



Report no. 07/01

KLIMA



NORDKLIM – Nordic co-operation within Climate activities

Visualisation tools for climate data

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DNMI - REPORT

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Visualisation tools for climate data

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NORDKLIM/NORDMET on behalf of the National meteorological services in Denmark (DMI), Finland (FMI), Iceland (VI), Norway (DNMI) and Sweden (SMHI)

SUMMARY:

Visualisation tools are an important part in presenting and sharing climatological information. A step in making climatological information visual is the creation of the NORDKLIM homepage.

This report shows the visualisation tools used in the NORDKLIM countries today, as well as a system for exchange of climatological data used in Norway. Most of the tools are accompanied with a short description and an example. Examples are also given on the type of information that can be put on the Internet.

KEYWORDS:

Visualisation, graphical, web presentations, Java, Geographical Information Systems (GIS).

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Foreword

This report is prepared under task 2 in the Nordic NORDKLIM project: *Nordic Co-Operation Within Climate Activities*. The NORDKLIM project is a part of the formalised collaboration between the Nordic METeorological institutes, NORDMET.

The main objectives of NORDKLIM are:

- 1). *Strengthening the Nordic climate competence for coping with increased national and international competition*
- 2). *Improving the cost-efficiency of the Nordic meteorological services (i.e. by improving procedures for standardized quality control & more rational production of standard climate statistics)*
- 3). *Coordinating joint Nordic activities on climate analyses and studies on long-term climate variations*

The NORDKLIM project has two main tasks:

1. **Climate data** (Network design, Quality control, long-term datasets).
2. **Climate Applications** (Time series analysis, use of GIS within climate applications, mesoscale climatological analysis, extreme values and return periods).

A detailed description of the project is given by Førland et al.(1998).

NORDKLIM is coordinated by an Advisory Committee, headed by an Activity Manager. Each of the main tasks is headed by a Task manager.

The Advisory Committee in NORDKLIM is presently consisting of:

Hasse Alexandersson, SMHI
 Eirik J. Førland, DNMI (**Activity Manager**)
 Raino Heino, FMI
 Trausti Jónsson, VI
 Lillian Wester Andersen, DMI

The present task managers are: Task 1: Pauli Rissanen (FMI), Task 2: Ole Einar Tveito (DNMI)

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Sweden: Swedish Meteorological and Hydrological Institute, S-60176 Norrköping, Sweden, (www.smhi.se)

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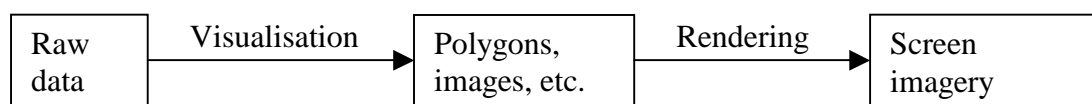
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1. Introduction

The Nordic countries together hold a vast amount of climate data in their databases. A goal for NORDKLIM should be to make the process of locating, acquiring, and sharing climate data less difficult. Another goal should be to exchange experiences of different visualisation tools and to develop efficient systems co-operatively. Section 2 gives an overview of visualisation tools that are in use in the Nordic countries. Maps or tables illustrate many of these tools. Section 3 contains a brief discussion on exchange of data. Section 4 describes a web-based system for retrieval and presentation of the climate database at DNMI. Section 5 gives some examples of climate information available on the Internet site at SMHI.

2. Visualisation tools

Visualisation tools concentrate on the mapping of data to graphic form, such as polygons, images, charts and tables.



The quality of the final product depends on the underlying system. There are quite a number of visualisation tools on the market. The following tools are used in the Nordic countries for visualisation of climate data.

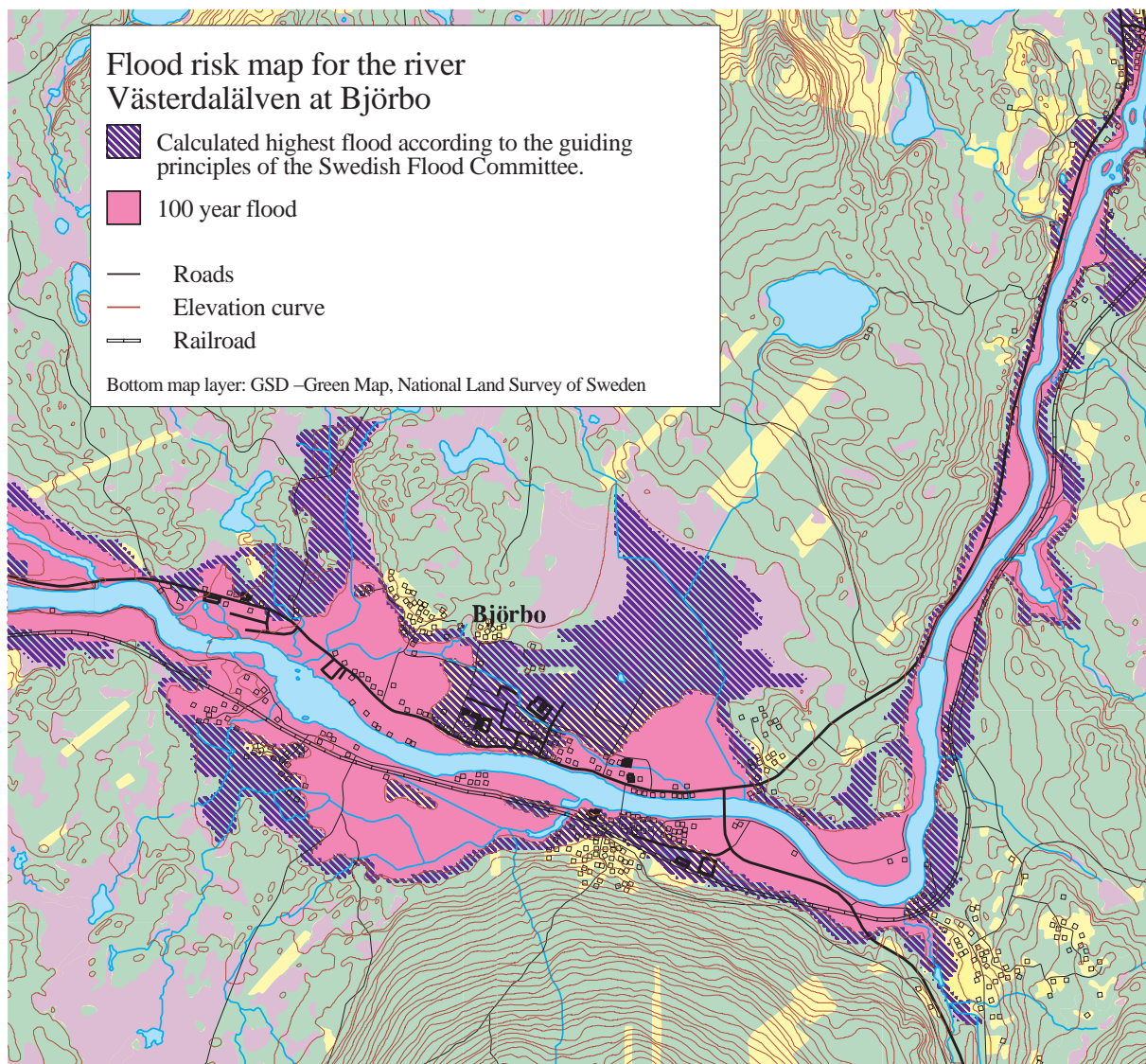
| Tools | Finland | Iceland | Norway | Sweden |
|---------------------|---------|---------|--------|--------|
| ArcInfo | X | X | X | X |
| ArcView | X | X | X | X |
| Mapinfo | | | | X |
| ArcIMS | | | X | X |
| AVS | | | | X |
| Microsoft products | X | X | X | X |
| Acrobat (pdf) | X | X | X | X |
| Java | | X | X | X |
| eXpose | | | | X |
| Visual Basic | | | (X) | (X) |
| GrADS | X | | | |
| GMT | X | X | | |
| GnuPlot | X | X | | X |
| StarOffice | X | X | | |
| Jasc Paint Shop Pro | | X | | X |
| Surfer | | | X | X |
| Grapher | | | | X |
| PageMaker | | | X | X |
| Adobe Illustrator | X | | | X |
| Ferret | | X | | |

(X) = not used today, but will be used in the future, according to plans

ArcInfo

ArcInfo is a complete GIS for creating, managing, dissemination and applying geographic knowledge. ArcInfo is a system of applications. The system handles vector-data (points, lines and polygons) and raster data, as well as triangular irregular networks (TIN) for representing surfaces.

