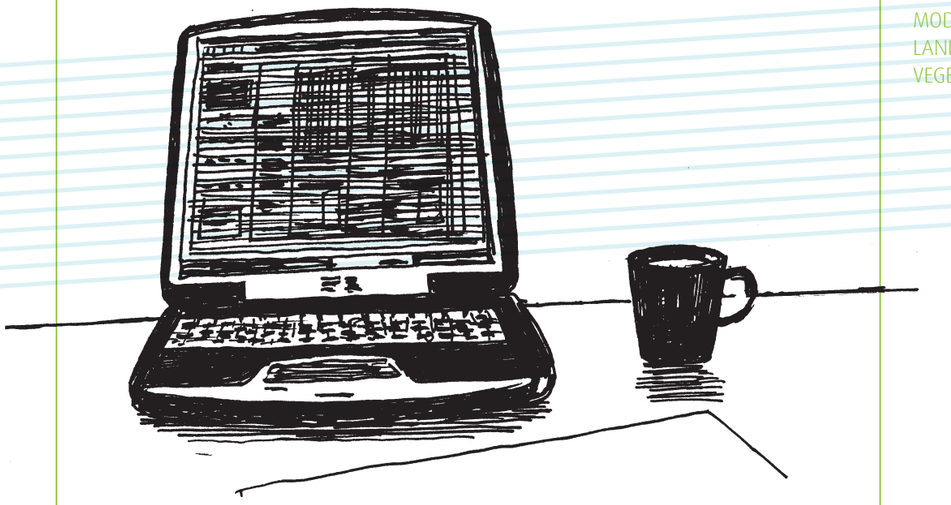
A better understanding of terrestrial ecosystems



Observation area
The entire planet,
Africa and Europe
Satellite imagery
NOAA-AVHRR
METEOSAT
MODIS
LANDSAT
VEGETATION

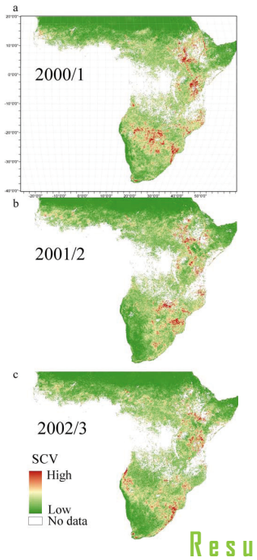
Caring for the planet's welfare

Human activities are increasingly influencing the dynamics of terrestrial ecosystems and causing dramatic changes in land cover and use. This has far-reaching consequences for biodiversity, climate and food production worldwide.
It was to better identify these problems with a view to promoting a healthier and more secure planet that GMES was set up. GMES stands for "Global Monitoring for Environment and Security" and is a joint initiative of ESA (European Space Agency) and the European Commission. It aims to collect continuous data on our changing planet for processing into information that can be readily used by policy bodies and other users. To this end, low resolution Earth observation satellites take daily readings of the entire Earth's surface, thereby providing an important source of information. However, to be sure that the information furnished is reliable, a better understanding of the processes at work in the terrestrial ecosystems is essential.

Mapping global changes in land cover

Three Belgian research organizations pooled their complementary expertise within a consortium to carry out an in-depth study of dynamic terrestrial ecosystems with the aid of Earth observation. This research aimed to help define products and services in the framework of GMES.
Low resolution datasets obtained by various sensors were combined to produce a unique high quality long-term time series [1985- 2005] of data with which to analyse trends in land use and land cover. By developing specific indexes it was possible to detect seasonal and annual land cover changes.
In addition, the risk of fire and the recovery potential of vegetation were assessed in the savannah regions of Southern Africa, these are factors with a major impact on CO_2 levels in the atmosphere. The ability to estimate the plant production of forests and major crops was also improved, partly by taking into account plant evaporation and limits in water availability. This quantitative approach is resulting in a better understanding of global vegetation dynamics and consequently in a more effective policy.

Change in vegetation across Africa as measured by SCV index (the absolute sum of the change vectors) between (a) 2000-2001, (b) 2001-2002, and (c) 2002-2003.



http://geofront.vgt.vito.be/geosuccess

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GEOSUCCESS

Up-to-date Earth observation products available via the Internet
The operational GEOSUCCESS Service Centre offers users a wide range of Earth observation products for the purposes of monitoring vegetation cover and parameters worldwide. The aim of the GEOSUCCESS Service Centre Demonstration project was to offer users an improved service by making updated images continuously available to permit almost real time monitoring of vegetation parameters.
This service is accompanied by a helpdesk that assists users by answering their specific questions. The GEOSUCCESS services are available via the **http://geofront.vgt.vito.be/geosuccess** website that also provides additional product information and on-screen viewing of available products for selection purposes. The GEOSUCCESS website was expanded to offer a wider range of products, extra selection parameters and new services.
GEOSUCCESS is a project implemented by GIM, Trasys and VITO.

Objective › › ›

The project aims to arrive at a better understanding of terrestrial ecosystems dynamics by:
- The development of remote sensing-based measurements of important parameters for vegetation status (NDVI, NEP, etc.).
- The analysis of the evolution of these parameters on 10-day, seasonal and annual time scales.
- Linking of these parameters to ecosystem processes as a scientific basis for developing products and operational services.

Methodology › › ›

- Improvement of the VITO-VTT NOAA-AVHRR processing chain, mainly in relation to image calibration and geometry. The chain was also extended to include modules to determine the following terrestrial surface variables: broadband albedo, vegetation cover fraction (VCF), land surface temperature (LST), evaporative fraction (EF), water deficit index (WDI), temperature difference vegetation index (TDVI), evapotranspiration (ET) and soil moisture content (SMC).
- Development of the PDRS (Prospect, Disord, Rahman 6S) radiative transfer model for SPOT VEGETATION specific bio-geophysical parameters.
- Extension of the C-Fix model for estimating vegetation productivity in water-limited situations.
- Creation of a processing chain for the global detection of changes in spectral, spatial and temporal characteristics of land cover.
- Development of new change detection indices: Sum of the absolute value of the change vector (SCV), Difference in integrated vegetation indices (DIV) and Seasonal shift index (difference between SCV and DIV).
- Evaluation of fire risk indices with the aid of binary logistics regression; test of selected chlorophyll-related indices on the basis of Fuel Moisture Content (FMC) in the savannah ecosystems of Southern Africa.
- Development of a regreening index for monitoring the regrowth of disturbed vegetation by comparing disturbed pixels with undisturbed reference areas with a comparable soil, vegetation and climate.

Result › › ›

- New bio-geophysical products for the SPOT VEGETATION instrument.
- Estimation of evapotranspiration and soil moisture content in Europe.
- A long-term time archive for Southern Africa allowing to assess changes in vegetation.
- New parameters for analysing the variability of vegetation dynamics.
- Quantification and analysis of annual changes in vegetation in Sub-Saharan Africa between 2000 and 2004.
- A better estimate of carbon fixing by plants.
- More precise estimate of fire risk in savannah regions and evaluation of vegetation regrowth after natural disasters.