



**NERC EARTH OBSERVATION DATA CENTRE (NEODC)
ANNUAL REPORT 2005/06**

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1 OVERVIEW

1.1 NEODC Rationale

The role of the NEODC is, in line with NERC Data Policy, to ensure the responsible stewardship and distribution Earth Observation (EO) data acquired and generated by NERC, to give guidance on the availability and use of EO data and to coordinate the acquisition of new data resources. Such services are to be carried out in an efficient and cost-effective manner in response to requests from its customers in the environmental science community.

The NEODC collaborates with relevant EO-related initiatives, both in the UK and worldwide, and strives to improve the service it can offer in connecting environmental scientists with the resources they need to carry out NERC's scientific objectives. NEODC's mission is described in detail in Appendix 1.

1.2 Highlights of the Year

1.2.1 (A)ATSR Archive

The NEODC project to create a common-format archive of (A)ATSR products started in 2005. The archive forms a unique time-series of observations spanning fifteen years, invaluable to current science quantifying the effect of climate change via observations of sea-surface temperature. This project, a joint venture between DEFRA, NERC, CCLRC and ESA is significantly raising the profile of NEODC and brings huge benefit to NERC, securing data access for all NERC users at minimal cost to NERC. Demand for this dataset is already high, with positive feedback from users regarding the ease of access. A major Knowledge Transfer project is about to start with the aim of reprocessing the entire archive for the climate record.

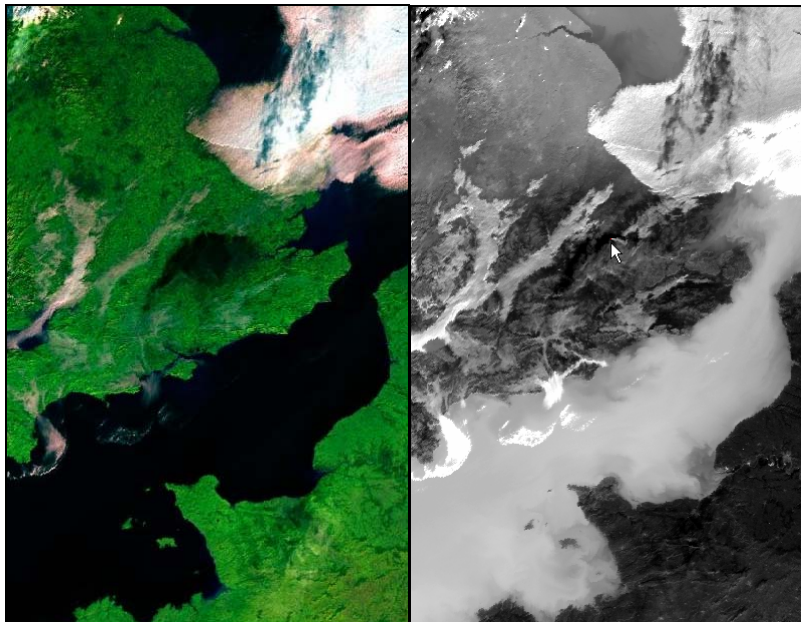
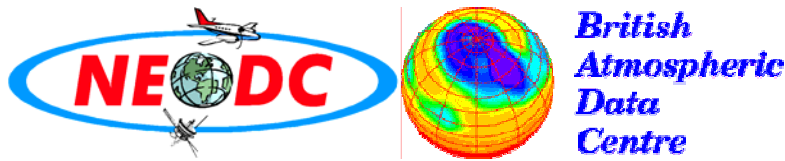


Figure 1 Visible (left) and thermal (right) composite images of the Buncefield oil depot fire of 11/12/2006. The visible image shows the extent of the smoke plume across much of southeast England, while the thermal image shows a narrow, southeast-trending thermal plume emerging from the fire, indicated by the white arrow. The entire set of such data products from the AATSR instrument is now available from the NEODC online.

1.2.2 CEDAR



The CEDAR (Centre for Environmental Data Archival and Research) programme was created in 2005, to amalgamate the data curation activities of the British Atmospheric Data Centre (BADC) and the NEODC. The Data Centres now work efficiently together to provide services to the NERC science community, while retaining their individual identities and accountability to their respective communities and funding lines within NERC.

1.2.3 Aerial photography scanning project

The NEODC made use of a one-off funding opportunity provided from the NERC Data Coordination Budget to initiate a project to digitise the unique and valuable collection of NERC ARSF airborne photography spanning 20 years.



Figure 2 Examples of ARSF aerial photographs

1.2.4 ARSF Archive

The collection of ARSF data (aerial photographs, CASI, ATM and LiDAR) is now searchable via the NEODC website and the locations can be viewed on an interactive map, enabling users to view the spatial relationships between the collections for the first time, and providing detailed metadata about the data products.

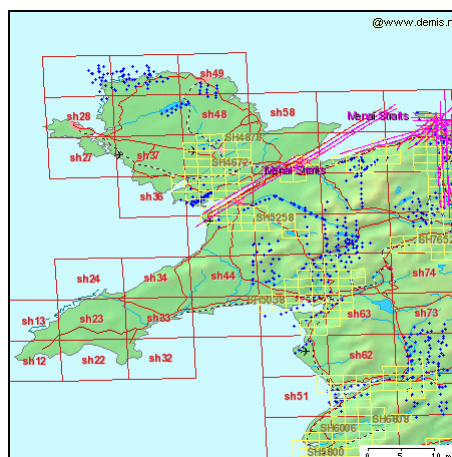


Figure 3 New interactive map of NEODC and related airborne datasets showing NEXMap Britain tiles (red boxes), Environment Agency LiDAR data (yellow boxes), ATM & CASI (red/pink lines), and aerial photography (blue dots).

1.2.5 SMA

NEODC received a favourable report in the NERC EO Science and Management Audit Review and a recommendation was made for longer-term funding.



1.2.6 Increasing support of NERC science community

The list of research project titles in Appendix 1 gives an example of the wide range of high-quality science that has been supported by the services and data provided by the NEODC over the past year. The list includes only projects using data at NEODC, in addition to these a large number of enquiries (95 in total April 2005-March 2006) for information or advice are handled without the provision of data. It is clear that the NEODC is reaching a wide section of the science community and is supporting environmental science both in the UK and internationally, which is of credit to NERC as an organisation.

1.3 Progress on Deliverables / Key Milestones

1.3.1 Deliverables

The following comments relate to the deliverables defined in the NEODC Technical Annex for 2005/06 which forms part of the NERC/CCLRC SLA for that year.

1.3.1.1 Delivery of EO Data Services

Delivery of data to customers has been improved significantly over the year with 18 datasets now available via NEODC. Approximately 180 user enquiries were logged this year, three times as many as in the previous year. The number of registered users also increased significantly (from 84 to 287), as did the volume of data downloads (e.g. users downloaded 4 Tb of data in the first quarter of 2006, compared to 7Gb in the second quarter of 2005). Detailed usage statistics are shown in section 2.2.1.

1.3.1.2 NEODC Website

The website has been updated throughout the year and the “Data browser” is now used to deliver the bulk of NEODC datasets on-line. Changes and additions to the website include:

- Up to date news items
- RSS news feed
- Dataset fact sheets for new datasets
- New Help section with FAQs
- Interactive map showing locations of airborne data
- Reorganised structure
 - Clearer separation between information about data held at NEODC and data held elsewhere
 - Pages to reflect new activities of NEODC: on-line workspaces, pages for the EO Centres of Excellence and other projects (Rothera ARIES AVHRR Project, NCAVEO).

