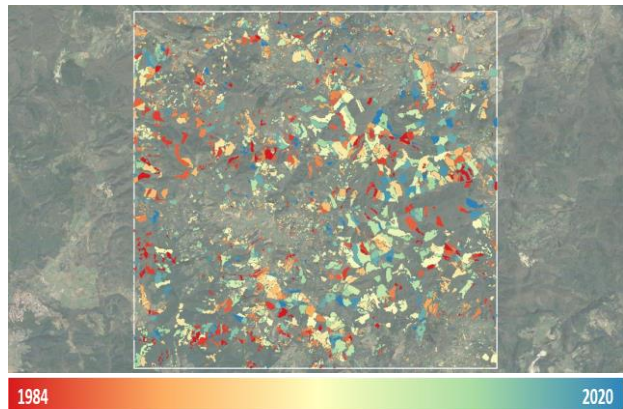


NDVI
 $\frac{NIR - RED}{NIR + RED}$

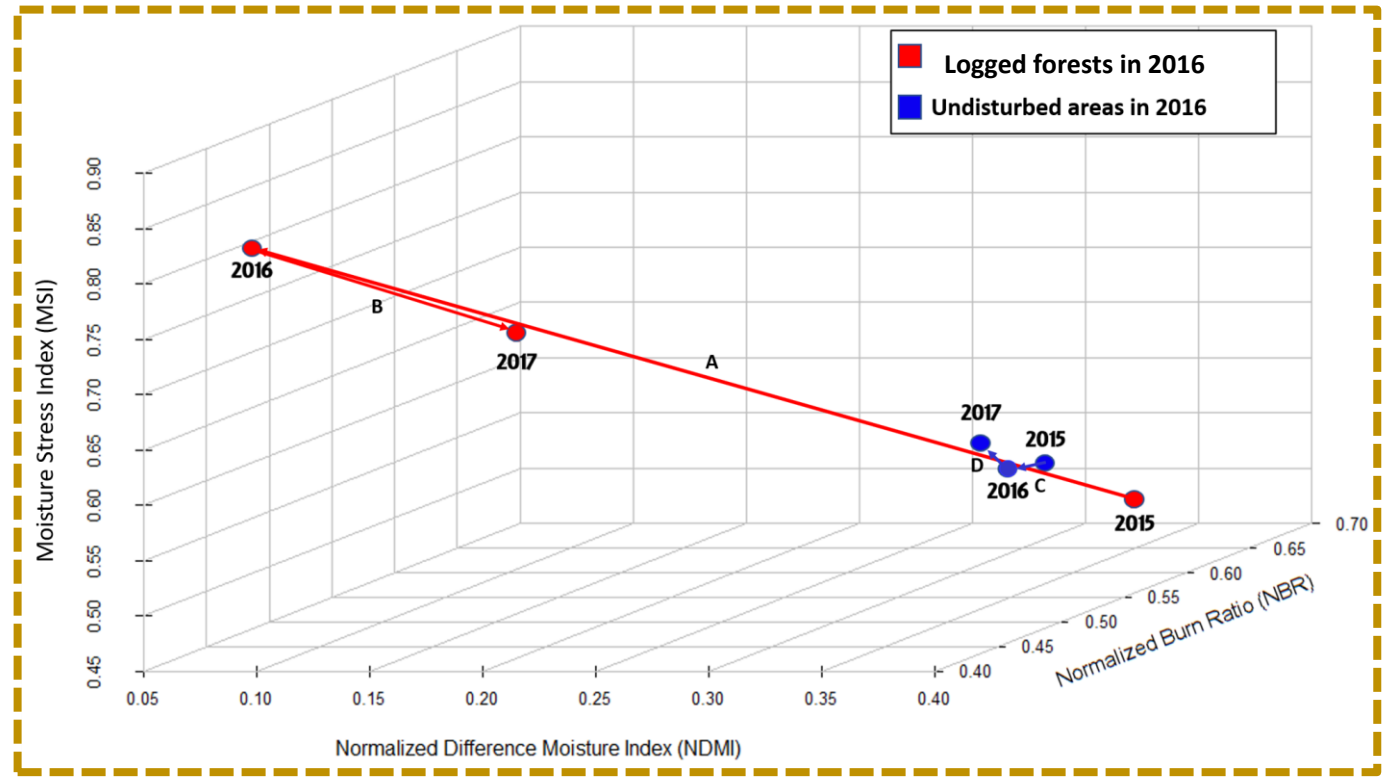
NBR
 $\frac{NIR - SWIR}{NIR + SWIR}$

MSI
 $\frac{SWIR}{NIR}$

Forest disturbance map



3I3D



INTERNATIONAL JOURNAL OF REMOTE SENSING
 2021, VOL. 42, NO. 12, 4693–4711
<https://doi.org/10.1080/01431161.2021.1899334>



The Three Indices Three Dimensions (3I3D) algorithm: a new method for forest disturbance mapping and area estimation based on optical remotely sensed imagery

Saverio Francini^{a,b,c}, Ronald E. McRoberts^d, Francesca Giannetti^{b,a}, Marco Marchetti^b, Giuseppe Scarascia Mugnozza^c and Gherardo Chirici^{b,a}

International Journal of Applied Earth Observations and Geoinformation 106 (2022) 102663

