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# Computer Supported Cooperation - the future of the IAG Information Service and of Cooperation within IAG.

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**Abstract**: Today the International Association of Geodesy (IAG) information service is a WWW/Internet based information system supported by ftp file access. Experiments in the project MANICORAL (Multimedia and Networks in Cooperative Research and Learning) points at enhancements of this system. Users may, through video and audio tools, get in direct contact with the IAG Central Bureau, or the IAG Services and officers who have access to these tools. In the MANICORAL project three typical information service prototypes are developed and tested: (a) a satellite radar altimeter data service, (b) a software service, i.e. including programs for altimeter processing , (c) a geoid service , i.e. providing results from supporting models, here precomputed geoid values. In MANICORAL, a computer supported cooperative work system, ***MERCI***, allowing cooperation between geographically distributed researchers have also been implemented and will work together with the services. The tools will be enhanced by a digital visualization system to be developed in close contact between geodetic users and visualization experts from the Rutherford Appelton Laboratory (UK). A common data interface is also being designed, which will be useful for most geodetic data types. The system will be useful not only for access to scientific data and tools, and in research cooperation, but may also be used for distance teaching at all levels. It has already been tried out for presentation of Ph.D.-seminars, which were broadcast on internet using Mbone. Currently the main problem seems to be the limited band-width available.

## 1. Introduction.

The IAG Information System was established in the early nineties by the Central Bureau, at that time located in Paris. It was based on ftp (file transfer protocol), and the file system primarily

contained Handbook and Newsletter material, i.e. addresses of individuals and institutions, lists of future meetings.

When the Central Bureau moved to Copenhagen in 1995, a World Wide Web (WWW) based information system i.e. a home-page, see Figure 1, was established. Today it gives full access to the Geodesists Handbook ( Figure 2 ), the IAG Newsletter (as printed in Journal of Geodesy), position announcements, meeting announcements and links to home-pages of other IAG bodies and other organizations.

The development of the IAG Information System should not stop here, but continue to explore new technological possibilities, with a view to future developments. What are the possibilities for serving the geodetic community better, and facilitate international cooperation within geodesy?

In the following, we report on the EU Telematics project: MANICORAL. It has been a major inspiration to many of the IAG officers involved in the project, and points towards exciting future possibilities.

**2.Network based cooperation in research.**

The European Union (EU) Telematics Program (within the 4. Framework Program) has a subprogram denoted "Telematics for Research". In the program a direct involvement of users is required. The reason for this is that history has shown, and it has been documented extensively in Human-Computer Interaction literature, that too many technological systems have failed, because they have been developed from at technological point of view, not from the point of view of users.

When the call for proposals was issued in 1995, the geodetic research group "Altimetry for Research in Climate and Resources" (AFRICAR) was contacted by researchers from the Human-Computer Cooperation research field (represented between the authors by Janni Nielsen, CBS). She proposed that AFRICAR became a test group for new network based Computer Supported Cooperative Worksystem (CSCW) technology.

After brain-storm meetings with this geodetic mini-community, the project MANICORAL was designed, and in the late 1995 it was accepted for funding by EU. Besides the user community and the human-computer experts also visualization expertise from the Rutherford-Appelton Laboratory (UK) joined the project, since an important factor in geodetic communication is visual information.

The reader will notice that most of the authors of this paper are IAG officers. Especially one of the authors is, in his capacity as Secretary General of IAG responsible for the IAG Central Bureau and for the IAG Information Service. The participation in the MANICORAL project has given us insight into many new possibilities for enhanced collaboration, which will be discussed in the following.

**3. Communication and collaboration within geodesy.**

Most geodetic collaboration are organized through the IAG commissions and special study groups. However there are non-IAG groups, such as AFRICAR, which are collaborating actively. For all these groups it is characteristic that the funds for travel and meetings are limited. Consequently the collaboration relies heavily on e-mail and exchange of data and software by ftp. Also very few scientists from developing countries participate in the geodetic cooperation.