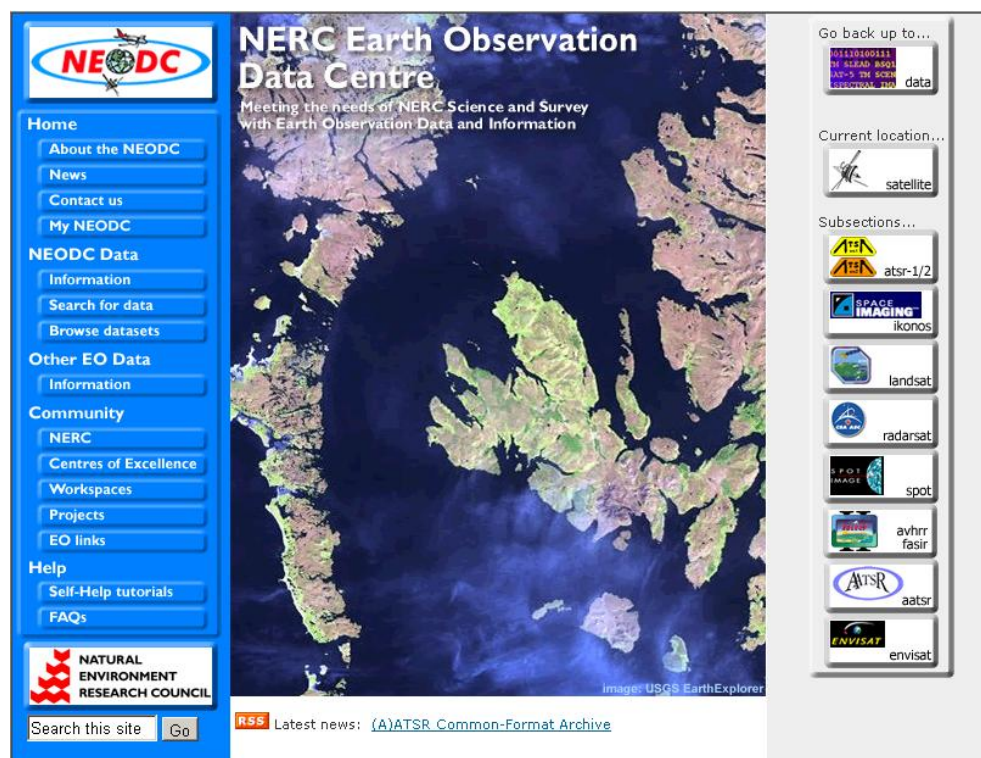


Figure 4 Reorganised NEODC website

1.3.1.3 Physical Storage

As the user demands for new data have risen the NEODC has continued to increase its amount of online storage capacity. New systems were purchased jointly with BADC, increasing the NEODC's online capacity by 40 Terabytes. This has mainly been used for the ATSR UBT archive and for the new digitised photography collection. Other data assets continue to be held on the Atlas data store at RAL which provides secure back-up, and which is complemented by online storage at NEODC, enabling rapid access to data as it is requested.

1.3.1.4 Secure DSRS Secondary Archive

Provision of secure storage for the secondary DSRS AVHRR and SeaWiFs data archive has continued.

1.3.1.5 Search Interface / System Infrastructure

The search/browse interface for the remainder of NEODC data products was maintained on a "best effort" basis during this period, but with no major developments, although the existing system is still operating well to provide access to our commercial satellite and airborne data collections.

NEODC and BADC have merged many of their management and infrastructure functions, and now share a common user database. Existing NEODC datasets (Landsat, ARSF, etc) were moved over to a structure which enables registration and self-service access and new datasets were also added to this system. The bulk of NEODC data are therefore now available via the BADC/NEODC Data Browser and FTP server.

1.3.1.6 ARSF Data Management

Data from the NERC ARSF aircraft were delivered for the previous years' flying campaigns and archived at NEODC. The diverse catalogues of ARSF data have been consolidated into a spatial database and interactive map. All data since 1995 are now available on-line and organised by year and project.

NEODC staff attended meetings of the ARSF Steering Committee plus meetings with ARSF technical staff.

1.3.1.7 Interaction with NERC EO Centres of Excellence

The scoping study to determine the data curation and facilitation needs of the NERC EO Centres of Excellence (CoEs) was completed in 2005. Data management plans were written, incorporating the inputs from the COEs via questionnaires and individual visits, and are available via the NEODC website. It has been clarified which datasets of interest to the wider community will be produced by the Centres.

The number of CoE researchers using NEODC services (helpdesk support, dataset registration and download) is increasing and several NEODC activities have been in direct response to CoE requests (e.g. new datasets, meetings with scientists and data providers). The scope of an activity to provide full data management support to CoEs, and the most appropriate funding mechanism, are currently under discussion.

1.3.2 Key Milestones

The Key Milestones were defined in the NEODC Technical Annex which forms part of the NERC/CLRC SLA. All milestones were met this year.

1.3.2.1 Quarterly Reports

Quarterly reports (covering NEODC Core and NEODC DMAG Enhancement) were delivered on schedule for the quarterly NERC SLA meetings.

1.3.2.2 Annual Report 2004/5

The NEODC annual report (covering NEODC Core and NEODC DMAG Enhancement) for 2004/5 was completed and delivered.

1.3.2.3 Collaboration with EO Centres of Excellence

Data management plans were completed and made available via the website. The results of the survey of CoEs were presented to EOEG in May.

1.3.2.4 Enhanced Delivery and Visibility for Multiple Earth Observation Datasets (DMAG Enhancement)

The objectives for this project are "Enhanced Delivery and Visibility of Multiple EO Datasets", via

- Enhancements to the ATSR UBT archive
- New metadata system
- Web services for enhanced data delivery
- Groundwork for future datasets

Milestones

The Key Milestones were defined in the NEODC DMAG Technical Annex which forms part of the NERC/CLRC SLA. All milestones were met this year.

Progress towards objectives

Enhancements to the ATSR UBT Archive

The ATSR-1 UBT production is now complete and preview images and metadata have been generated. The resulting final coverage has been presented to the AATSR Quality Working Group.

New metadata system

Tools have been generated to generate DIF-format discovery records from NEODC FGDC-format XML documents, enabling them to be included in the NERC DataGrid discovery service. An initial set of records is now available via the NDG Discovery service.

Web services for enhanced data delivery

A web service for on-demand conversion of ATSR-1/2 UBT products to ENVISAT format has been developed and is now undergoing tests and integration within the ESA Service Support Environment user interface. An additional service demonstrating geocorrection of ARSF ATM & CASI data is also under development.