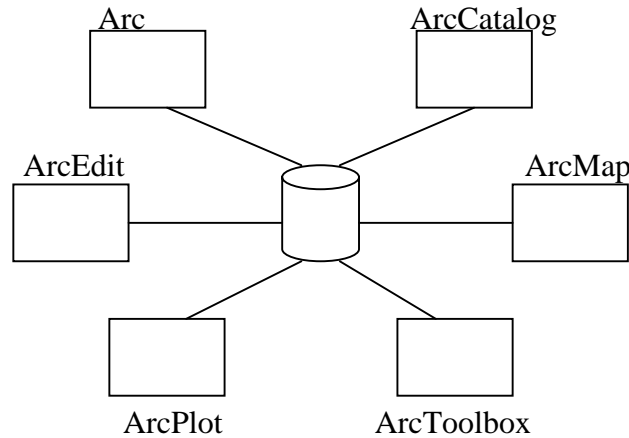
ArcInfo runs in a client/server environment and the system can be optimally configured by having high-performance UNIX machines host data and geoprocessing servers, while PC:s running Microsoft Windows NT are used to best advantage by end users. The new version of ArcInfo, ArcInfo 8, is an integrated system composed of two major parts: Workstation ArcInfo and Desktop ArcInfo. Workstation ArcInfo includes the modules ARC, ARCEDIT, ARCPLLOT, AML, INFO, GRID, NETWORK, ARC TIN etc. Desktop ArcInfo consists of three new applications, Arc Catalog, Arc Map and Arc Toolbox. Each application is tailored to help the user accomplish related tasks quickly. All Desktop ArcInfo applications have standard Windows environment and are designed for use solely on Windows NT. These applications work with existing Workstation ArcInfo environments.



Example; Map created using ArcInfo

ArcInfo 8 supports two primary geographic data models – the georelational model (i.e. coverages and shapes with attributes) as well as a new object-oriented model called a “geodatabase”

ArcInfo 8 base modules



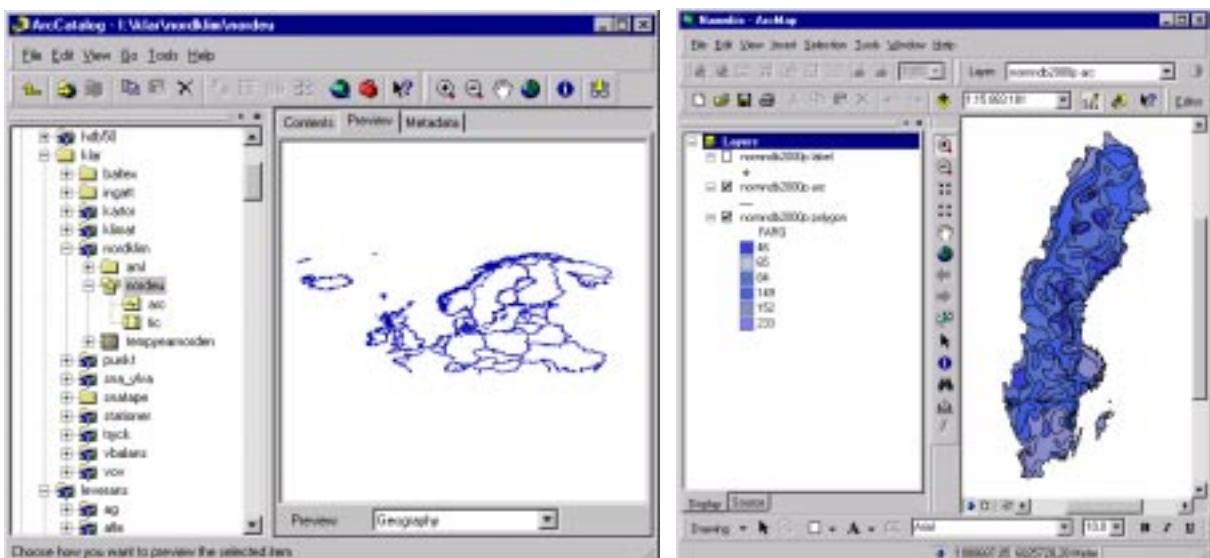
ArcCatalog is the application for locating, browsing and managing spatial data and ArcCatalog resembles the Windows Explorer®.

ArcMap is the environment for working with map data and creating cartographic output, reports, and charts. ArcMap includes an editor.

ArcToolbox provides access to all of ArcInfo software’s coverage processing and analysis functions. Each tool has a dialog-driven interface with wizards.

Read more: <http://www.ersi.com>

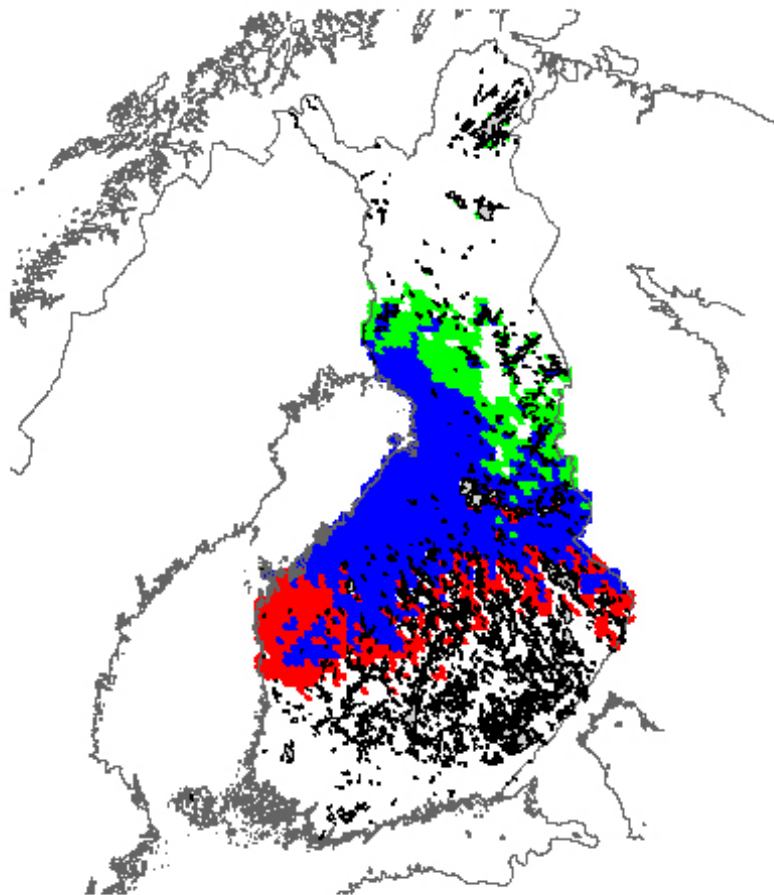
Examples: ArcCatalog and ArcMap



ArcView

ArcView GIS is a desktop geographic information system. With ArcView GIS you can create intelligent, dynamic maps using data from virtually any source and across most popular computing platform. ArcView provides the tools to let you work with maps, database tables, charts and graphics. You can also use multimedia links to add pictures, sound and video to your maps.