How can we improve this situation ?

Here the WWW (and dedicated networks) offers many new possibilities:

- video-conferencing

- support for group work (exchange of files, images, audio, video, shared whiteboard)

- support of person to person collaboration

- access to teaching material and scientific papers and data.

However, in the EU Telematics program the cooperative technologies have gone a step further. A talced named ***MERCI*** for scientific collaboration has been developed. Right now (June 1997) it is running under UNIX, but will be released in a PC version shortly. The tools are unique in that they include:

video: everybody can see everybody

audio: everybody can talk to everybody

white-board (Wb): everybody can write on the same white-board and load images on the Wb.

Document-editing: everybody can simultaneously edit the same document.

The three first tools have been tested extensively by representatives from the AFRICAR group

while being monitored by communication experts from the Human Computer Collaboration (H.C.) group(Nielsen et al 1996, Daniels et al 1996). ***MERCI*** was used primarily for lecture-style meetings, where new results were explained to other members of the group. Obviously, testing the system in real-life scientific collaboration has made many problems visible. Lack of consistency in the User Interface design, limitations to the import of files( 1 MB maximum size), lack of pen based interaction for writing equations - however, these are minor problems, being dealt with in the redesign. Other problems are related to the cooperation culture. A CSCW mediated interaction is not the same as face-to-face meeting. AFRICAR has therefore had to develop a new communication and meeting culture, e.g. prior to meeting start, the host must check with each participant that audio and video function, a "Can you hear me, can you see me check". However, the problem which has caused most breakdown in the communication is due to the limited bandwidth available of some sites, and due to the new-ness of the multi-to-multi user (so-called Multics) communication routing system, Mbone.

On the positive side, we have found that the system is ideal for "presentation-type" meetings. It allows immediate interaction between the "lecturer" and the participants. Meetings, however, have to be conducted in quite a different way than usual, and new meeting cultures are developing. In collaboration with the H.C.-group, new rules are being developed, and new requirements to the ***MERCI system*** are being defined, which, when implemented, should further enhance this system.

Based on the first experience with the system, a new project "Doctorate in Geodesy in Europe" (DOGE) was defined. In this Ph.D. program seminars and schools should be run using ***MERCI***. (For details see http://www.gfy.ku.dk/~cct/doge.html ).

Several requirement for enhanced collaboration by computer were defined in the phase before the project started. It is easy to envisage a situation where a participant requests to see details about the underlying data, run a program with an alternative data set, use a different auxiliary data set (another - better - geoid) or visualize the data or results in an alternative manner.

**4. Distributed Collaborative Visualization tool**.

A system for Distributed Cooperative Visualization (DCV) is being developed by visualization experts from the Rutherford Appelton Laboratory. The prototype now being worked on is based on commercial software which, as a side-product to the images created, also creates a "script" defining the visualization elements, the input data, and the output format. This script may easily be transferred to other participants in a computer based cooperative session, and they may execute the commands defined in the script locally. Data to be visualized may simultaneously be picked up from the geoid service or the altimetry data-base. In this manner very small data sets are transferred over internet, compared to the MB-sized images created by the visualization. It

should also be possible locally to change e.g. the color-scale or the cut in a 3-D model, and then have the results showed immediately at other sites.

**5. Enhanced data services.**

It is obvious that the cooperative work depends heavily on fast access to data (here geoid data, altimetry, software, visualization scripts). A dedicated centralized information repository, AFRICAR Information Repository (AIR), (Knudsen et al., 1997) has consequently been proposed. A design based on the Distributed Oceanographic Data System (DODS) has been found to fulfil most of our wishes. A prototype DODS server has been established at TU Graz, and is now being tested. Examples of its use are shown in Fig. 1.

The project includes the development of 3 prototype services which will be interconnected by DODS:

- A software service (to be run by KMS - Denmark)

- A geoid service (to be run by the International Geoid Service, Milano)

- An altimetry data service (to be run by Delft University of Technology, Netherlands).

