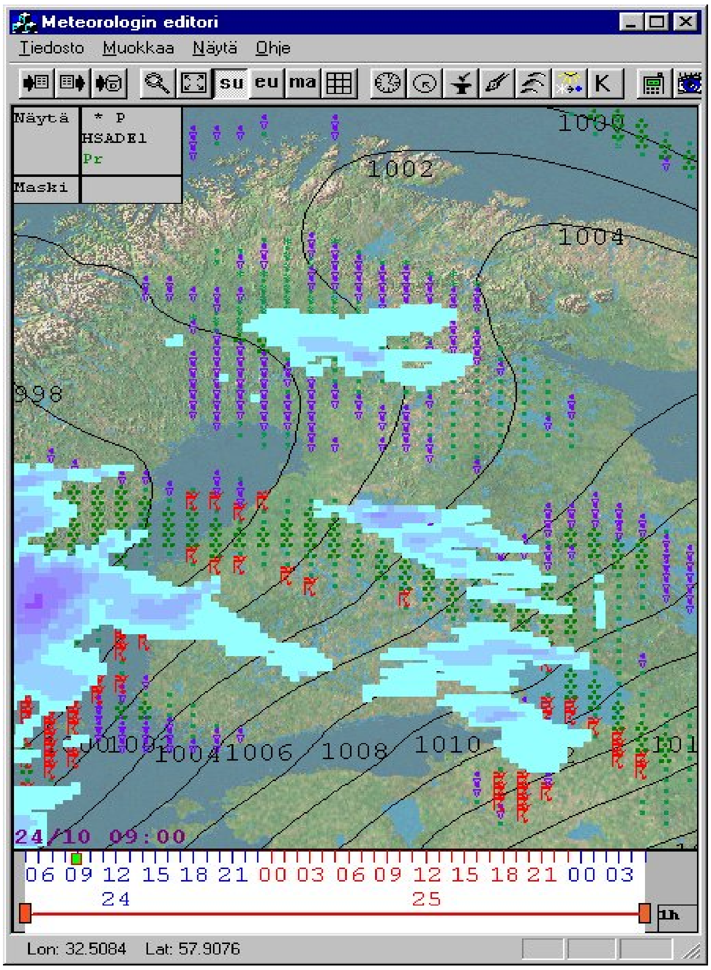
Proceedings of the

11the EGOWS meeting

held at FMI, Helsinki, Finland, 5-8 June 2000



Organisation

The 11the meeting of the European Working Group on Operational Meteorological Workstation Systems, EGOWS, was hosted by FMI, Finland.

The organisers of the meeting
Juha Kilpinen
Leena Roivainen

Acknowledgement

Hewlett Packard Finland has kindly provided a workstation for demonstration purposes

Introduction

The 11th meeting of the European Working Group on Operational Meteorological Workstation Systems, EGOWS, was held at Fmi Helsinki, Finland. The actual meeting was took place at the facilities of the University of Helsinki (address: Unioninkatu 37) and the demonstrations were help at the FMI building.

In his opening speech Prof. Erkki Jatila, Director-General of FMI welcomed all 43 participants from 19 countries and from the ECMWF. He wished that the meeting and the demonstrations would be fruitful and new co-operation between the countries and developers would grow up.

EGOWS was invited by Sigbjörn Grönås (DNMI) and Jean Coiffier (MF) and the first meeting was organised at Oslo by DNMI in 1990 and FMI was hosting the meeting the previous time in 1992. The other meetings were organised by MeteoFrance in Paris (1991), by DWD in Offenbach (1993), by DMI in Copenhagen (1994), by ZAMG in Vienna (1995), by UKMI in Reading (1996), by MeteoFrance in Toulouse (1997), SMHI in Norrköping (1998) and by KNMI in De Bilt (1999).

During the meeting 20 presentations were given by the participants. The subjects of the presentations covered the recent developments and future plans from different institutes.

In the demonstration sessions several meteorological workstation systems or application was demonstrated. The following systems was demonstrated:

- Synergie System from MeteoFrance on Linux
- KNMI workstation on DEC Alpha
- Xcharts application from Met Eireann on RedHat Linux
- MAP workstation from DWD on SGI Unix
- An XML based application from HIS (Slovenia)
- DNMI workstation from DNMI on SGI Unix
- DMI application on Web
- Horace system from UKMO on HP Unix
- TAF workstation from FMI on WindowsNT
- Grid Editor from FMI on WindowsNT
- Satrep Editor (and other applications) from FMI on Web (Java)
- Nimbus system from UKMO on WindowsNT
- GIS Meteo system from Mapmakers Group (Russia) on WindowsNT

Within the meeting another working group had its meeting. This group is called “Working group on Meteorological Objects in Interaction with Gridded Fields” chaired by Eric Brun from MeteoFrance. This working group had its own discussions with the other sub-groups of EGOWS.

The theme of the sub-groups were:
Visialisation techniques (chaired by Hans-Joachim Koppert)
Graphical Interaction (chaired by Magali Stoll)

Reports of the presentations and group discussions are presented at the end of this publication. The report of the Working group on Meteorological Objects in Interaction with Gridded Fields is already sent to the participants of this group.

In the final discussion the reports of the working groups was presented. The meeting was considered successful and SMA from Switzerland was willing to host the next meeting in 2001

Recent system developments at SMHI

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Working with the Y2k problems

To be able to secure all systems we first had to identify all products and systems, and the owners of them. To do this all departments at SMHI had to define their ten most important products. When this was done the system management department had to identify what systems the products depended upon. It might sound strange, but it took a lot of time to identify what systems the products depended upon. Many systems have been running for a long time and the dependencies were not obvious.

The work was made in a few stages where important systems had the highest priority. For some systems the dates were set by the Swedish government, so it was very important to be finished in time.
The systems were separated in three groups:
- Systems important for the society except some for the season not relevant.
- Systems important for business except some for the season not relevant.
- Other systems

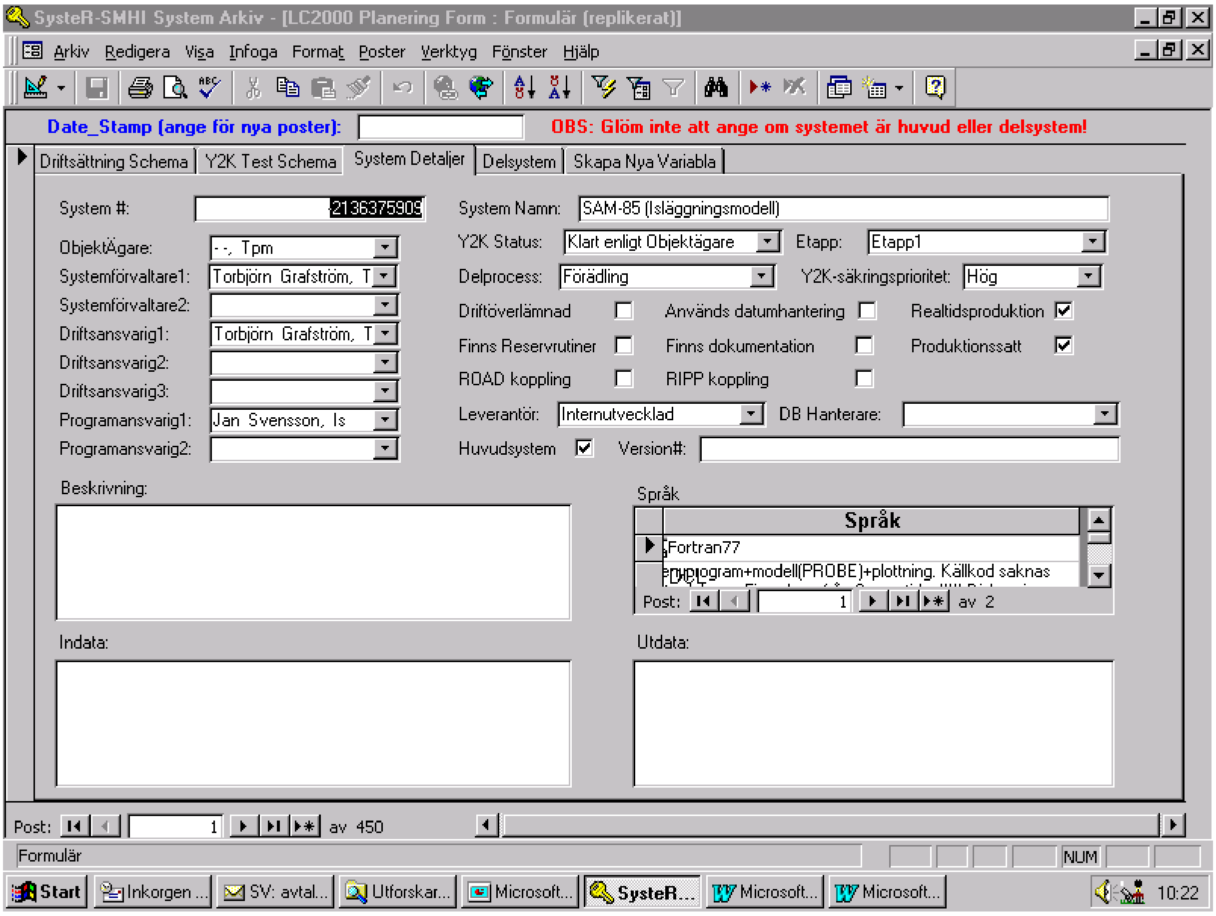
STAGES	CONTENT	IMPORTANT DATES
Stage 1	Systems important for the society except some for the season not relevant.	Restored, tested latest 1999-06-01 Operational latest 1999-10-01
Stage 2	Systems important for business except some for the season not relevant	Restored, tested latest 1999-06-01 Operational latest 1999-10-01
Stage 3	Other systems, except some for the season not relevant.	Restored, tested operational latest 1999-12-01
Stage 4	Substage from stage 1 and 2: Systems needed for spring summer and autumn related products.	Restored, tested operational latest 2000-03-31
Stage 5	Systems only used for producing a few products. Manually produced products.	After 1999-12-31 if necessary

An access database was created for listing the systems and products. This was necessary to do to get a good overview of the systems. The systems are listed in different classes with different priorities. The systems used for warnings had the highest priority of course, then those important for business. The dB also contains information on what platform they are running on and if they are dependent on any freeware etc.

When the work with identifying the products and systems were done it was time to test the systems. This was made in a special room called the Y2k-lab. In this lab a smaller network

was built up. This network was not connected to our Intranet so that there wouldn't be any disturbances. All different hardware's used at SMHI were installed in the lab. A smaller version of our ROAD database was built up, and filled with test data for Dec. 1999 to Mars 2000.
In this way we could test all type of systems for potential Y2k and leap year problems. Both old and newly developed systems were tested, and we actually did find some problems even with some new systems, mostly because of incorrect use of the tm structure in C or C++ code.
The biggest problems were however personal problems. There are a lot of Fortran systems running, and not so many Fortran programmers left at SMHI.

Fortunately we managed to get ready on time. During a long time new systems were detected, so though systems were secured the number of systems to restore didn't decrease. But finally all systems were ready.



A view of the SysteR db, showing system owner, Y2k status, programming languages etc for the system

The EuroWeather system

The purpose with EuroWeather was to produce weather forecasts for newspapers as automatically as possible. The product should contain different so-called weather elements, such as maps, diagrams, tables, symbols, satellite images, observations and also some statistics.

Input data is fetched via APIs from various sources. It is easy to change where from data should be fetched. Some data comes from our ROAD dB. Fetching data is called preparing.

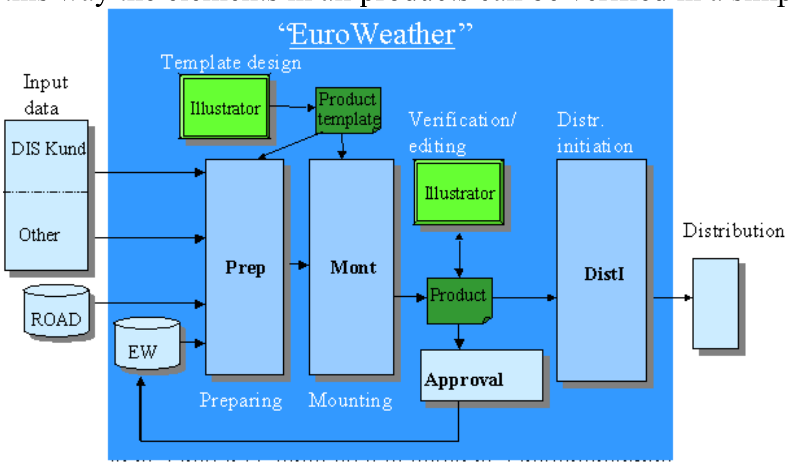
In an Illustrator document input data values are mounted in what is called product elements. These product elements match the weather elements. They are also objects in Illustrator, such as text fields, picture links etc.

An Illustrator document with product elements is called a product template. The product elements in the product template contain references to product element definitions in the EuroWeather database. These definitions contains all information needed for the system to know where and how data is to be used.

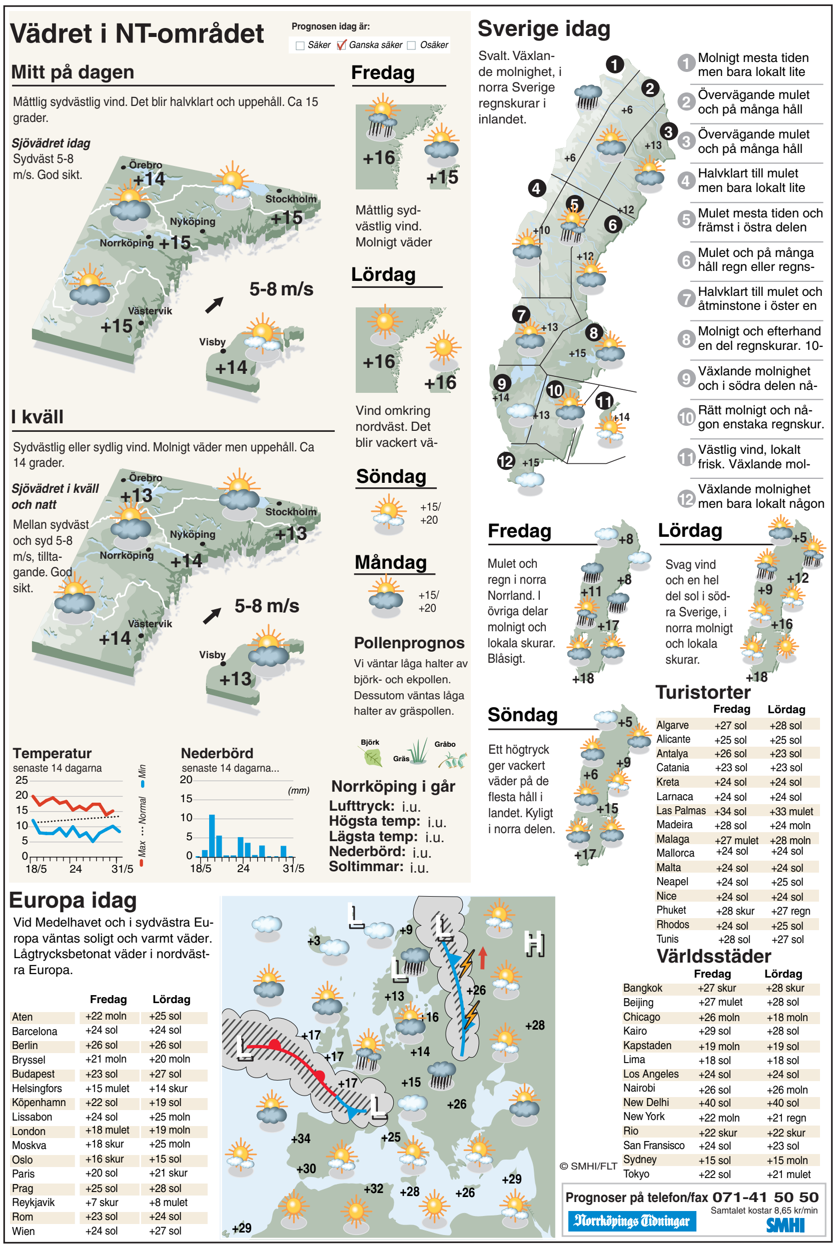
Creating a template is called template design. First it is created by putting maps, backgrounds and all other static information into an Illustrator document. After that all product elements are added. For each product element there is a reference to a product element definition in the EW dB. This is made in a Java Applet. The Java Applet is run in an Applet Viewer. Creating an Illustrator macro is also included in the template design. The macro will automatically control that the product will be sent to the customer in the correct format.

Before a product is delivered to a customer it must be verified and maybe edited. This is done in Illustrator. If a product element is edited, all products containing this element will use the edited element.
After verifying the product it will be approved and then distributed to the customers.

There are many products, and there is no time to verify each one of them. Therefore a set of products, so-called verification products are set up. These contain all product elements. In this way the elements in all products can be verified in a simpler way.



