



**forestry**  
tep

**VTT**

# Forestry TEP

ESA RepreSent user workshop  
4 May 2023

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VTT – beyond the obvious

# Forestry TEP session

1. Introduction and platform features (20+5 min)
2. Service demonstrations including SSL (20+5 min)
3. Developer's perspective (10 min)

A dense forest of evergreen trees, likely spruce or fir, with a thick mist or fog rising from the ground, creating a serene and atmospheric scene. The trees are a deep green color, and the mist is a light, hazy white.

# Forestry TEP Overview



**Climate change**

**Forest loss**

**Illegal logging**

**Sustainable forest use**

**Forest monitoring**

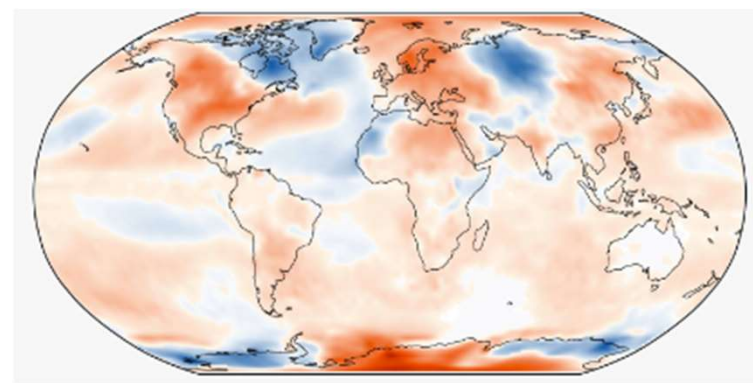
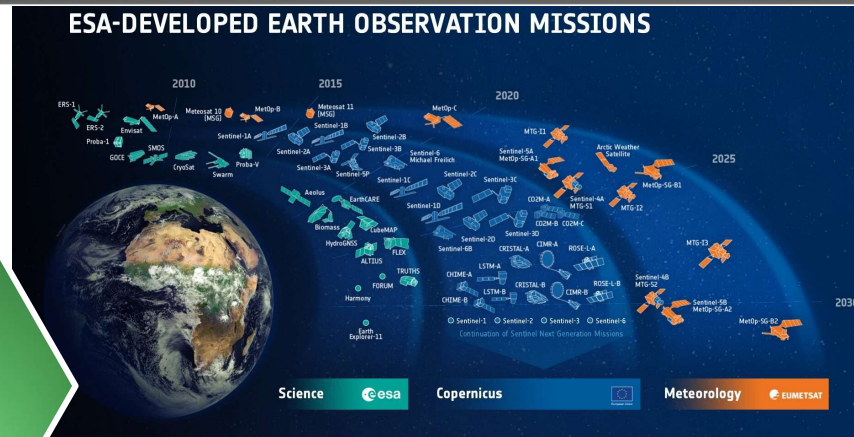
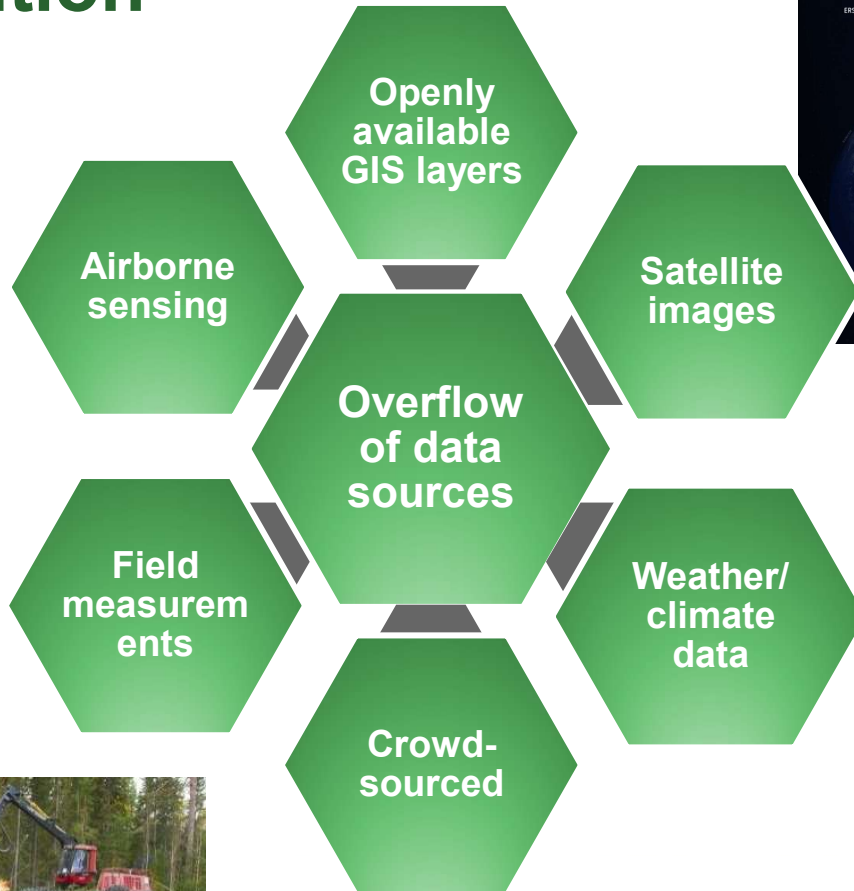
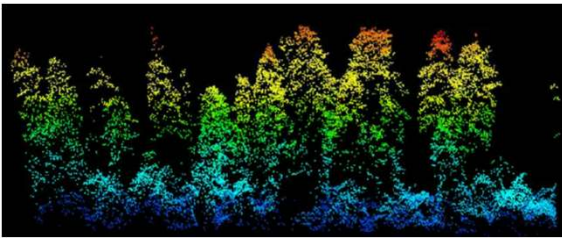
**Forest research**