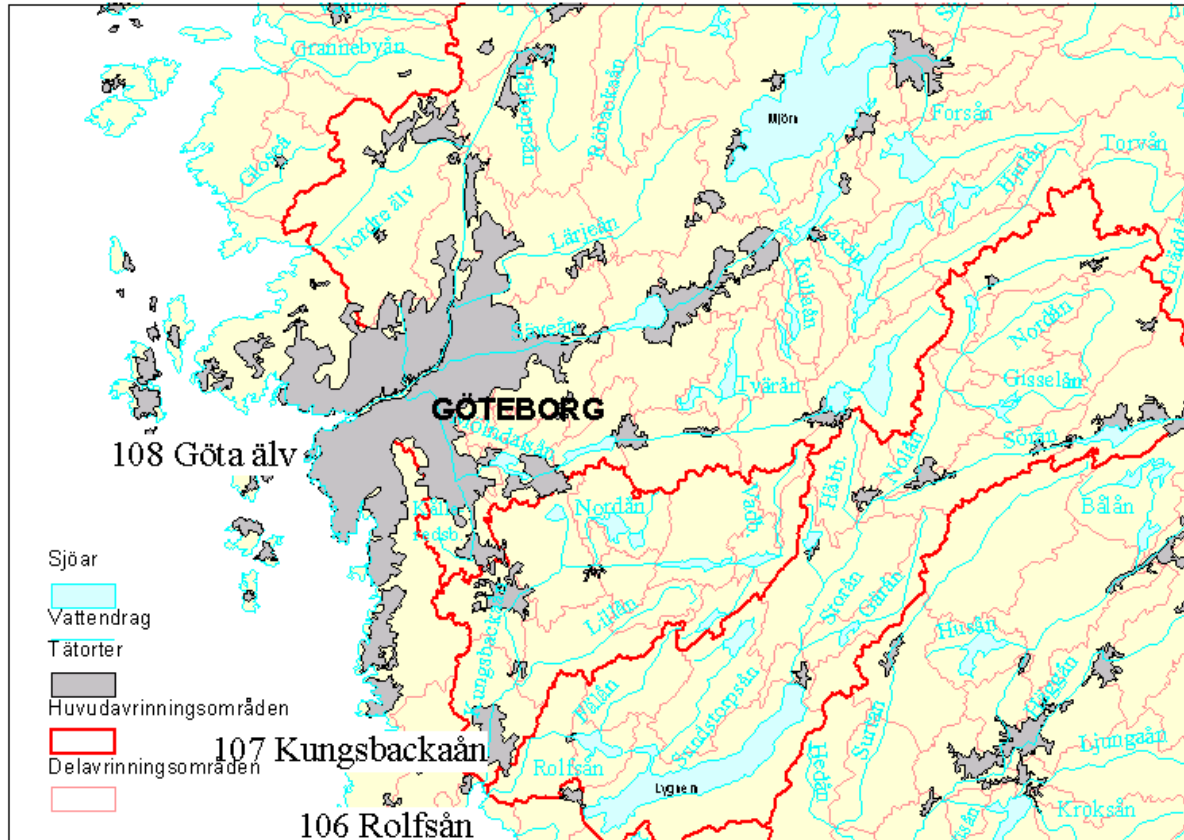
There are quite a few extensions to ArcView GIS that you can load when you need additional functionality. Several extensions come together with ArcView GIS and there are also optional extensions that provide advanced analysis and functional capabilities such as ArcView 3D Analyst, ArcView Spatial Analyst and ArcView Internet Map Server.



Example; Map made in ArcView
Read more: <http://www.esri.com>

Mapinfo

Mapinfo Professional is a software for mapping and geographic analysis. It includes a built-in geocoder, an extensive collection of pre-designed maps. It's mostly used for making maps to enhance presentations and aid in decision making.



Example; Map made in Mapinfo

Read more: <http://www.mapinfo.com>

ArcIMS

ArcIMS is a product in the “Arc-family” from ESRI and provides a platform for distributing geographic information via the Internet. It takes the standard *Arc-shape* format and *geo-images*.

ArcIMS lets you exchange, integrate and analyse data. Users can combine data and information accessed via the Internet with local data. The ArcIMS architecture is specifically engineered to serve GIS-data and services on the Internet by providing Web-enabled GIS. The user-interface can be JAVA- or pure HTML-based.

AVS – Advanced Visual Systems

AVS users can construct their own visualisation applications, by combining software component into executable flow networks. The components, called modules, implement specific functions in the visualisation cycle:

- Filtering the basic data into a more usable form
- Mapping the filtered data into either: geometric primitives that when combined together produce a three-dimensional geometry representation of the data, or mapping the data into pixels that when combined together produce a two-dimensional picture or image representation of the data
- Rendering the 3D geometry or 2D images into pictures on the display screen

Read more: <http://www.avs.com>

Microsoft products

Microsoft products such as Excel and PowerPoint are used for making tables and presentations.

Read more: <http://www.microsoft.com>

Arcobat files

Documents converted to Acrobat pdf-files can easily be made accessible on the Internet via a hyperlink. It's easy to download and the software necessary to read the information, Acrobat Reader, is available as freeware.

Read more: <http://www.adobe.com/products/acrobat/main.html>

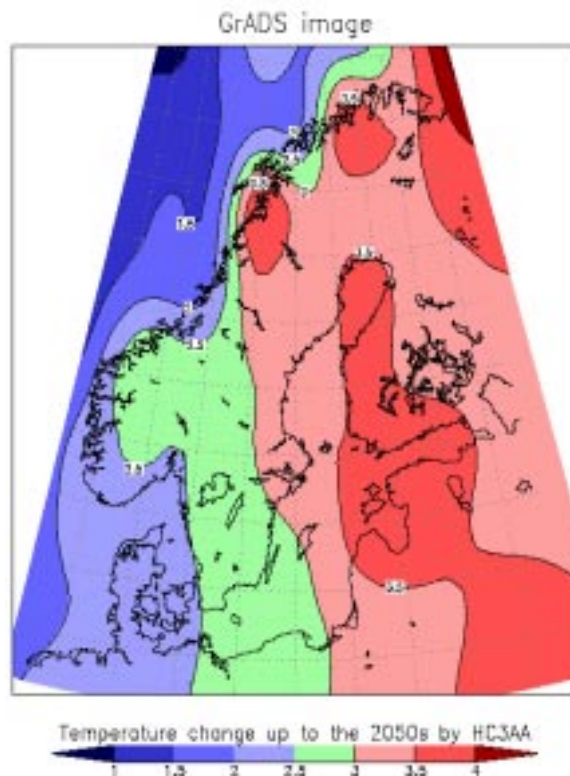
GrADS

The Grid Analysis and Display System (GrADS) is an interactive desktop tool for access, manipulation, analysis, and visualisation of gridded and point data. The grids may be regular, non-linearly spaced, gaussian, or of variable resolution, and the format of the data may be either binary, GRIB, or NetCDF.

Data analysis capabilities are accessed through built-in or user defined external functions, and a programmable interface can be used to automate complex multi-step calculations or displays. Graphical techniques include line, bar and scatter plots, as well as smoothed contours, shaded contours, streamlines, wind vectors, grid boxes, shaded grid boxes, and station model plots. Graphics may be output in PostScript or image formats.

GrADS is freely distributed, and its versions are available for UNIX, Linux, PCs running Windows 95/NT or DOS, and MacIntosh computers.

Read more: <http://grads.iges.org/grads/>



Example; Map made with GrADS

GMT – The Generic Mapping Tools

GMT is a set of about 60 freely available tools for map-making and drawing scientific diagrams. GMT allows using both point data and gridded data. Co-ordinate transformations and some analysis are also possible. GMT has also free world basemap with very accurate sea shorelines and fairly accurate lake shorelines, rivers and state borders.