Software design



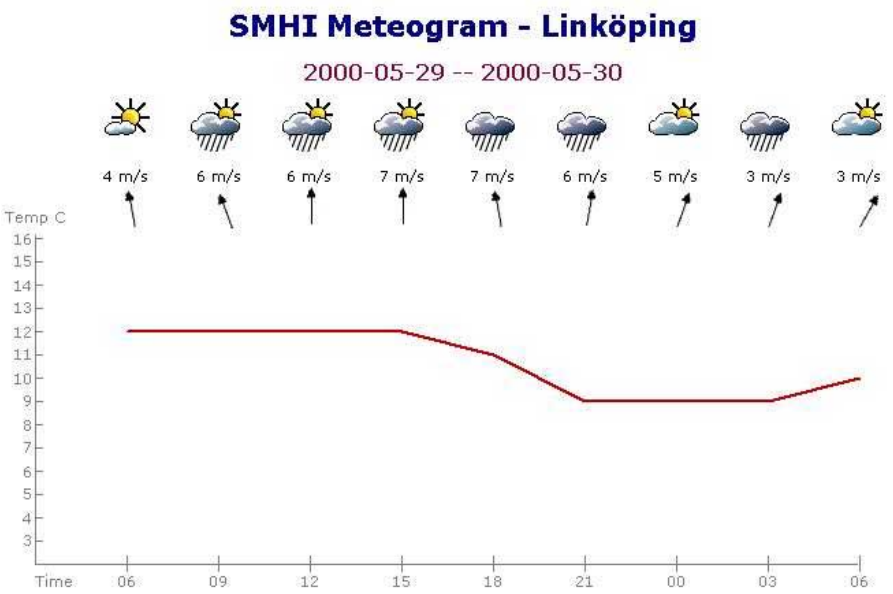
Sample of a EuroWeather product showing a forecast in the Swedish newspaper Norrkpöings Tidningar

BizMet

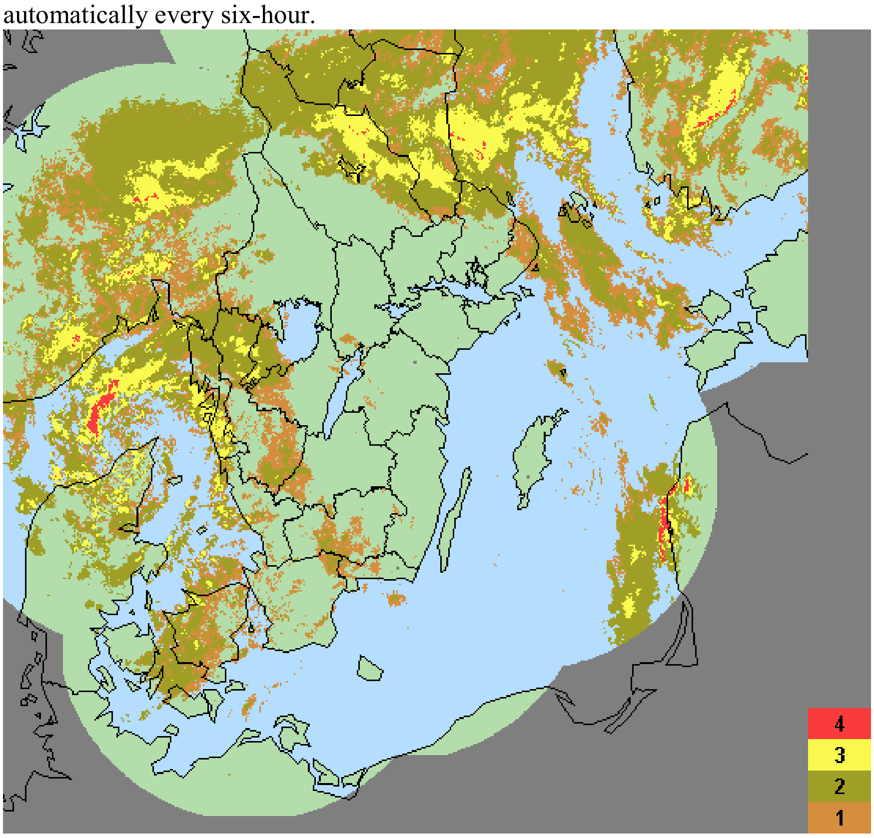
BizMet is an Internet product where the customers can set up what product parts they want to prescribe.
The products at the BizMet site can be used for making business decisions, e.g. production level of ice cream, milk etc.

SMHI is searching for a business partner for Internet products. For the moment SMHI is working with a small company called MetLine. The intention is to build an "Internet platform" that can be used for many different products. The BizMet product is the first one and can be seen as a prototype.
The server is physically located at MetLine, and the operational maintenance is handled there.

Some samples of products at the BizMet site (www.bizmet.net):



Meteogram: temperature, wind and weather symbols in a three-hour resolution. These Meteograms are updated automatically every six-hour.



Radar images and sequences.

Denna vecka: 133 **Nästa vecka:** 118

50	80	95	105	120	150
Mycket Positiv	Positiv	Hygglig		Negativ	Mycket negativ

	Senaste 5 dygn	Tisdag 00-05-09	Onsdag 00-05-10	Torsdag 00-05-11	Fredag 00-05-12	Lördag 00-05-13	Söndag-Torsdag
Väder							
MedelTemp	11	11	14	13	12	13	12
MaxTemp		17	18	17	18	19	17
MinTemp		10	11	10	10	11	10
Molnighet 8-delar		0	0	0	0	4	4
Nederbörd mm	0	0	0	0	0	0	0
Risk för snö		Ingen	Ingen	Ingen	Ingen	Ingen	
Vindhast. m/s		3	2	3	2	2	
Risk byar >15 m/s		Ingen	Ingen	Ingen	Ingen	Ingen	

Kommentarer:
DYGN 1-5: MEST TORRT OCH SOLIGT
* Högtrycket ligger kvar och ger fortsatt mest soligt väder.
* Min-temperaturer i allmänhet under 10 grader i inlandet.
* Risk för lokal markfrost flera av nätterna.
* I slutet av perioden viss risk för någon regn- eller åskskur.

DYGN 6-10: HÖGTRYCKET FÖRSVAGAS
* Dagens datakörningar indikerar en försvagning av högtrycket från söndag/måndag.
* Därmed inleds troligen en period med ostadigare väder. Troligen också något lägre dagstemperaturer.
* Utvecklingen får bedömas som osäker.

Arne Gustavsson

Ten days forecast with weather index.

The HAWK system: Recent developments at HMS

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Hungarian Meteorological Service

HAWK=Hungarian Advanced WorKstation

Basic features

- Developments started in 1994
- 1st operational version: 1997 October (HAWK-1)
- Developers: 2-3 men (1994-1998)
  1 man (1999-)
- C++, Xlib, Motif
- Platform: HP-UX 10.20.
- Input data: mainly netCDF files

Components of HAWK-1

- Map-based display (isoline, trajectory, synop, temp, lightning, satellite, radar)
- Emagram display
- Meteogram display
- Real-time lightning localization display

Recent developments: HAWK-2

- A completely new system (developments started in 1999)
- Map-based, emagram and meteogram visualization will be integrated
- HAWK-2 has one big window divided into 5 or 4 subwindows
- All the subwindows can be configured independently
- The system will be running on HP-UX and on Linux
- GI and OSM will not be implemented

Future plans

- Make HAWK-2 operational at the end of 2000
- Input data in the future will be stored in ORACLE database
- Implementation of grid editing with EDF (from NOAA/FSL)

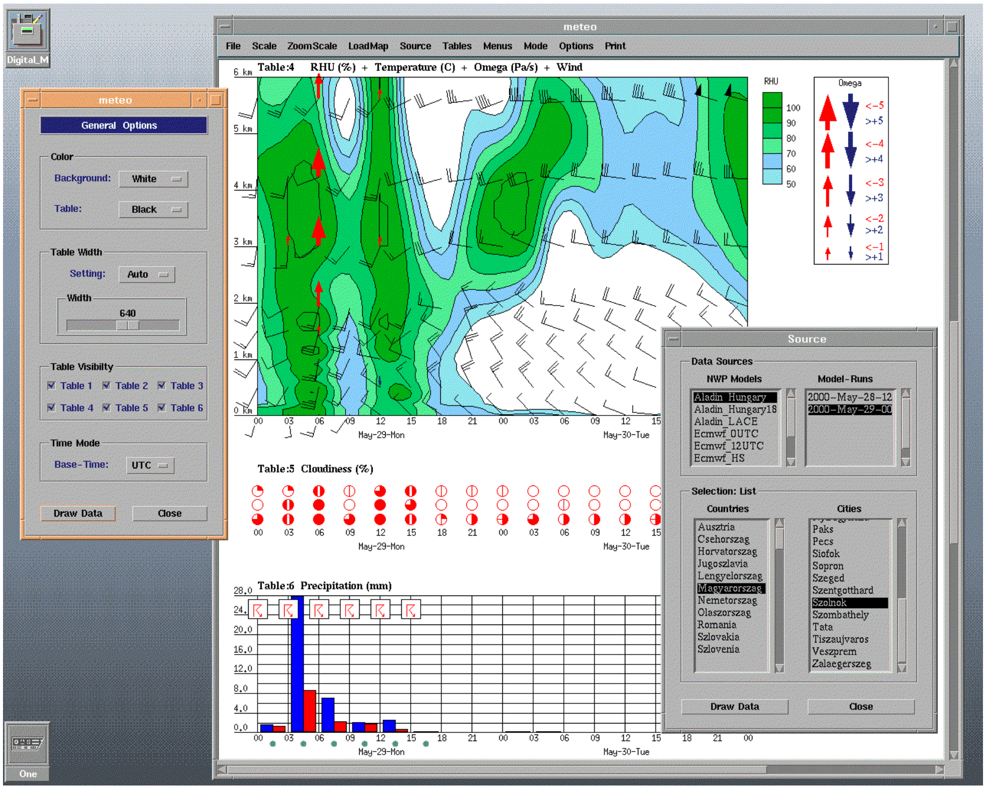

Fig. 1. The meteogram display with vertical-time cross section

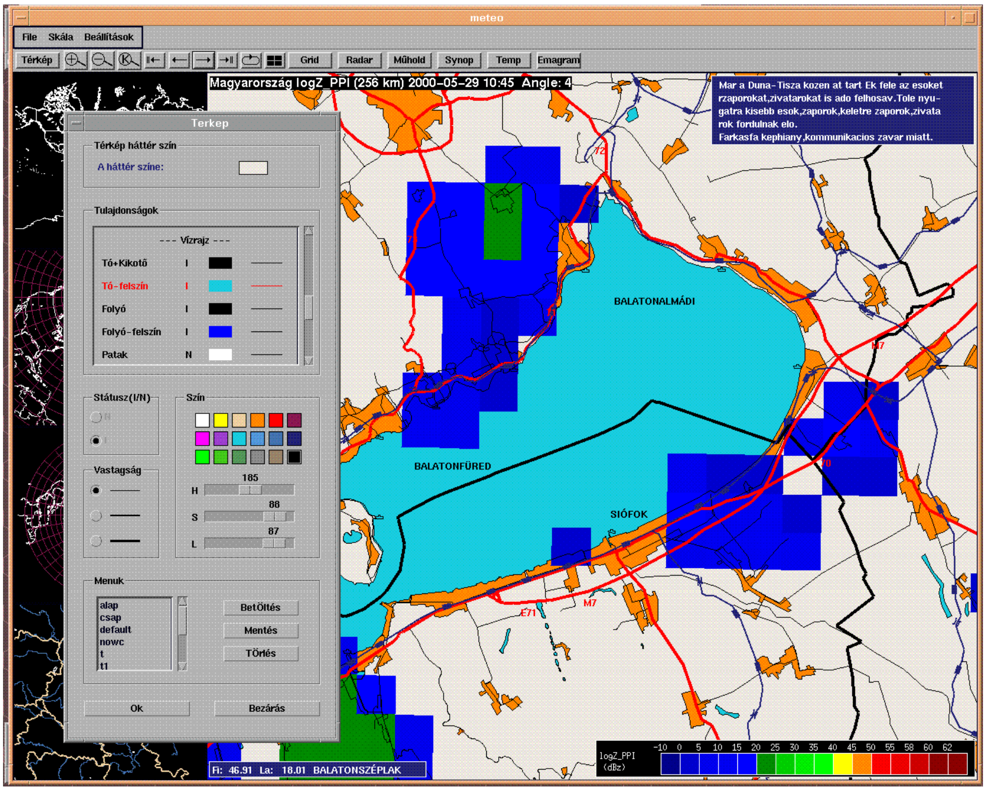

Fig. 2. Snapshot of HAWK-2 with 5 subwindows

Recent Developments at ECMWF

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EGOWS
5-8 June 2000

1 elokuu, 2000 EGOWS 2000 ECMWF/JD-1

Overview

- Status and plans for MAGICS
- Status and plans for Metview
- EPS Meteograms
- Graphics on Linux
- Summary

1 elokuu, 2000 EGOWS 2000 ECMWF/JD-2

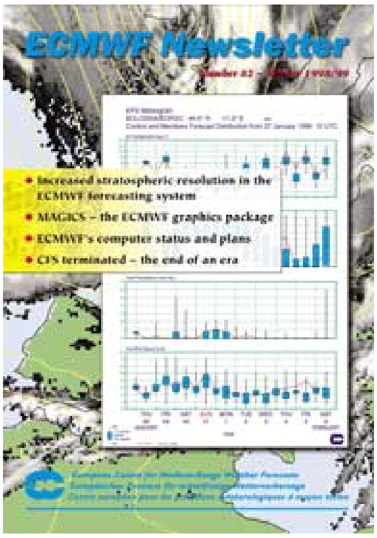
MAGICS

- MAGICS is a software system for plotting contours, satellite images, wind fields, observations, symbols, streamlines, isotachs, axes, graphs, text and legends
- Developed by ECMWF

MAGICS 6.1

- Available to MS
- SGI, Compaq, HP, SUN and Linux platforms
  – Linux Fortran compiler
- Manuals on ECMWF-MS Web site
  – PostScript format
- MAGICS - The ECMWF graphics package
  – ECMWF Newsletter Number 82 - Winter 1998/99

ECMWF Newsletter Number 82 Winter 1998/99



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MAGICS 6.1

- PostScript driver
- PNG driver
  - PNG: http://www.libpng.org/pub/png/
  - FreeType text: http://www.freetype.org/
    - TrueType patents
    - FreeType auto-hinter in development
  - TrueType fonts
    - http ://www.microsoft.com/typography/fontpack/default.htm

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MAGICS 6.1

- Observation plotting of one variable on exact station position
- Date / Time axes and Curve plotting extended to allow dates to be specified as character strings
  - Required for Year 2000 support
- Reversed and vertical Date / Time axes
- New Text/Legend facilities for Metview 2 / PlotMod

1 elokuu, 2000 EGOWS 2000 ECMWF/JD-7

MAGICS 6.1

- Plotting of quasi-regular wave fields and RADAR_Altimeter data (wind strength and wave heights) in observation plotting
- Shading improved in a number of areas
  - Land/sea shading on satellite projection
  - Contour shading using all techniques (polygon, cell_shading and marker shading) on satellite and Mercator projections
  - Control of hatch shading
- Better control over the closeness of lows and highs on contour maps

1 elokuu, 2000 EGOWS 2000 ECMWF/JD-8

MAGICS
Plans

- MAGICS 6.2
  - QuikSCAT support
  - JPEG driver
  - IBM AIX support
- Manuals on ECMWF-MS Web site
  - HTML format
- Some netCDF support (for Metview)
- New GRIB formats for Seasonal Forecasting
- Update MAGICS Web-pages
- Update MAGICS test-suite

1 elokuu, 2000 EGOWS 2000 ECMWF/JD-9

Metview

- Metview is an interactive meteorological application, which enables operational and research meteorologists to access, manipulate and visualise meteorological data on UNIX workstations
- Developed by ECMWF and INPE / CPTEC, Brazil with participation from Météo-France

1 elokuu, 2000 EGOWS 2000 ECMWF/JD-10

Metview 2

- Available to MS July 1999
- SGI, Compaq, HP and SUN platforms
  - Linux test pre-release December 1999
- Manuals on ECMWF-MS Web site
  - HTML and PostScript formats
- Metview - Meteorological data visualisation and processing software at ECMWF
  - ECMWF Newsletter Number 86 - Winter 1999 / 00

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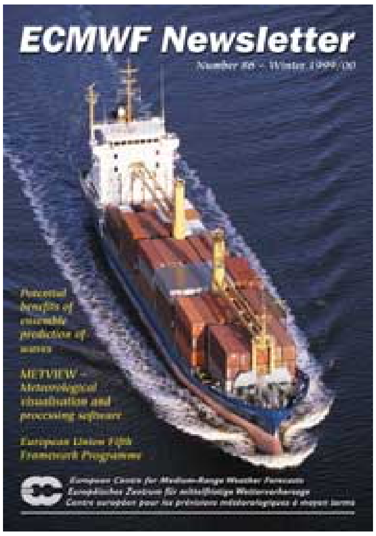
ECMWF Newsletter Number 86 Winter 1999 / 00



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Metview 2

- Interface to Vis5D
- PlotMod
  - New OpenGL / MAGICS 6 based visualisation module
  - Extended Experimental Build
- VisMod
  - Old GKS / MAGICS 5.5 based visualisation module
  - VisMod will be supported for some time

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Metview
PlotMod visualisation module

- Combines the facilities for batch and interactive visualisation
- Uses ECMWF MAGICS 6 graphics package
  - PostScript driver
  - OpenGL / Metview drivers
- OpenGL based
  - Metview 2 / PlotMod requires OpenGL 1.1 and GLU 1.2 or higher
  - GLU is the OpenGL Utility Library and used by MAGICS 6 / OpenGL for contour shading

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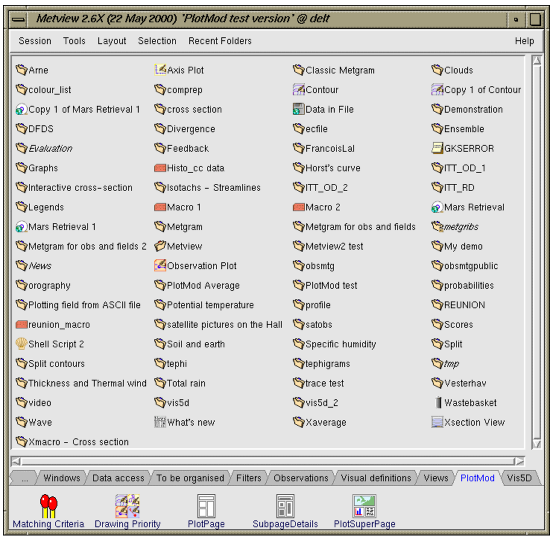
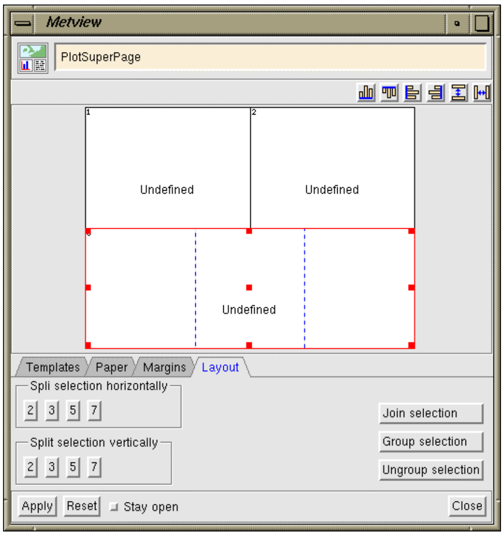
Metview
Plans

- Metview 3
  - Linux (Metview prototype available) and IBM AIX platforms
  - New and improved features
    - Customisable main user Interface
    - Graphics page layout control
    - Geographical specification
    - Show contents
    - Animation control
    - Titles and legends
    - Automatic conversion of VisMod macros
    - Handling of satellite images
  - MAGICS 6.2 features including PNG and JPEG drivers
  - Revised User Guide (HTML and PostScript)

Metview 3
Customisable main user interface



Metview 3
Graphics page layout control



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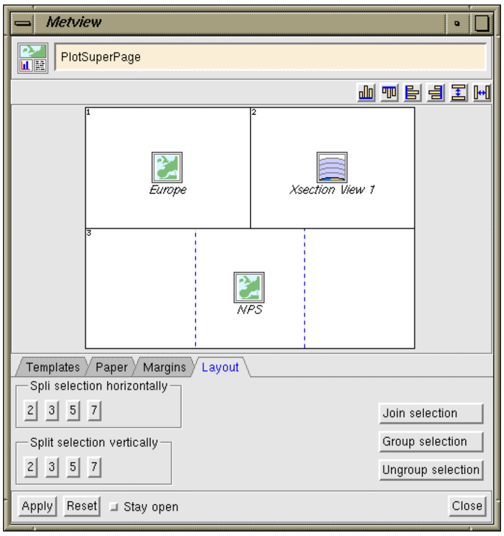
Metview 3
Views



