Ionia

– A tool for Data User
   Element project outreach

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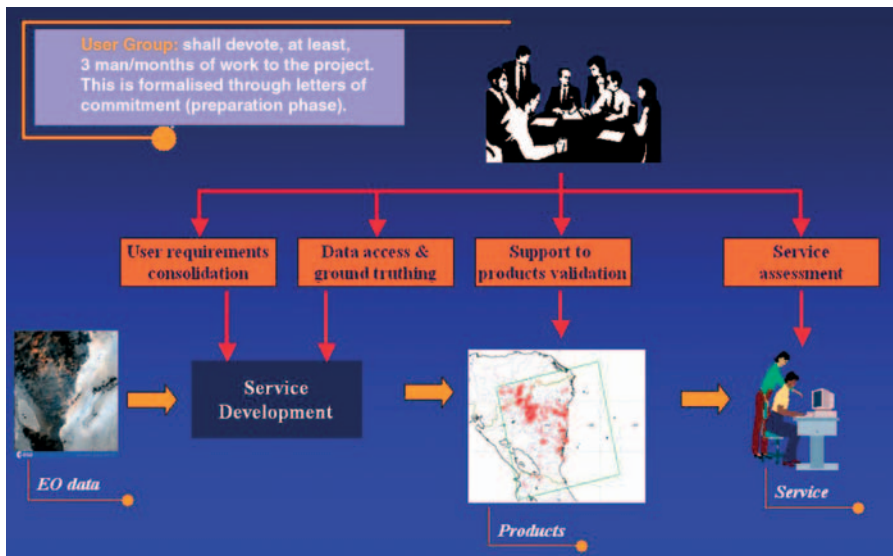ESA Directorate of Earth Observation
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Achieving the maximum outreach from ESA pilot projects funded through the Data User Element (DUE) of the Earth Observation Envelope Programme (EOEP) is one of the duties of those responsible for the programme's execution. The projects section of the Earth Observation Science and Applications Department at ESRIN is using numerous communication channels and opportunities for effective project dissemination prior to, during and after contract execution. Internet technologies are seen as the widest-reaching and most cost-effective means of showcasing the results of the DUE pilot projects for all interested communities; hence the Agency's decision to develop the Ionia website (http://www.esa.int/due/ionia) as an Internet gateway for fast and easy access to demonstration products developed within the DUE pilot projects.

Introduction

The EOEP Data User Element

The Data User Element (DUE) is a programmatic component of the Earth Observation Envelope Programme (EOEP), an ESA Optional Programme currently subscribed to by 14 ESA Member States. Its function is to increase and strengthen user communities involved in Earth Observation (EO) applications by carrying out projects that develop and demonstrate user-driven EO-based services. The DUE largely follows the objectives of its predecessor, the Data User Programme (DUP), which ran from 1996 to 2003 and was subscribed to by just four Member States (B, NL, CH and I), with a total of 50 projects funded and an overall budget of 14 MEuro. As of December 2005, there are 27 on-going DUE projects, with a total value of 13.5 MEuro.

The three main DUE programme objectives are to:
– create an environment allowing for the development of user communities for both institutional and commercial applications;
– support European industry in the development and demonstration of information products, principally derived from current and future ESA missions;
– support European industry in establishing useful and cost-effective services.

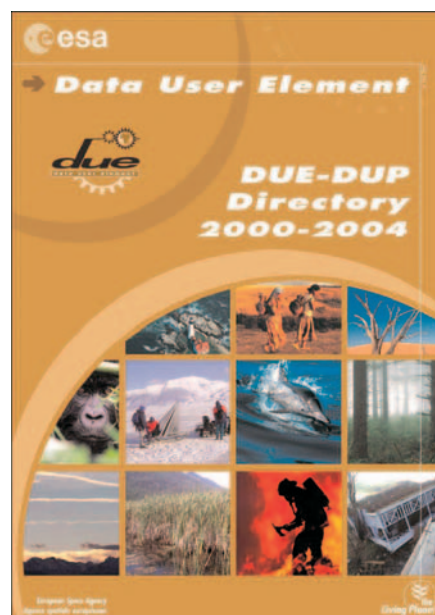*User-driven, a key feature of the EOEP Data User Element*
Top priority for the DUE is on the user side. To attract the interest of end-user organisations from widespread and fragmented user communities, the Agency is working in close partnership with overarching user organisations that have a strong influence on their communities. The definition, implementation, integration, validation and qualification of the products and services developed under the DUP/DUE are carried out in close collaboration with these user organisations, and in agreement with their standards and practices. Such a user partnership is perceived by the Agency as the best manner in which to reach out to the large community of user organisations that are directly concerned by the systems

and products developed and demonstrated under the DUP/DUE projects.