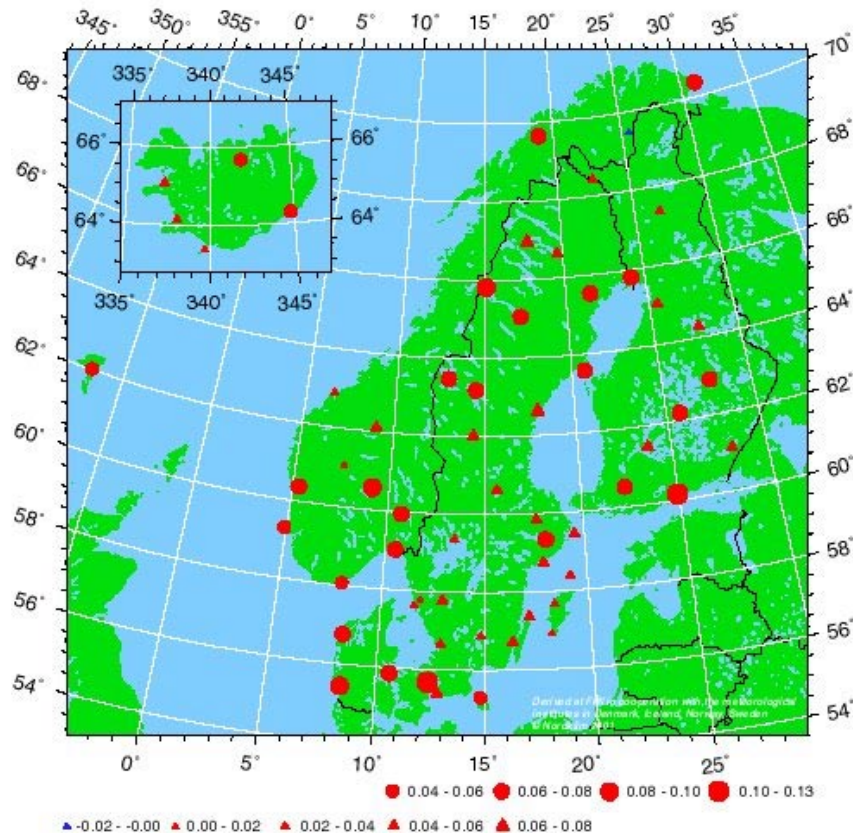
GMT is available for Unix, Linux, Windows and OS/2. GMT tools are either UNIX commands or DOS commands. They can be included in any UNIX or DOS script and this is also the usual way to use GMT.

Positive:

- It is possible to specify very accurately how all features will appear in maps and diagrams.
- It is often easily possible to combine GMT with other programs and applications (e.g. awk, Fortran programs, Oracle Sqlplus etc.).
- User to user support via the GMT mailing list is working.

Negative:

- Writing GMT –code may be time-consuming.
- GMT is not suitable for animations.
- The spatial interpolation algorithms are probably not the best possible. However, there exists a partially GMT –based third party interpolation toolkit called Spherekit (<http://www.ncgia.ucsb.edu/pubs/spherekit/>) with better spatial interpolation tools.



Example; Map made with GMT

JAVA

JAVA is a programming language, which is object oriented and has a lot of *class*-libraries with a lot of functionality. A *Class* is a JAVA general-standalone-object. You can add the libraries (of *classes*) you want, and build up your owns.

- JAVA is an “easy-to-learn” language.
- JAVA does not have multiple heritance, or pointers.
- JAVA has not “closing/killing” of objects, which is good for the programmer. This is because JAVA has it’s own garbage collector, cleaning up unused objects (that means STOPS) when running.
- The most special with JAVA is that it’s interpreting when running, JRE (Java Runtime Environment). That means that JAVA is slowly when running and it needs lot of internal memory (this depends on the size of the application).
- JRE is running on the client. It is therefore smart to have much of the logic on the server, using JAVA-servlets.
- JRE is integrated in the browser but if the application need more than the standard components for JAVA, or newer versions, the client must install a JAVA-plugin in the browser.
- When running JAVA in a browser environment it has a heavily start, because the JAVA-application is downloaded to the client (this depend for sure on the baud-rate for net-communications and the size of the application).

JAVA-history

<http://java.sun.com/features/1998/05/birthday.html>

Why Java technology?

Networks require software that is portable, modular, and secure – all areas where Java technology shines, because it was designed for use on networks from the beginning.

What is the JAVA platform?

<http://java.sun.com/nav/whatis/index.html>

This is a very good link, telling shortly about the JAVA-platform. Developing on the JAVA platform means that projects are completed faster and with less debugging. Java is system-independent and runs on all user platforms and even in the browser environment. Java-components are easily reusable.

Read more: <http://java.sun.com> or <http://www.javasoft.com>

GnuPlot

GnuPlot is a command-driven interactive program for visualising 2D and 3D data points and functions in many different styles (points, lines, error bars, contour plot, mesh). It supports a large number of graphics file formats and devices, including postscript and gif, and it is freely distributed for a number of platforms: Unix, Linux, VAX/VMS, Windows, Macintosh, etc..

StarOffice

StarOffice software, including products such as Calc for spreadsheet and Impress for presentations, runs on several platforms (the Solaris Operating Environment, Linux, and Microsoft Windows) and is freely available.

Adobe PageMaker

Adobe PageMaker is a desktop program for creating publications such as newsletters, brochures, magazines and interactive pages on the World Wide Web.

Read more: <http://www.adobe.com/products/pagemaker/main.html>

Grapher

Grapher is a graphing package for creating publication-quality graphs.

Read more: <http://www.golden.com/frames/grapherframe.htm>

Surfer

Surfer is a contouring and 3D plotting program.

Read more: <http://www.golden.com/frames/surferframe.htm>

Adobe Illustrator and Jasc Paint Shop Pro

Adobe Illustrator and Jasc Paint Shop Pro are used for finalisation of the images mentioned above.

Read more: <http://www.adobe.com/products/illustrator/main.html>
<http://www.jasc.com/product.asp?pf%5Fid=001>

Ferret

Ferret is an interactive computer visualisation and analysis environment designed to meet the needs of oceanographers and meteorologists analysing large and complex gridded data sets. It runs on most Unix systems, and on Windows NT/9x using X windows for display. It can be installed to run from a Web browser ("WebFerret") for use while away from your desk or from a system lacking X windows software. It can transparently access extensive remote Internet databases using DODS.

Read more: <http://ferret.wrc.noaa.gov/Ferret/>

Visual Basic

Read more: <http://msdn.microsoft.com/vba/>

3. Exchange of Climate data

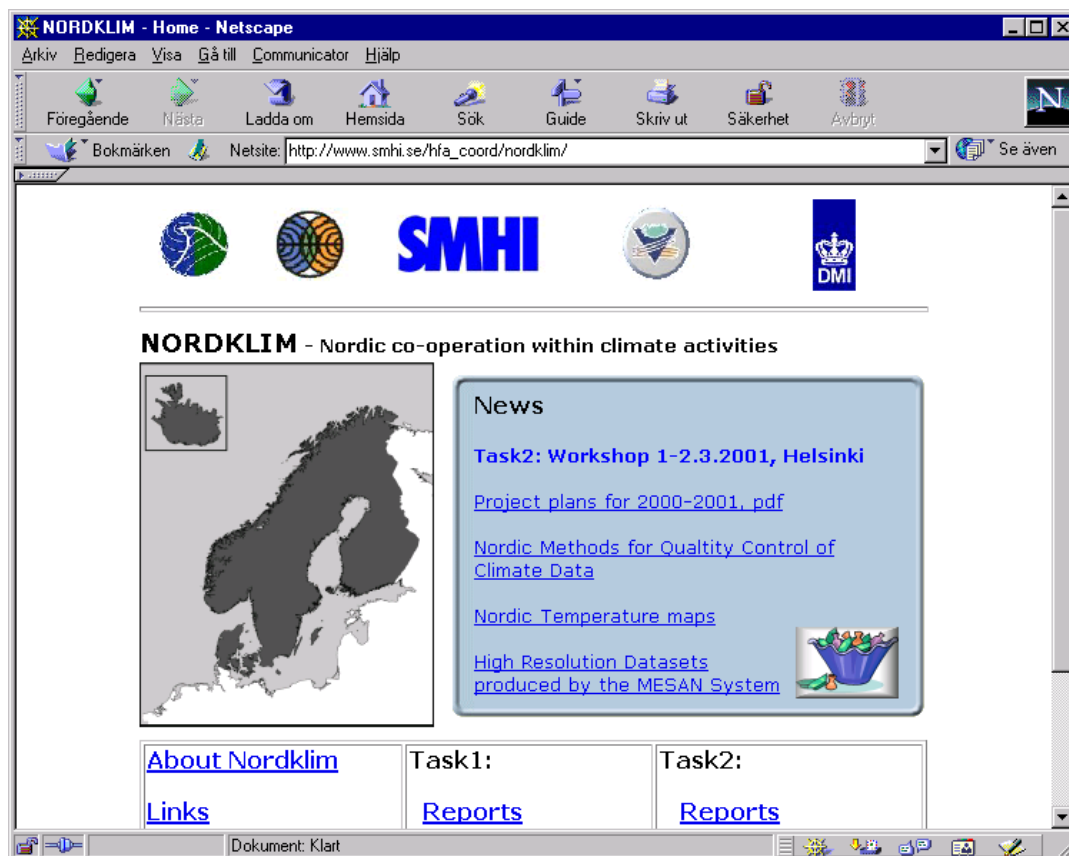
The best way to make information available today is to link it to the Internet. Information can either be made public or shared with other climatologists through an extranet or common server. Our possibilities to make data public are restricted by agreements in ECOMET and WMO.