**Biocarbon assessment**

**Forest asset management**

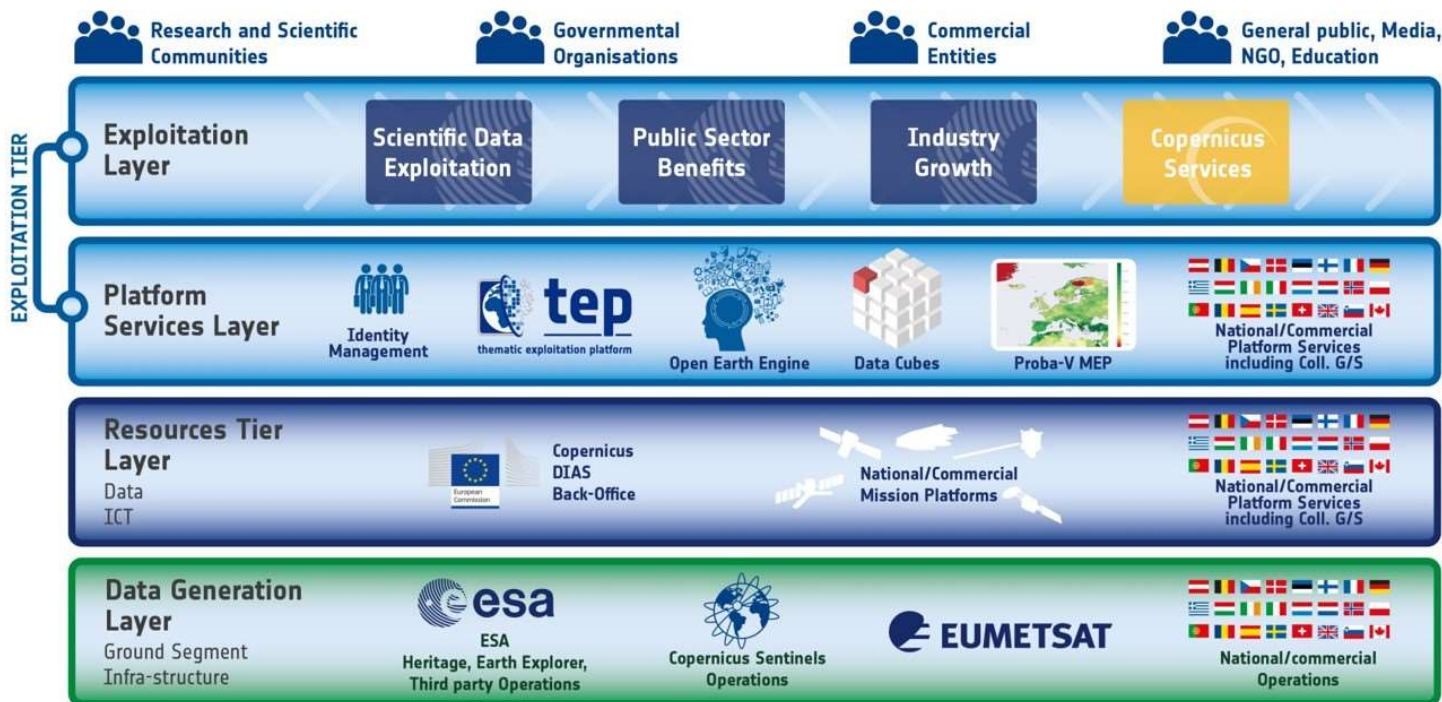
- Forest and climate research community
- Forest owners and managers
- Forest certification organisations
- Regional/national forest administration
- International initiatives, research programmes and panels
- International development banks
- Sustainable development NGOs
- UN organisations
- Value adding (SME) industries

# Big Data Revolution

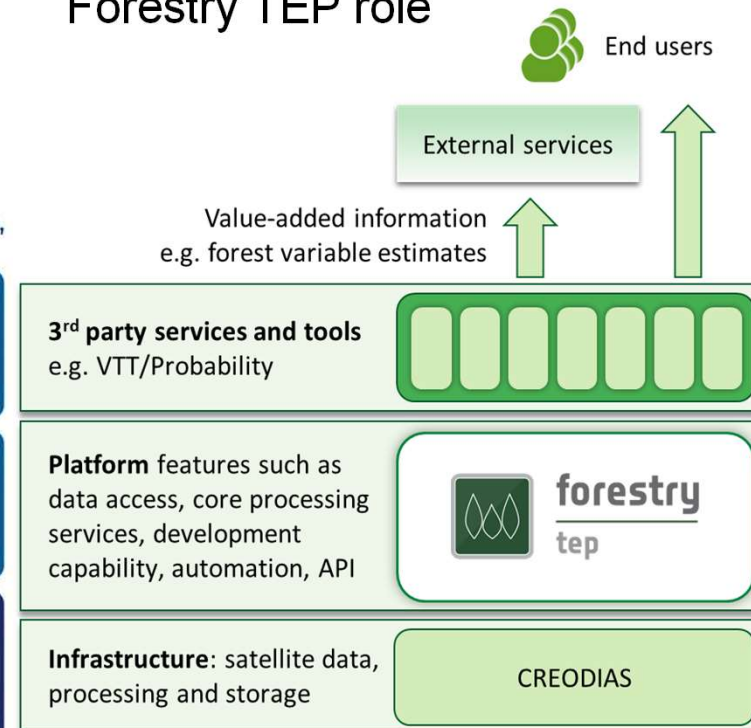


# Forestry TEP, part of a big puzzle

ESA vision on data and processing platforms



## Forestry TEP role



A dense forest of evergreen trees, likely spruce or fir, with a thick mist or fog rising from the ground, creating a serene and atmospheric scene. The trees are a deep green color, and the mist is a soft, white vapor that drifts through the forest.