By the end of 2005, more than 150 user organisations had participated in DUP/DUE demonstration projects, conducted in more than 50 countries worldwide.

Exploiting all communication channels
Since the birth of the Data User Programme in early 1996, ESA has continuously explored all communication mechanisms and has put in place an effective framework within which all opportunities for project outreach are fully exploited. The overall objective of these

The DUE-DUP 2000-2004 directory, an exhaustive report on five years of ESA working with user communities

communication activities is to increase public awareness of the benefits of Earth Observation from Space, in the broadest sense possible. The audiences are primarily the end-user communities (i.e. policy and decision makers, as well as technical staff), but also include other beneficiaries and sponsors of EO technology. This includes: the EO value-adding industry as it tries to gain a lasting foothold in the highly competitive market for remote-sensing products; research laboratories and universities; the downstream industrial sector (i.e. those service companies currently offering similar types of services with traditional technologies); and last but not least the governments of the ESA Member States.

During the preparation and execution of the DUP/DUE pilot projects, but also following contract completion, the Agency is very active in exploiting all communication channels for effective project dissemination. This includes organising workshops in collaboration with participating user organisations as a first step; organising regular meetings with overarching user organisations; publication of papers in scientific and user journals; participation in scientific and user symposia; distribution of brochures, handbooks, flyers, posters, publicity CD-ROMs and DVDs; distribution of project newsletters; publishing of a DUP/DUE Directory; organisation of user workshops; organisation of side events at international conferences; publication of web stories on the ESA Portal (more than 30 news stories have been published so far on DUP/DUE projects); publication of articles in newspapers and magazines; and maintenance of a dedicated Web Portal. All of these communications channels are necessary elements in establishing strong user communities around EO satellite applications.

The DUE website, an indispensable tool for project outreach

Developing an outreach mechanism centred on Internet services

The DUE *web portal* (http://www.esa.int/due), which has been active for more than three years, is a fundamental communications asset for DUE project outreach, and in particular for enhancing user and industry awareness of the programme's achievements.

The website provides inventories and descriptions of all pilot projects financed by the DUP/DUE programme (with final reports available online), as well as of all participating companies and user organisations (with contact details). It is an essential gateway for project outreach, but more can be done using state-of-the-art Internet applications. An extension of the DUE Web Portal, called the *Ionia website,* was therefore recently implemented, allowing online browsing of the demonstration products and providing access to the most-representative results.

Ionia as a Gateway to EO-based Geospatial Products

The Ionia website is named after the ancient Greek school of philosophy that explained all natural phenomena as the outcome of four basic elements: fire, water, air and earth. These four elements, which are now observed from spaceborne instruments and constitute the main fields of interest for Earth Observation, have been used as a classification system for the Ionia products, which can also be searched alphabetically and geographically. The website provides online access to a growing number of EO-based products generated under ESA DUP/DUE-funded projects, using sensors from a variety of satellites, including third-party missions. In addition, some products are generated through ESA internal projects. This is the case in particular for the World Fire Atlas (WFA) products, which consist of monthly global inventories of 'hot spots' produced using the ATSR instrument series onboard