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

International Journal of Applied Earth Observations and Geoinformation

journal homepage: www.elsevier.com/locate/jag

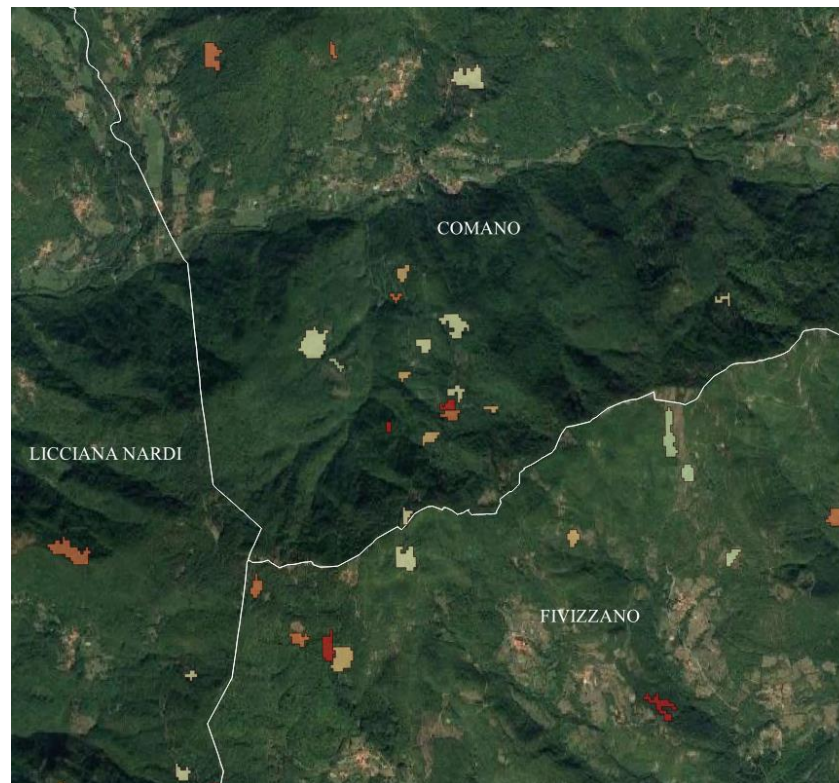
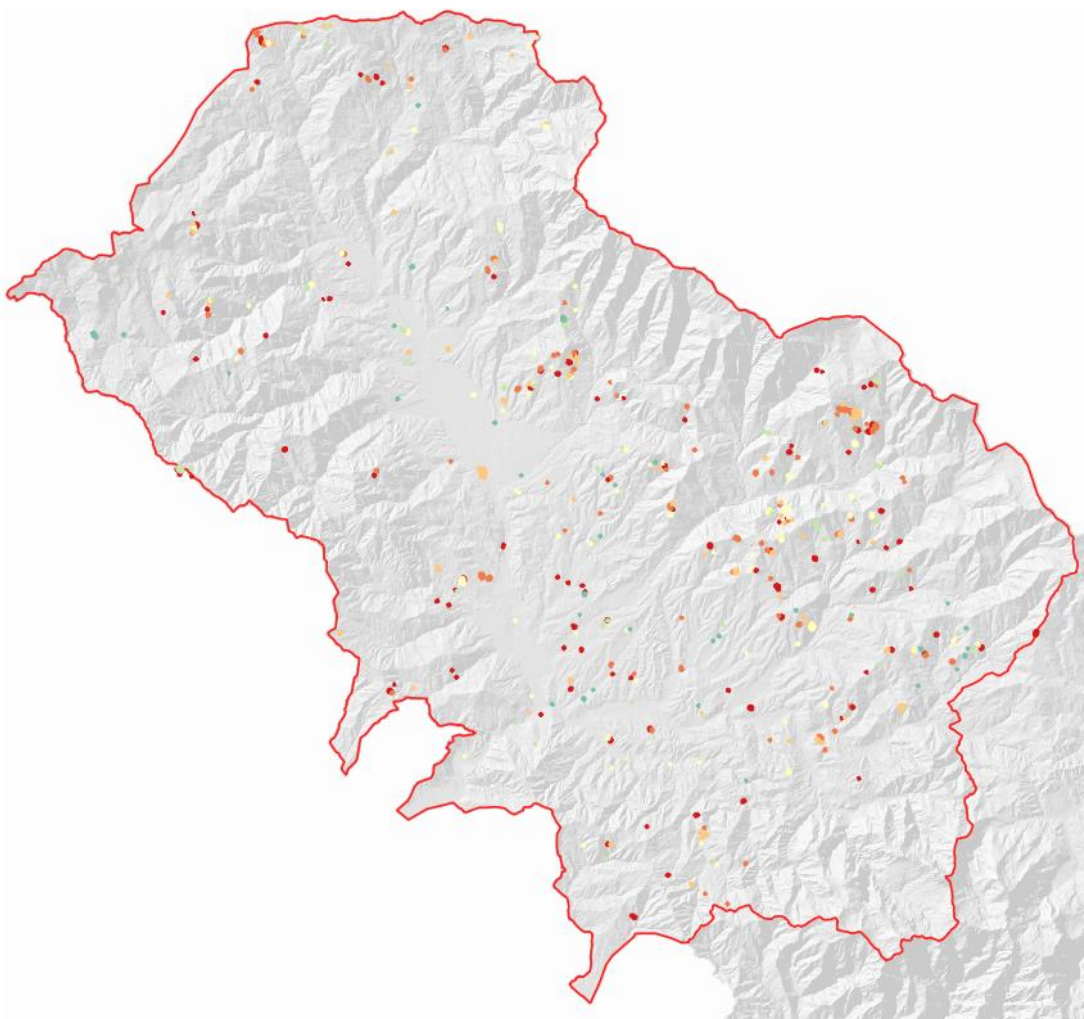
An open science and open data approach for the statistically robust estimation of forest disturbance areas

Saverio Francini^{a,b,c}, Ronald E. McRoberts^d, Giovanni D'Amico^a, Nicholas C. Coops^e, Txomin Hermosilla^f, Joanne C. White^f, Michael A. Wulder^f, Marco Marchetti^b, Giuseppe Scarascia Mugnozza^c, Gherardo Chirici^a



Mappatura dei disturbi forestali

Risultati 3I3D



Anno	Numero disturbi	Superficie Totale (ha)	Superficie Media (ha)
2017	89	66.69	0.75
2018	83	60.47	0.73
2019	70	57.22	0.82
2020	71	44.62	0.63
2021	45	27.90	0.62
2022	34	16.94	0.50



Green Community e Servizi Ecosistemici:
verso una Gestione Sostenibile e
Responsabile del patrimonio forestale

Giovanni D'Amico

Email – giovanni.damico@unifi.it

  @giova_damico

www.geolab.unifi.it



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DAGRI
DIPARTIMENTO DI SCIENZE
E TECNOLOGIE AGRARIE,
ALIMENTARI, AMBIENTALI E FORESTALI



geo



laboratory of forest geomatics