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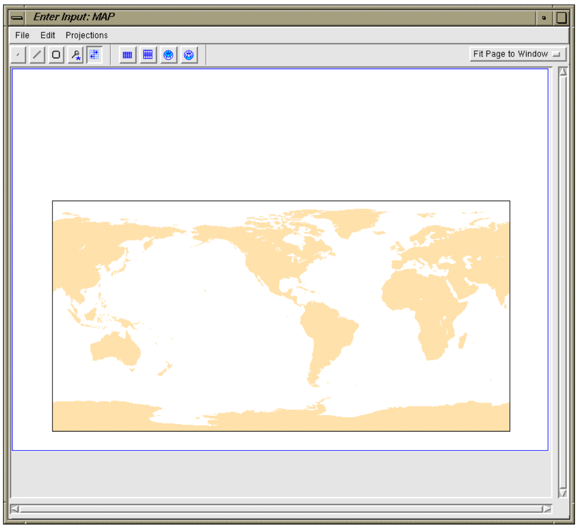
Metview 3
Geographical specification



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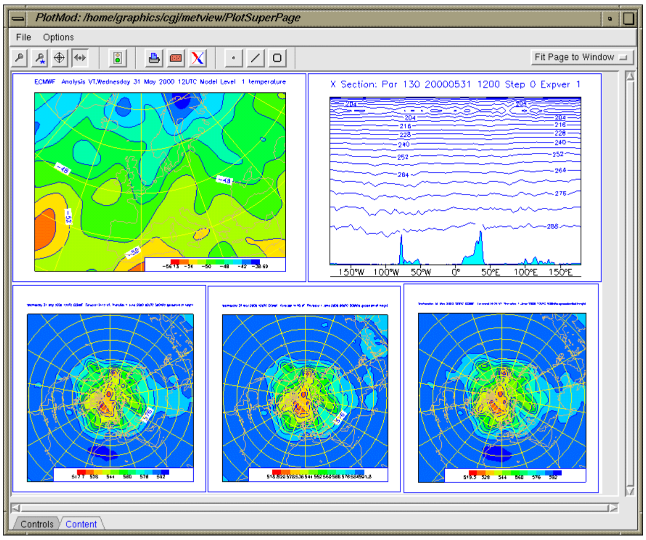
Metview 3
PlotMod plotwindow



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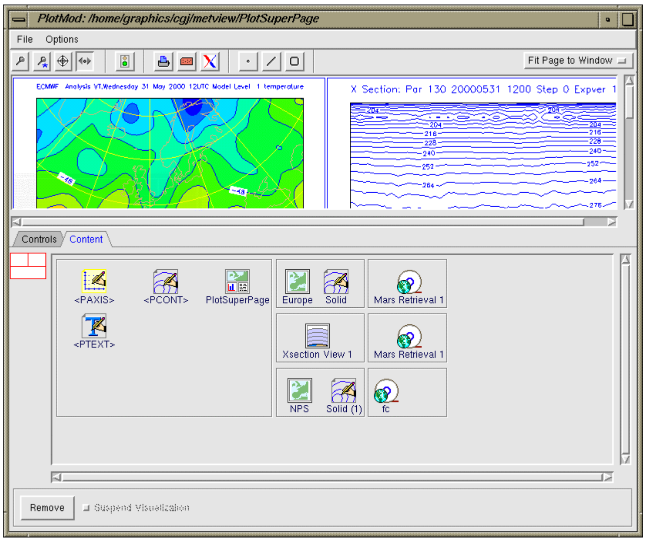
Metview 3
Show contents



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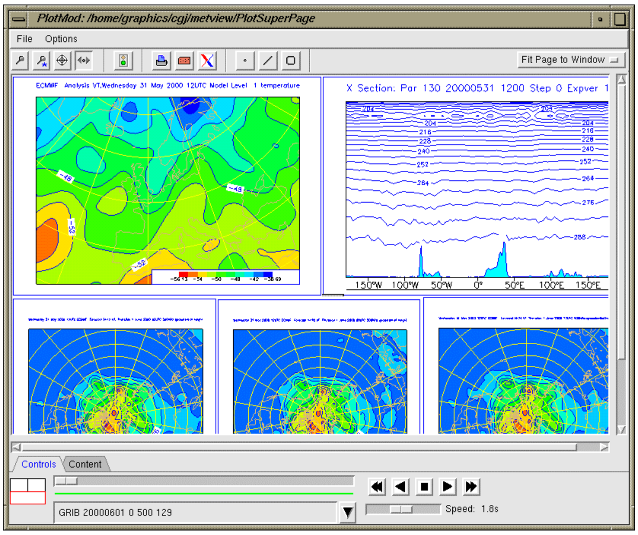
Metview 3
Animation control



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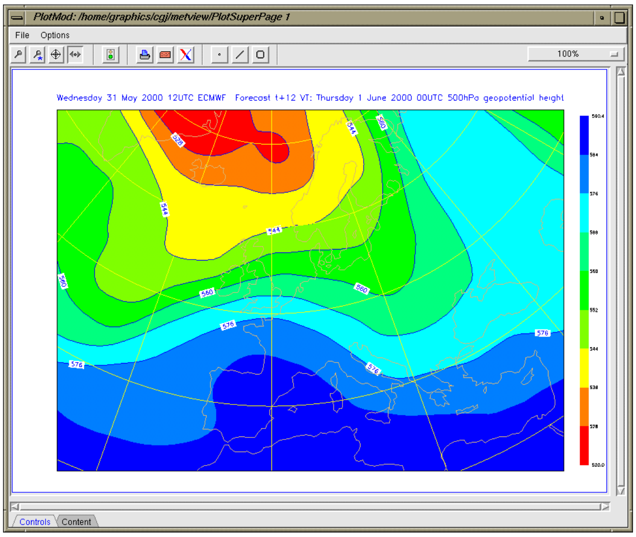
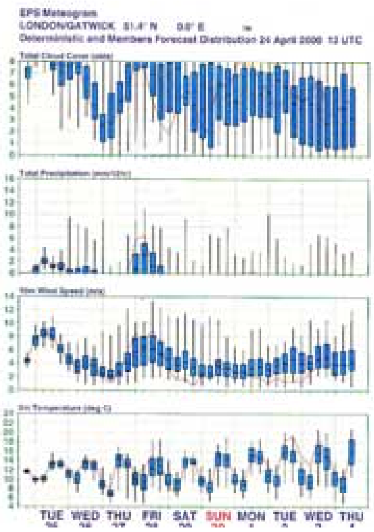
Metview 3
Titles and legends



EPS Meteograms

- Metview interface
  - Shows EPS members forecast distribution for a model run
  - Currently only available at ECMWF
- Plans
  - BUFR data interface
  - Can be used from Metview in MS
  - Same format as dissemination files

EPS Meteograms



Graphics on Linux

- Graphics cards
- OpenGL
- GLU

Graphics on Linux
Graphics cards

- New releases every 3-6 months
  - Jumps in price/performance
- Chip sets e.g. NVIDIA, Intel, S3, 3Dfx
- Graphics cards e.g. Appian, ASUSTek, ATI, Canopus, Creative Labs, Diamond, Elsa, Evans and Sutherland, Guillemot, Hercules, Leadtek, Matrox, Number Nine, Quantum3D, S3, 3Dfx, 3DLabs (Intense3D), 3Dfx
- PC-vendor cards e.g. HP, SGI
- Volume market: Games ...
- Office usage and CADCAM (Video RAM)

Performance of graphics cards

- SPEC Graphics Performance Characterization (GPC)
  - http://www.spec.org/gpc
- SPECviewperf 6.1.1
  - ProCDRS
  - Data Explorer (DX)
    - 10 different tests
  - DesignReview (DRV)
  - Advanced Visualizer
  - Lightscape Visualization System
- No results yet for Linux

Graphics on Linux
OpenGL implementations

- Mesa
  - Free but currently not fully working GLU 1.2
- SGI
  - OpenGL for their PC graphics cards
  - Free reference implementation of OpenGL but without drivers
- HP
  - OpenGL for their PC graphics cards (beta)
- NVIDIA
  - Free OpenGL for their graphics cards (beta)
- Xi Graphics, Metrolink
  - OpenGLs with drivers for selective cards

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Graphics on Linux
OpenGL drivers

- 2D hardware acceleration benefits e.g. Metview
  - X driver
    - XFree86 3.3.5 or later & GLX
- 3D hardware acceleration benefits e.g. Vis5D
  - Direct rendering (new)
    - Direct Rendering Infrastructure (Precision Insight / VA Linux)
    - NVIDIA / SGI / VA Linux
    - SGI, HP
    - Xi Graphics, Metrolink
  - XFree86 4 & GLX
- Linux drivers from chip set makers via Internet

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Graphics on Linux
GLU 1.2

- Mesa
  - Not fully working GLU 1.2
- SGI
  - GLU for their PC graphics cards
  - Free reference implementation of GLU 1.3
- HP
  - GLU for their PC graphics cards (beta)
- NVIDIA
  - No GLU
- Xi Graphics, Metrolink
  - GLU for selective cards

1 elokuu, 2000 EGOWS 2000 ECMWF/JD-31

Summary

- MAGICS 6.1 and Metview 2 available to MS
- MAGICS 6.2
  - Includes PNG & JPEG drivers
- Metview 3
  - Includes improved PlotMod, Main User Interface
  - Linux support
  - Includes PNG & JPEG drivers
- EPS Meteograms from BUFR for MS
- Graphics on Linux
  - Hardware acceleration new and promising

1 elokuu, 2000 EGOWS 2000 ECMWF/JD-32

Forecasters' Workstations - a manager's problems

Bill Moores, UK Met Office

Introduction:

I took up a new responsibility as Head of Production systems on the 1st April 2000. This was a new post and it brought responsibility for the Horace and Nimbus systems under a single line manager. Horace and Nimbus are the systems used in the UK Met Office to provide forecaster support. Forecaster support includes one or more of the processes identified in Table A.

On taking up any new post various issues emerge. The purpose of this paper is to identify these issues. Anyone working in this field will be aware of some of these issues but it will help the learning process to restate them. Unlike other papers presented here this one will include very little technical detail. It will emphasise management rather than technical problems.

Resources:

As a manager I have responsibility for staff. At this moment the Horace team comprises 32 staff whereas the Nimbus team numbers some 28 staff. These staff undertakes a multitude of activities, all of which relate to either the support of forecasters or product generation capability on either Unix or NT boxes. This brings me on to the first issue - retention of staff. This workforce is highly skilled and the skills are highly marketable both internal and external to the organisation.

Horace characteristics:

Horace was first deployed in 1993. It is now a mature and stable system and is well liked by its users. It is based on Hewlett Packard workstations and servers, uses UNIX operating system and X MOTIF. Most of the applications running on the system are programmed in-house. The main programming languages used are C and FORTRAN.

Nimbus characteristics:

Nimbus is a fairly new system. It is currently being deployed. It uses PCs/servers running NT as the operating system. Many of the applications make extensive use of off-the-shelf products such as MS Office, Visio, Oracle and GIS (ArcView). Bespoke programming is undertaken in either Visual Basic or Borland Delphi.

Horace; users:

Horace users include:

- National Meteorological Centre - this is the UK Met Office's central guidance forecast office - 23 clients
- HQSTC - about 11 clients
- Navy - about 6 clients
- Commercial or paying customers - these include the Thai Met Department, USAF (Europe) and the Australian Bureau of Meteorology - about 40 seats

In general Horace is well suited to the large guidance function role though some of the newer applications are developing its production capability.

Nimbus; users:

As it is a newer system using a number of off-the-shelf products, Nimbus is more modular in its design. In particular the database and visualisation applications are used as the basis in a number of spin-off type systems. The customer base is therefore broader than that for Horace. Users include:

- UK Met Office production units - these include all the distributed sites manned by Met office forecasters. When rollout is finished (Dec 2000) 60 sites (400 clients) will have Nimbus.
- Commercial Customers - this variant of the system is called MIST - about 150 users
- NATO - called NAMIS - about 100 terminals
- RAF - this is a browser based variant, currently quite different from the Nimbus visualisation. There are about 280 users of this system.
- Offshore Helicopter operators - a variant of the visualisation and database applications with a very simple user interface. About 30 terminals in use.

- Public Display Systems - touch screen variants used at various locations.

Support issues:

Horace and Nimbus service a very diverse customer base covering the complete spectrum of users through from guidance forecasters to the general public. For systems like Horace we have control over both the hardware and software. For some of the PC based systems (in particular Commercial Mist and NAMIS) we have no control over the hardware at all. The user installs the software on his system along side all his other applications. Indeed we currently support variants of the software running under Win 95, Win 98 and NT - we finally managed to ditch Windows 3.1 versions. Support is therefore a real issue. The requirement for multi-language support is now growing.

Pressures:

Pressures for change and enhancement for the above portfolio of products come from a number of sources. In particular there are

Higher management pressures to

- Reduce support and development costs,
- They even identify the solution as moving to a single platform independent solution,
- ISO9000 and TickIT: better and tighter control over the software lifecycle process.

Forecasting pressures

- The changing role of forecasters,,
- To reduce production costs. This pre-supposes forecasters are actively involved in product generation.

Technical:

- Technical advances which make obsolete current processes - LINUX, JAVA, XML etc etc
- The gradual move away from the mainframe as a production platform,
- Although functionality of Horace and Nimbus are different - for instance Horace is mainly visualisation and Nimbus concentrates on production/dissemination - there are areas of overlap. There are significant user/customer generated pressures to increase the areas of overlap.

Customers

- Customers have expectations. They demand even greater customisation and enhanced functionality. The more you deliver and the quicker you deliver it the greater their expectations.

Middle Management

- Inter team rivalry - Horace better than Nimbus and vice-versa. How do we sensibly move to a 'converged' system?

Many of the above pressures are conflicting. In particular strategic, customer and forecasting requirements are often orthogonal. In general the dilemma can be summarised as too much to do and not enough resources to do it with.

Solutions:

If it is agreed that there is too much to do and not enough resources to do it with then various options emerge:

- Pull out of some activities
- Adopt common solutions internally - Horace/Nimbus convergence is already underway but is not a simple process and higher management are already looking for and taking savings from this activity
- Adopt common solutions with other organisations. Many of the functions listed in Table A are common to all European Met Service workstations.

In my view the only viable option is collaboration.

Table A

Workstation functionality

Forecaster's workstations comprise one or more of the following functions:

Management of data
Visualisation of met data
Graphical interaction - data modification or 'correcting ' of data/information and adding forecasters expertise
Weather watch and nowcasting facilities
Automated or non-automated production generation capability
Product distribution capability to internal and external users
Work scheduling
Verification

THE LATEST DEVELOPMENTS OF METEOROLOGICAL WORKSTATIONS AND PRODUCTION TOOLS AT FMI

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Finnish Meteorological Institute (FMI)
Helsinki, Finland

1. INTRODUCTION

A new meteorological information and visualization system is under development at Finnish Meteorological Institute (FMI). The database has been the most important part during the past but during the past few years most effort has been given to the workstation part. The aviation workstation was introduced few years ago and it has been used operationally since that (Kilpinen & Pietarinen, 1998). Some new features have been implemented to the system this year and the outlook is slightly different. The automatic product generation has also been an important part of development work.
Since the last EGOWS meeting most effort has been given to development of an editor for grid data. The use of the editor begun on May 1999 and since that several new versions of the software has been introduced. Most effort has been given to the nowcasting editing features of the software. The aviation workstation and the grid editor are developed using C++ -language.
Some new operational applications have been developed using Java or JavaScript.

2. THE GRID EDITOR

The forecasters are able to edit the grid data with the new editor. The prototype of the editor was introduced in 1998 (Kilpinen, 1998; Kilpinen & Pietarinen, 1998, Kilpinen et. al. 1999).
The user can get model data or previously edited data for editing. After editing is finished the data can be stored locally or to the database. Once the data has been stored to database it is available for those application that are connected to database. At the moment HIRLAM (High Resolution Limited Area Model) and ECMWF data can be used operationally. The present implementation has also versions for ECMWF grid point data up to +8 days.
The editing is only possible in the time-series window (Figure 2.). The presentation outlook can be chosen from a large variety of options. Different masks are used to make the editing fast and to keep the meteorological consistency between the edited parameters (e.g. temperature vs. cloudiness and cloudiness vs. rain). The pain brush tool makes it possible to edit the parameters but the physical consistency or consistency in time is no guaranteed anymore.

The other editing tools enables the shift of data in time or space as well as different kind of smoothing of data (Fig. 2). As a new feature the editor offers a possibility to combine of model data and observational data.

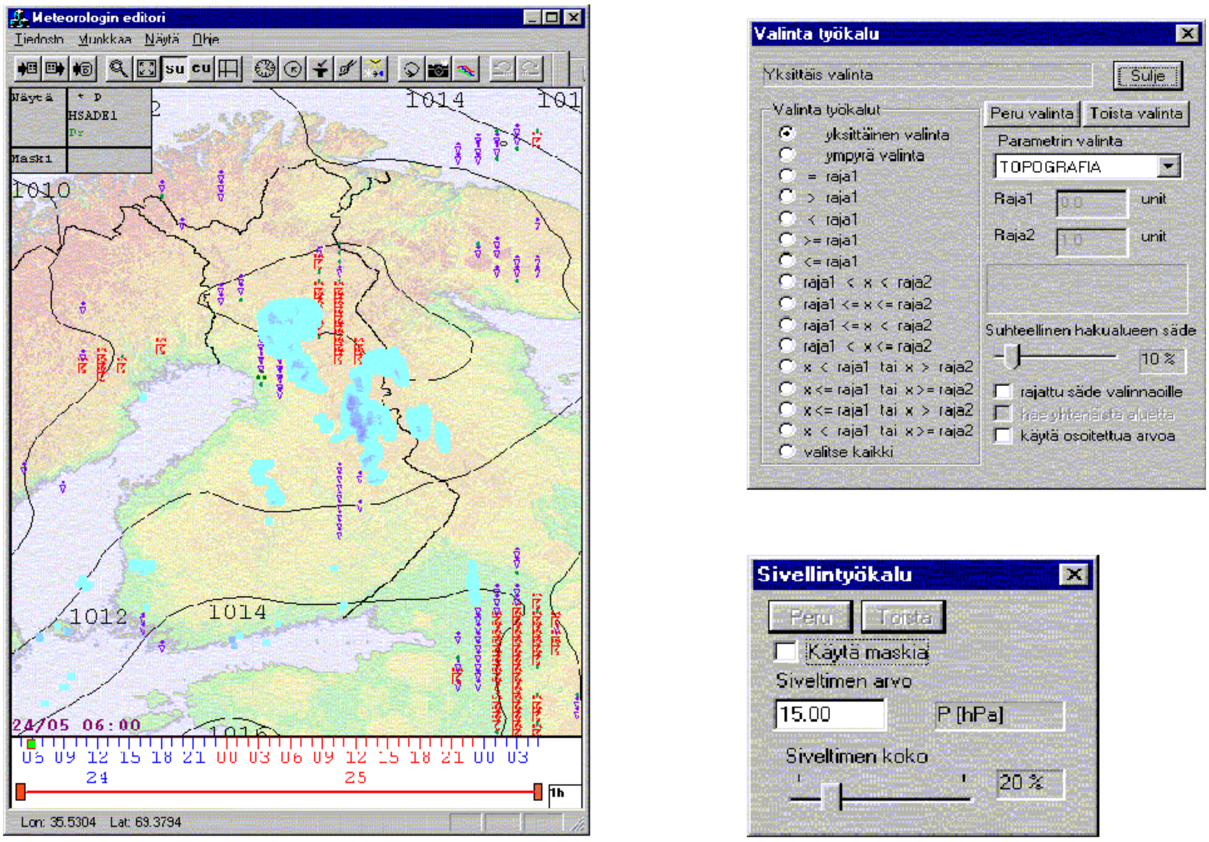

Figure 1. Map display of the editor with isoline and text/symbol representations and some editing toolboxes (paint brush (below) and mask tool (above)).