Groundwork for future datasets

This workpackage is to identify new datasets in need of data management by NEODC and carry out scoping studies and/or implementation of necessary arrangements where appropriate. The following datasets were identified:

- **ENVISAT ASAR** NEODC has been asked to host some Envisat ASAR data for distribution in a collaborative project but also for long term archival. Discussions are underway with ESA to establish whether NEODC would be permitted to release the data to other researchers in future
- **Environment Agency** NEODC was asked to investigate distribution of EA airborne data. A meeting was held with NCEDS/EA at which it was established that although the EA will release small amounts of data to bona fide researchers via their own distribution system, it is unlikely that larger scale data access will become possible through NEODC, due to EA's strict control on usage. NEODC now has a web page describing EA data and how to request it from the Agency.
- **NCAVEO** – See update on datasets section 2.2.2
- **MTCI** – See update on datasets section 2.2.2

1.3.2.5 Data Coordination Budget £75k allocation

A one-off allocation of £75k from the Data Coordination budget was available made to all NERC Designated Data Centres to enhance visibility and accessibility of NERC data. At the NEODC, it was decided to use these funds to digitise the ARSF aerial photography archive. The collection is extremely valuable as a record of environmental change over the last 20 years in the UK. NEODC currently acts as the public interface for the archive and a steady stream of enquiries for availability comes from users. Currently the photos reside at BGS as rolls of film (~43,000 frames), from which hardcopy prints can be made (at a cost). The digitisation will ensure long-term preservation of the data, improved knowledge of what exists, increased availability as users can browse through available images rather than having to request hardcopy of perhaps incorrect areas, increased usage through easier access and no cost, and reduced effort for NEODC and BGS in servicing enquiries.

A tender was issued to organisations with the appropriate scanning hardware and experience, Bluesky International Ltd was selected and following a trial set of scans and user feedback the scanning was started in January. As much of the archive as possible within the available budget (~30,000 images) will be scanned during 2006.

The most recent films are being scanned first, with the intention to work back in time through the archive. Land surface photographs will be scanned as a priority over sea surface. Scanned image files are delivered to NEODC on a monthly basis and a comprehensive metadata catalogue will be generated as part of the project.

At the end of the project an assessment will be made of the remaining unscanned films, including quality and completeness of available documentation and options for scanning the remainder will be evaluated.

2 SCIENTIFIC AND TECHNICAL OUTCOMES

2.1 Strategic Goals

It is anticipated that the NEODC strategic goals will be reviewed during 2006, following the outcome of the NERC EO SMA in 2005.

The NEODC primary strategic goals for the period 2002-2006 were defined as:

1. Maintain and improve the acknowledged valuable services which the NEODC has previously delivered to the NERC scientific community
2. Provide enhanced data, metadata and information services through the NEODC website
3. Develop automated search and retrieval systems to further improve the quality and timeliness of the NEODC EO data services
4. Develop and implement the professional curation of the ATSR-1/2 archives and the future delivery of associated data product services for which there is increasing demand from the NERC community.

Work has continued to meet the strategic goals as outlined above and significant progress has been made towards increasing NEODC's engagement with the EO community and improving the services it offers to a growing base of customers.

A priority objective has been for the NEODC to collaborate with the NERC EO Centres of Excellence by supporting their requirements for data acquisition, access, delivery and ongoing curation, as appropriate in meeting the wider needs of the NERC scientific community. Progress has been made towards this objective, with increased visibility of NEODC in the community and increased communication between NEODC and CoE researchers.

In addition, following the direction by EOEG and the NERC Data Management that the management and infrastructure functions of the NEODC and BADC at RAL should be merged, significant progress has been made towards this objective. Regular, joint management meetings are held and much infrastructure is shared: data distribution systems, project management, user databases and data storage. Plans are in place for even closer cooperation, while the two data centres continue to retain their own individual identity to their own community.

2.2 User Support, Operations, Science Support and Research

2.2.1 Update on User Support

The NEODC provided data and information services across the range of the environmental science disciplines: NEODC's registered data users are split into science disciplines, institutes and countries as follows:

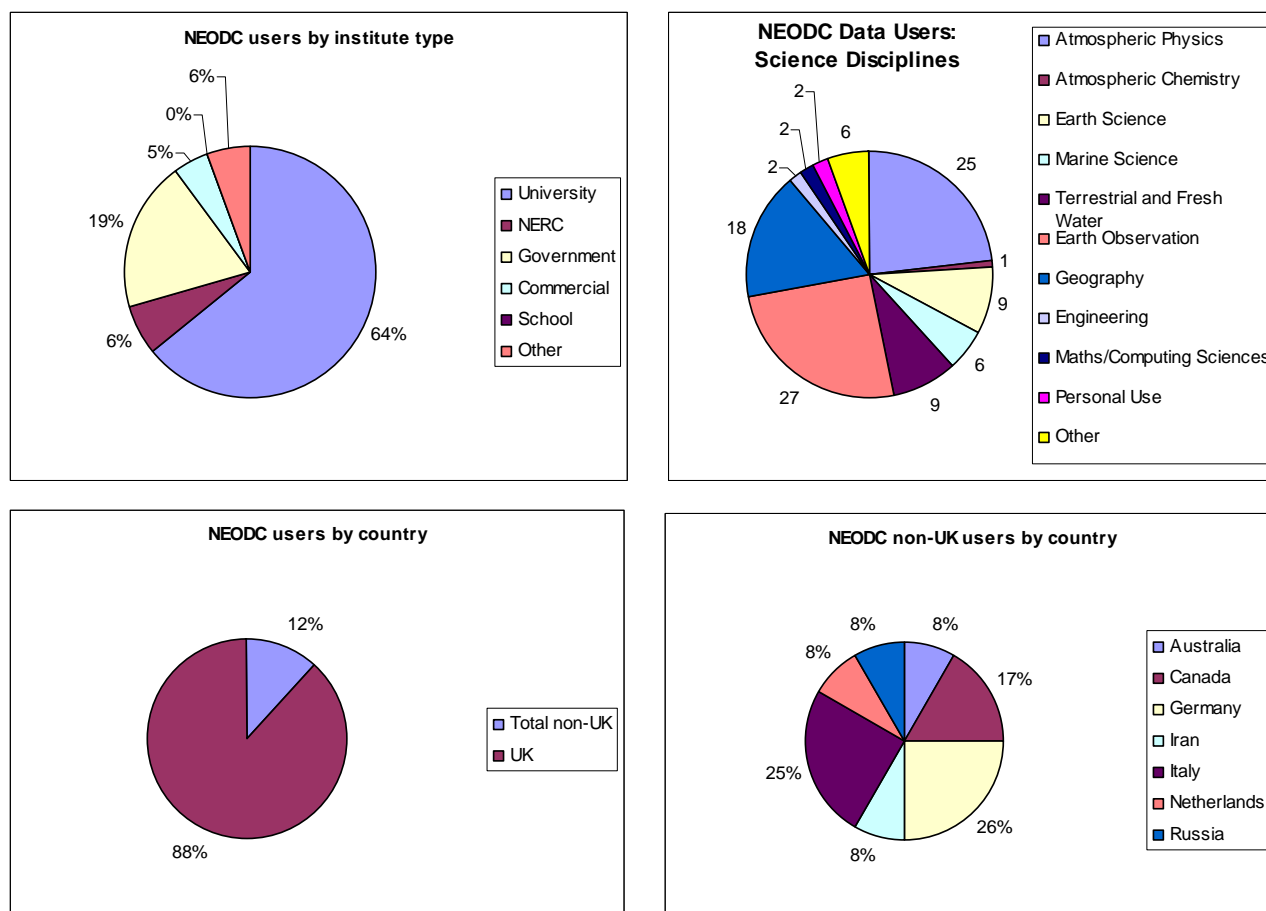


Figure 5 NEODC user statistics

NEODC continues to field a large number of enquiries regarding general data availability, i.e. not restricted to its own data archives, and is increasingly acting as a source of information about EO and remote sensing in general.