# Forestry TEP Offering

# How to benefit from Forestry TEP?

## Ways to use the platform

- Use available applications that combine EO data and your own input datasets
- Develop your own processing scripts
- Share or license applications
- Access or share output products

## Two modes of usage

- Online web user interface
- REST API for interconnecting between systems



## Guidance at [f-tep.com](https://f-tep.com) > [Registration and support](#):

**Registration and login:** how to access the platform

**Learning:** introductory videos, 2-4 min each

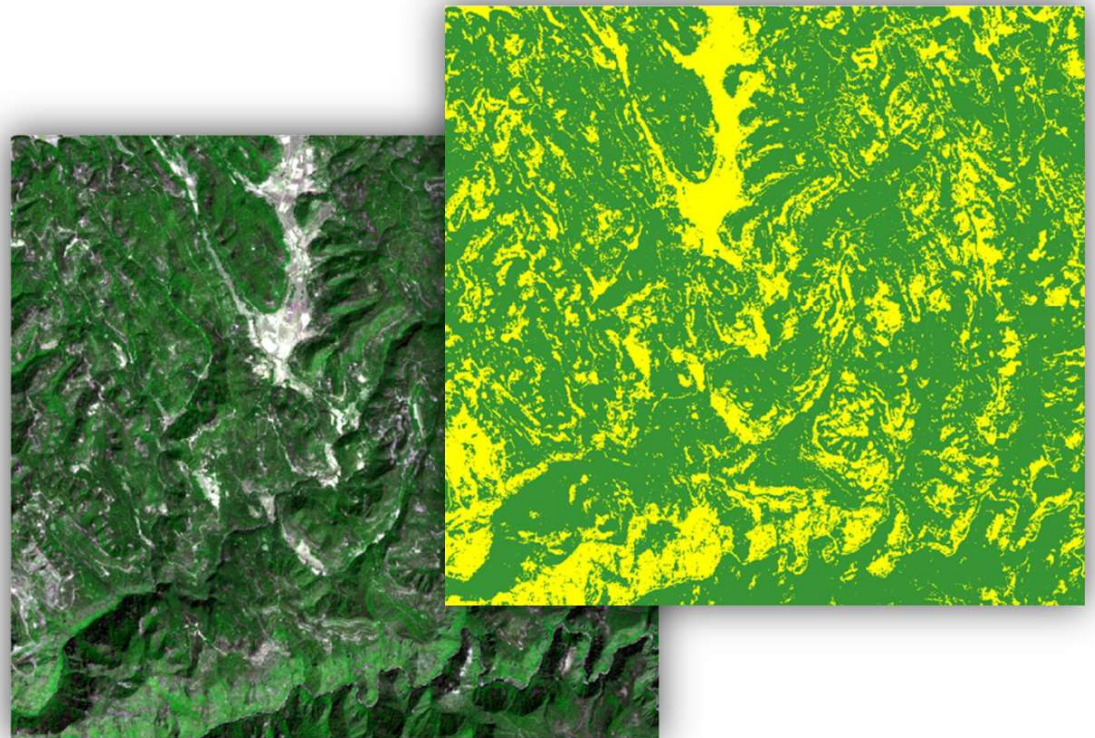
**User manual:** User Manual document (pdf) and REST API tutorial

**Creating services:** Service Developer Guide (pdf) & supporting information



# Processing Services and Tools

- **Thematic processing services**  
*e.g. vegetation indices, land cover mapping, forest change mapping*
- **Supporting processing services**  
*e.g. S-1 stacking, masking, mosaicking, radiometric correction*
- **Interactive applications**  
*e.g. QGIS, SNAP*
- Full listing at <https://f-tep.com/>  
*Additional services by agreement, e.g. VTT AutoChange and Probability*



# Service development

## Online development environment

- Based on Docker and Linux
- Developer defines the processing logic and input parameters
- Implementation in any programming language
- Libraries such as SNAP, Orfeo Toolbox, GDAL etc. can be used
- Templates are provided
- No software needed locally

The screenshot displays the 'VegetationIndices' service configuration in a web-based development environment. The interface includes a service overview, a file explorer, a code editor, and a parameter table.

**Service Overview:**

- Service Name: VegetationIndices
- Docker Tag: fltp/vegindexsinglefile
- Application Port: 8080/tcp
- Title: Calculate a variety of radiometric indices for vegetation
- Version: 1.0
- Service Type: Processor
- Description: Radiometric indices for single-file Sentinel-2 images, provided by Orfeo Toolbox. A core F-TEP service.

**Code Editor:** Shows a Dockerfile for the service, including dependencies (libfreetype, gdal, proj, python, python-dev, python-gdal) and the main processing script.