3. OTHER APPLICATIONS

The Aviation Workstation (TafEditor) is a Windows program for meteorologist to **visualize**, **write** and **monitor** aviation messages and **send** edited messages to the ICAO-network. In addition it shows the current **HIRLAM**-prediction for selected aviation station. When editing messages TafEditor **checks spelling** and agreement (compatibility) with **ICAO-standards**. In connection with sending messages to ICAO TafEditor checks the sending time and forecast sections due to the **TAF-sections** and **send window** specified in ICAO-standards.
TafEditor receives METAR- and TAF-messages from ICAO and monitors TAFs with METAR-observations coming inside the TAFs forecast section - if a contradiction takes place the spot of the aviation station will have a warning colour in the map and list view. In addition TafEditor supports and monitors task lists of TAFs, which has been booked from a customer (Civil Aviation Administration).

The aviation workstation/TafEditor has been developed slightly further. The model data has been added to time/vertical cross-section display. An example of these new features is presented in Figure 3.

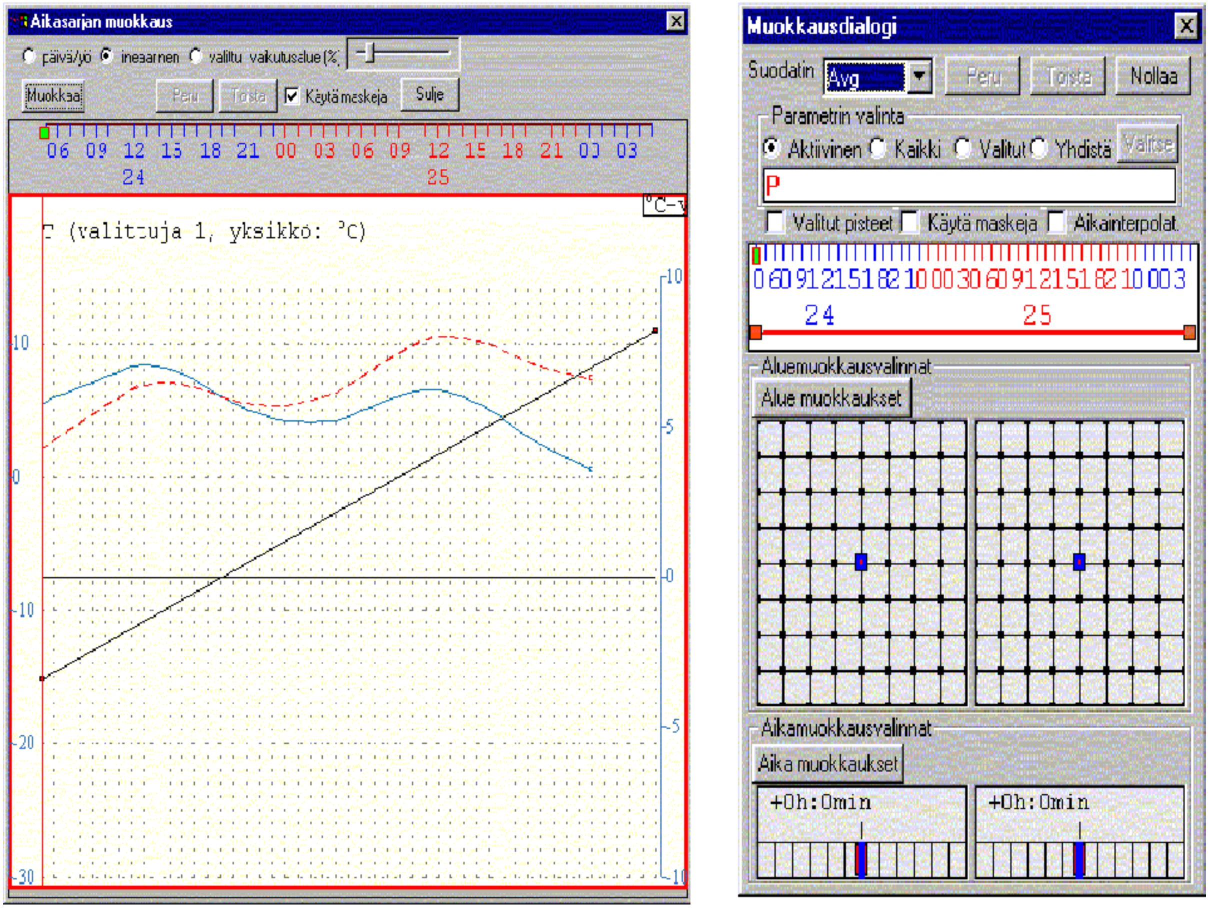

Figure 2. The time-series-editing window of the grid editor is presented in this figure. The continuous line represents the original temperature, the thick line with dots represents the magnitude of change and the dashed line shows the corrected temperature.

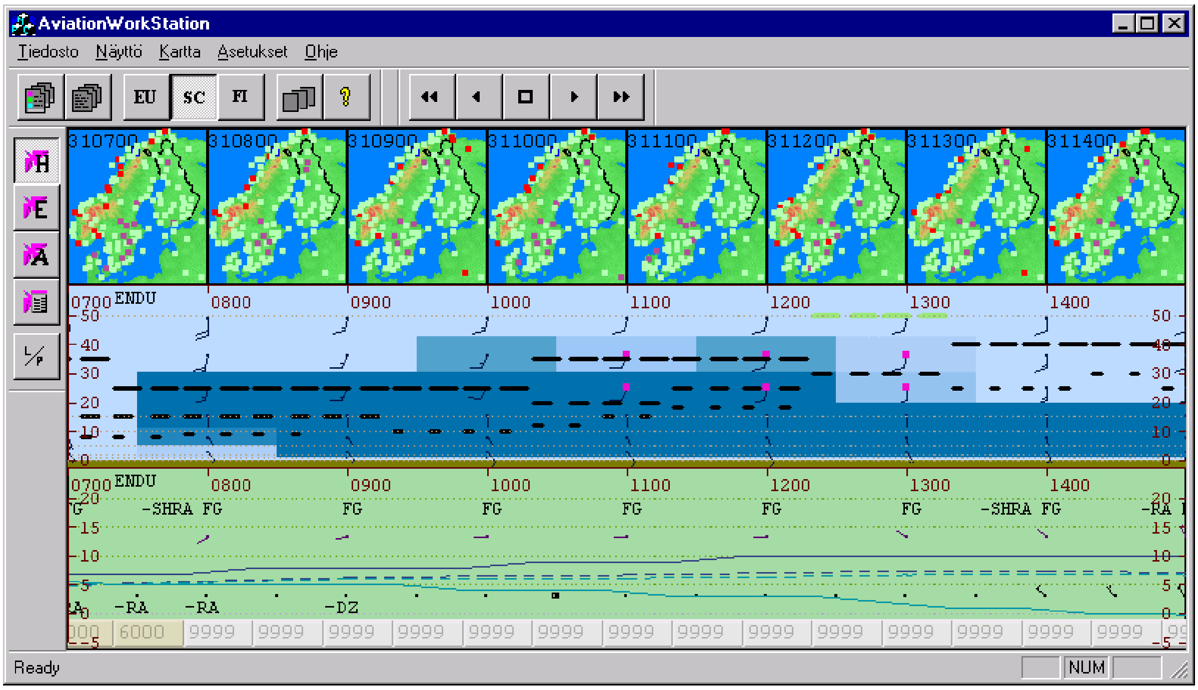

Figure 3. The time/vertical cross-section of observed data in aviation workstation.

Among others the edited data has been used for SMS (Short Message System) of mobile phones (GSM standard). Short text messages is a very convenient way to transmit forecasts and warnings to different customers. A new system has been developed to serve customers.
At the moment the languages supported by the system are Finnish, Swedish, English, German, Spanish, Italian, Hungary and Savo (a Finnish local dialect). The system produces equivalent products to WAP –phones (Wireless Application Protocol). The user interface in WAP phones is based on hierarchic menu structure (see Figure 4.) and the user does not have to remember key word (like in SMS based services).

Figure 4. An example of weather service applying WAP phones.

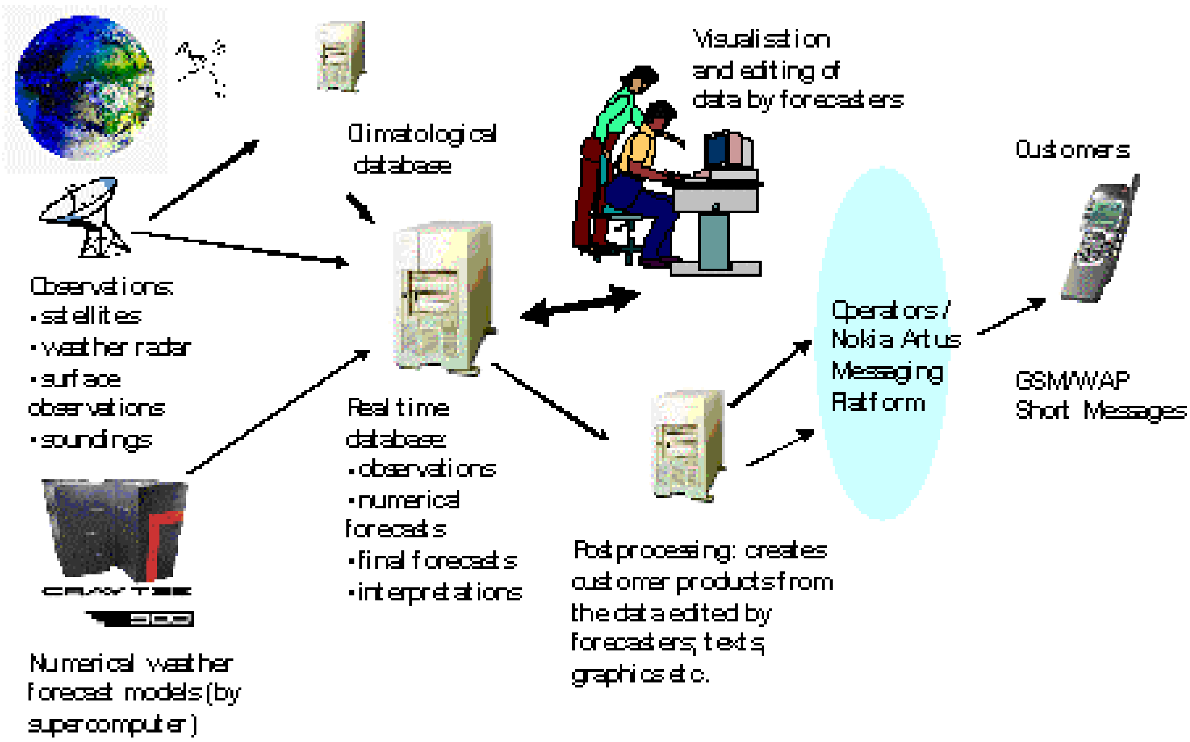

Figure 5. FMI's automated production chain for WAP and SMS of mobile phones (GSM standard).

Several applications producing end product for customers are already using the real time database described earlier. Among these products are graphics for newspapers, transportation and industry using Web?
Some new Java or JavaScript based visualization applications has been developed. The first one of these is the editor and visualization part for SATREP (Satellite Report). This application is presented in the figure below.
Together with a mobile operator and some other companies FMI has arranged a trial where navigation information and weather has been connected. The trial is demonstrated in figure 9. A mobile sends a location information together with weather request. Within the operators system the location information is converted to latitude/longitude information. FMI's application server understands latitude/longitude information and finally the system sends back to the customer the weather forecast of that particular location. The typical accuracy of location information is from about 100 meters to couple of kilometres. The location is indicated in forecasts by given the name of the suburb or nearest village.

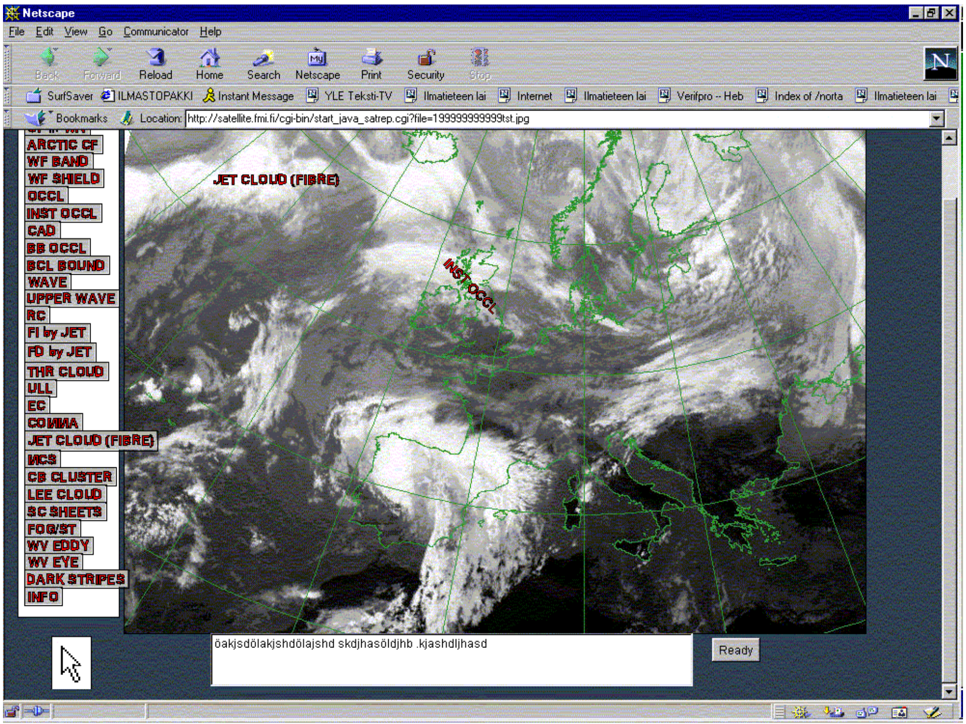

Figure 6. The SATREP editor is used at FMI when forecasters produce the SATREP (18 UTC) analysis.

The other new application is for comparison of different models. The graphics is produced on background using MetView (ECMWF) and the JavaSript application is used select the model /parameters/time etc.

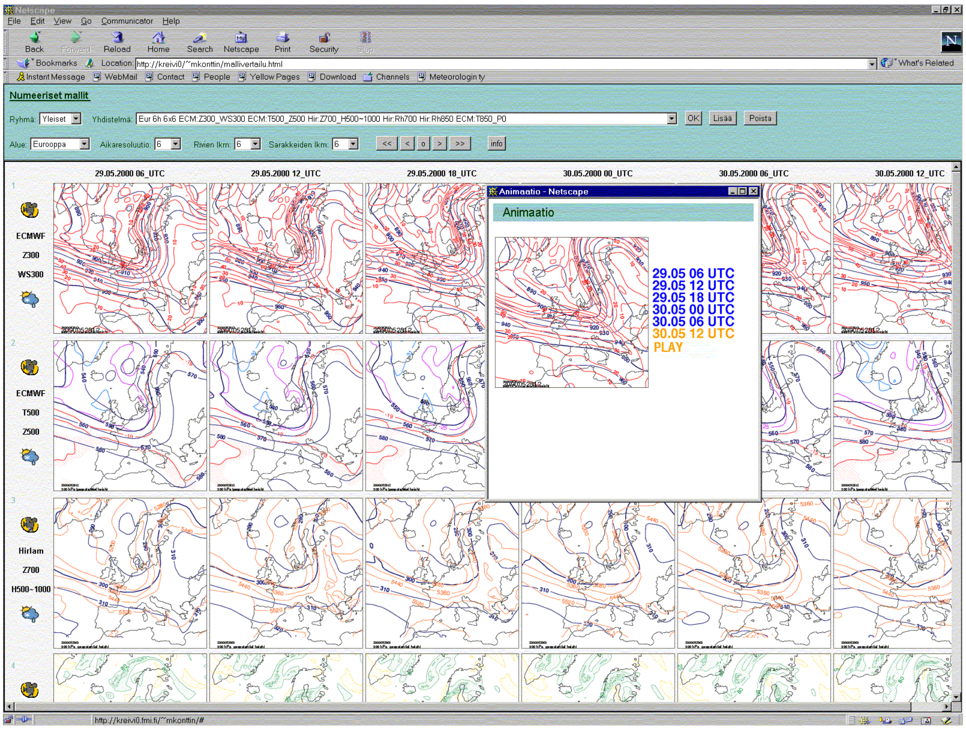

Figure 7. A JavaScript application for comparison of model output.