Ionia homepage, a gateway to EO demonstration products
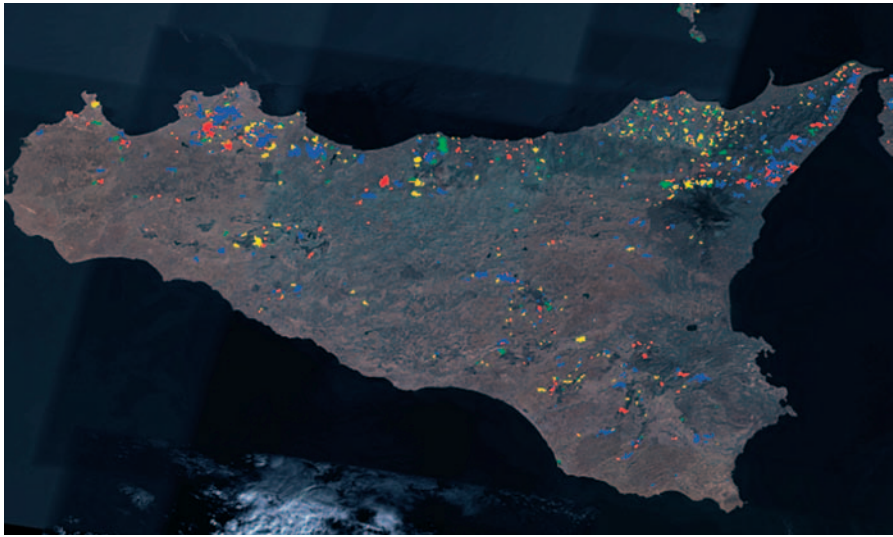
### Ionia: a varied selection of demonstration products

The products available on Ionia cover a large variety of thematic applications and have very different geographical and temporal scales. Some of the projects regularly generate large-scale products over a long time period, such as the CLIMSCAT soil-moisture monitoring project, which generates soil water index measurements across the globe on a monthly basis for 10 years. The CLIMSCAT products can be visualised via the Ionia Web Map Server, and tailored data products can be directly requested from IPF Vienna, one of the project partners, which hosts the entire product database (http://www.ipf.tuwien.ac.at/radar/ers-scat). The MEDSPIRATION sea-surface-temperature monitoring project is another good example, generating high-

ESA's ERS-2 and Envisat satellites. 14 pilot projects were listed on Ionia as of November 2005.

The Ionia website has existed since 1995, but was initially mainly a repository for internal ESA products. It is only since 2004 that the number of products listed has increased dramatically, with the inclusion of the products generated within the DUP and DUE projects. The products listed can either be browsed using a dedicated Internet application (Web Map Server technology), or downloaded directly. Associated documentation and links to scientific papers that have employed the products are also available for consultation.