In the first phase of the project user-requirements to the services were collected, analyzed and converted to design requirements for a prototype, which will be ready at the end of 1997, (Knudsen et al.,1997).

The geoid service is already international (a part of IAG) and will continue to serve the whole geodetic community. However the participation in MANICORAL has aided in giving the service a modern interface, so that it is not only ftp-based. Sub-areas of an area can be selected, and retrieved, for example, see Figure 3 . Data request in AIR.

Figure 4. Example of response to data request in AIR.

The software service will be, as agreed by the IAG Executive Committee in March, 1997, (see J. of Geodesy, Vol. 71, p 503, 1997), the IAG software service prototype. Program descriptions, source-code, in- and output examples may be retrieved interactively and transferred by ftp. For the moment the prototype database contains the GRAVSOFT-programs (Tscherning et al., 1995). It is expected that the database also will contain "quality" indications and well as tutotorial material.

The altimetry database will contain geophysical data records corresponding to 1 s sampling for all altimetric satellites. ( Only the AFRICAR group will have access to the ESA ERS data since AFRICAR is an ESA project.)

**6. Conclusion.**

The experience in MANICORAL show that tools for Computer Supported Cooperative Work are so well developed that they should be used for cooperation within geodesy in general and especially with IAG. The tools are not easy to use, and we should maintain close collaboration with experts from the H.C.-field, in order to get advice and feed-back on the most effective use of the tools.

The supporting tools: access to models, data, software and visualizations must be further enhanced. This will open up for a broader international access to the latest scientific products, so that nobody is left behind. Scientists from developing countries should with the improved access to internet in this way become defacto included in the geodetic collaboration.

The problems we want to solve in geodesy can only be solved by international collaboration, and the use of modern communication technology is absolutely necessary to reach our goals. Other organisations that IAG (EU, ESA, NASA) has also realized this and are setting up advanced data-services, from which geodesy may benefit, see e.g. Fusco & Landgraf, 1997.

**References**.

Fusco, L. & G.Landgraf: EARTHNET ONLINE: The ESA Earth Observation Multi-Mission user information services start the operational phase. Presented 21. General Assenbly EARSeL, Lyngby, 1997.

Danielsen, O., J.Nielsen & L. Dirckinck-Holmfeld & M.Vendelø: Conceptual Framework and Methodology Definition. MANICORAL deliv. 3.1., 1996.

Knudsen, P., W.Fürst, M.Naeije & G.Venuti: Functional specification and design of services. MANICORAL, Ext. Rep., RE-4.2, 1997.

Nielsen, J., L. Dirckinck-Holmfeld and M. Vendelø: Methodological Framework for Multimedie and network in Cooperative research and learning, MANICORAL deliv. 3.1, 1996.

Tscherning, C.C., R.Forsberg & P.Knudsen: Description of the GRAVSOFT package, Dep. of Geophysics, University of Copenhagen, 4. Ed., 1994