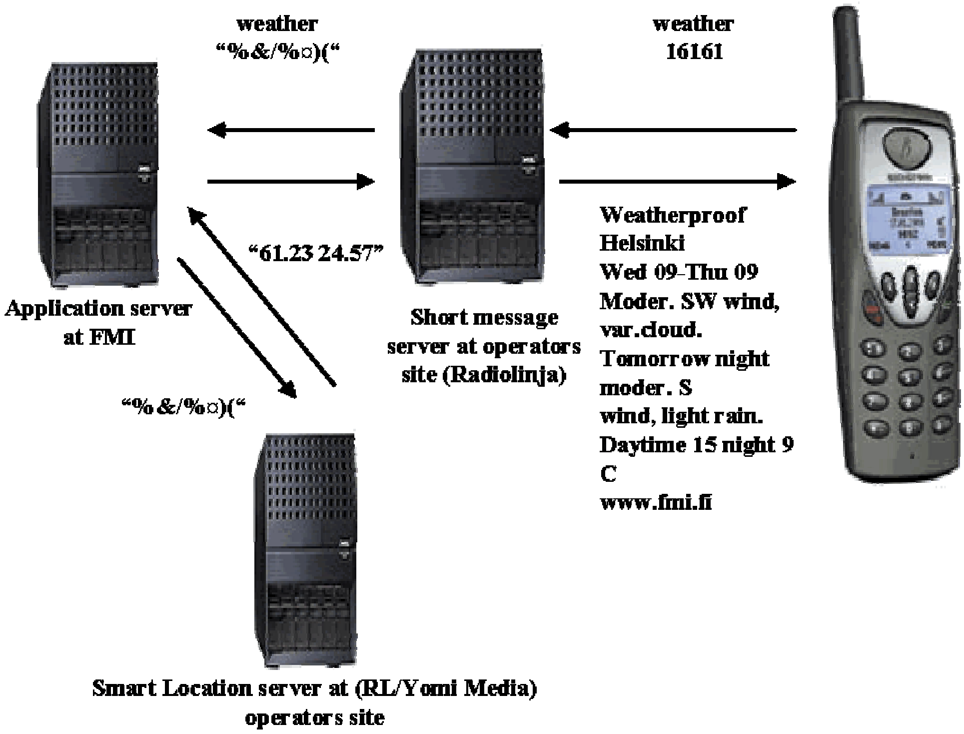

Figure 8. A customer sends the text message "weather" or "sää" (in Finnish) to operator (Radiolinja) with location information included. Normally a customer sends the name of the place or the postal code or latitude/longitude coordinates. The location information of the mobile phone is converted to latitude/longitude coordinates and the FMI's application server generates the text forecast according to the given coordinates and sends it back to customers' mobile phone.

5. **REFERENCES**

Kilpinen J., and M. Pietarinen, 1998: The New Workstation Software for Aviation Forecaster. 14th International Conference on Interactive Information and Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology, 11-16 January, 1998, Phoenix, Arizona, pp. 445-446.

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Recent developments on the DMI workstation project

Knud Erik Christensen, DMI (kec@dmi.dk)

Y2K

In 1999 a lot of efforts were used in the Y2K issue. All applications had to be tested and providing test data was the gratest challenge for this.

The opportunity was used to close down some old systems, for instance the fax-systems for aviation use was replaced by a web service.

New programming language and tools

Starting a new millenium made us think about the future - application development has to be faster and we need to be able to reuse code. All of the development team have been to courses on JAVA and object oriented design and programming and Motif will no longer be used for development of applications with graphical user interface.

C and C++ will still be used for development of application without user interface, but JAVA will also be used in this kind of applications.

With the use of JAVA the applications will run on any Unix workstation or PC that has a JAVA virtual machine.

Examples of JAVA applications

Audit - an editor for regional 7-day forecasts. It communicates with a database server through a TCP-port. The system has forecasts for 378 values (7 days, 6 areas, and 9 parameters) with automatic first guess on all values based on ECMWF data.

.

First release required the use of mouse for all editing, but that was quickly modified so that forecasters can work in keyboard mode. A better user interface must be developed if more detailed information has to be forecasted in this way. The system is used for generating input to weather graphics generators on the Internet and in TV and newspapers.

SPOT (system for production and monitoring of TAF's) also a JAVA application that replaces the TAF-monitor we have been using for some years. The system prevents typing and syntax errors in TAF's and monitors METAR/SPECI to see if any TAF needs to be amended. It will also provide forecaster with information on statistical data for visibility and other parameters for the individual locations.

www.dmi.dk

We are continuously expanding the amount of data available on our website. There is a growing interest in the general public for live information like weather observations, real time water levels or lightning detection. Real time data can't be published in newspapers, so the web is a new media for new data.

Presently we have around 150000 pageviews/20000 user sessions per day (May 2000). Sponsor banners on the website finance some of the development for the general public.

We are currently planning a redesign of the website, to make generation of dynamic content easier. Also layout and content of pages has to be separated, to make it easier to change layout without rewriting all pages.
A possible solution could be dynamically generated web pages with an object-oriented web design, where pages inherit their layout from other pages. If you change the layout of the root page, all other pages will inherit the same changes.

Future: web applications?

Caused by problems with distribution of ever growing amounts of data time has come to rethink some of the things we are doing. Traditionally we have distributed all necessary data to the local workstations, but due to ever-growing amount of data this cannot continue.

The answer to this problem could be web applications - JAVA servlets running on a central web-server and generating web pages by request - so we are back to the mainframe with less work for system administrators. The user interface will be web pages and the applications will generate HTML and GIF/JPG on the fly.

The workstation will be a web browser on any platform and the browser takes care of printing and other things that normally must be put into applications. Also employees without Unix workstations will have access to applications in this way.

Our first servlet is a web interface to Metview, making a simple user-friendly interface to Metview with access to a predefined number of models, areas, and parameters. Popular plots will be pre-generated and shown fast, other plots will be available but takes about 10 seconds to be generated. Next generation will be able to visualize GRIB-data without Metview, but we have not yet the JAVA modules to do so.

Traditionally we have made Motif applications for the Unix workstations, PC-programs for customers and Internet service for the general public, but in the future Internet service and workstation applications could be two sides of the same thing.
The public access to data will be limited to a smaller part of the available data, paying customers will have access to a wider range of data and the forecasters will have access to all data. All generated by the same application.

Workstation Systems at DWD
Recent Developments

Dirk Heizenreder

EGOWS 05.06.-08.06.2000

Workstation systems at DWD

- **Introduction**
- **Recent developments**
- **Outlook**

Introduction

OBS

NWP

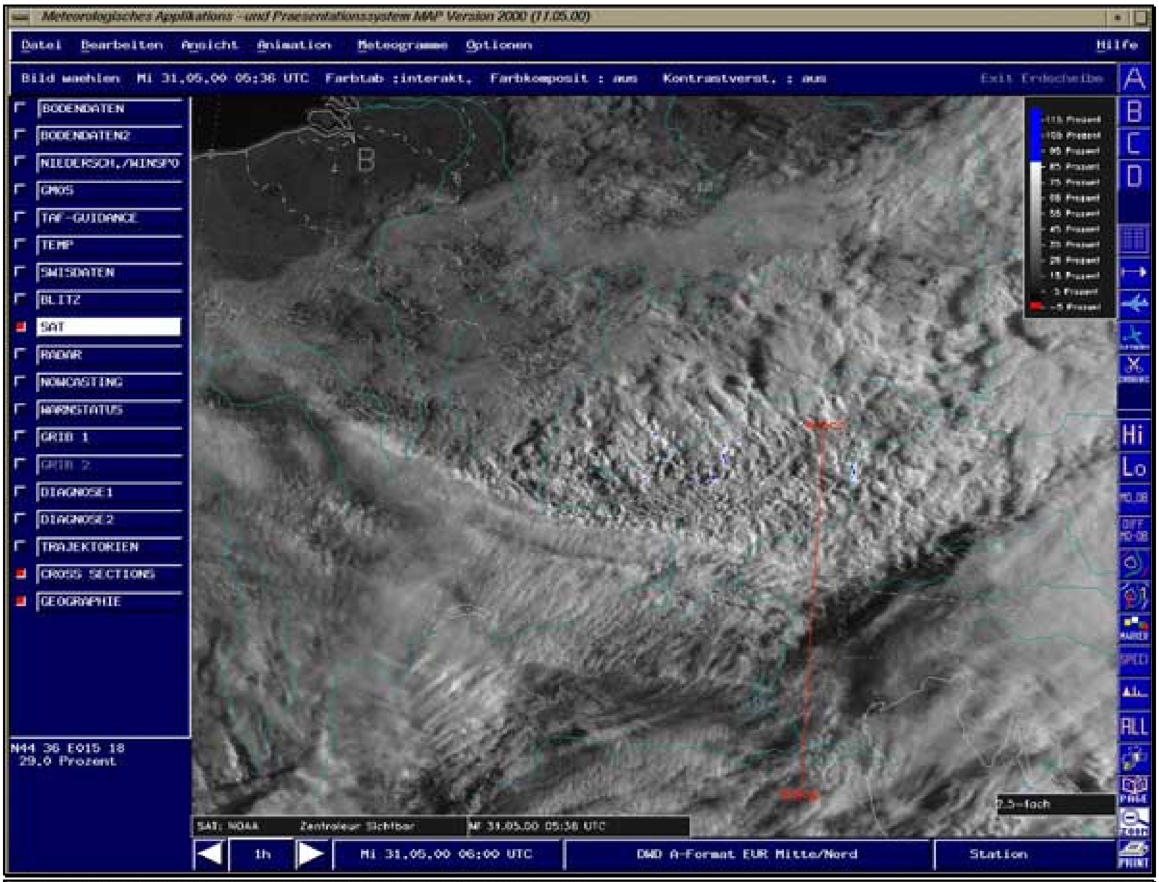
MAP

IGS

TriVis

MAP - recent developments

- Images
- Interactive Selection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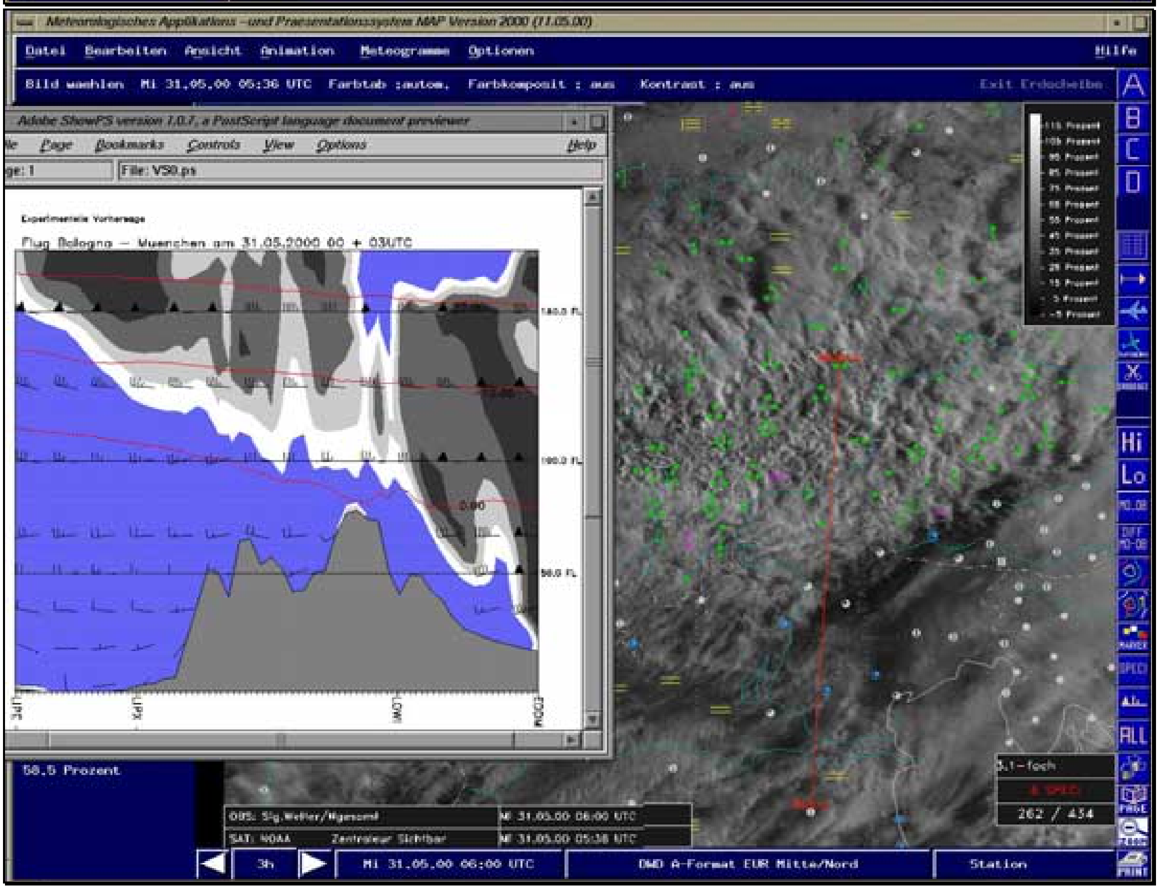
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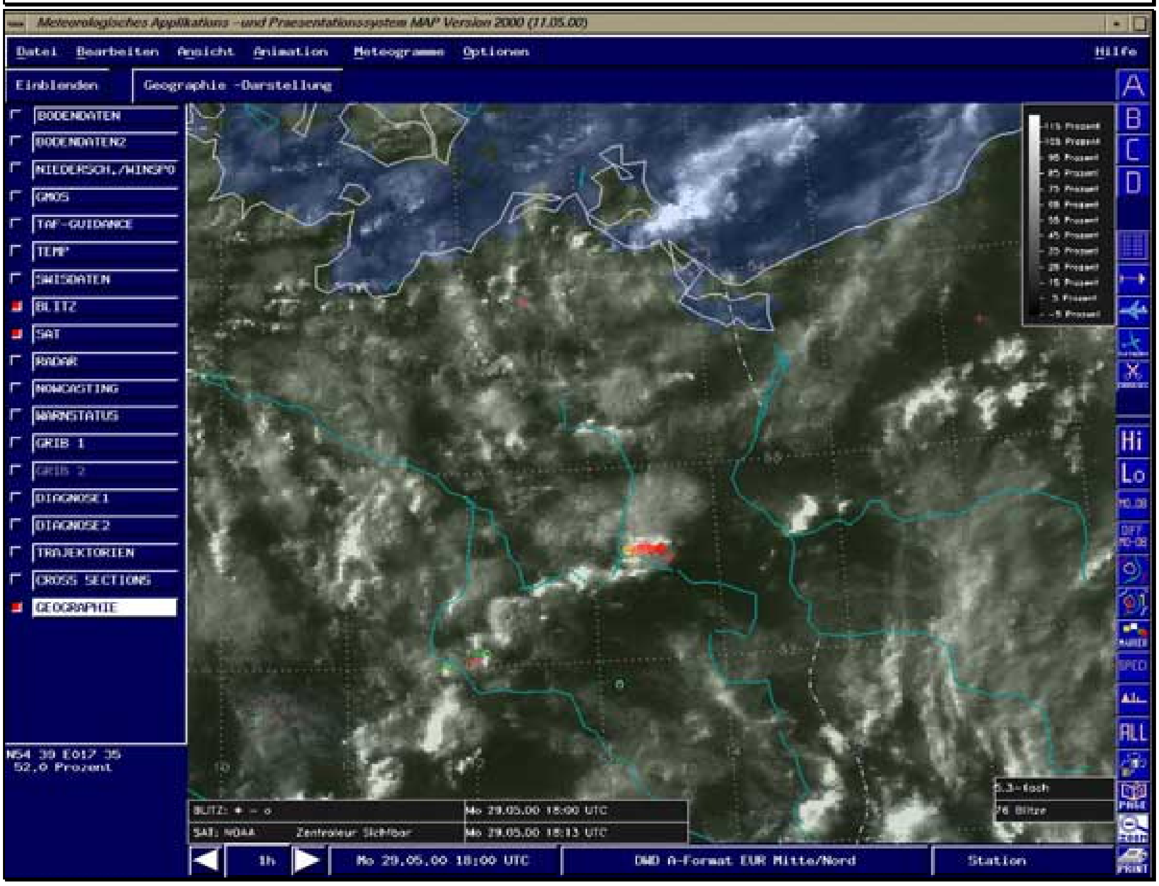
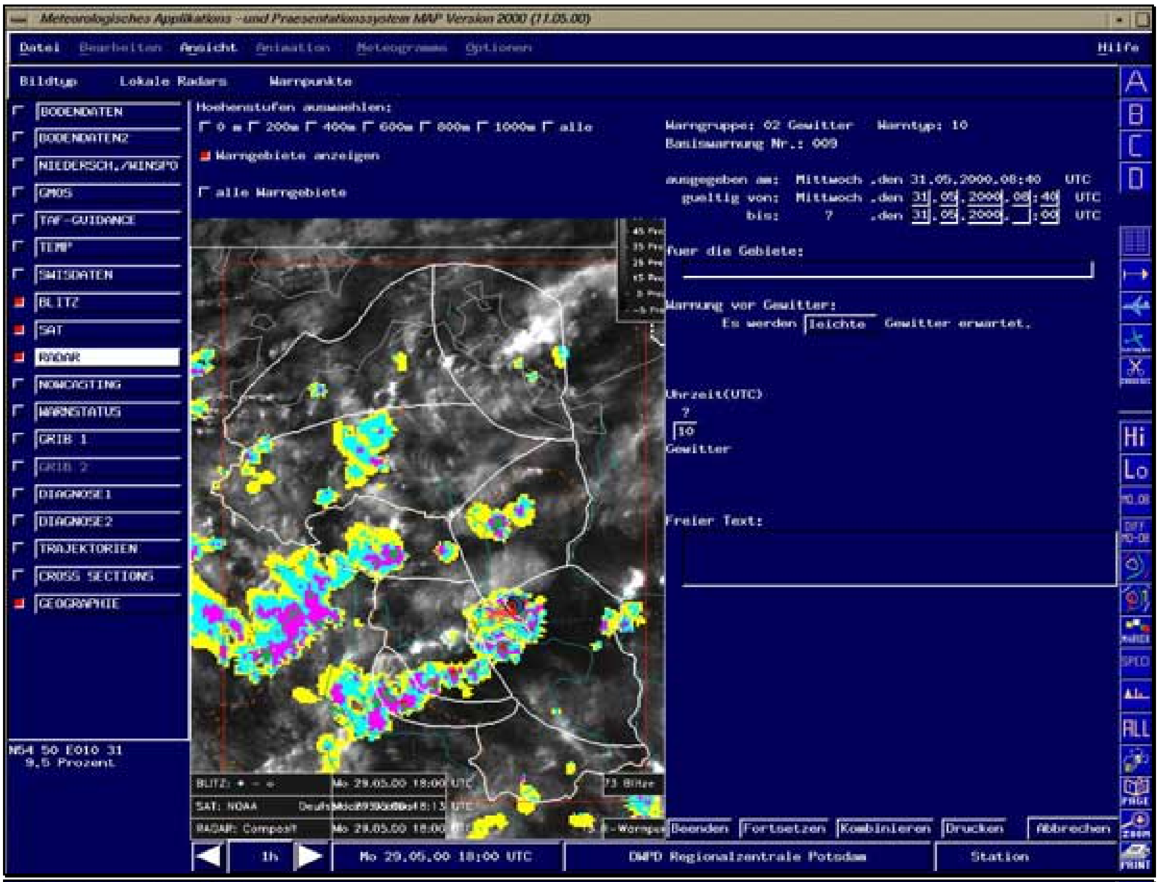
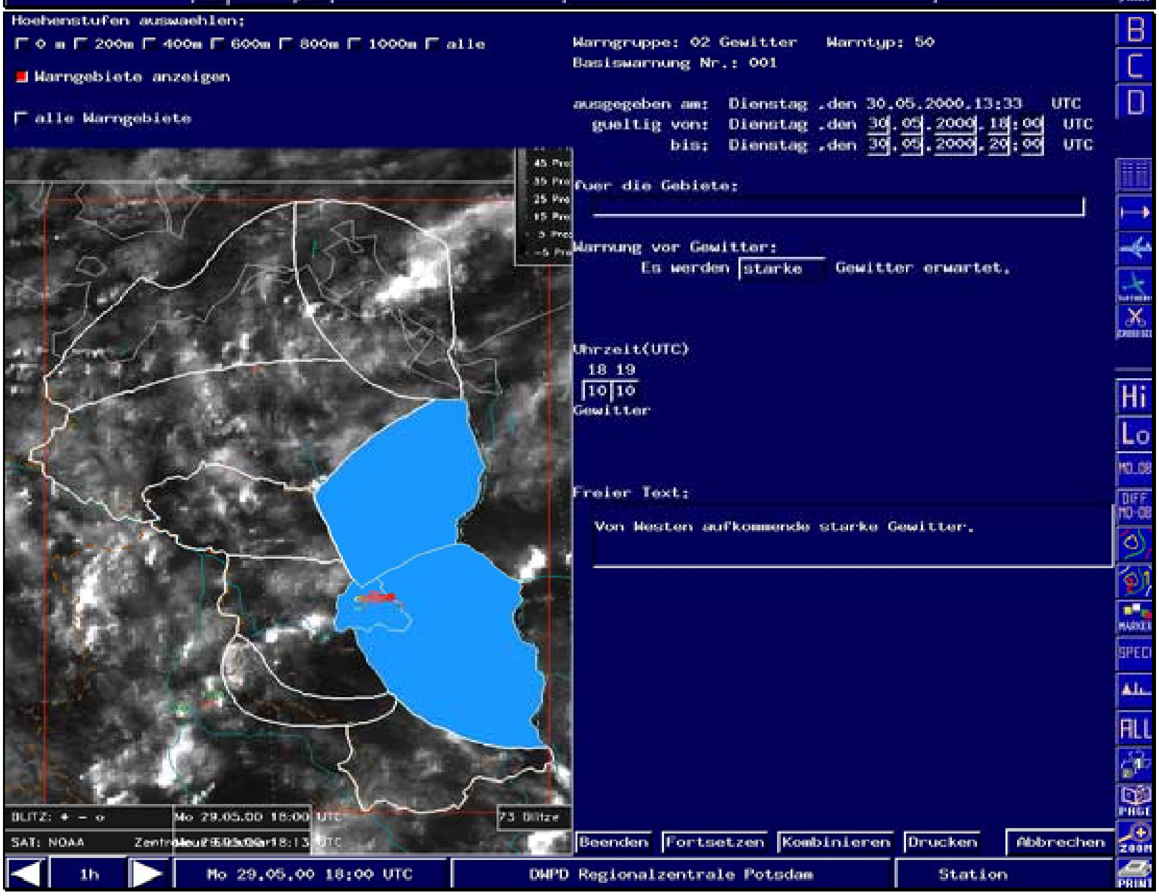
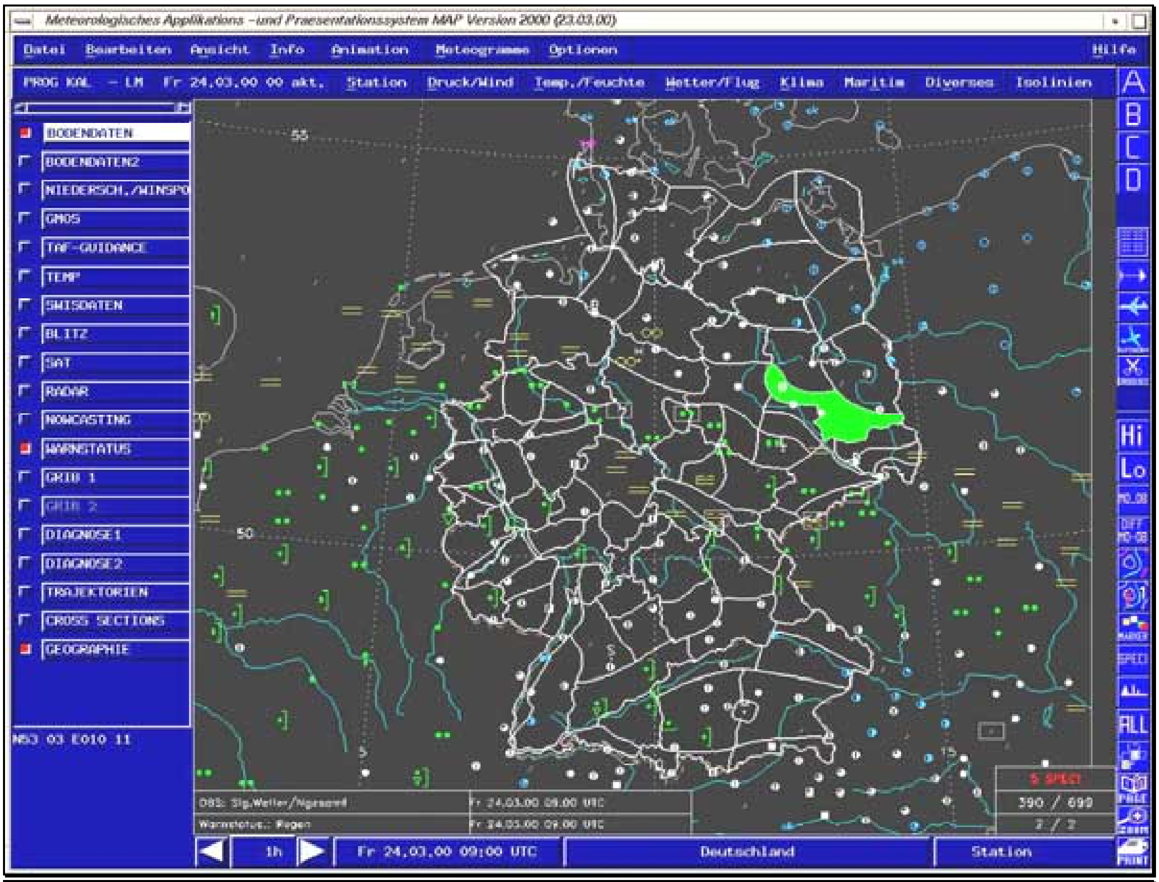
MAP - recent developments