WMS client application developed for Ionia. Layers selected here include political borders from the Cubewerx server, a MERIS global mosaic in the background, and the ATSR hot spots recorded during the month of January 2004 (ATSR World Fire Atlas)
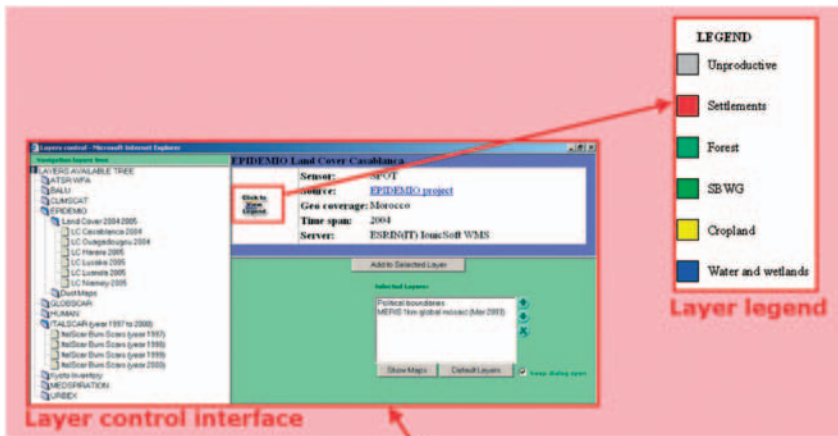
Ionia Web Map Server functionalities. The layers of interest are selected via a layer control interface. The range of dates displayed is also adjusted via a dedicated pop-up window
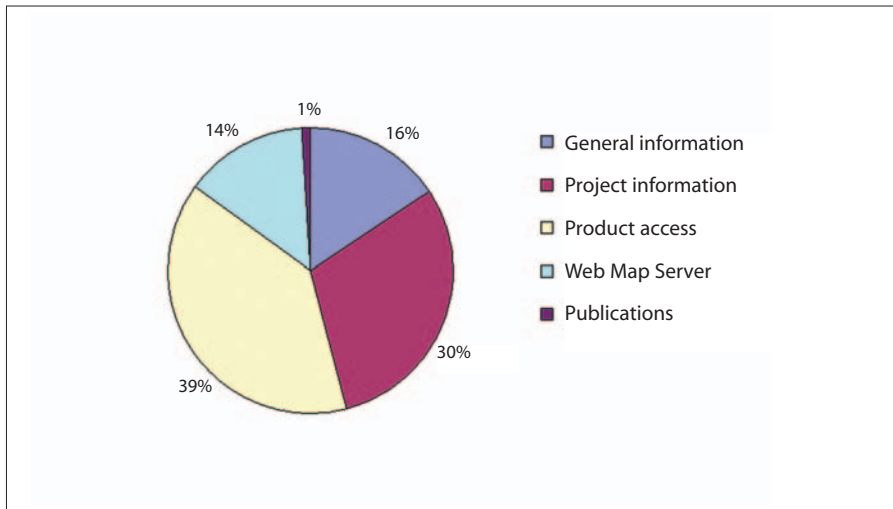
resolution sea-surface-temperature maps of the Mediterranean with 2 km resolution, on a daily basis for the period 2005-2007. MEDSPIRATION products are available via FTP from the project website (http://www.medspiration.org) and from the Ionia website, an average of 24 hours after acquisition. Visualisation via the Ionia Web Map Server Client is also available in near-real-time. The outputs for these types of projects are generated using a set of satellite data combined both in time and space in order to cover the area and period of interest.
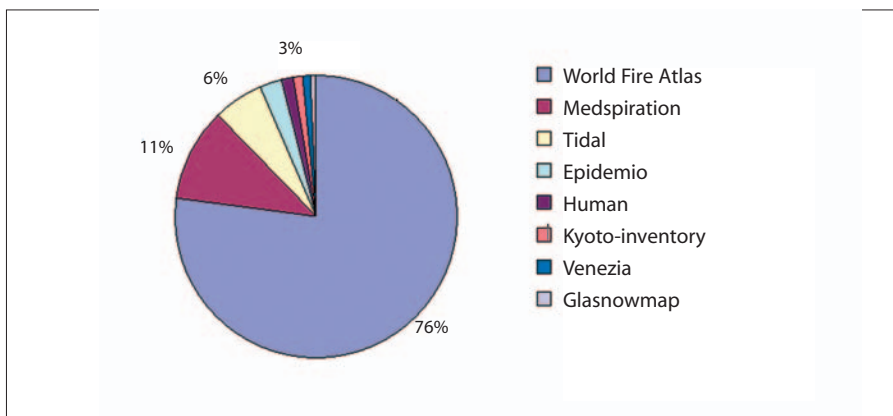
By contrast, other projects produce unique outputs over more limited geographical areas, at national or sub-national scale. This is the case for the URBEX products (urban-expansion monitoring) for instance, which consist of urbanization maps of Italy from 1995 to
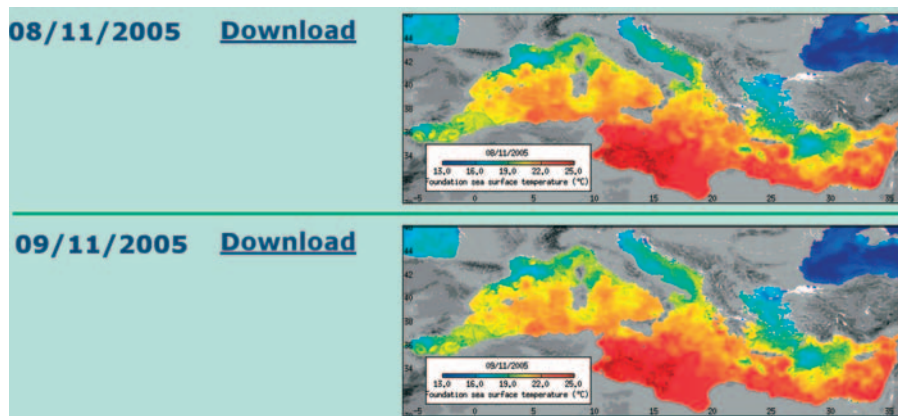
Near-real-time access from Ionia to the daily sea-surface-temperature products of the ESA DUE MEDSPIRATION project. In addition to the technical data files (netcdf format), quick-looks are also available for downloading

Types of requests (total 40 044) made to the Ionia server. General information includes Frequently Asked Questions, Terms and Conditions, etc.