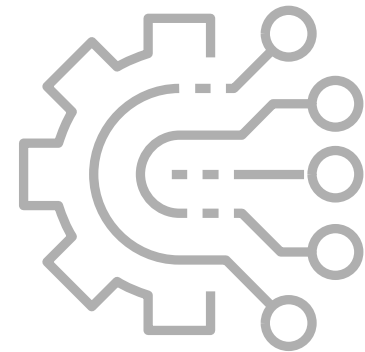
```
FROM ubuntu:16.04
MAINTAINER Forestry TEP
# Dependencies
RUN apt-get update && apt-get install -y \
bc \
curl \
libfreetype \
gdal-bin \
proj-bin \
python \
python-dev \
python-gdal \
&& apt-get clean && rm -rf /var/lib/apt/lists/*
#####
# Download and install SNAP
ENV SNAP_MAJ_VER="5" \
SNAP_MIN_VER="0" \
SNAP_POINT_VER="0"
ENV SNAP_BASE_URL="http://step.esa.int/downloads/${SNAP_MAJ_VER}" \
SNAP_INSTALLER="esa-snap_sentinel1_unix_${SNAP_MAJ_VER}"
LABEL snap.version="${SNAP_MAJ_VER}.${SNAP_MIN_VER}.${SNAP_POINT_VER}"
RUN curl -sL "${SNAP_BASE_URL}/${SNAP_INSTALLER}" > /
# Install SNAP
RUN echo -e
```

**Parameter Table:**

ID	Title	Description	Data Type	Default Value	Min Occurs	Max Occurs	Input Defs	Search Param	Parallel	Edit	Remove
inputfile	Input data	Sentinel-2 data file(s)	string		1	50	True	False	True		
vegindex	Radiometric index algorithm	Vegetation index to calculate	string	NDVI	1	1	False	False	False		
aoi	Area of interest	AOI to be processed, in the well-known text (WKT) format, e.g. POLYGON(...)	string		0	1	False	False	False		
targetResolution	Output pixel spacing	Request output spacing in metres, e.g. 10 or 20	string		1	1	False	False	False		

# REST API

- **The F-TEP REST API enables inter-platform collaboration – utilizing the platform features from external systems**
  - Authenticated access to resources (services, data, processing)
  - Technically based on Spring Data REST, with JSON contents
- **The API allows to (e.g.):**
  - Query the data catalogue
  - Query the available processing services and their interfaces
  - Create and launch processing jobs
  - Retrieve outputs of completed jobs
- **Python library** also available for easy REST API access in external scripts



# Get involved!

- **Utilize in projects – by yourself or together with us**
  - VTT Remote Sensing team has long experience in coordinating and participating in cooperative projects
  - Expertise in remote sensing based forest monitoring and platform processing
- **Bring in your business!**
  - We will support you to onboard your business ideas on the platform



Contact us at: [f-tep.com/](http://f-tep.com/)



# ESA funding for platform use

- The European Space Agency (ESA) has set up the [Network of Resources](#) (NoR) to stimulate the uptake of platform services.
- Forestry TEP is an eligible service provider in the NoR.
- **For research and pre-commercial uses, our users can apply for NoR sponsorship to cover for the costs of the platform use.**
- To apply for our Platform Package:
  - Head to the [NoR Discovery Portal](#) and search for VTT.
  - Check the Details, select *Pricing Wizard* and proceed as instructed to submit a sponsoring request to ESA.
  - We also provide User Trainings and other support services via the NoR.