- Cross Sections (Visual)
  - Images
  - Interactive Selection
- Production and Monitoring of Warnings





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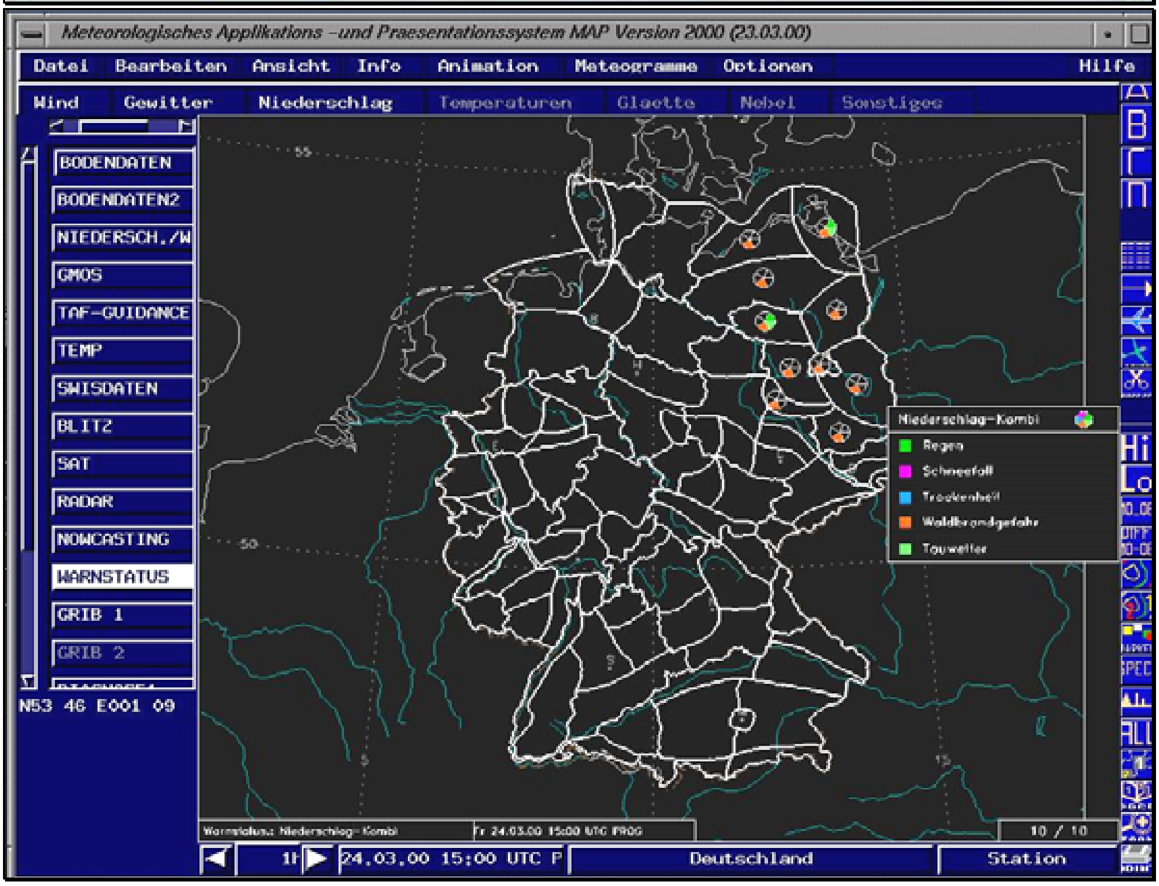
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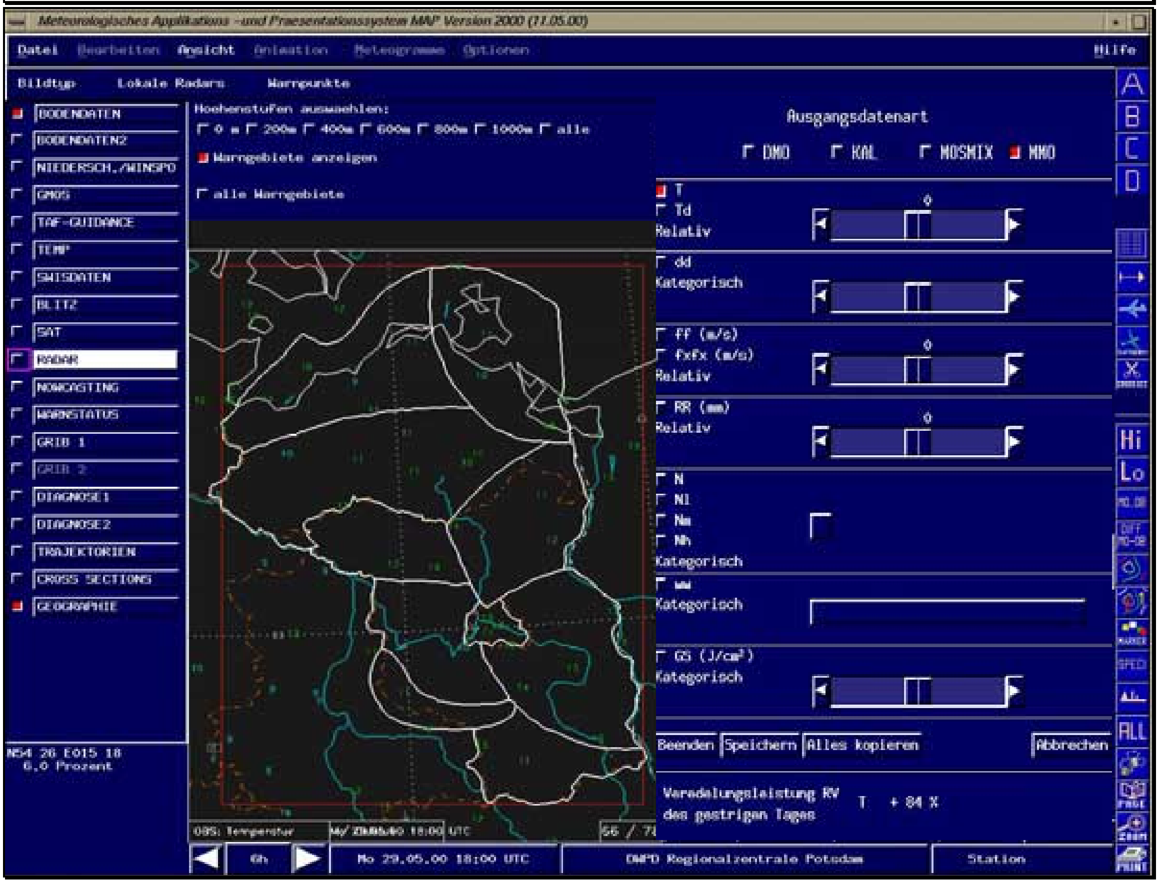
MAP - recent developments

- Cross Sections (Visual)
  - Images
  - Interactive Selection
- Production and Monitoring of Warnings
- MMO

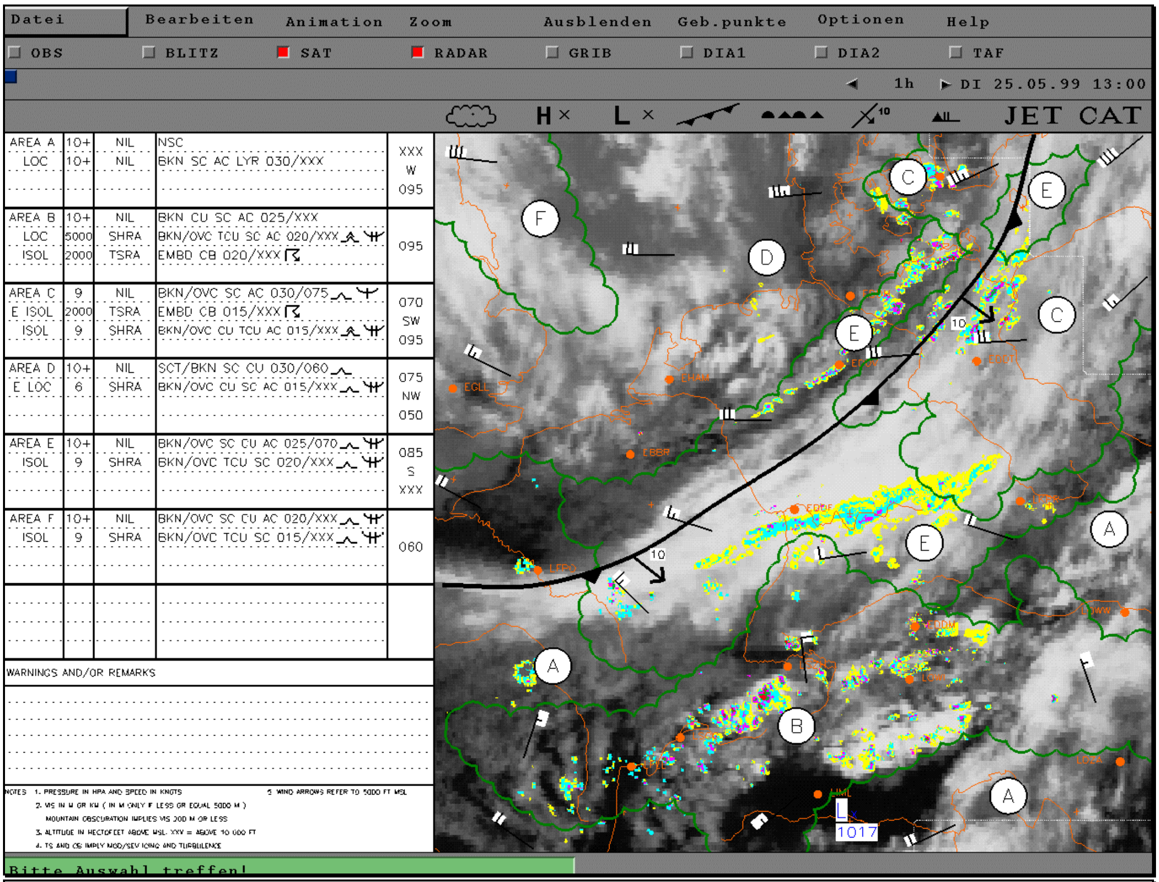


MAP - recent developments

- Cross Sections (Visual)
  - Images
  - Interactive Selection
- Production and Monitoring of Warnings
- MMO
- Archive
- Installation, Configuration File Server

IGS - recent developments

- SWL
  - Object oriented GUI
  - New meteorological content (FL 240)

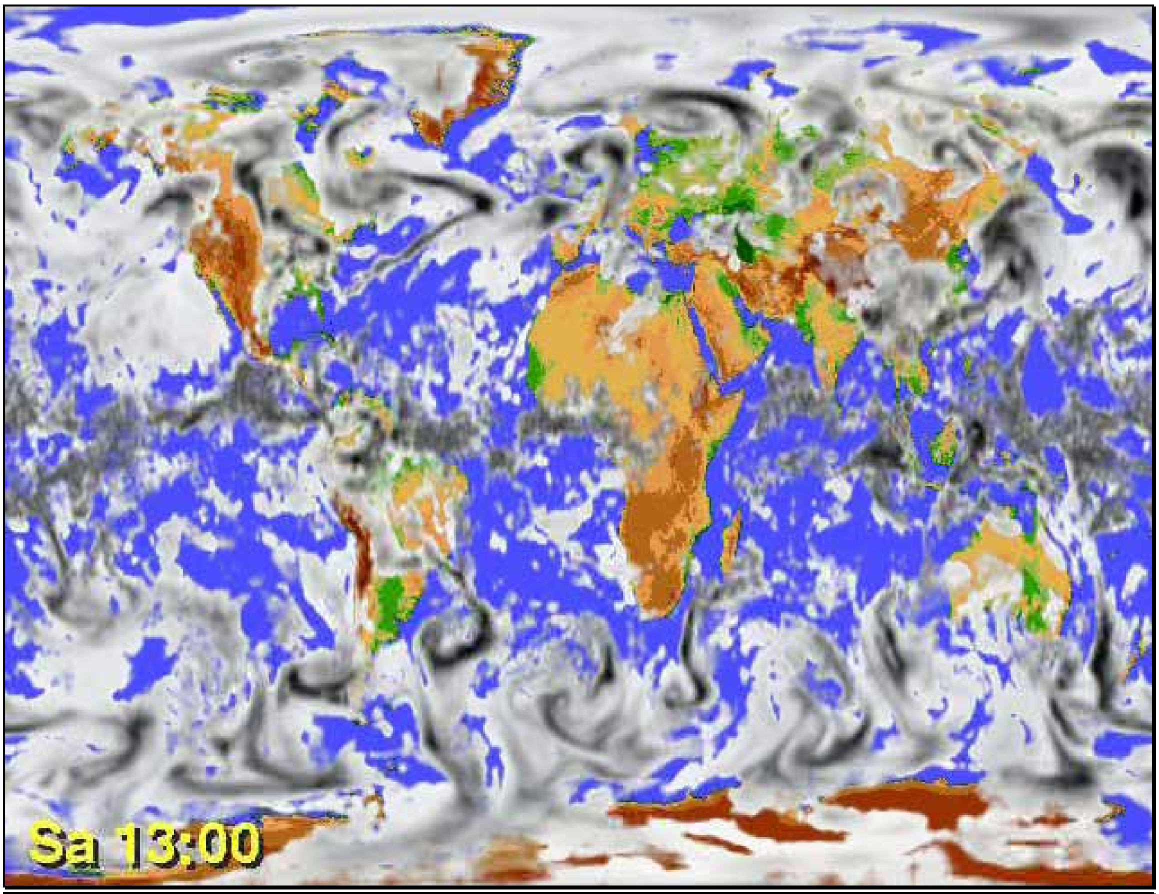


IGS - recent developments

- SWL
  - Object oriented GUI
  - New meteorological content (FL 240)
- MAP
  - Interactive Production of warnings
  - MMO with verification
  - Concept of AUTOTAF editing