No significant data quality problems were recorded during the year and no complaints regarding the quality and delivery of the NEODC services during 2005/06 have been received. In fact, there has often been correspondence complimenting the NEODC on the quality and timeliness of its data and information services.

Approximately 180 user enquiries were logged this year, three times as many as the previous year. The number of registered users also increased significantly by 240% from 84 to 287. Quantitative data access statistics are now available from the joint BADC/NEODC data access system. The tables below, and Figure 6 show NEODC users (includes BADC users registered for NEODC datasets), and registered users per dataset.

Registrations	Total this year	Total
NEODC users ¹	203 ²	287
NEODC dataset users	93 ²	107

Dataset Registrations	Total this year	Total
NEXTMap Britain	27	36
AVHRR FASIR	7	7
AATSR multimission	17	17

¹ Note that not all NEODC registered users are also registered for datasets: they may have signed up to a mailing list, an on-line workspace or simply registered with the NEODC system before making an enquiry or searching for data.

² Includes 24 users of Envisat data previously registered with BADC

ATSR UBT	8	9
Landsat7	2	2
Shac2000	4	4
ARSF	4	4
Envisat – MERIS	11	11
Envisat – MIPAS	20	20
Envisat – GOMOS	0	0
Envisat - SCIAMACHY	5	5
NCAVEO LCM2000	2	2

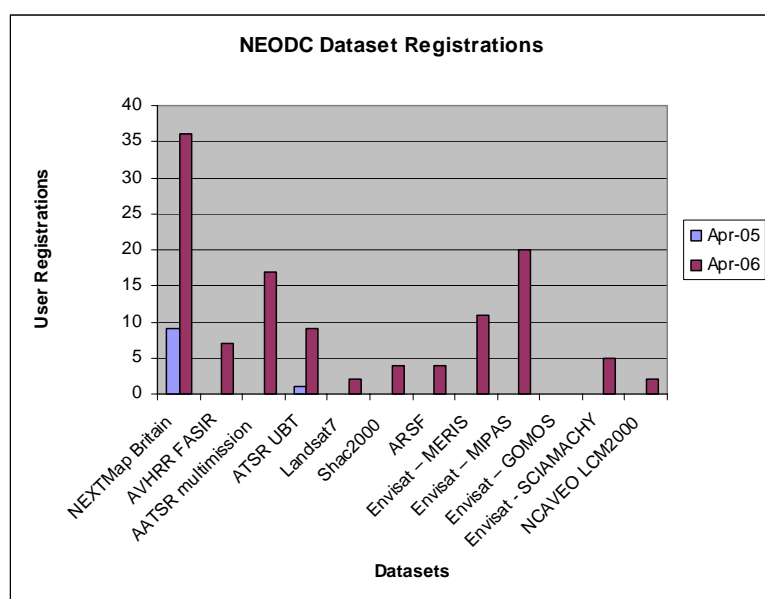


Figure 6 NEODC dataset registrations

Download volumes by dataset are now also monitored and shown in the table below and Figure 7 for the first quarter of 2006 only (monitoring began at the end of 2005)

Dataset	Users	Number	Size (GB)
Aatsr_multitemission	14	22252	3129.0
NEXTMap	13	5765	9.0
ARSF	7	105	6.4
MIPAS	7	900	214.4
ATSRUBT	6	115023	616.1
MERIS	5	20	13.2
SHAC2000	4	96	80.6
SCIAMACHY	4	38	4.3
NCAVEO_LCM2000	3	98	0
LANDSAT7	2	2	0

In addition data were delivered on disk/tape as follows:

Dataset	Delivered to	Size (GB)

ATSRUBT	ESA	10000 (compressed) (33000 uncompressed)
NEXTMap	NERC ARSF & CEH Lancaster	600

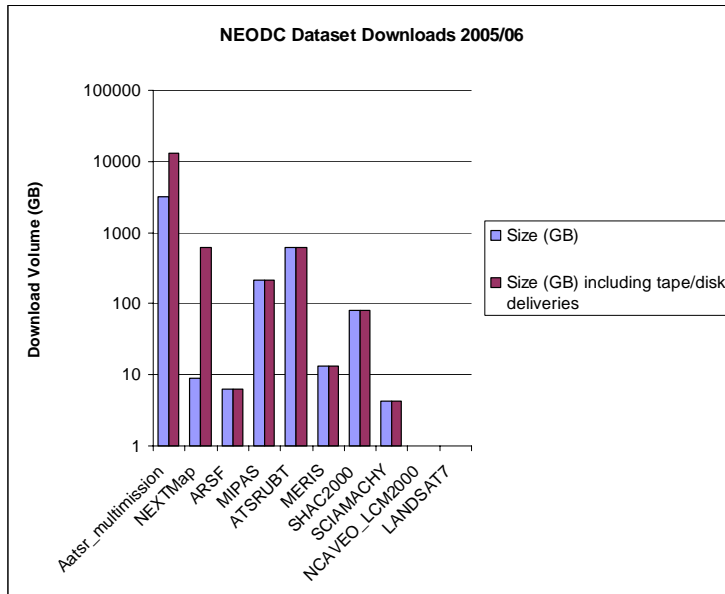
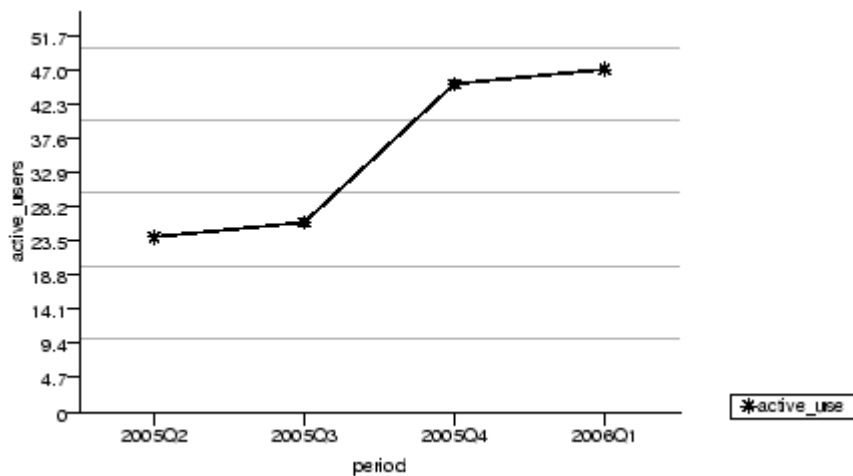


Figure 7 NEODC Dataset downloads, Q1 2006

The figure and table below show the increase in users and data downloads during the year. Although efforts have been made to accurately track data downloads back to April 2005, some downloads may be omitted in earlier quarters. From December 2005, results should be reliable.