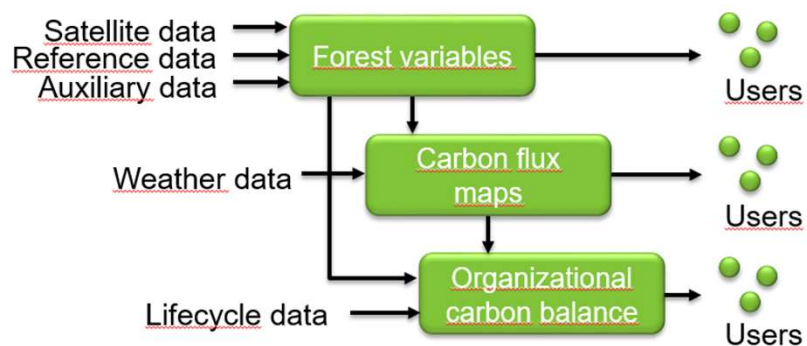
# Forestry TEP

## Ongoing activities

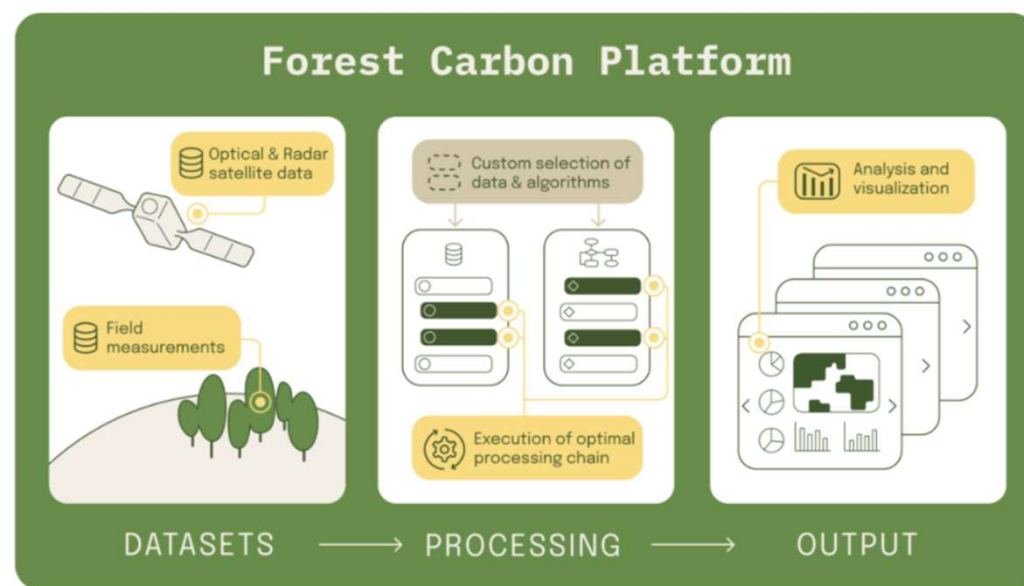
# Forestry TEP – Ongoing activities

Heavy platform use in multiple projects:

- [Forest Flux](#) (EU)
- [Forest Digital twin precursor](#) (ESA)
- [Forest Carbon Monitoring](#) (ESA)
- See <https://f-tep.com/news-and-outreach/>