TriVis - recent developments

- New GUI and Storyboard producer
- New data interfaces
  - Binary data interface (LM, GME)
  - NetCDF data interface in Australia
- TriVis user
  - ZDF
  - BOM (Intranet, Regional offices)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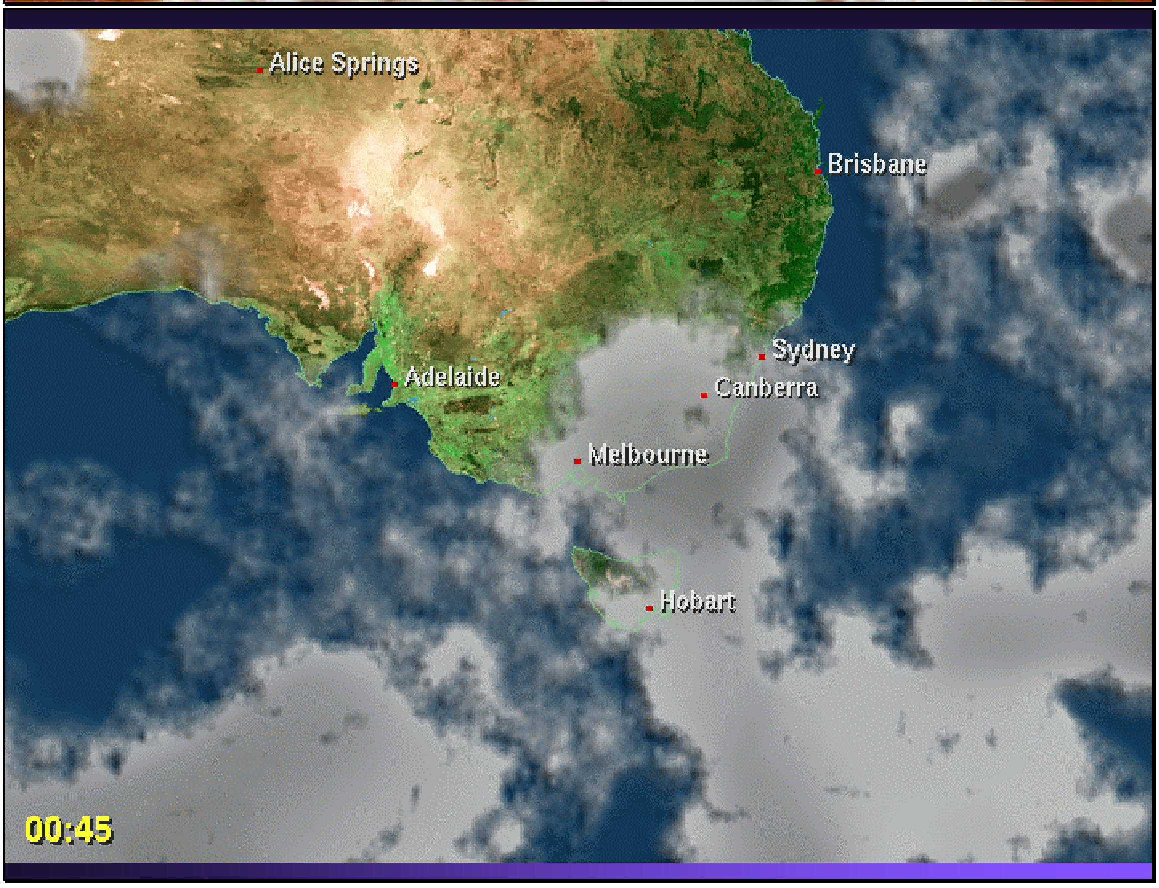
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Outlook

- MMO operationell
- GGS
  - MAP substitution
  - Co-operation
- GeoDB
  - GIS based
  - Levels of detail

Recent developments at KNMI, Netherlands

Dick Blaauboer (dick.blaauboer@knmi.nl)

Outline

- **Workstation KNMI overview**
- **GI concepts**
- **KNMI GI project**
- **synoptic scale GI**
- **short range GI**
- **next year's developments**

Workstation KNMI overview

Data Sources

- Observations
- satellite: NOAA, Meteosat
- radar: national, mozaics neighbour countries
- lightning
- conventional: synop/ship, metar, buoy, temp/pilot, satob
- windprofiler/RASS (BUFR)
- aircraft (AMDAR)
- Model output (fields, time-series, profiles, cross-sections, trajectories)
- Hirlam
- ECMWF
- UKMO
- wave/surge models
- Drawings
- Folders/Overlays
- Miscellaneous: metafile

Views

- maps (overlays)
- vertical X-sections
- time-height X-sections
- profiles (overlays)
- time-series
- alphanumeric

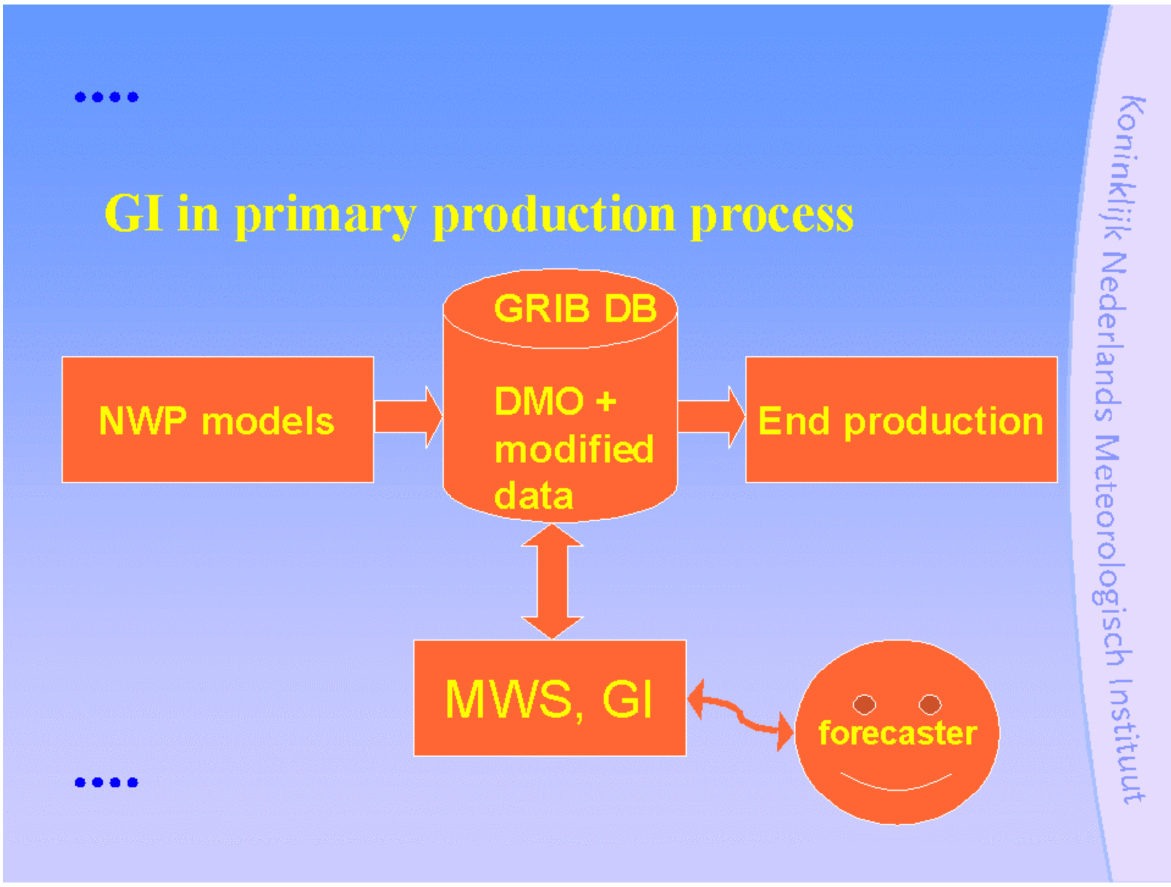
Actions

- pan/zoom/animate
- draw package
- post to overlay/folder
- print: PS, Shapefile
- Various projections (WVS, GTOPO30): polar stereographic, mercator, satelliteview
- alerts/conditional plots
- macro's: Perl based
- product generator (GIF, JPEG, TIFF, etc.)

Why Graphical Interaction?

- high degree of automation of primary production process
- forecaster is monitoring, interfering
- monitoring: display workstation
- interfering: GI tools needed
- interference at a meteorological level
- premiss: forecaster is adding value

GI in primary production process



Four levels of GI

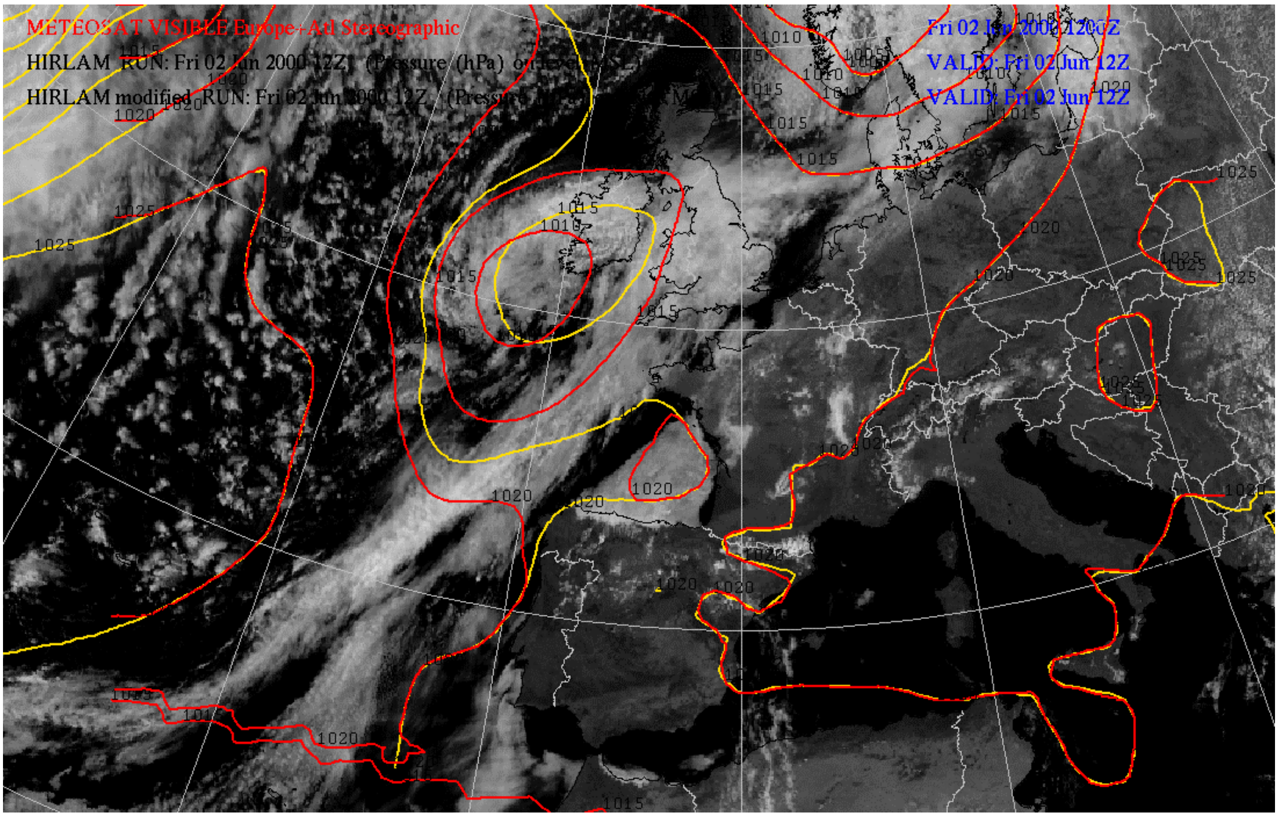
- interaction with analysis: research projects adjustment PV using WV-imagery
- synoptic scale: meteorological consistency very important, On Screen Field Modification (OSFM) tool UK MetOffice
- short range: delta-techniques, Meteorological Objects (MO)
- interaction on final products

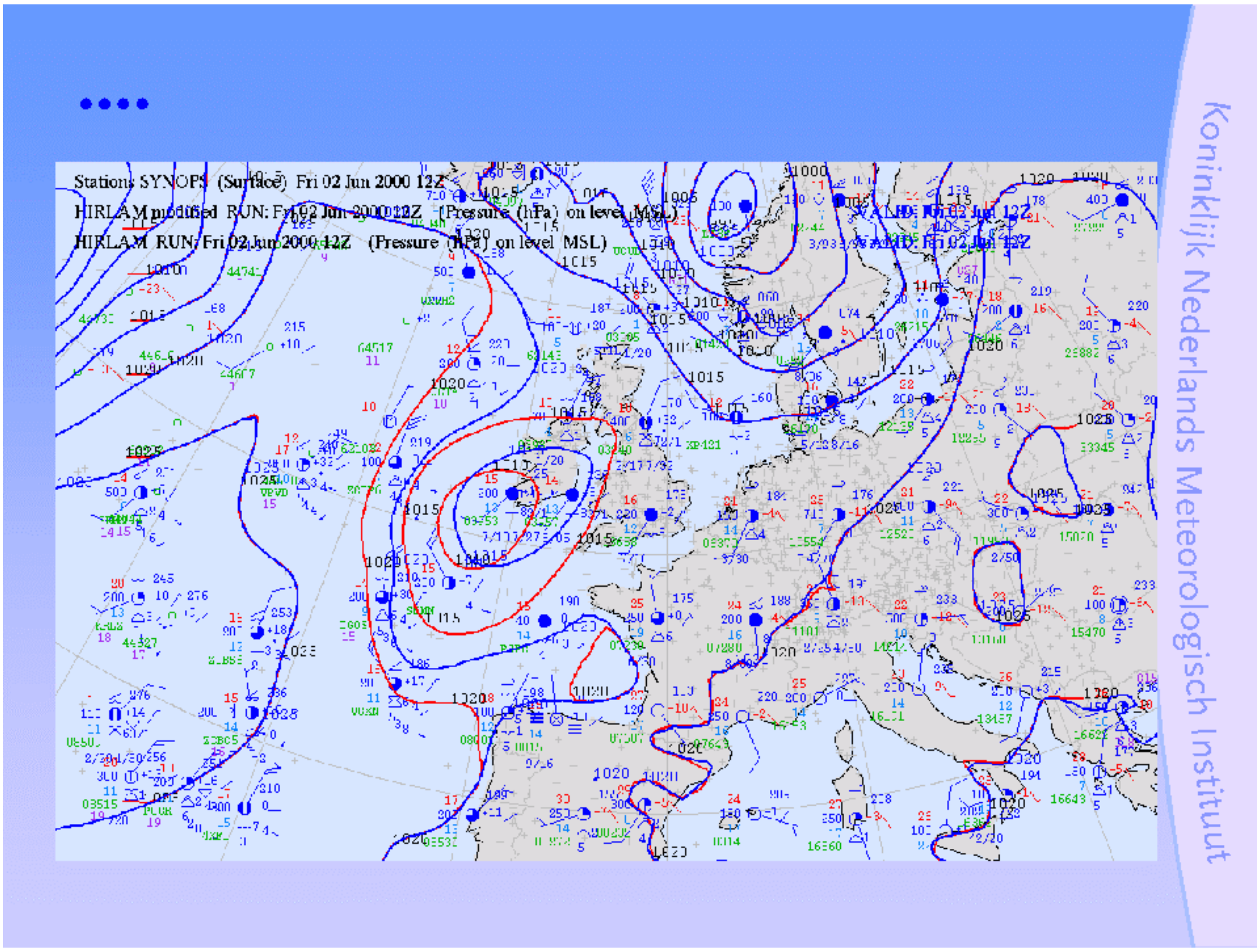
Project GI

- goal: operational implementation of general tool for interaction on model output of all operationally used parameters
- emphasis on but not restricted to (very) short range
- integration in operational MWS
- start: December 1998
- end: March 2001
- design phase until Summer 1999
- implementation phase 1: integration of OSFM tool UKMO: delivery March 2000; co-operation KNMI with UKMO and 3SI
- implementation phase 2: scheduled for late Autumn 2000; co-operation KNMI with 3SI
- follow-up anticipated based on user feed-back

Synoptic scale GI (OSFM)

- using PV inversion principle (Carroll)
- consistent modification of
- MSLP
- geopotential height
- temperature
- and, with some assumptions, of
- horizontal and vertical wind
- relative humidity
- precipitation
- interaction
- directly on PMSL/gph (not using PV)
- acting on PMSL/gph via PV
- modification of low level temperature (using PV)
- integrated with MWS functionality
- pan/zoom
- animate
- overlay





Short range GI

- delta techniques
- poke / stomp / move / merge / draw / cut and paste
- horizontal interpolation
- influence radius
- structure functions
- vertical interpolation
- time evolution
- automatic postprocessing

Structure function

$P_{mod}(r)= P(r)+\delta S_h(r)$

With $P(r)$ and $P_{mod}(r)$ the field before respectively after modification
$S_h(r)$ the structure function
δ the modification

$S_h(r)=1$ for $r<=r_s$ and

$S_h(r) = r_s^n/r^n$ for $r>r_s$

Meteorological objects

- object is data + method
- delta technique is type of objects
- interaction with objects:
- derive object from underlying fields
- interact with object
- translate result back to underlying fields
- degree of complexity from symbols to conceptual models
- hierarchy spatial scales, time scales, dynamics, relation between them
- adapting the interaction to the forecasters view of the world (meteorological interaction differs from graphical interaction)

Time evolution

- identify objects at variable points in time (keyframes)
- specify time resolution (framerate)
- edit timeline along keyframes
- motion tweening: trajectory of geometric centre
- shape tweening: shape hints
- attribute tweening: specify time evolution of any attribute

