DESCW: PC Software Supporting Remote Sensing Data

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What is DESCW?
DESCW (Display Earth remote sensing Swath Coverage for Windows) is a software tool for personal computers developed by Eurimage in collaboration with ESA/ESRIN in 1992 and improved over time in response to user requirements, comments and suggestions.

DESCW software performs multi-mission inventory searches for the major ESA-supported remote-sensing missions (ERS-1, ERS-2, JERS-1, Landsat and Envisat) by displaying the satellites’ coverage over an Earth map. It features ‘Quick Looks’ for the Landsat-5 TM, ERS SAR and JERS-1 VNIR missions and prepares orders for selected scenes.

In version 4.0, special functions were added in order to simplify the selection of image pairs suitable for interferometric applications.

In the latest version of the software (v. 4.1), ‘Interferometric Pairs Selection’ is assisted by a new feature, ‘Tandem Pairs Selection’, specifically tuned for speedy identification of ERS-1 and ERS-2 scenes acquired as tandem pairs. With this feature, it is also possible to identify those pairs best suited for specific interferometric applications.

Weekly updates to inventory files ensure the provision of scene locations, whether ‘available’ (already acquired), ‘planned’ (future passes) or ‘visible’ (technically acquirable).

The most important features of DESCW are a user-friendly graphical interface, a powerful multi-area search mechanism and mission-specific filtering tools (Fig. 1).

Background
The first version (1.xx), called DESC (Display ERS-1 SAR Coverage), was limited to ERS-1 satellite data and ran under DOS (Figure 2 shows the Data Selection screen of this early version). The software followed the evolution of the ERS-1 Mission Phases and was complemented by a separate package to view the ERS-1 ‘Quick Looks’. Related manuals were printed in three issues until September 1993.

In version 2.00, the software progressed into DESCW (Display Earth remote sensing Swath Coverage for Windows), a multi-mission tool supporting ERS-1, ERS-2, JERS-1 and Landsat-5 (also with Quick Look display), redesigned to run under MS Windows 3.1x. The first release, issued in March 1995, was enhanced over time with many new features, the most important of which were the addition of a layered and tiled map in three levels of resolution, and the polar projection view (June 1996).

In May 1997 version 3.00, running in both the Windows 3.1x and Windows ‘95 environments, was completed and included:

- a new combined Mission/Filter window
- an improved Frame List window (with sort, selection and undelete)
- geographic/graphic definitions of Landsat TM full-, quarter- and mini- floating scenes
- an improved Quick Look viewer for Landsat TM and JERS-1 VNIR
- area definitions by town or country name
- a new, simplified installation procedure
- the possibility to select Scene List columns for printing or saving in a file.

In February 1998, version 4.00 was released (the related manual was printed in May 1998) with:

- binary inventory files for ERS-1 and ERS-2 providing additional details per frame on acquisition stations, Processing and Archiving Facilities (PAFs) and quality
- the possibility to select interferometric pairs through a graphical and user-friendly interface
- the display of main Envisat swaths (for the ASAR, AATSR and MERIS instruments)
- multi-area support (single search performed
Figure 1. DESCW windows – multi-area search

Figure 2. DESC data selection screen (1993 version)

Figure 3. Navigation Map window

against a complex area made up of a collection of polygons, as for Italy or France).

Also, the distribution format of the software and the related inventory files moved from diskettes, to CD-ROM, to online download and, finally, to online push (April 1998).

What's on the DESCW screen

The major elements of the DESCW screen are the Menus, the Toolbar, the Status Bar and the Interaction Windows.

At the top of the screen, the Menu bar is displayed. Just below it, the Toolbar allows quick access to commonly used commands.

At the bottom of the DESCW screen, the Status bar provides such information as:

- current active process
- search area name
- number of scenes retrieved by the most recent query
- geographical coordinates (in degrees and minutes) of the mouse position in the Zoom window.

DESCW provides a number of Interaction windows to the user. The three major ones are the Navigation Map window, the Zoom window and the Scene List window.
The Navigation Map window (Fig. 3) is a small map of the Earth from where it is possible to choose an area of interest – the Focus Rectangle – to be displayed in the Zoom Window. By moving the Focus Rectangle, the area enlarged in the Zoom Window moves accordingly. Conversely, by changing the area in the Zoom window (through the scroll bars), the Focus Rectangle moves.

The Zoom window (Fig. 4) is displayed either by selecting the Zoom window option on the View menu or by clicking, or dragging, on the Navigation Map window. It expands the area contained in the Focus Rectangle from the Navigation Map window, at a level of detail determined by the Map Layers option. It is possible to zoom in and out using the Zoom options on the View menu. Search area polygons can be drawn in this window. When a search has been completed, frames outlining each of the scenes found are displayed in the window.

When a search has been completed, this window (Fig. 5) will list the scenes found. Moving the cursor over a column in the window will highlight all scenes with the same value in that column. For example, if the cursor is over a number in the Track column, DESCW will highlight all scenes with the same Track Number; the same scenes will also be highlighted in the Zoom window.