Period	Users	Methods	Datasets	Number(M)	Size(GB)
2005Q2	24	3	5	0.002952	7
2005Q3	26	3	9	0.022154	73
2005Q4	45	3	12	0.088881	959
2006Q1	47	3	12	0.144386	3977
ALL	101	3	14	0.258373	5018



2.2.2 Update on Datasets

The present NEODC data holdings comprise commercial satellite datasets acquired in support of environmental research since 1972: most of these are data from the Landsat series together with smaller holdings of SPOT, Radarsat, ERS-1/2 SAR, AVHRR and Ikonos imagery over the UK and worldwide. The NEODC holds complete sets of the satellite imagery used by NERC to create the UK Landcover Maps for 1996 and 2000. The Data Centre now also holds the complete ATSR-1/2 data archives (~40Tbytes) and (A)ATSR 15-year common format archive (increasing to ~80 Tb).

NEODC also hosts the total archive of airborne data - digital multi-spectral imagery and photography - acquired by the NERC Airborne Research and Survey Facility (ARSF) since 1982.

Specific datasets added to the NEODC archive during 2005/06 included:

- AATSR multimission archive
 - AATSR L1B, L2 and Meteo products (historical and ongoing)
 - ATSR-1/-2 in ENVISAT data format (L1B, L2 and Meteo products)
- ATSR-1/-2 UBT product archive
- NERC ARSF campaign data
 - Data from 2005 flying campaign
 - Remaining data from 2003 & 2004 flying campaigns
- AVHRR FASIR
 - Biophysical parameters from AVHRR
- NCAVEO_LCM2000
 - Subset of CEH Land Cover Map 2000 data covering 5 UK sites selected by NCAVEO (NERC Network for cal/val of EO data) as 'UK test sites' for cal/val knowledge transfer purposes. NEODC set up the licence agreement with CEH and now makes the data available to users.
- Envisat data: MERIS, MIPAS, SCIAMACHY, GOMOS (Envisat data were previously hosted by BADC but were handed over to NEODC in December 2005)

The NEODC also holds a secure secondary off-line archive of the total AVHRR and SeaWiFs imagery acquired by the NERC Dundee Satellite Receiving Station (DSRS); this secondary archive is augmented quarterly each year.

Significant projected future additions to the NEODC archive include:

- NERC ARSF campaign data
 - Data from 2006 flying campaign
 - Missing ARSF data from past years: gaps in the NEODC ARSF archive are being filled in collaboration with Andrew Wilson at CEH
- (A)ATSR archive
 - AATSR L1B, L2 and Meteo products (ongoing), including data from the latest ESA reprocessing of AATSR due to start in July 2006
 - ATSR-1/-2 in ENVISAT data format (L1B, L2 and Meteo products)
 - ATSR-1, ATSR-2 & AATSR data in GHRSSST-L2 (netCDF) format (currently under negotiation with ESA)

- MTCI data: MERIS Terrestrial Chlorophyll Index, a level 3 product produced by Infoterra and to be made available for distribution to EO scientists via NEODC in the first quarter of 2006/7.
- Scanned Aerial photographs : ARSF analogue photography from 1985-present scanned at high resolution (20 μ m).
- NCAVEO field experiment data : archive for NCAVEO field experiment planned for June 2006

The majority of the NEODC data holdings are probably unique in the UK in the context of their local UK geographical coverage and the period of data coverage.

Certainly the total archive of the NERC Airborne Research and Survey Facility datasets – comprising Airborne Thematic Mapper (ATM), Compact Airborne Spectrographic Imager (CASI) and aerial photography is a unique collection both in the context of the data characteristics and their temporal coverage. Similarly the complete satellite imagery of the UK - predominantly Landsat and SPOT - which formed the basis of the UK Landcover Maps created by NERC for 1996 and 2000 is almost certainly unique.

It is possible to duplicate much of the commercial satellite imagery acquired over the preceding three decades by NERC, and lodged with the NEODC, by purchase from other sources. It is not possible to duplicate any of the NERC airborne datasets which are the sole property of NERC and for which NEODC acts as primary repository.

NEODC is the primary archive of ATSR-1 and -2 UBT products, however one of the aims of the (A)ATSR Archive Project is to establish synchronised archives at NEODC and ESA for the UK and international communities, respectively, of the complete (A)ATSR time series.

2.2.3 Update on System Infrastructure

A number of network-attached storage servers have been purchased this year, to allow large data volumes to be stored online. The entire ATSR UBT data archive is now stored online, as well as the majority of the NEODC's previous airborne and satellite data holdings. The data are securely backed up at the Atlas DataStore at RAL

The "Footprints" helpdesk software, also used by the BADC, has continued to provide an efficient means of logging and handling enquiries by email and telephone.

2.2.4 Update on Services

Web access statistics for 2005/6 show an increased level of activity compared to the previous year. Around 4,400 individual "visits" took place each month, compared to 2,000 last year. These represent a total of over 450,000 individual HTTP requests ("hits") - see Appendix 2 for full web access statistics for ignis.neodc.rl.ac.uk and definition of "visits" and "hits"

Data delivery to registered users via the NEODC/BADC data browser has continued successfully.

A number of mailing lists and on-line collaborative workspaces have been set up for projects and groups of data users:

- Workspaces were set up for: ARSF data management, Aerial photography digitisation project, ARSF Steering Committee, NEXTMap Britain users.
- Mailing lists were set up for: NEXTMap Britain users, AATSR users.

2.2.5 Update on Liaison and Publicity

- NEODC set up a stand at the NERC EO/RSPSOC conference in Portsmouth, September 2005, with posters and handouts promoting the activities and datasets of the NEODC
- VLJ presented a poster of NEODC activities at the CASIX science meeting, Southampton, September 2005
- SJD attended a one day conference "Elevation Models for Geoscience" in London, March 2006.
- MJP and VLJ attended the ESA MERIS/AATSR workshop at ESRIN, Frascati in September 2005 and presented a talk and poster about the (A)ATSR archive at NEODC
- VLJ attended two meetings with other representatives from NERC Designated Data Centres to plan the production of joint publicity material. A colour brochure to promote the Environmental Data Centres' activities will be produced in summer 2006, for distribution at conferences and meetings, amongst users and relevant institutions.
- VLJ gave several talks to visitors at CCLRC/RAL about the work of BADC/NEODC
- MJP and SJD attended the NEXTMap User Workshop at BGS in September 2005. MJP presented a talk on NERC-wide access to NEXTMap data via NEODC and support services to users

2.2.6 Update on Collaboration

Matt Pritchard (MJP) attended the regular meetings of the NERC Data Management Advisory Group (**DMAG**).

MJP and Steve Donegan (SJD) continued work with a consortium with Plymouth Marine Laboratory and the British Antarctic Survey in a NERC EO Enabling Fund project to expedite access to the **Rothera AVHRR archive**. NEODC created metadata (for dissemination via the NERC DataDrid and other discovery metadata systems) and assisted in the development and provision of a web interface to make this dataset available to the user community.

A major Knowledge Transfer project, "**(A)ATSR Reanalysis for Climate**" (ARC) led by Edinburgh University and including the Met Office, University of Leicester, RAL and SOC is about to start, with the aim to exploit the archive of (A)ATSR data for a climate-quality global sea surface temperature record. NEODC will facilitate the data processing, and archive and make available to the community, the outputs of the project.