The data can be put on the net as raw data from our data sets or as presentations in the forms of maps, tables or text-documents. The ways to present data on the net is developing rapidly. Using web access to climate data for distributing the data makes the information easy to find, easy to evaluate and makes it easy to retrieve the desired data.

To be able to share data within NORDKLIM requires a common area where data can be stored and accessed by all NORDKLIM countries. Security aspects make it difficult to have a common area where all participants can update the information. The only easy solution we have found today is to store the data on an ftp-server, where access is restricted. This is not an ideal solution because the ftp-server will not permit data processing. It can only be used as a data storage area for raw datafiles. Up till now much of the data exchange has been done by using e-mail with attached ASCII-files in so called NACD format.

We have created an Internet site for NORDKLIM. It can be used as a platform to share climatological information from the different countries. Reports and maps can be made available through this site.

NORDKLIM www-page: http://www.smhi.se/hfa_coord/nordklim/



4. CLIMATIC DATA-WAREHOUSE WEB-application at DNMI.



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Introduction

The system is using a 3-layer structure:

Database – server – client (Figure 1).

The *database* is a Data-warehouse containing derived parameters as observations, daily- and monthly- values, normals and extremes. The *server* produce dynamic HTML documents containing tables and graphs for selected parameters using JAVA-servlets. The *client* contains the user interface, including an interactive map for selection of stations.

The application is programmed in JAVA1.2 and is running in the Java-plugin environment. Using this technology we can make advanced user interfaces running in a browser.

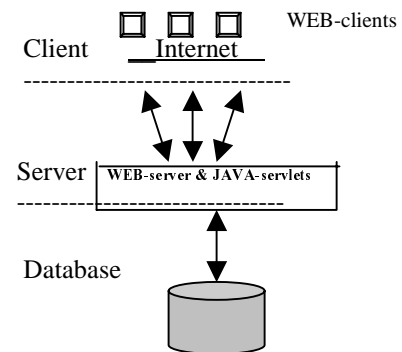


Figure 1: System architecture

Web clients

The use of Internet technology in our Climatic Data-warehouse applications will increase the accessibility for our data. The technology has several advantages:

- It is platform independent.
- It makes the system easy to maintain.
- There is no installation needed on the client other than the JAVA-plugin (the user has then to accept a certificate, for DNMI, from the certificate authority Thawte Consulting).
- Internet standards also offer tools for handling security problems including monitoring of traffic (customers).

3-layer structure: Database – server – client.

This configuration makes thin clients. Only the user interface (JAVA-applet environment) is loaded over to the client. The database logic and heavy operations are located on the server. This configuration also makes it easy to design an object-oriented system. We can separate the “business logic”, the user interface and the presentation of data in separate modules.

-Database

The Climatic Data-warehouse is an Oracle 8.0.5 database, running on UNIX. The database can be easily reconstructed from the main climatic-database.

-Server

WEB-server

We are running APACHE WEB-server because it is free and highly scalable and exists for all common systems/computer environments. We use JServ 1.0 for APACHE to run JAVA-servlets.

JAVA-Servlets

Servlets is server side Java programs for generating dynamic HTML-documents or other data-objects. This technology is faster than the traditional CGI-scripts. We decided to use servlets because it's flexible and we can use already developed Java modules. The servlets have basically two main functions:

- It produces the station map showing stations that have the selected parameters for a given period.
- It produces a HTML-; text- or Excel- document showing the data for selected stations, parameters and period.

In the HTML user interface, servlets are used to make a dynamic dialog with the user. The servlets, and not the applet/client, communicate with the database using JDBC (JAVA DataBase Connectivity).

-Client

User interface

The user interface consists of dialogs with the user, in 1 to 5 parts. It results in the 6th- the report. The user interface (dialogs) exists in both JAVA-version (advanced, but the user must have the JAVA-plugin installed) and HTML-version (thin-client, the most advanced reports are not implemented here)

1. Dialog for selection of report type: The reports are specified in an XML-document. When the user select a report type, a dialog for required inputs is popping up.
2. Dialog for choosing parameters (in a tree-structure)
3. Special (required) inputs (ex. max-values, interval ++)
4. Period (years and months, or dates)
5. Station selection for actual stations: from a station table or from a map interface for graphically selection of stations where the user is able to zoom in and out in the map, panning, zoom into selected stations and zooming to the extent of all stations.
6. Change format/quality for the document (default: HTML)
7. When the user has finished the selection, the result will appear as a report in a new frame or window.

Examples are shown in attachment 1.

Content/Reports for the application

We have about 40 different reports available in the system. It is different kinds of reports:

- Time series; observations, daily- and monthly- values.
- Normal values
- Extreme values
- Frequencies –reports (counts the number of occasions for some parameters)
- Meta-information about stations and parameters

The reports can be given in different formats as: HTML, plain text and MS Excel. Statistically data are integrated in many of the reports, and it is also possible to get a graphical view.

Conclusions

There have been significant technical challenges to overcome, but use of Internet technology allows us to increase the accessibility of climatic data. Our focus on building a general platform will surely be paid back in further development of the system:

- It is very easy to add and define new reports in the system.
- The components (JAVA-classes) are built in such a way that they are easy to reuse. It is therefore possible to use the components in other systems, connecting to other databases with few adjustments.

Further plans

- Upgrade Oracle database and install Oracle application-server.
- Make the application scalable for different languages
- Build the reports in XML-format (more flexible and general) for future formats (ex. WAP)
- Distribute the application on the Internet for customers, partners and the public (has to declare restricted data and areas). This is a security challenge!

GIS-Plans

We have now installed ArcIMS (Internet Mapping Server) in order to publish climatic data also as map-interface. It is a challenge to make the maps dynamically accessible for users.

We will focus on:

- Monthly- and annual- normals
- Monthly- and annual- precipitation values
- Monthly- and annual- mean temperature values
- Extreme precipitation (return periods).

The maps will be shown as point values and interpolated grid values.

Examples from User Interface (Java-applet):

1) Report Selection

-
- 📁 Klimarapporter
 - 📁 Tidsserier
 - 📁 Observasjoner
 - 📄 Observasjoner
 - 📄 Standard observasjonsliste
 - 📄 Nedbør- type og høyde snø- dybde og dekke
 - 📄 Lufttemperatur, skydekke og nedbør
 - 📁 Døgnverdier
 - 📄 Døgnverdier
 - 📄 Døgnverdier - parametervis
 - 📄 Døgnverdier - parametervis m/statistikk
 - 📄 Siste ukesrapport
 - 📄 Ukerapport
 - 📄 Månedssrapport - døgnverdier
 - 📄 Årsrapport - døgnverdier
 - 📁 Månedsverdier
 - 📄 Månedsverdier
 - 📄 Månedsverdier - parametervis
 - 📄 Månedsverdier - parametervis m/statistikk
 - 📄 Datadekning - månedsverdier - parametervis m/statistikk
 - 📁 Homogeniserte Månedsverdier
 - 📄 Homogeniserte månedsverdier
 - 📄 Homogeniserte månedsverdier - parametervis
 - 📄 Månedsverdier - parametervis - m/statistikk
 - 📁 Frekvensfordelinger
 - 📄 En-parameter frekvensfordeling
 - 📄 To-parameter frekvensfordeling
 - 📄 To-parameter frekvensfordeling månedvis og totalt
 - 📄 Vindretning/-hastighet frekvensfordeling
 - 📄 Antall døgn m/forekomster - parametervis
 - 📄 Antall døgn m/forekomster - parametervis - månedsverdier
 - 📄 Antall døgn m/forekomster av parametre i kombinasjon
 - 📁 Ekstremer
 - 📄 Nedbørintensitet
 - 📄 Standard ekstremrapport
 - 📄 Ekstremrapport for stasjoner
 - 📄 Ekstremer for Norge
 - 📄 Ekstremstatistikk for døgnverdier
 - 📄 Ekstremstatistikk for månedsverdier
 - 📄 Ekstremstatistikk for intervall
 - 📄 Ekstremstatistikk for døgnverdier - flere år - månedvis
 - 📁 Normaler
 - 📁 Informasjon