Full details about other windows and related functions can be found in the manual and the online help.

How it Works

A high-level view of the DESCW structure and possible sequence of operations is shown in Figure 6. After having broadly selected the region of interest through the Navigation Map window, it is possible to graphically draw the polygon detailing the area of interest. The next step is to identify the missions and date ranges of interest, as well as other specific filtering parameters (Fig. 7). The search can now start using the data of the Inventory files (updated weekly from the Internet). The search result is stored in the Working Set and displayed on the Scene List window. Unwanted scenes can be removed from the Working Set by selecting them and clicking with the right mouse button (all selected scenes will be removed from the list and the Zoom Window).

Other functions can be activated for the selected scenes. For example, double-clicking on the Status column of a scene will display its Quick Look (if generated and the related CD-ROM is available), permitting also limited image manipulation. Additional support functions (e.g. show full coverage, show sub-satellite track, show current satellite position show scene details, compute shifted scenes, change map layers/colours, save/load areas, parameters or user requests, etc.) can be activated through other specific interaction windows.
For this function, a new set of ERS-1 and ERS-2 inventory files were generated, separating the scene pairs into a number of different files according to the difference in the perpendicular baseline values as follows:
- below 30 m
- 30 – 100 m
- 100 – 200 m
- 200 – 400 m
- 400 – 600 m
- 600 – 1000 m
- above 1000 m.

This is a preliminary list; the final set of ranges will be selected after the completion of more tests.

Practical experience indicates that certain ranges of perpendicular baseline values are preferred for different application types. As a very broad guideline for DEM generation and land-cover mapping, values between 50 to 400 m are normally used, while for movement detection a value below 50 m is suggested.

ERS-1 & 2 Tandem Pairs Selection
In version 4.1, the Interferometric Pairs Selection is assisted by a new function, which is specifically setup for fast identification of ERS-1 and ERS-2 scenes acquired as tandem pairs (i.e. acquired at one-day interval), with perpendicular baseline values falling within a pre-defined range and, therefore, best suited for specific interferometric applications (Fig. 8).
However, this does not preclude good results with baseline values outside these ranges.

It is necessary to select all inventory files for ERS-1 and ERS-2 containing scenes with perpendicular baseline value differences falling in the required range. For example, should the required baseline be within 150 and 250 m, two pairs of files will have to be selected. After this initial selection, all the other DESCW features can be applied as usual, including the Interferometric Pairs Selection.

With this new option, it is possible to use the baseline range as a filter for the different interferometric applications and, therefore, the screen displays only the couples with a one-day interval between the two acquisitions.

**Other new features**

Version 4.1 includes other new features or enhancements in addition to the above described ERS-1 and ERS-2 Tandem Mission Support. The main ones are:

- **Multiple filters**: it is now possible to define more than one filter set for each mission and include more than one time range, which copes, for example, with seasonal searches over the same area. Each filter set appears as a separate line in the ‘Selected Missions’ list and can be handled separately.
- **Increased performances**: the query time (search and frames display) is greatly reduced, with a more than an order of magnitude improvement. This was achieved by multi-threading, permitting full exploitation of the CPU, and optimising memory usage.
- **Current satellite location**: it is possible to see in real time where the sub-track of the selected satellite(s) is currently located. The satellite icon moves with time. This representation is generated from nominal orbital parameters and is linked to current computer date and time settings.
- **Simplified maintenance**: the software has been fully restructured, permitting faster reaction to new requirements in the future.

**Installation and updates**

The DESCW software and related inventory files (updated weekly) are available, for free installation and updates offline (see ‘Support’ section) or online from the ESA/ESRIN server.

**FTP access**

- **Address**: earthnet.esrin.esa.it
- **Username**: anonymous
- **Password**: (your e-mail address)
- **Directory**: /FTP/software/descw

**World Wide Web access**

- **http://earthnet.esrin.esa.it**

Follow ‘Software Gallery’, then ‘Software to Obtain Satellite Earth Coverage’.

**BackWeb**

BackWeb is a client-server application that sends data from a server, via the Internet, to all clients who have subscribed to a specific ‘channel’. It applies data-push technology using idle online time and check-point/restart (after a break the transmission resumes from the point of interruption). The BackWeb client is free of charge and can be downloaded from:

- **http://www.backweb.com**

Once the BackWeb client is installed, subscribe to the DESCW channel from:

- **http://earth1.esrin.esa.it/backweb**

In order to complete the installation or updates, select the required options (Fig. 9), and follow the instructions provided by the installation package.

**Support**

The DESCW software and manual are also available offline. For a free copy please contact:

**ENVISAT & ERS Help Desk**

ESA/ESRIN

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For more information, queries and suggestions about DESCW contact:

**DESCW Technical Support**

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Figure 9. DESCW setup