MJP has continued to work on the major (~£0.5M) **(A)ATSR Archive** project to create a seamless archive of (A)ATSR data products with over 80 Tb of data to be made available via the NEODC. The archive is now populated with nearly 30 out of the expected 80 Terabytes (Tb) of data and demand for this dataset is already high, and user feedback very positive. The project is a joint venture involving DEFRA, NERC, ESA and CCLRC.

MJP attended regular meetings as a member of the **AATSR Quality Working Group**.

System development and programming work was completed on the EOEF-funded project to develop the **format conversion tool** from ATSR-1/2 UBT format to AATSR L1b format, which is a crucial part of the seamless (A)ATSR archive. Large scale processing to create ENVISAT format products from ATSR-1 and ATSR-2 is now underway.

VLJ continued to attend **NCAVEO** meetings and steering committee meetings, as a result NEODC is hosting datasets of relevance to the NCAVEO programme. This activity is already raising the profile of NEODC in the EO community.

3 FINANCE OVERVIEW

Note: Funding for the DMAG project is, for this financial year, included in the figures below. From April 2005, financial reporting was reorganised internally so that monies received by NEODC from DMAG are managed separately from the EO funding line, and separate Technical Annexes have been prepared for EO and DMAG. Quarterly Reports on progress against DMAG funding and milestones are reported separately to the NERC Data Management Coordinator.

3.1 Expenditure for 2005/06 and budget for 2006/07

The table below shows income and expenditure for both the NERC EO and DMAG funding lines (figures in £k).

	05-06			06-07		
	EO	DMAG	DMAG 75k	EO	DMAG	DMAG 75k
Income						
Internal Carry Over	24.0	9.8	0.0	39.0	51.0	66.6
Deferred Income	51.0	43.0	0.0	0.0	0.0	0.0
In-Year Allocation	168.0	69.5	75.0	190.7	40.5 ¹	0.0
Pension uplift	12.5	7.2	0.0	?	?	0.0
Total Budget	255.5	129.5	75.0			66.6
Spend						
Staff	96.6	42.8	0.0			
Recurrent	3.8	0.7	8.4			
Overheads	66.9	29.6	0.0			
Capital	49.0	5.4	0.0			
Total Spend	216.3	78.5	8.4			

Notes:

EO: Internal carry-over will be carried forward to fund NEODC Core activities in 06/07.

DMAG 75k: the photo digitisation project will be completed by end 2006

DMAG: Some additional staff effort has been available this and more will be available in 05/06 to complete the DMAG enhancement project. Some funds will be used in the photo digitisation project (storage hardware, creating a comprehensive metadata catalogue and making the data available via web).

¹ 35.5k DMAG Enhancement project, 5k NERC Metadata Gateway work

4 FUTURE DEVELOPMENT & STRATEGIC FORWARD LOOK

4.1 Update on Strategic Goals

4.1.1 Collaboration with NERC EO Centres of Excellence

As a result of the survey of the CoEs, NEODC's role in data archival and other support to the Centres (liaison with data providers, purchasing datasets, community education regarding data formats, metadata, catalogues etc) is currently under discussion and it is intended that NEODC will prepare a bid to NERC detailing what the required activities are and what resource will be required to carry them out effectively.

4.1.2 Outcome from NERC EO SMA

The NERC EO Science and Management Audit review was conducted in 2005. The Review Team assessed NEODC as follows: Excellence α 4, Fit to NERC Priorities A, Reward High, Cost effectiveness IV.

The Review Team expressed the view that NEODC is doing an effective job, and the continued integration into CEDAR is strongly supported. The concerns and recommendations are summarised here:

- there was concern at the limited resources available to NEODC, and the adequacy of the current management structure
- recommendation that NEODC should be directly responsible to the Director, EO, following advice from the EODAB and the NERC Data Management co-ordinator
- recommendation for longer-term core funding (5 years) in line with the other NERC Designated Data Centres. In addition, programmes in the EO sector should explicitly bid for funds to cover data activities.

4.1.3 Support for the Data Management Advisory Group

The NERC Data Management Coordinator has, from funds available to the NERC Data Management Advisory Group (DMAG) provided resources to several projects aimed at improving the management of data within NERC and the delivery of those data in support of NERC science.

The projects active at NEODC in the coming year are listed here.

- NEODC Enhancements – support for lifting the technical base of the NEODC and concurrent data and metadata population
- Metadata Gateway – Transitional Coding for the NERC DataGrid to support the previous functionality of the NERC metadata gateway
- Digitisation of the ARSF aerial photography archive

4.1.3.1 (A)ATSR Seamless Archive

The major development for the NEODC is the DEFRA-funded project to create a seamless archive of products from the (A)ATSR series of instruments, with the following scope:

- To produce and maintain an archive of consolidated AATSR and ATSR GBTR (Level 1b) global 1 km data, the Level 2 averaged and gridded products, and Level 2 Meteo products.
- To supply a consolidated set of the (A)ATSR Level 2 Meteo products to the Hadley Centre.
- Provide (A)ATSR products to DEFRA and NERC scientific users

Work began on this project in April 2005. This is a hugely important dataset, bringing together a unique time-series of observations needed to address current scientific challenges.

4.1.4 Future Funding Opportunities

NERC: A “position document” for NEODC was prepared and feedback sought in April/May 2005. The document outlines the activities, current and potential, which best address the needs of the UK/NERC EO research community. The document was based on material provided by a meeting of representatives from the NERC EO Centres of Excellence, together with email follow up and results from the survey of CoEs. This, together with the outcome from the NERC SMA, plus the data management requirements of the CoEs and ARSF, will be taken into account in a funding request to the NERC EO programme.

ESA: NEODC was successfully involved (2004/2005) in an ESA project to develop services for ESA’s Service Support Environment and both ESA and NEODC are keen to pursue future opportunities of this nature.

(A)ATSR Archive: As demonstrated with the initiation of the (A)RC Knowledge Transfer project, the (A)ATSR archive is already opening up new opportunities for exploiting high-quality data from this series of instruments. It is anticipated that, once initial construction of the archive is complete (with the addition of ATSR-1 & -2 data) the archive will be in demand for use by research groups wishing to undertake efficient, large-scale processing of the archive by bringing the processing to the NEODC.

4.1.5 Opportunities for Improvement

4.1.5.1 Engagement with the Scientific Community

The NEODC has significantly increased its engagement with its scientific customers during the past year. The interaction with the EO Centres of Excellence was the first step, coupled with greater publicity and communication with the scientific community. It is clear that it is important to be seen to be not only a valuable data archive but a coordinating body for the management and exploitation of EO data. Participation in the NCAVEO network is a further valuable activity – once again increasing visibility of NEODC and educating the EO community about data management.

4.1.5.2 IT infrastructure

The IT infrastructure of the NEODC has improved considerably and will continue to benefit from increased sharing of resources with the BADC. Further online storage capacity will be acquired as necessary and, where possible, resources will be managed centrally within NEODC/BADC, to reduce duplication of effort.

4.1.5.3 Physical data storage and cataloguing

Work continues on the task of improving data access and visibility by migrating data onto online storage and making datasets available via the data browser and FTP systems. More efficient ingestion procedures are being developed in collaboration with CEDAR colleagues responsible for BADC data ingestion: these will ensure that metadata creation keeps pace with physical storage for future acquisitions. Developments within CEDAR to produce a new catalogue system based on the NERC DataGrid “MOLES” metadata model continues and, once implemented, will improve NEODC’s ability to record useful and informative metadata about datasets and their associated instruments and activities.