**Appendix**: URL's:

IAG: http://www.gfy.ku.dk/~iag/

MANICORAL: http://www-geomatics.tu-graz.ac.at/manicoral/

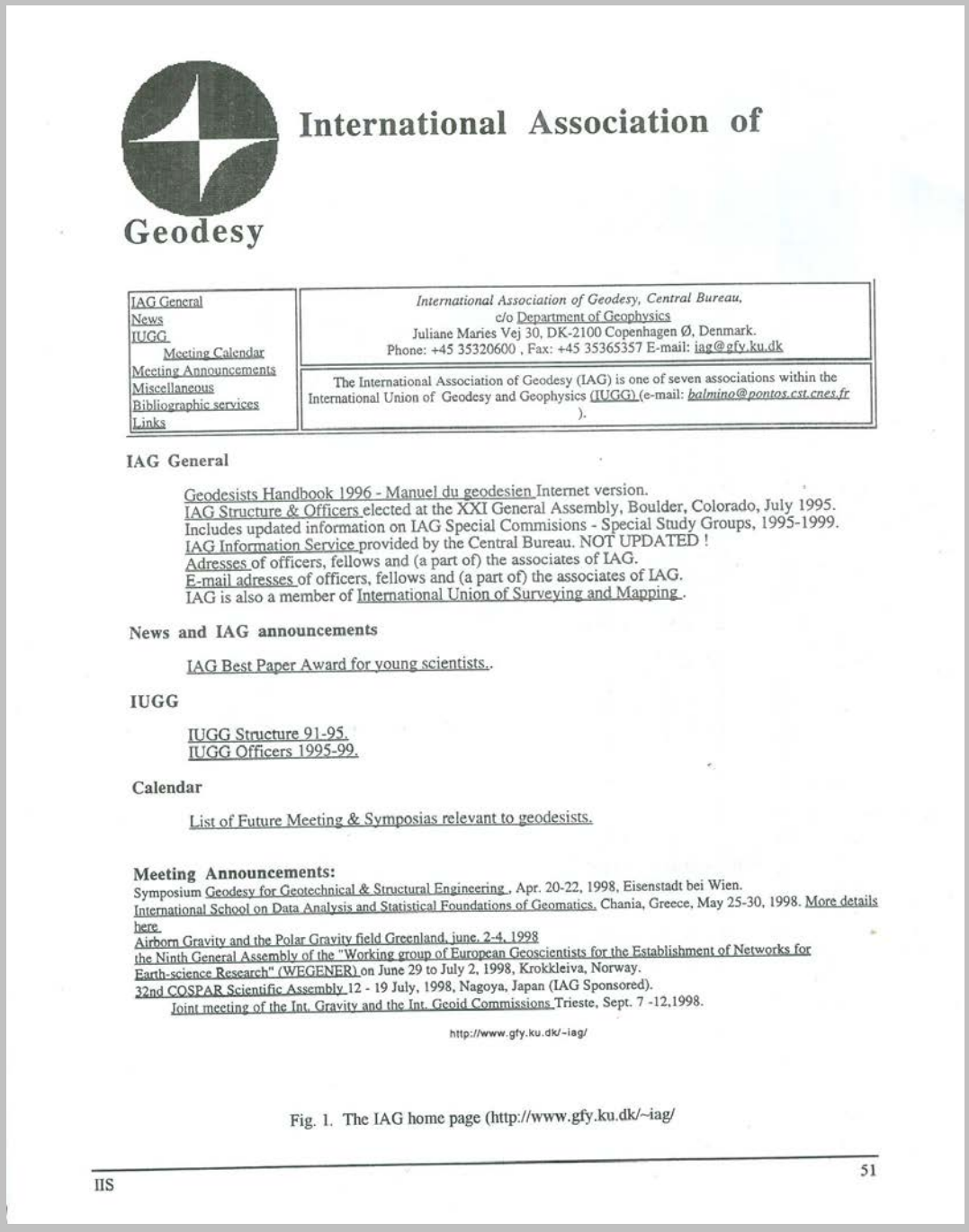
http://ipmtf4.topo.polimi.it/~igs/

EU Center for Earth Observation, JRC, Ispra: http://ewse.ceo.org.

ESA Earthnet: http://earthnet.esrin.esa.it

DODS http://dods.gso.uri.edu/DODS/

DOGE: http://www.gfy.ku.dk/~cct/doge.html



# International Association of Geodesy

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|---|---|
| IAG General<br>News<br>IUGG<br>Meeting Calendar<br>Meeting Announcements<br>Miscellaneous<br>Bibliographic services<br>Links | *International Association of Geodesy, Central Bureau,*<br>c/o Department of Geophysics<br>Juliane Maries Vej 30, DK-2100 Copenhagen Ø, Denmark.<br>Phone: +45 35320600 , Fax: +45 35365357 E-mail: iag@gfy.ku.dk |
| | The International Association of Geodesy (IAG) is one of seven associations within the International Union of Geodesy and Geophysics (IUGG) (e-mail: *balmino@pontos.cst.cnes.fr* ). |

**IAG General**

Geodesists Handbook 1996 - Manuel du geodesien Internet version.
IAG Structure & Officers elected at the XXI General Assembly, Boulder, Colorado, July 1995.
Includes updated information on IAG Special Commisions - Special Study Groups, 1995-1999.
IAG Information Service provided by the Central Bureau. NOT UPDATED !
Adresses of officers, fellows and (a part of) the associates of IAG.
E-mail adresses of officers, fellows and (a part of) the associates of IAG.
IAG is also a member of International Union of Surveying and Mapping .

