

Message from the editor

By Stefanie Linser, Umweltbundesamt

Dear EUFODOS partners, users and interested audience, I am happy to present you the ninth EUFODOS Newsletter. As the last project year has started we are now able to present more detailed preliminary results which should raise your interest.

Development of Downstream Services based on HR CORE data within EUFODOS

By G. Ramminger, GAF AG, J. Ermert u. M. Dees, FeLIS, H. Sagischewski, ThuringenForst

GAF AG, a remote sensing company based in Munich, Germany together with the Department for Remote Sensing and Landscape Information System (FeLIS) of the University Freiburg in Germany, is developing satellite (SAR and optical data) based Downstream Services using HR Forest CORE Services (e.g. GIO) as a reference input for fast and reliable assessment of damaged forest areas caused by severe storm events (e.g. tornado), snow and insects.

As forests play a key role for the European economy and environment these damage events can cause a considerable financial problem in forestry. National and regional forest administrations need timely information about the damage extent and the areas concerned to support management planning, stabilizing wood market and support the planning of appropriate counter measures. The main bottlenecks today are timely data acquisition (e.g. after storm), data assessment and provision of results.

Based on the specific user requirements, coming from ThuringenForst, an Institution under Public Law owned by the Federal Thuringian State in Germany and key user within the FP7 EUFODOS project, potential Downstream Services have been established and tested in Thuringia within the framework of EUFODOS.

GMES Initial Operations (GIO) CORE Services

The land monitoring CORE services of the initiative for Global Monitoring of Environment and Security (GMES), now called Copernicus, has now entered into its Initial Operations (GIO) phase and will provide users with European wide information based on Earth Observation data on a regular manner. These datasets, derived by high resolution optical satellite data can serve as basic information to enhance further downstream services such as assessment of forest damages. As time is one of the most critical issues, it is of major importance to also include already existing data (Satellite data, EO based Forest Cover Maps, Forest GIS, DEMs,...), which can provide reliable information about the status before the storm event to improve "rapid

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mapping" and also facilitate "detailed mapping" of damages such as storm, snow and insects (Figure 1).

GMES Core Services

- High-resolution thematic land cover / land use layers (Tree Cover Density in %, Forest Types: Broad-leaved/Coniferous)
- Freely available pan-European satellite imagery* (Image 2006 - 2012, AWiFS, SPOT,...)

Additional Data

- Satellite imagery**, acquired after significant events (storm, snow damage, forest, forest management measures)
- Ancillary data (e.g. Regional DEM's, forest borders, inventory data)

Forest Downstream Services

- Locating and quantifying changes in forest cover
- Providing timely and accurate results

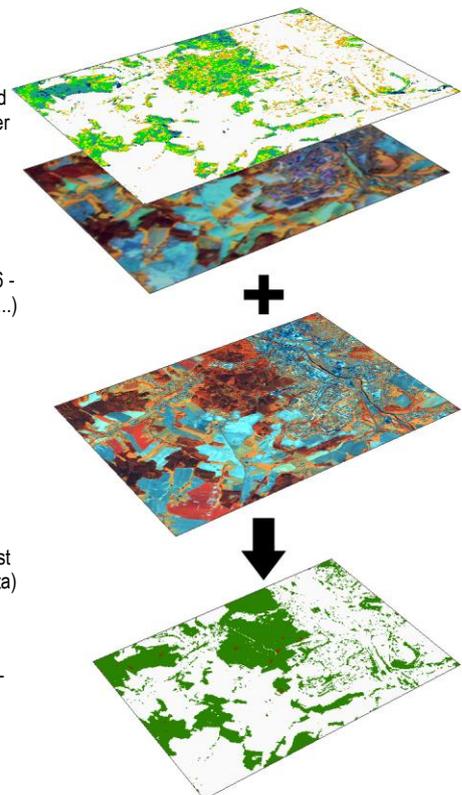
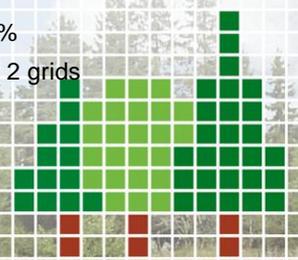


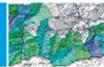
Figure 1: Use of CORE and additional data to provide Forest Downstream Services

From 2013/14 onwards, standardised high-resolution maps of Tree Cover Density [%] and Broadleaved / Coniferous Forest distribution will become freely available for all of Europe. GAF is implementing a major part of the mapping in Central Europe on behalf of the European Environment Agency (EEA). These datasets can be used as input for change detection methods to classify damaged forest areas.