2) Parameter selection

Parametervalg

- DVH_DOGN
 - Fordampning
 - Fuktighet
 - Midlere relativ luftfuktighet(UUM)
 - Minimum relativ luftfuktighet(UUN)
 - Maksimum relativ luftfuktighet(UUX)
 - Nedbør
 - Nedbør(RR)
 - Nedbør fra ikke-daglige stasjoner(RRID)
 - Nedbør i temperaturdøgnet(RRTA)
 - Nedbørslag(snø, regn ...)(SLAG)
 - Sjø/vann
 - Laveste sjøgang(SGN)
 - Høyeste sjøgang(SGX)
 - Skyer
 - Klarvær(NN04)
 - Pent vær(NN09)
 - Overskyet vær(NN20)
 - Midlere skydekke(NNM)
 - Minste skydekke(NNN)
 - Størst skydekke(NNX)
 - Snø
 - Snødybde(SA)
 - Snødekke(SD)
 - Soltid
 - Synsvidde
 - Laveste synsvidde(VVN)
 - Høyeste synsvidde(VVX)
 - Temperatur
 - Graddager (basis TAM 17 grader)(GD17)
 - Midlere lufttemperatur(TAM)
 - Laveste lufttemperatur(TAN)
 - Høyeste lufttemperatur(TAX)
 - Gressmintemperatur(TGN)
 - Sjøtemperatur nær vannoverflaten/Vanntemperatur(TW)
 - Varmesum (sum(TAM-5) ,TAM >0.0)(VEKST)
 - Varmesum (sum(TAM) , TAM>0.0)(VSUM)
 - Trykk
 - Midlere lufttrykk i stasjonsnivå(POM)
 - Laveste lufttrykk i stasjonsnivå(PON)
 - Høyeste lufttrykk i stasjonsnivå(POX)
 - Midlere lufttrykk i havsnivå(PRM)
 - Laveste lufttrykk i havsnivå(PRN)
 - Høyeste lufttrykk i havsnivå(PRX)
 - Vanndamptrykk(VP)
 - Vind
 - Vær

3+4) Dialog for period and required inputs (example of the JAVA-user interface in a browser environment)

Ekstremstatistikk for døgnerver...

Velg parameter

Høyeste lufttemperatur(TAX)

Maks (synkende sortering)
 Min (stigende sortering)

Antall:

Siste hele år

Fra år: Til år: Mnd:

2001 Alle
 2000 Jan
 1999 Feb
 1998 Mar

Velg stasjoner

OSLO - BLINDERN

Kart

Egenskaper

Vis i nytt vindu

Vis rapport

Hjelp

kdvh@dnmi.no © DNMI



Ekstremstatistikk for døgnerverdier

Stasjoner

| Stnr | Navn | I drift fra | I drift til | Hoh | Fylke | Kommune |
|-------|-----------------|-------------|-------------|-----|-------|---------|
| 18700 | OSLO - BLINDERN | feb 1937 | | 94 | OSLO | OSLO |

Elementer

| Para | Beskrivelse | Enhet |
|------|------------------------|----------|
| TAX | Høyeste lufttemperatur | grader C |

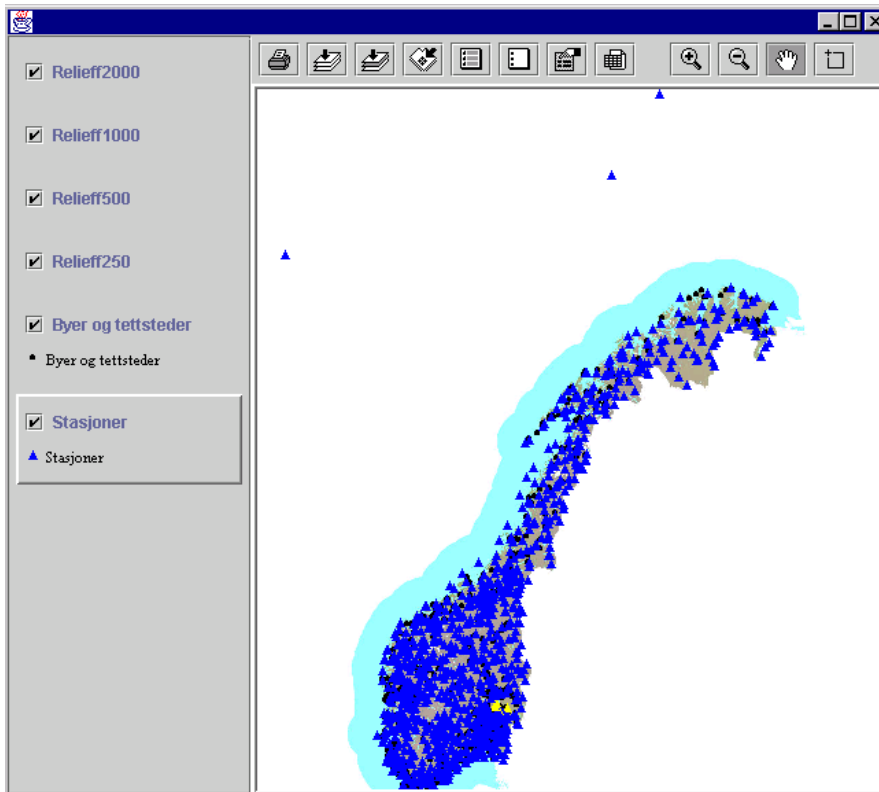
**18700 med TAX
1998-2001, 10 maksimale verdier**

| jan | feb | mar |
|------------|------------|------------|
| 10,2 | 13,7 | 15,9 |
| 17.01.2000 | 23.02.1998 | 31.03.1998 |
| 6,5 | 12,8 | 15,4 |
| 06.01.2000 | 19.02.1998 | 20.03.2000 |
| 6,4 | 10,9 | 11,2 |
| 08.01.2000 | 18.02.1998 | 30.03.2000 |
| 6,0 | 10,1 | 11,1 |
| 07.01.2000 | 26.02.1998 | 06.03.2000 |
| 5,8 | 9,5 | 10,6 |
| 20.01.1999 | 25.02.1998 | 27.03.1998 |
| 5,7 | 9,3 | 10,4 |
| 15.01.1998 | 04.02.1999 | 21.03.2000 |
| 5,7 | 8,9 | 10,2 |
| 20.01.2000 | 06.02.2000 | 22.03.1998 |
| 5,3 | 8,6 | 9,9 |
| 29.01.2000 | 24.02.1998 | 28.03.1999 |