**News and IAG announcements**

IAG Best Paper Award for young scientists,.

**IUGG**

IUGG Structure 91-95.
IUGG Officers 1995-99.

**Calendar**

List of Future Meeting & Symposias relevant to geodesists.

**Meeting Announcements:**

Symposium Geodesy for Geotechnical & Structural Engineering , Apr. 20-22, 1998, Eisenstadt bei Wien.
International School on Data Analysis and Statistical Foundations of Geomatics, Chania, Greece, May 25-30, 1998. More details here.
Airborn Gravity and the Polar Gravity field Greenland, june. 2-4, 1998
the Ninth General Assembly of the "Working group of European Geoscientists for the Establishment of Networks for Earth-science Research" (WEGENER) on June 29 to July 2, 1998, Krokkleiva, Norway.
32nd COSPAR Scientific Assembly 12 - 19 July, 1998, Nagoya, Japan (IAG Sponsored).
Joint meeting of the Int. Gravity and the Int. Geoid Commissions Trieste, Sept. 7 -12,1998.

http://www.gfy.ku.dk/~iag/

Fig. 1. The IAG home page (http://www.gfy.ku.dk/~iag/



Fig. 1.

# GEODESIST'S HANDBOOK - 1996 - MANUEL DU GEODESIEN

This is the preliminary electronic version of the geodesists handbook 1996.
Ole B. Andersen 961001

## PART 1



## PART 2



## PART 3



## PART 4



## PART 5



## OUT OF GEODESISTS HANDBOOK



Fig. 2. The Geodesist's Handbook on the IAG home page.



Fig. 2.


File Edit View Go Bookmarks Options Directory Window Help
Location: file:/usr_6/fuerst/test/html/AIR-entries.html
What's New? What's Cool? Destinations Net Search People Software
Entries in AIR which fulfill you request
Category : Altimetry
Keywords in description (AND): "ERS crossover"
Region: phi = 47.0000 : 30.0000, lambda = -5.0000 : 37.0000
ERS 2 pass 2a06869d.001
Category
Altimetry
Description
from ESA CD F2A0014_I_IC
crossover adjustment performed,
best orbit from Delft applied, see also
http://dutlru8.lr.tudelft.nl/ers/precorbs/
Pointers
[DODS-Url] [Attributes] [Structure] [Send Url]
Remarks from:
Remko
Per
ERS 1 35 day repeat cycle, Mediterranean
Category
Altimetry
Description
ERS 1 data selected for Mediterranean,
35 day repeat cycle
crossover adjusted
Pointers
[DODS-Url] [Attributes] [Structure] [Send Url]
No Remarks
Werner Fürst
Home Page