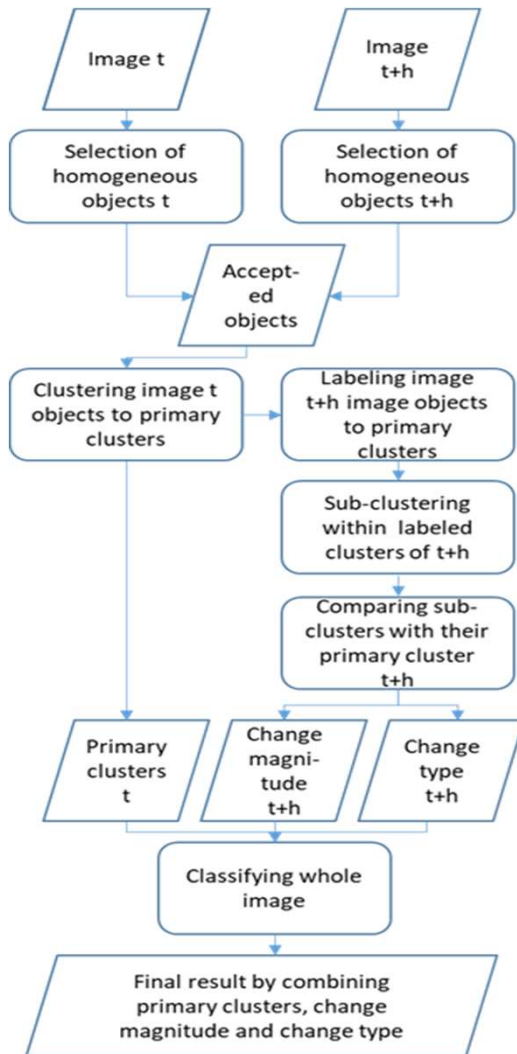


<https://www.forestflux.eu/>



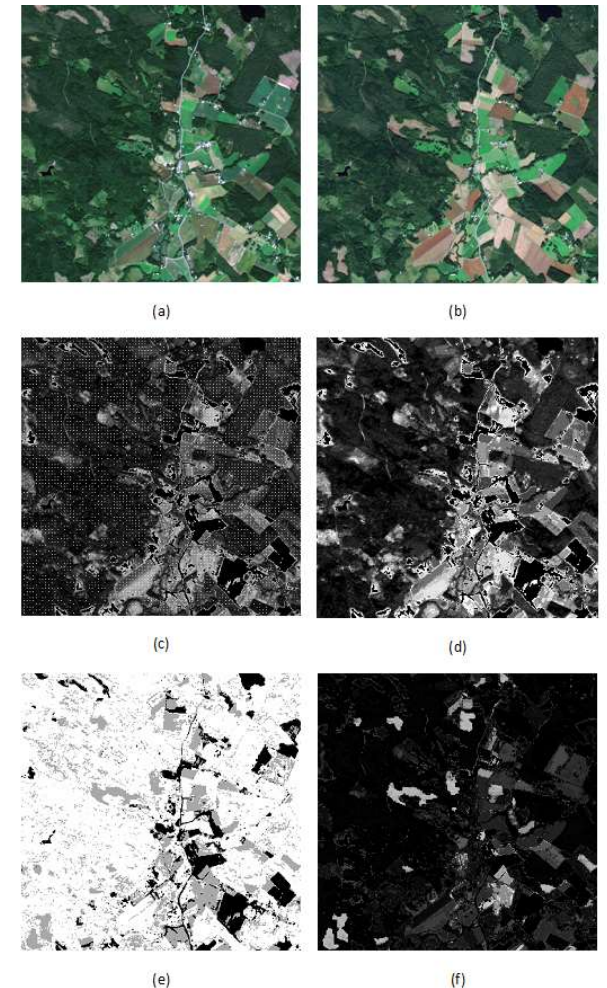
<https://www.forestcarbonplatform.org/>

# AutoChange



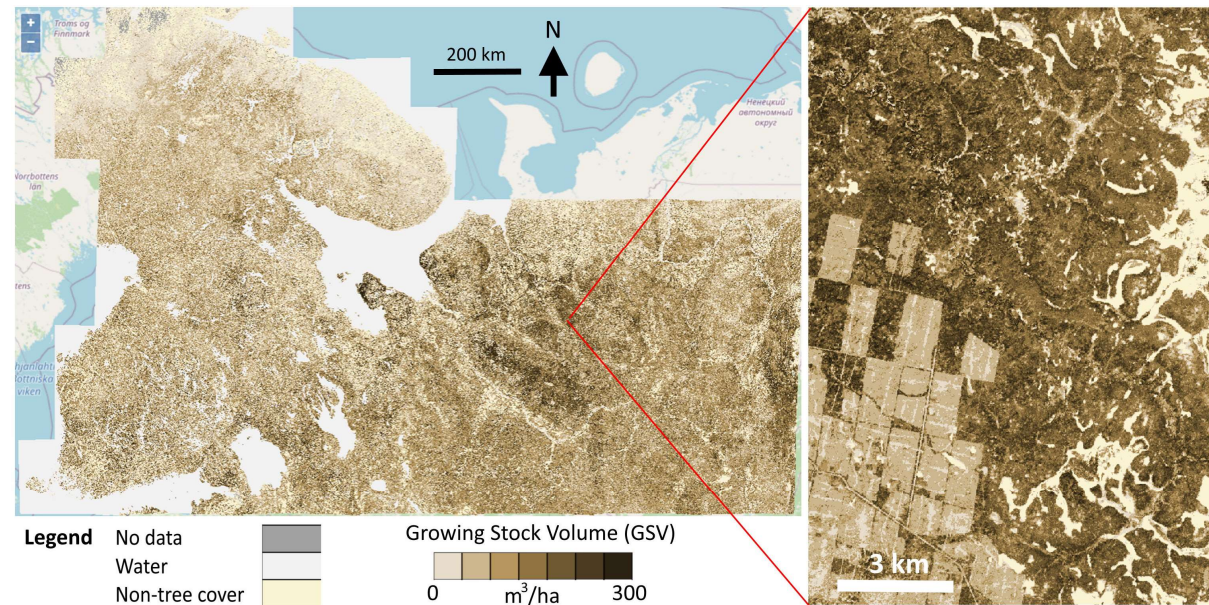
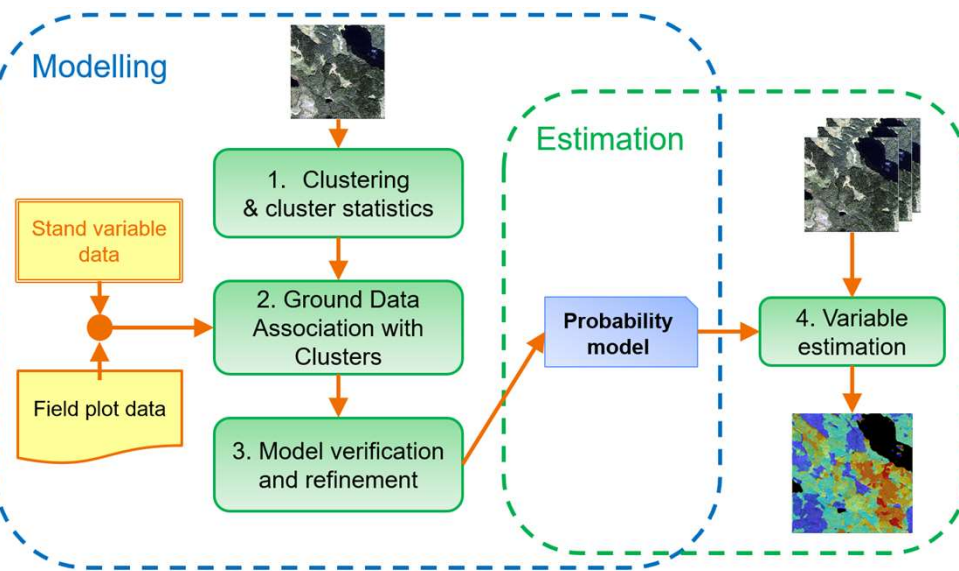
Output of S2-S2 Autochange classification.

Detail of 3.6 x 3.6 km<sup>2</sup>: (a) Sentinel-2A 2015, (b) Sentinel-2A 2016, (c) observations selected for clustering as white dots, (d) primary clusters from pre-change image sorted by increasing red band reflectance, (e) change type, (f) change magnitude.