5) Select stations

| Stnr | Navn | Snr | Fylke | Kommune | Hoh | I drift fra | I drift til |
|-------|---------------|-----|--------------|--------------|-----|-------------|-------------|
| 41370 | BJELLAND ... | | VEST-AGDE... | MARNAROK... | 110 | jun 1978 | |
| 41450 | SKJERKA ... | | VEST-AGDE... | ÅSERAL ... | 263 | nov 1969 | |
| 41480 | ÅSERAL ... | | VEST-AGDE... | ÅSERAL ... | 278 | jul 1895 | |
| 41490 | ÅSERAL II ... | | VEST-AGDE... | ÅSERAL ... | 286 | 1927 | 1940 |
| 41550 | LJOSLAND ... | | VEST-AGDE... | ÅSERAL ... | 504 | aug 1971 | |
| 41560 | LJOSLAND ... | | VEST-AGDE... | ÅSERAL ... | 547 | jul 1919 | jun 1971 |
| 41640 | VIGMOSTA... | | VEST-AGDE... | LINDESNE... | 38 | 1940 | |
| 41660 | KONSMO - ... | 439 | VEST-AGDE... | AUDNEDAL... | 260 | jul 1964 | mai 1989 |
| 41670 | KONSMO - ... | 439 | VEST-AGDE... | AUDNEDAL... | 263 | jan 1992 | |
| 41680 | KONSMO - ... | 439 | VEST-AGDE... | AUDNEDAL... | 320 | jan 1951 | nov 1990 |
| 41720 | BYREMO ... | | VEST-AGDE... | AUDNEDAL... | 125 | jul 1895 | des 1902 |
| 41750 | LINDESNE... | | VEST-AGDE... | LINDESNE... | 4 | jul 1921 | 1936 |
| 41760 | LINDESNE... | 436 | VEST-AGDE... | LINDESNE... | 37 | 1936 | aug 1979 |
| 41770 | LINDESNE... | 436 | VEST-AGDE... | LINDESNE... | 13 | jan 1946 | |
| 41820 | KVÅVIK ... | | VEST-AGDE... | LYNGDAL ... | 4 | 1972 | |
| 41830 | BERGE I LY... | | VEST-AGDE... | LYNGDAL ... | 5 | jul 1895 | des 1923 |
| 41850 | HÆGEBOS... | | VEST-AGDE... | HÆGEBOS... | 185 | feb 1993 | |
| 41860 | KVINESHEI... | | VEST-AGDE... | KVINESDAL... | 317 | mai 1986 | |
| 41870 | KVINESDAL... | | VEST-AGDE... | KVINESDAL... | 249 | jul 1994 | des 1996 |
| 41880 | KVINESDAL... | | VEST-AGDE... | KVINESDAL... | 343 | jan 1923 | des 1985 |
| 41930 | GARDØL ... | | VEST-AGDE... | HÆGEBOS... | 200 | 1921 | 1926 |
| 41950 | HAUGE ... | | VEST-AGDE... | HÆGEBOS... | 193 | jul 1895 | des 1926 |
| 42080 | BRYNE ... | | VEST-AGDE... | FARSUND ... | 11 | jul 1895 | des 1926 |
| 42160 | LISTA FYR ... | 427 | VEST-AGDE... | FARSUND ... | 14 | jan 1926 | |
| 42240 | FEDEFJØR... | | VEST-AGDE... | KVINESDAL... | 1 | 1939 | 1949 |
| 42250 | FEDAFJØR... | | VEST-AGDE... | KVINESDAL... | 26 | jul 1949 | |
| 42280 | ØYESTRAN... | | VEST-AGDE... | KVINESDAL... | 2 | sep 1964 | aug 1966 |
| 42320 | EIGELAND ... | | VEST-AGDE... | KVINESDAL... | 34 | jul 1895 | des 1905 |
| 42350 | GALLDAL ... | | VEST-AGDE... | KVINESDAL... | 236 | jun 1972 | okt 1992 |
| 42400 | RAFOSS ... | | VEST-AGDE... | KVINESDAL... | 85 | jul 1895 | jun 1911 |
| 42480 | HELLE ... | | VEST-AGDE... | KVINESDAL... | 177 | jul 1895 | des 1923 |
| 42500 | BIRNEDALE... | | VEST-AGDE... | KVINESDAL... | 240 | 1895 | |

OK



6) Select format/quality

Vis dokumenter som:

HTML-dynamisk

HTML-statisk

Tekst

Excel

Kolonneskilletegn for tekst:

Mellomrom

Semikolon

Tabulator

Desimalskilletegn:

Punktum

Komma

OK

7) The result: a report

There is a linked stylesheet to the report and hyperlinked stations and parameters to fetch more information about them.

Nedbør- type og høyde snø- dybde og dekke

Stasjoner

| Stnr | Navn | Type | I drift fra | I drift til | Hoh | Fylke | Kommune |
|-------|-------|------|-------------|-------------|-----|---------------|---------|
| 10400 | RØROS | VS | mai 1952 | | 628 | SØR-TRØNDELAG | RØROS |

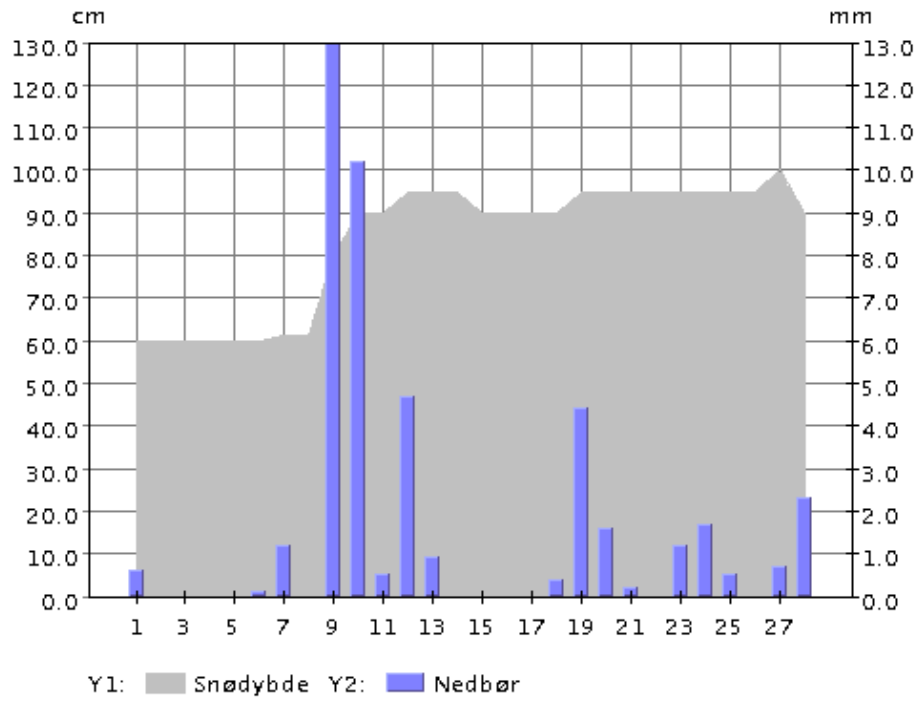
Elementer

| Para | Beskrivelse | Enhet |
|------|--------------------------------------|---------|
| RR | Nedbør | mm |
| SA | Snødybde | cm |
| SD | Snødekke | 4-deler |
| V10 | Været siden forrige hovedobservasjon | kode |
| V11 | Været siden forrige hovedobservasjon | kode |
| V12 | Været siden forrige hovedobservasjon | kode |
| V4 | Været siden forrige hovedobservasjon | kode |
| V5 | Været siden forrige hovedobservasjon | kode |
| V6 | Været siden forrige hovedobservasjon | kode |
| V7 | Været siden forrige hovedobservasjon | kode |
| V8 | Været siden forrige hovedobservasjon | kode |
| V9 | Været siden forrige hovedobservasjon | kode |