4.1.5.4 Aircraft data management

As the volume of data deliveries from ARSF to NEODC and from the FAAM aircraft to BADC continues to increase, the need for consistent data formats, metadata, delivery methods and data protocols is vital. It is thought that the appointment of a NERC aircraft data liaison could significantly improve the processes already in place and ensure reliable systems for the future. This concept is likely to be incorporated into a bid for funding to NERC.

4.1.5.5 Management structure

The NERC EO SMA highlighted the need for a clearer management and reporting line for NEODC. It is hoped that the implementation of the SMA's recommendations will lead to improved communications and management relationships, including information exchange between NEODC and NERC EO, the data management community and NERC directed mode programmes, and decisions on the strategic direction and activities of NEODC.

5 Appendices

5.1 Appendix 1: NEODC Mission

The NEODC Mission is:

“To deliver effective services to the NERC community in locating, accessing, interpreting and exploiting Earth Observation data and information, and to ensure the long-term integrity of EO datasets produced and acquired by NERC projects and programmes.”

In order to achieve its mission, the NERC Earth Observation Data Centre:

- maintains a central archive and catalogue of NERC commercial satellite data and NERC airborne remotely-sensed data, accessible through the NEODC website at www.neodc.rl.ac.uk
- provides access to this data for NERC Centres and Surveys, the UK HEI community, NERC Directed Mode Programmes, NERC EO Centres of Excellence, and NERC-funded academics in accordance with the terms of the NERC Data Policy
- co-ordinates and supervises the archiving of all digital data and ancillary information relating to the annual flying campaigns of the NERC Airborne Research and Survey Facility
- maintains an informative web site containing a wide range of EO-related information resources
- works to ensure the professional curation, and ease of access for registered customers, to all EO data held on the NEODC archive
- has overseeing responsibility for NERC EO data held elsewhere within the community, ensuring it is managed and where possible made available to other NERC users
- continues to develop its infrastructure to improve the quality and scope of its data services to the scientific community
- acts as a contact and liaison point for communications on other national and international archiving/cataloguing initiatives relating to EO data
- provides policy and strategy input to NERC corporate data policy through the NERC Data Management Advisory Group.

5.2 Appendix 2: Projects supported

The list below shows research projects of NEODC data users, and funding information where available.

Retrieving aerosol properties and surface reflectance from AATSR/ATSR-2 **NERC CLASSIC**

Retrieval of CO₂ vertical columns from SCIAMACHY **NERC CASIX**

ASSET (Assimilation of Envisat Data) project: assimilating GOMOS, SCIAMACHY and MIPAS stratospheric ozone, temperature and water vapour data into the Unified Model **EU ASSET**

Investigating physical processes at ice-stream beds: integrating modern and palaeo-ice stream records **NE/B50117/11**

Validation of operational MIPAS data and investigate the production of improved and non-operational MIPAS data products **NERC DARC**

NERC ARSF software development extension of ARSF azgcorr software to support NEXTMap DEMs in the geocorrection process **NERC ARSF**

Using archaeological geophysical techniques to an area of the Thames floodplain to look for archaeological features and relate any archaeological sites discovered to contemporary landscape features **NER/S/M/2004/12217**

Validation of MIPAS ozone profiles

Investigating stream groundwater interactions in lowland chalk catchments using hydrogeophysical characterisation of the riparian zone **NRT/T/S/2001/00948**

Study of circulation around Madagascar and South Africa

Monitoring shallow slides and debris flows in upland Britain **NER/S/A/2004/12248**

Deriving leaf area index for running model to simulate the carbon dioxide exchange between biosphere and atmosphere

Diffuse pollution: develop a framework for the analysis of the relative risk of different locations in the context of different environmental requirements within receiving water bodies **NE/BS01171/1**

CSIP Convective Storm Initiation Project

Study of wetlands in the floodplain of the River Lambourn in Berkshire and using a variety of techniques to determine sources of water. **NER/S/A/2003/11344**

Time series analysis in the Sahel and comparison with atmospheric aerosol, precipitation and land surface temperature. **NERC CLASSIC**

Water, water quality and fine sediment production in managed upland wetlands **NER/I/S/2001/00712**

Sustainable upland management for multiple benefits **NERC/ESRC/BBSRC/RELU project**

Sustainable and holistic foodchains for recycling livestock waste to land **RELU involving NERC, BBSRC and ESRC**

The origin, evolution and effects of non-convective clouds at the tropical tropopause **NERC CWVC**

Digital terrain analysis for use in a semi-distributed hydrological rainfall-runoff model in a number of catchments in the UK. **NER/L/2001/00658 GR3/11450**

Using Envisat data, together with other relevant datasets and ocean models, to validate current ocean GCMs and investigate questions related to the variability in large-scale ocean circulation and its effect on the global climate system.

Validation of ATSR cloud products

Developing the use of VR and visualisation techniques for participatory coastal zone management, and developing an integrated regional coastal simulator. **Tyndall Centre T3.42**

Flood inundation modelling **FRMRC**

Testing NEXTMap in conjunction with other DEMs to improve the geolocation of MODIS data.

Rainfall modelling based on radar information. **NER/S/J/2003/11726**

Investigation of the variability of primary production in the Mediterranean Sea

Colloidal phosphorus speciation in agricultural run-off to catchments using field flow fractionation **NE/C514107/1**

Comparison of AVHRR LAI data and other sources of data, such as MODIS.

Intercomparison of sea and land surface temperatures from different sensors and the investigation of climate trends in satellite data.

Perform an overall assessment of the performance of the new AATSR land surface temperature (LST) product.

Evaluate the impact of hurricane Pauline in ANPP for the southwest part of Mexico.

AATSR/ATSR-2/SCIAMACHY/GOME calibration study

Study to investigate penetration of limb sounding observations into the troposphere with the MASTER and MIPAS instruments and characterise the state of the atmosphere. **ESA**

Study of the impact of vegetation phenology on the validity of vegetation indices for long-term time-series analysis at regional to national scales.

Study considering whether synthetic aperture radar (SAR) can provide a means for mapping wind energy regimes off the UK coast with sufficient reliability and accuracy to be suitable for the planning and development of offshore wind turbines **NER/S/C/2004/12739**

GRAPE - Global Retrieval of ATSR Cloud Parameters and Evaluation and GlobAEROSOL (ESA Data User Element programme) **NER/T/S/2001/00205 and ESA**

ADRIEX - Aerosol Direct Radiative Impact Experiment and GlobAEROSOL (ESA Data User Element programme)

Knowledge Transfer Network for Calibration and Validation of Earth Observation Data **NE/C508569/1**

Investigating coastal dune landscapes around the UK. **NE/D521314/1**

Validation of coastal model predictions at high resolution.

Correction of ENVISAT ASAR measurements **NERC COMET**

Research to look at polarizations in forest classification.

Clouds and cloud flagging in the D band of MIPAS datasets.

Exchange of data to fill gaps in NEODC / CSIRO archives.