Requests (total 15 755) made to the Ionia Server for access to products in the period August-November 2005, classified by pilot project

and arranged in layers. Using WMS and WFS technologies extends the distribution of spatial data and analysis to a wider audience, since it becomes unnecessary for users to purchase GIS software to manipulate the data and perform analyses – all of which is accomplished via an Internet browser interface.

In Ionia's case, a dedicated WMS configuration has been developed for each pilot project (thematic layers of interest, pertinent geographical scale and time span). The Web Map Server follows the recommendations of the internationally recognised Open Geospatial Consortium (OGC), a voluntary organisation encouraging the development and implementation of standards for geospatial content and services, GIS data processing and exchange. In practice, this means that layers from other servers can be overlaid easily with the Ionia products. Conversely, external users can link from their own WMS system into the Ionia product layers.

In a similar way, products from different DUP/DUE pilot projects can also be visualised simultaneously on the WMS client. This facilitates in particular inter-comparison and correlation analysis of the results whenever appropriate.

Ionia: a fast and easy way to access DUP/DUE products

Demonstration products from several projects are available for downloading via the Ionia website. In most cases, access is provided directly from the website, as with the EPIDEMIO project. Access can also be provided through the website of the contractor responsible for the project's execution, when online product delivery forms part of the contractor's duties. This is the case, for example, for the GLOBSCAR products (Global Burned Forest Mapping), which are available at: http://www.geosuccess.net.

In the case of the TIDAL service (tidal information on water levels and currents for offshore users), only one set of demonstration products is available on Ionia, together with a link to the online subscription service hosted by ARGOSS, the company in charge of the project (http://www.tidal-info.com). Similarly, in

2000, plus one evolution map between 1995 and 2000. Another such project is ITALSCAR (burn-scar mapping), which produced annual inventory maps of burned areas of Italy at 1 ha resolution for four consecutive years (1997 to 2000). The products were generated from 136 Landsat image pairs covering Italian territory at the beginning and the end of each summer season.

Going further down in geographic scale, some projects concern local areas within one or more countries, as in the case of the HUMAN service (high-resolution customised local maps for humanitarian-aid agencies, involving 11 different countries) or the EPIDEMIO project (EO-based environmental information to support

epidemiologists in several African countries). The output products for those projects are typically the size of one satellite image over each of the areas of interest.

Ionia: a user-friendly tool for visualising DUP/DUE products

The Ionia website uses the Web Map Server (WMS) and Web Feature Server (WFS) technologies. WMS is an Internet application used to visualise and generate maps drawn in a standard image format (PNG, JPEG, etc), based on a standard set of input parameters. It allows one to explore geographical data from many sources, including geo-spatial data derived from EO satellites. A number of geographic data sources can be displayed

the case of the HUMAN project (Humanitarian Disaster Mapping Service), demonstration products are available for downloading on Ionia, while the overall mapping service developed within the HUMAN project is available online to subscribing customers at: http://human.keyobs.be/human.

Ionia access statistics

Since August 2005, there has been a monitoring system in place to generate a number of indicators concerning how the Ionia website is being used. According to the figures provided by this first analysis, more than 50% of the requests concern product visualisation and downloading, reflecting a strong interest in Ionia website assets.

A significant portion of the requests for Ionia products concern 'World Fire Atlas' files, which have been available online for several years now (but via a different environment) and have an established user community. It is estimated that, on average,

500 Fire Atlas products are retrieved each month from the Ionia website. Another indicator of the high interest in the Atlas is that four of the five top search keywords used to access the website are associated with those products: ATSR, world, fire and atlas. However, more recent products have also stimulated strong interest among the visitors: the MEDSPIRATION sea-surface-temperature files for example, which have been available in near-real-time (1 day) on Ionia since mid-September 2005, have already attracted more than 300 requests for products.

Looking at the geographical distribution of the visitors to the website, as of November 2005 requests for access had been made from more than 55 different countries, the core of the identifiable requests being from Europe, followed by North America and Asia. The visualisation of the products generated by DUP/DUE projects is therefore already recognised as a significant asset of the Ionia website. The ultimate objective is to load it with

demonstration products from all DUP/DUE pilot projects with visualisation and download access. Future improvements will be to explore new means of geospatial data visualisation, in particular the Google Earth visualisation and navigation tool, or NASA's World Wind, the most recent web-based applications that enable the viewing of geographic information over 3-D models of the Earth.