Fig. 3

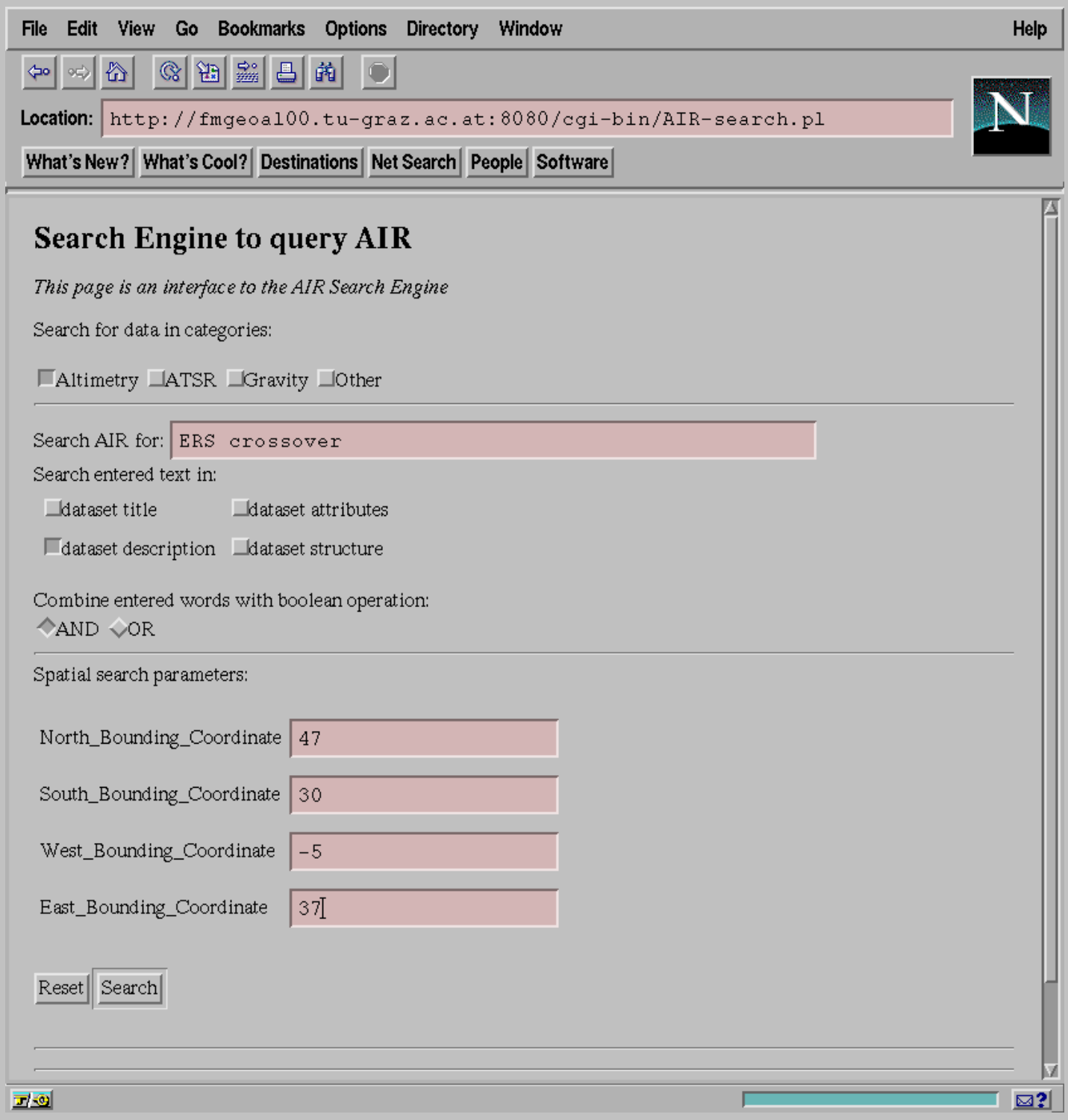
File Edit View Go Bookmarks Options Directory Window Help
Location: http://fmgeoal00.tu-graz.ac.at:8080/cgi-bin/AIR-search.pl
What's New? What's Cool? Destinations Net Search People Software
Search Engine to query AIR
This page is an interface to the AIR Search Engine
Search for data in categories:
Altimetry ATSR Gravity Other
Search AIR for: ERS crossover
Search entered text in:
dataset title
dataset attributes
dataset description
dataset structure
Combine entered words with boolean operation:
AND OR
Spatial search parameters:
North_Bounding_Coordinate 47
South_Bounding_Coordinate 30
West_Bounding_Coordinate -5
East_Bounding_Coordinate 37
Reset Search

Fig. 4.