Investigating the applications of remote sensing in Continuous Cover Forest management **NER/S/A/2004/12732**

Studying the interaction between land surface processes and boundary layer structure

Final year project for degree in GIS

Visualising and mapping glacial geomorphology as part of research on reconstructing the former British ice sheet. **NE/C509523/1**

AATSR visible channel calibration

Improving exploration targets for sand and gravel deposits using remote sensing and GIS by integrating higher resolution datasets

Examining the effects of sea level rise on designated habitats on the South coast and this will feed into

other work on spatial planning in relation to biodiversity.

To test the retrieval algorithm of aerosols and trace gases from SCIAMACHY. **Canadian Foundation for Climate and Atmospheric Science (CFCAS).**

Evaluate the potential of EO data for mapping coastal habitats

Aerosol remote sensing using AATSR **NER/S/A/2005/13668**

Assimilation of SST data in an Irish Sea high resolution shelf model.

Part of modular assesment for MSc in applied geospatial technology. Specifically a landcover mapping project for the 'Sands of Forvie NNR'.

Setting the wider/larger area topographic context for archaeological sites for which airborne lidar survey data has been separately funded, and for which ORADS AMS radiocarbon dating has been agreed. **ORADS 2005/1/16**

Landslide assessment and flood erosion risk **NE/D005744/1**

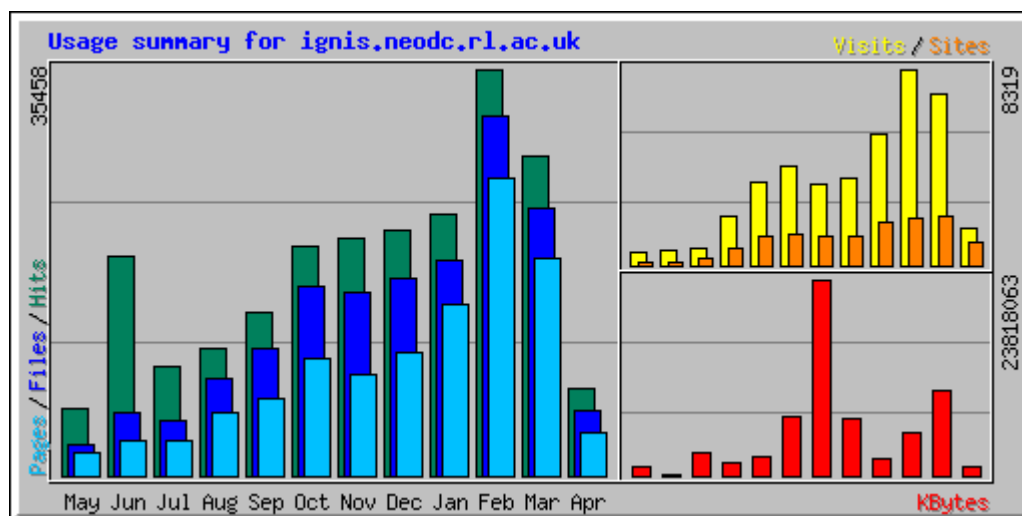
(A)AATSR Long Term Calibration & Instrument Performance

Surface temperature of the global oceans (aka) (A)ATSR Re-analysis for Climate **NE/D001129/1**

Hyperspectral-SAR data fusion algorithms

Developing and assessing novel remote sensing products for the coastal areas. **NERC CASIX**

Appendix 3: NEODC Website access statistics for FY 2005-6



Summary by Month										
Month	Daily Avg				Monthly Totals					
	Hits	Files	Pages	Visits	Sites	KBytes	Visits	Pages	Files	Hits
Apr 2006	377	282	185	77	989	1203435	1557	3703	5646	7559
Mar 2006	899	750	611	233	2067	10219986	7236	18948	23263	27873
Feb 2006	1266	1117	926	297	1993	5211839	8319	25945	31290	35458
Jan 2006	733	604	480	180	1811	2140631	5582	14881	18746	22732
Dec 2005	691	557	346	119	1258	6942649	3699	10736	17275	21432
Nov 2005	687	531	295	114	1253	23818063	3435	8853	15934	20622
Oct 2005	643	530	327	135	1333	7267119	4200	10165	16453	19944
Sep 2005	476	370	226	116	1253	2276856	3490	6793	11103	14306
Aug 2005	359	271	175	66	701	1561408	2061	5438	8418	11143
Jul 2005	307	156	97	23	322	2845297	731	3036	4840	9544
Jun 2005	637	185	99	20	145	200344	602	2975	5564	19138
May 2005	188	85	66	18	144	1163115	577	2051	2638	5849
Totals						64850742	41489	113524	161170	215600

Table 1 Tabular summary of access statistics for ignis.neodc.rl.ac.uk (see following notes for explanation of terms: e.g “visits” vs “hits”) Generated 20-Apr-2006 04:02 BST

Explanatory notes for web access statistics

Note that until August 2005, two web servers were in use: ignis.neodc.rl.ac.uk and www.neodc.rl.ac.uk. The access statistics for www.neodc.rl.ac.uk are included in the totals provided in the report.

Figure 1 and Table 1 show access statistics for the NEODC website at <http://ignis.neodc.rl.ac.uk/>. These statistics are produced by the *Webalizer* analysis program (available from <http://www.mrunix.net/webalizer/>).

The input data to these statistics consist simply of the Apache web server access log file, once the relevant log files covering the time period of interest had been concatenated. Filtering was applied to exclude from the statistics any visits to the site from computers operated by NEODC staff (by means of specifying their IP addresses), which would have skewed the statistics.

Several measures are reported, defined as follows:

- **Hits.** These are individual requests to the web server for any item, be they HTML documents, images, data files, requests to run a server-side script or other items. When a remote host (i.e. a computer elsewhere on the internet) requests a web address (say, a web page) from the web server, the loading of that page in the client's browser usually results in the requesting of many more files (e.g. images, stylesheets) which are part of that page, but count as separate "hits". Note that requests to non-existent pages or web addresses also result in "hits".
- **Files.** These are items successfully returned from the web server to the remote host. A request does not always result in a "hit", for a variety of reasons (e.g. mis-typing an address, files that have moved location, incorrect access permissions held by the client, etc.).
- **Pages.** These are text documents written in HTML, or generated on-the-fly by a request to a server-side script, that result in HTML text being transferred to the client's web browser. Images and other "files" are excluded (on the basis of their filename extension).
- **Sites.** These are remote computers, recognised as distinct IP addresses when recorded in the log file, which have submitted requests for items on the web server. Depending on how the client's access to the internet is configured, it is possible that multiple computers connected to the same network and sharing a web proxy (or cache) can result in only 1 "site" being reported for these multiple computers (Example: a classroom full of students using the internet, all submitting requests to the web server, may all count as 1 "site", [and, according to next definition, as one "visit"]). "Site" statistics are therefore likely to be conservative.
- **Visits.** Requests from the same "site" that are either the first request from that "site", or separated from the last request from that "site" by a period of 30 minutes. This is probably the most useful measure reported in the statistics, and is probably conservative. For example, someone browsing through the web site will initially access the front page, at which time the clock starts ticking and all subsequent requests to the webserver from their "site" still count as one visit, so long as no more than 30 minutes inactivity is recorded. The first request after a period of 30 minutes' inactivity will result in the visit count being incremented.
- **KBytes.** Kilobytes of data transmitted by the web server in response to successful HTTP requests from remote computers.