V10400 RØROS Februar 1997

| Dag | V4 | V5 | V6 | V7 | V8 | V9 | V10 | V11 | V12 | RR | SA | SD |
|----------------|----|----|----|----|----|----|-----|-----|-----|-------|-----|----|
| 1 | SB | | | SB | | | SB | | | 0,6 | 60 | 4 |
| 2 | | | | | | | | | | | 60 | 4 |
| 3 | | | | | | | | | | | 60 | 4 |
| 4 | | | | | | | | | | | 60 | 4 |
| 5 | | | | | | | SS | | | 0,0 | 60 | 4 |
| 6 | SS | | | SS | | | SS | | | 0,1 | 60 | 4 |
| 7 | | | | SS | | | SS | | | 1,2 | 61 | 4 |
| 8 | RB | | | | | | | | | 0,0 | 61 | 4 |
| 9 | SS | | | SS | | | SS | | | 13,0 | 80 | 4 |
| 10 | SS | | | SS | | | SS | | | 10,2 | 90 | 4 |
| 11 | | | | | | | LB | SS | | 0,5 | 90 | 4 |
| 12 | SS | | | | | | SB | | | 4,7 | 95 | 4 |
| 13 | SS | | | SB | | | SS | | | 0,9 | 95 | 4 |
| 14 | | | | SS | | | | | | 0,0 | 95 | 4 |
| 15 | | | | SS | | | | | | 0,0 | 90 | 4 |
| 16 | | | | | | | | | | | 90 | 4 |
| 17 | | | | | | | | | | | 90 | 4 |
| 18 | | | | | | | SS | | | 0,4 | 90 | 4 |
| 19 | SS | | | SS | | | SS | | | 4,4 | 95 | 4 |
| 20 | SS | | | SS | | | SS | | | 1,6 | 95 | 4 |
| 21 | SS | | | | | | | | | 0,2 | 95 | 4 |
| 22 | | | | | | | | | | | 95 | 4 |
| 23 | SB | | | | | | SS | | | 1,2 | 95 | 4 |
| 24 | | | | RB | | | SS | | | 1,7 | 95 | 4 |
| 25 | SS | | | RR | SL | | | | | 0,5 | 95 | 4 |
| 26 | | | | | | | | | | | 95 | 4 |
| 27 | SS | | | SS | | | SS | | | 0,7 | 100 | 4 |
| 28 | SS | | | | | | SS | | | 2,3 | 90 | 4 |
| Antall | 14 | | | 13 | 1 | | 16 | 1 | | 28 | 28 | 28 |
| Laveste | | | | | | | | | | | 60 | 4 |
| Dag | | | | | | | | | | 2 | 1 | 1 |
| Høyeste | | | | | | | | | | 13,0 | 100 | 4 |
| Dag | | | | | | | | | | 9 | 27 | 1 |
| Sum | | | | | | | | | | 44,2 | | |
| Middel | | | | | | | | | | | 83 | 4 |
| Normal | | | | | | | | | | 28,0 | | |
| % | | | | | | | | | | 157,9 | | |

RØROS Februar 1997



Generert: 20.02.2001

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5. Climatological information on the Internet from SMHI.

Today SMHI has the following information on the web, mostly in Swedish.

Weather of year 2000

Official Swedish meteorological records

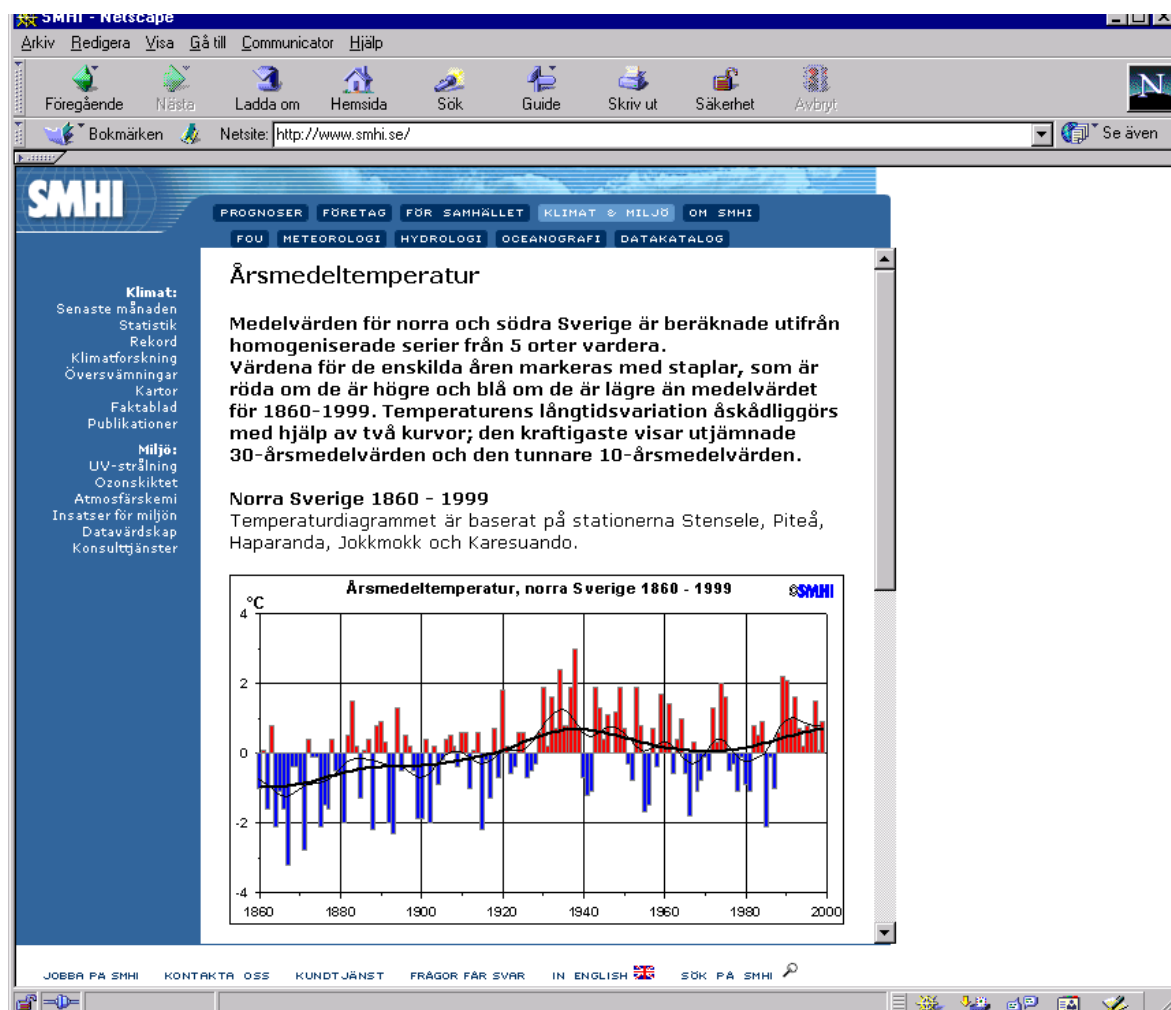
Maps from the National Atlas of Sweden, Climate, Lakes and Rivers

Factsheets

Statistical information, such as annual mean temperature for different parts of Sweden

Station maps for the temperature- and precipitation stations

SWECLIM information



Example from <http://www.smhi.se>

6. References

Climate Data Visualization on the Web. AMS – 13th International Conference on Interactive Information and Processing Systems for Meteorology, Oceanography and Hydrology, 1997

Visualization Tools, National Computational Science Alliance (NCSA)
<http://cgi.ncsa.uiuc.edu/Vis/Info/Intro/>

Geografisk informationsbehandling, Metoder och tillämpningar, Bygghälsningsrådet ULI, Sweden, 1999

Modeling our World, The ESRI Guide to Geodatabase Design, Michael Zeiler, ESRI Press

SMHI homepage: (<http://www.smhi.se>)

ESRI, <http://www.esri.com/software/>

MapInfo, <http://dynamo.mapinfo.com/products/web/Overview.cfm?productid=44>

GrADS, (<http://grads.iges.org/grads/>)

GnuPlot, (<http://www.gnuplot.org/>)

StarOffice, (<http://www.sun.com/staroffice/>)

GMT homepage: <http://www.soest.hawaii.edu/gmt/>

GMT mailing list archive: <http://op.gfz-potsdam.de/GMT-Help/>

AVS, (<http://www.avs.com>)

eXpose, (<http://www.nyk.zenon.se>)

Java, (<http://java.sun.com>), (<http://www.javasoft.com>)

Microsoft, (<http://www.microsoft.com>)

Surfer, (<http://www.golden.com/frames/surferframe.htm>)

Grapher, (<http://www.golden.com/frames/grapherframe.htm>)

PageMaker, (<http://www.adobe.com/products/pagemaker/main.html>)

Illustrator, (<http://www.adobe.com/products/illustrator/main.html>)

Paint Shop Pro, (<http://www.jasc.com/product.asp?pf%5Fid=001>)