# Probability forest variable estimation approach

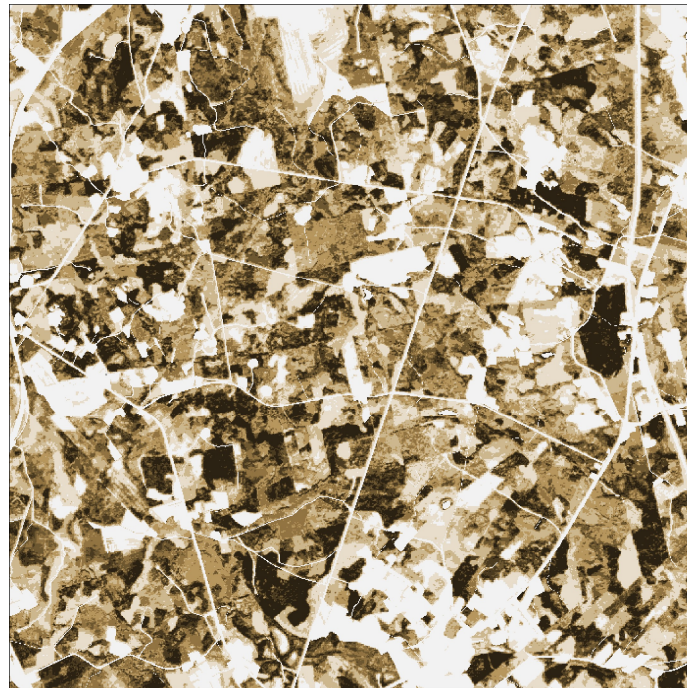
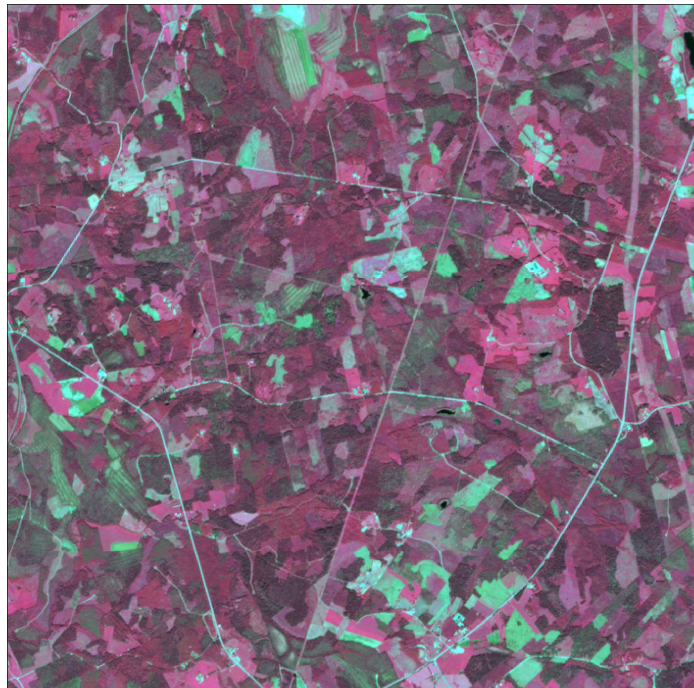


Häme et al. (2001) AVHRR-based forest proportion map of the Pan-European area. *Remote Sensing of Environment*, 77(1), 76-91.

Miettinen et al. (2021) Demonstration of large area forest volume and primary production estimation approach based on Sentinel-2 imagery and process based ecosystem modelling. *International Journal of Remote Sensing* 42: 9492-9514. doi: 10.1080/01431161.2021.1998715

# Probability + PREBAS ecosystem modelling

Results from Forest Flux:  
<https://www.forestflux.eu/>



False color composite of Sentinel-2 satellite data from June 2019 in Forest Flux pilot site in Eastern Finland. Size of the image area is 7 km by 7 km.

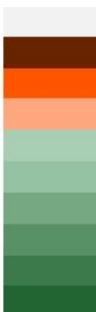
Growing stock volume estimated for the area of the image on the left using Sentinel-2 satellite data and sample plots from Finnish Forest Centre.

Non-forest  
 Open forest  
 $\leq 50 \text{ m}^3/\text{ha}$   
 $51-100 \text{ m}^3/\text{ha}$   
 $101-150 \text{ m}^3/\text{ha}$   
 $151-200 \text{ m}^3/\text{ha}$   
 $201-250 \text{ m}^3/\text{ha}$   
 $251-300 \text{ m}^3/\text{ha}$   
 $> 300 \text{ m}^3/\text{ha}$



Net ecosystem exchange 2019 computed using carbon flux models, satellite based forest variable estimates and weather data. Negative values (green) mean carbon assimilation and positive (red) carbon emission

Non-forest  
 $> 10 \text{ CO}_2\text{t}/\text{ha}/\text{a}$   
 $6 - 10 \text{ CO}_2\text{t}/\text{ha}/\text{a}$   
 $0 - 5 \text{ CO}_2\text{t}/\text{ha}/\text{a}$   
 $-5 - 0 \text{ CO}_2\text{t}/\text{ha}/\text{a}$   
 $-10 - -6 \text{ CO}_2\text{t}/\text{ha}/\text{a}$   
 $-15 - -11 \text{ CO}_2\text{t}/\text{ha}/\text{a}$   
 $-20 - -16 \text{ CO}_2\text{t}/\text{ha}/\text{a}$   
 $-25 - -21 \text{ CO}_2\text{t}/\text{ha}/\text{a}$   
 $< -25 \text{ CO}_2\text{t}/\text{ha}/\text{a}$