The main specifications of the GIO High Resolution Forest Layers are:

- **Tree cover density** values from 1-100 %
- **Forest Type (20m x 20m)** consisting of 2 grids
 - 1) **Dominant leaf type.**





- Binary product: Coniferous and broadleaved
 - MMU of 0.5 ha and 10% tree cover density threshold applied
- 2) Support layer:** Map of trees under agricultural use and in urban context from CLC and imperviousness 2009
- Forest Type (100m x 100m)**
- Coniferous, broadleaved and mixed
 - Trees under agricultural use and urban context from additional support grid removed

Offered Downstream Services within EUFODOS:

Rush-Service - Storm Damage Assessment

The service is based on a very fast assessment of damaged forest areas caused by severe storm events. The main focus of the service is to get a fast overview of damaged forest areas (3 ha minimum mapping unit) within a short time period after the storm.

Non-Rush-Service Damage Assessment

The purpose of the service is the exact assessment (0.3 ha minimum mapping unit) of the damaged forest areas for the planning of reforestation activities and the estimation of possible damages in the near future through e.g. bark beetles.

Insect Infested Damage Assessment

The primary objective of the service is the assessment (trees or collective of trees) of insect infested forest stands.

Assessment of Changes due to Forest Operations

Main objective of the service is the assessment (0.3 ha minimum mapping unit) of changed forest areas (based on former HR Core products) due to Forest Operations.

Forest Downstream Service Benefits

The Forest Downstream Services (FDS) are tailor-made and based on specific user requirements. Timely and accurate results can be provided based on a cost-efficient implementation (building on freely available CORE services). The FDS can address Federal / regional forest authorities, big to medium-sized public and private forest owners, wood industry as well as insurance companies.

Downstream Service Example – Tornado in Gera (Thuringia), Germany

On 5th July 2012 a tornado caused damages in a forest near the City of Gera in Thuringia (Germany). Around 20 ha of an urban forest area covered with approx. 80% conifers and 20% deciduous trees was affected by this event. The event has been used to demonstrate the usability of the “Non-Rush- Damage Assessment Service”. The service uses EO and HR Forest CORE datasets as the basis for reference mapping (see Figure 2).

EO data (RapidEye, TerraSAR-X) after the Tornado has been acquired in order to facilitate damage assessment.

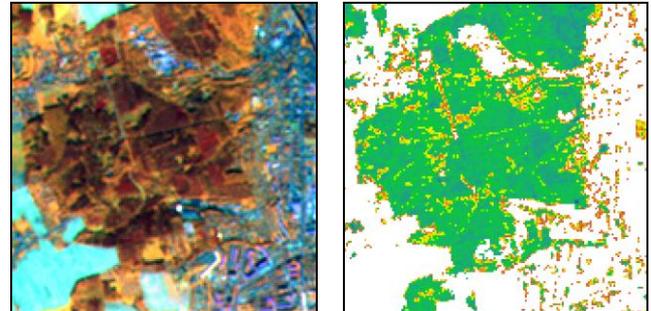


Figure 2: Left – Image 2009 data (IRS). Right – Derived Tree Cover Density Map. Both datasets were used as input for the reference mapping.

The overall workflow to derive potentially damaged areas includes a segmentation based change classification algorithm between CORE EO data and EO data after the Tornado. Additionally, the Tree Cover Density product has been used to further minimize potential classification errors. Figure 3 and Figure 4 provide an overview about the classified damaged forest areas.

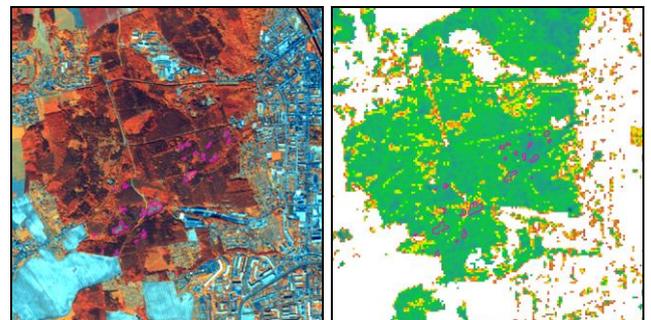


Figure 3: Left – RapidEye data after the Tornado and classified damaged areas (polygons in pink). Right – Overlay of the classified damaged areas over the Tree Cover Density Map before the storm.

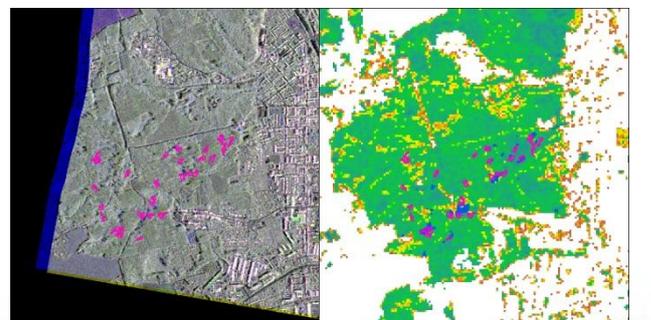


Figure 4: Left – TerraSAR-X HighRes mode layer composition 2009 DualPol HH/VV 2011 SinglePol HH and classified damaged areas (polygons in pink). Right – Overlay of the classified damaged areas over the Tree Cover Density Map before the storm.

More information is available at www.eufodos.info