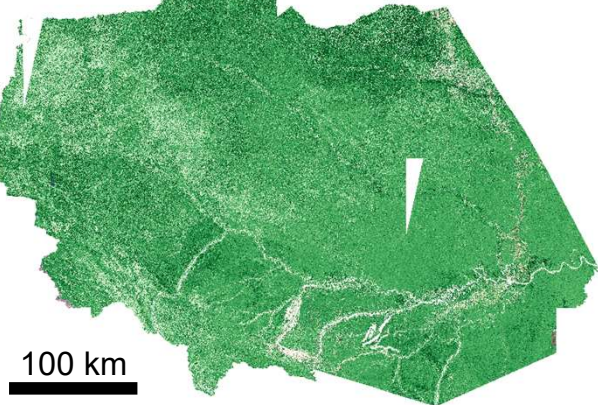
# Large scale demonstrations

Results from Forest Carbon Monitoring:  
<https://www.forestcarbonplatform.org/>

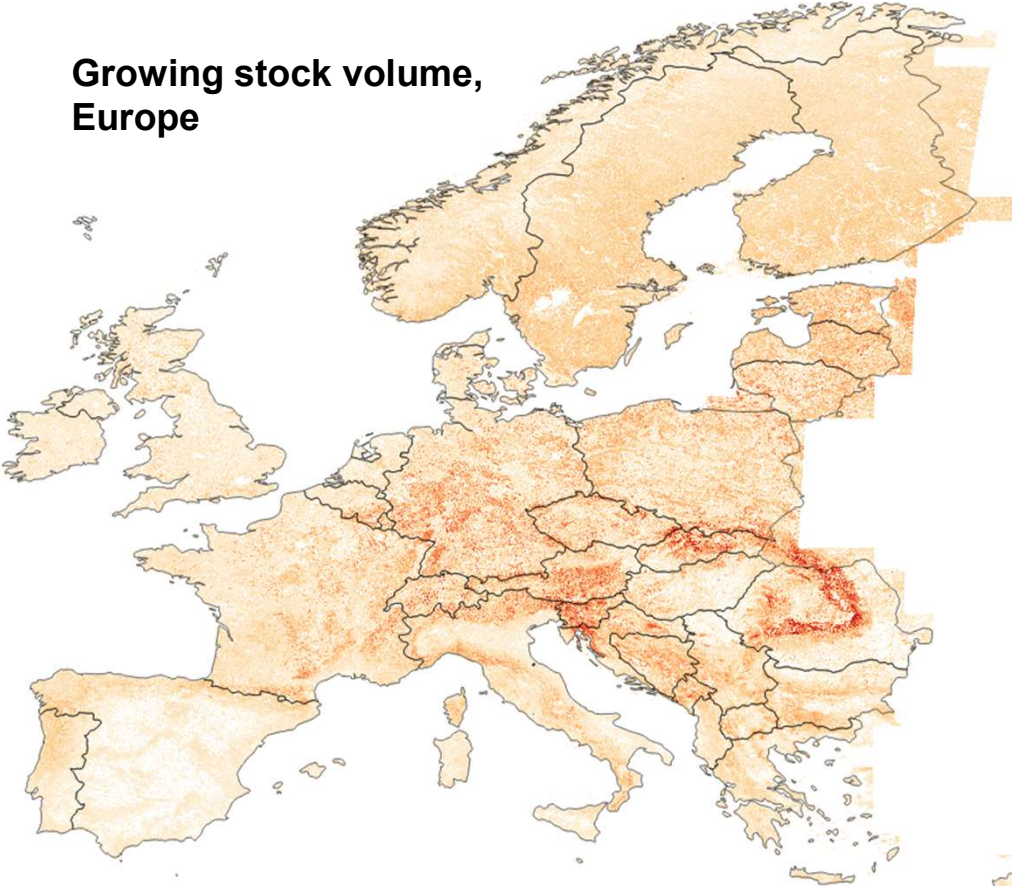
**Growing stock volume (GSV),  
Catalonia, Spain**



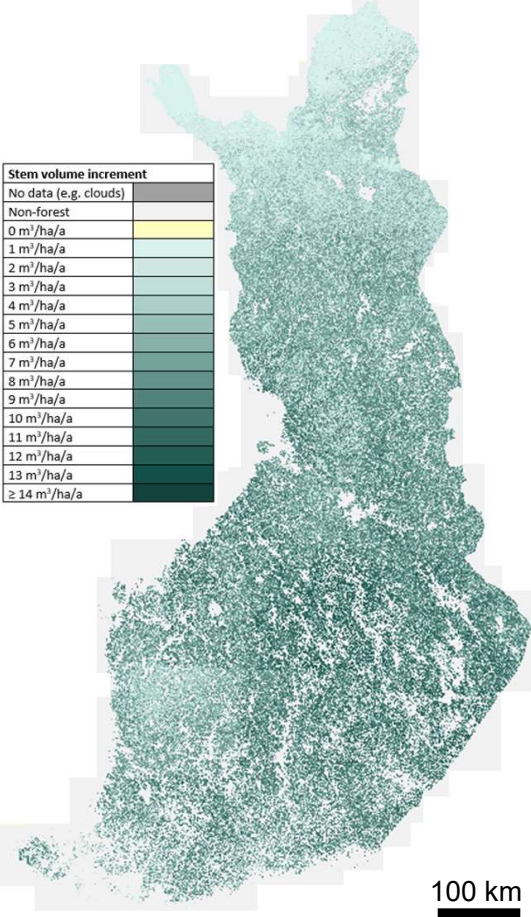
**Above ground biomass (AGB),  
Madre de Dios, Peru**



**Growing stock volume,  
Europe**



**Stem volume increment,  
Finland**



A dense forest of evergreen trees, likely spruce or fir, with a thick mist or fog rising from the ground, creating a soft, ethereal atmosphere. The trees are a vibrant green, and the mist is a pale, hazy white. The overall scene is serene and natural.

**Website for more  
information**

<https://f-tep.com/>



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# Keeping an Eye on Our Global Forests

Forestry TEP is an online solution for commercial, research and public sector users to improve forest management while ensuring sustainability and carbon sequestration.

[SUBSCRIBE](#)



A dense forest of evergreen trees, likely spruce or fir, with a thick mist or fog rising from the ground, creating a serene and atmospheric scene. The trees are a deep green color, and the mist is a light, hazy white. The overall mood is peaceful and natural.

**Thank you!**