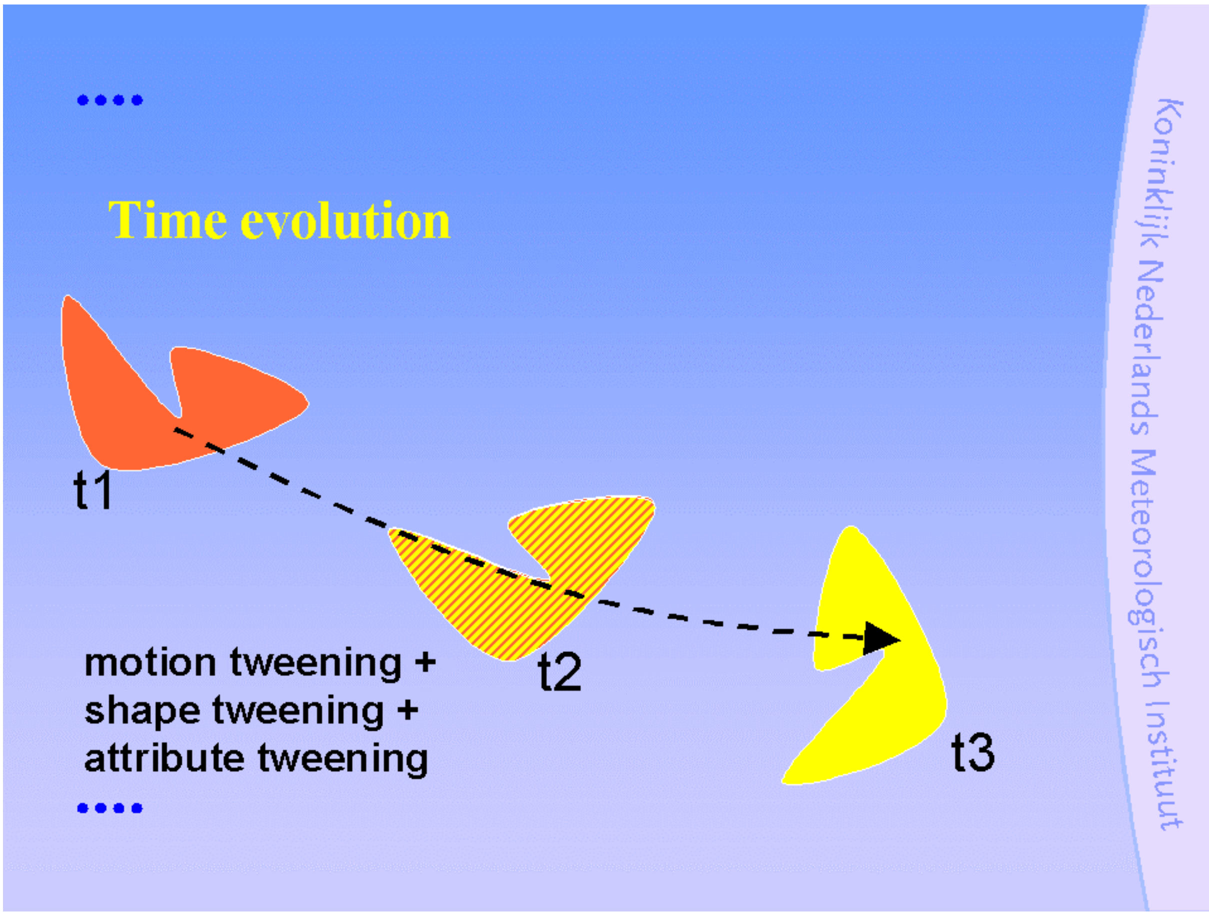
Automatic postprocessing

- goal: to derive dependent parameters in a consistent way
- interpolation for intermediate time steps
- vertical interpolations
- simple relations between parameters
- triggered by the completion of an interaction session

Next year's developments (GI)

- preparation of operational implementation, rest of 2000
- implementation of GI phase 2 including tools for small scales, December 2000
- forecasters training, January/February 2001
- operational implementation GI project, March 2001

Time evolution



Next year's developments (non-GI)

- new version of complete software: C++, GUI upgrade (SmartWindows)
- enhanced drawing capabilities
- noise filters
- enhanced BUFR interface
- observation quality status monitoring
- extension of time-profile source

Meteorological Applications: a forecaster view

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1. Actual Situation

The activity of a forecaster can be divided in 3 different phases:

-Visualization of observations and weather monitoring (->Analysis 1.1)
-Visualization of numerical products (->Forecasting 1.2)
-Forecast redaction or editing (->Production 1.3)

At MeteoSwiss, these tasks are performed with the help of a set of independent tools, which are discussed in the following paragraphs.

1.1 Analysis

Despite the increasing wealth of meteorological tools on computer, a great deal of analysis is still routinely on paper. This included the manual analysis of synoptic charts, upper air charts and tephigrams. No sign of change and no good reason seem strong enough to change this usage in the immediate future.
A number of electronic tools are available to obtain additional information.

METEOR
Siemens applications, about 20 years old, written in Assembler, with alphanumerical display and only with limited graphical features. Very fast in getting and displaying information.

MetAP VIS

Fairly new application written in Java 1.2. Designed to replace the old METEOR system. The information can be displayed in different ways, list, charts, and graphs. The main problems are the time required to get to the information (also a database problem) as well as the handling of the application.

WESAT

This application is used to display the satellite images (Meteosat and NOAA). It has been written in IDL5.0. It offers some facilities to manipulate the images or to extract information's from the image, however the use of these features is usually not possible within a forecasting shift.

RADAR Display

In addition to the 3 radar images covering Switzerland, images coming from radar located near to the border can also be displayed. The application has been written in IDL5.0.

In addition to these basic tools, a few others are available depending on the forecaster needs. For example, a wind alarm (IDL5.0) and a storm alarm (Java1.2) warns the forecaster when gusts or pressure differences between station of the automatic net exceed predefined thresholds.

1.2 Forecasting

Routinely, the forecasters of MeteoSwiss elaborate their forecasts with the help of 4 numerical models. The short-range forecasts are mainly based on a local area model with about 14-km resolution, the SM-model, which is closely related to the DM-model computed at DWD. Most of the output are viewed and analyzed on screen with the help of simple GUI (IDL5.0) written exclusively for this purpose. This viewer does not offer the possibility to overlay different fields on each other or numerical fields over satellite or radar images in order to compare the differences between numerical forecasts and reality. Nevertheless roughly 90% of the model analysis is done on a screen and only about 10% of the information are printed.
For middle range forecasts the basic source of information are the ECMWF runs as well as the GME runs obtained from DWD. Recently the tendency to use the ECMWF ensemble forecasts increases clearly. Although the forecasters have the possibility to display these numerical fields on screen, more than 90% of the analysis is done on printed fields. In this way the information hanging on a wall can be very rapidly viewed and compared.

1.3 Production

During the last 2 years a strong effort has been done to migrate most of the written products from a 20 years old system to a recently developed system (FPE, Forecast Product Editor, Java 1.2). The FPE is composed of product manager (PM) and a text editor. The PM contains the list of the products to be done as well as some information about their state (e.g. not yet edited, edited, sent etc.). Combined with a scheduler, the PM warns the forecaster when a product is due.

The text editor works with predefined HTML templates. Each product is composed of blocks, which are linked to the different products. Therefore several products ca be issued or modified with the edition of one block. Although this application runs under powerful hardware (UltraSparc 2), the text edition tends to become very slow as soon as the text reaches about half a page. Some graphical tools for the drawing of meteorological have also been added, however at the moment they are not used operationally. Despite some start problems this system is reasonably well accepted among the forecasters. The migration of pure text products is completed to about 95 %.

In order to palliate to the strong need of flexible forecast editing tools, some forecasters used the existing facilities available within the intranet of MeteoSwiss and developed small applications using the HTML format, JavaScript and the scripting language Perl5.0. Based on a identical scheme about 20 of those applications have been to developed, used in operational forecasts and dropped again if necessary.

2. Plans and wished improvements

2.1 Weather monitoring

- Improvement of diagnostic tools for TS, FG and low level clouds: This aspect of the forecaster activity will be part of a nowcasting project dealing with the warning duty at MeteoSwiss including also SAF-products generated on MSG images.
- Improvement of the nowcasting analysis by the use of cameras: The actual project of renewal of the automatic observation net foresees the installation of cameras, especially in the Alps.

2.2 Visualization and manipulation of numerical fields

- Since there is a bitter need for such application, MeteoSwiss plans in the short term to introduce Metview. For the next future a collaboration with the DWD is planned for the development of a Java-based application including also the actual functionality of the MAP (DWD).

2.3 Forecasts editors

- In order to reduce inconsistencies between forecasts, a common data set for all products will be introduced during next year. The edition of these data will performed using a newly developed application (FCE: ForeCast Editor)

The GIS Meteo Technology

MapMakers Group Ltd.
Yuri Shmelkin

History

- We started in 1980-1984 years at Hydrometeorological Center of the USSR
- Our subdivision was developing software for data acquisition, decoding and plotting that data on the meteorological maps.
- At that time we used big computers like IBM 360/370 and big table-like plotters.

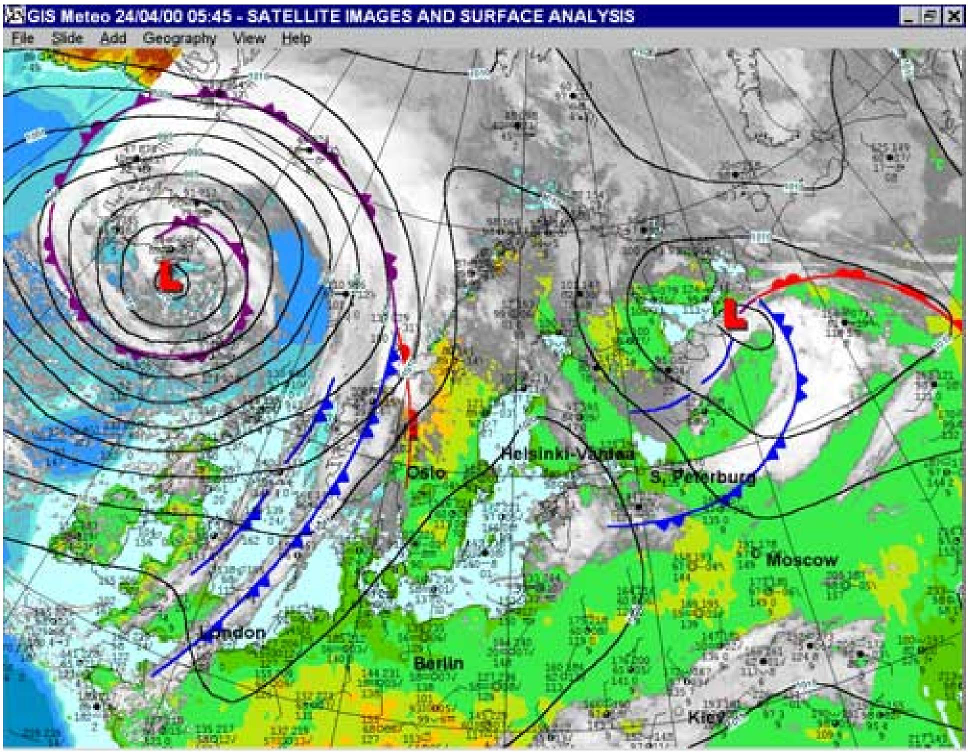
History

- In 1990 we quit Hydrometeorological Center and started our own company
- Now we have 35 people, all of them has university level education
- Our company is still situated in the building of Hydrometeorological Center in Moscow
- For 6 years our company is a member of Russian Meteorological Consortium

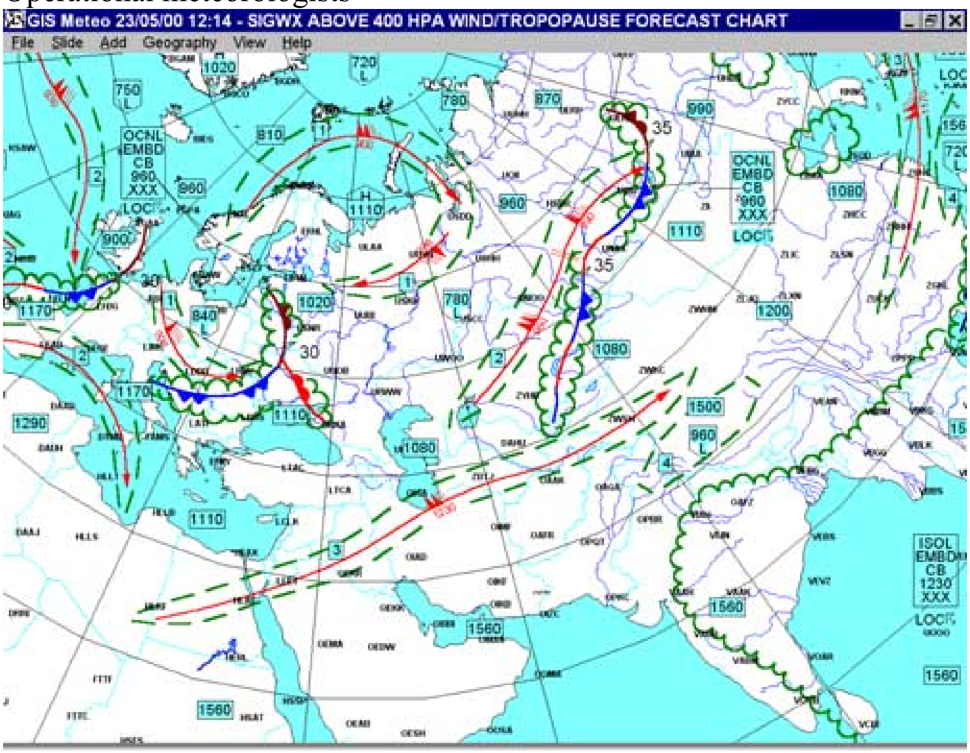
Our Tasks

- Development of applications for meteorological services with different specializations and scale
- Assembling and “turn-key” installation of complex GIS Meteo systems
- Support and upgrading of existing GIS Meteo systems
- GIS Meteo courses for our customers
- The technical and informational support of other companies, in particular Internet portals and local TV studious
- Running web-site (#25 in Russia) for customer support and for publishing short-range forecasts for more than 300 towns
- Technology improvement in Russian Hydrometerological Service
- Global proposals for NMS’s of former CIS countries

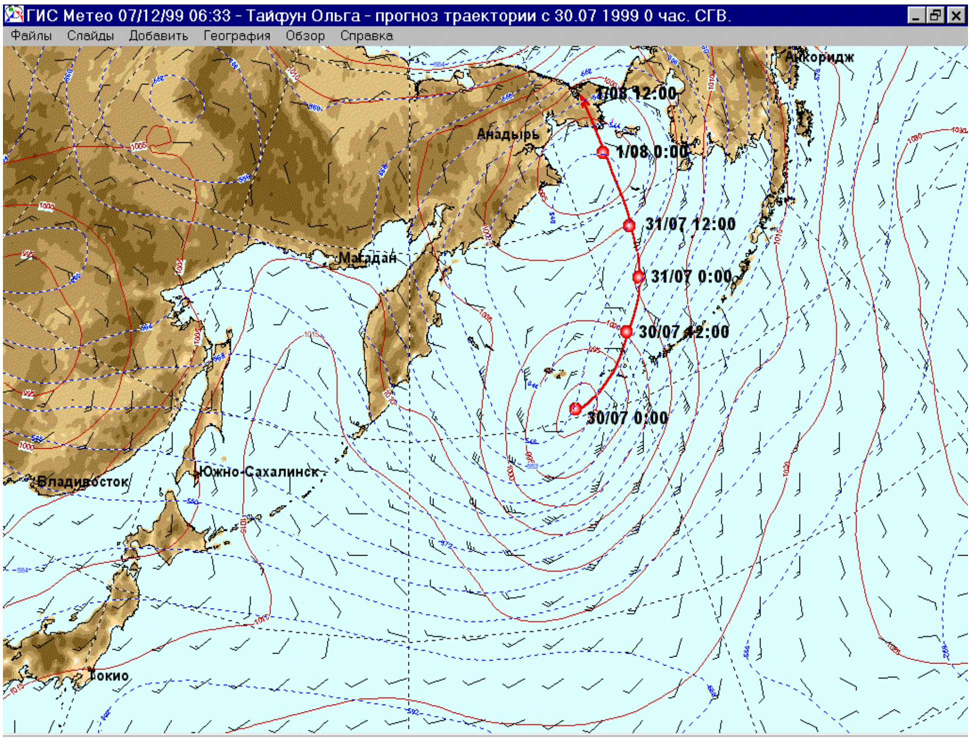
GIS Meteo Specializations



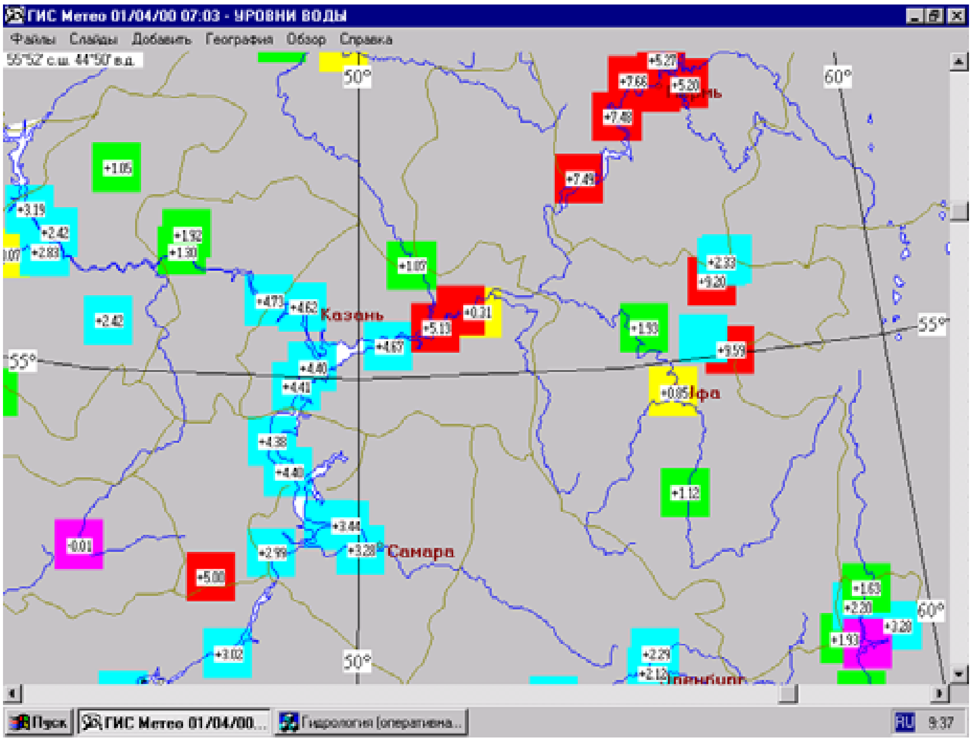
Operational meteorologists



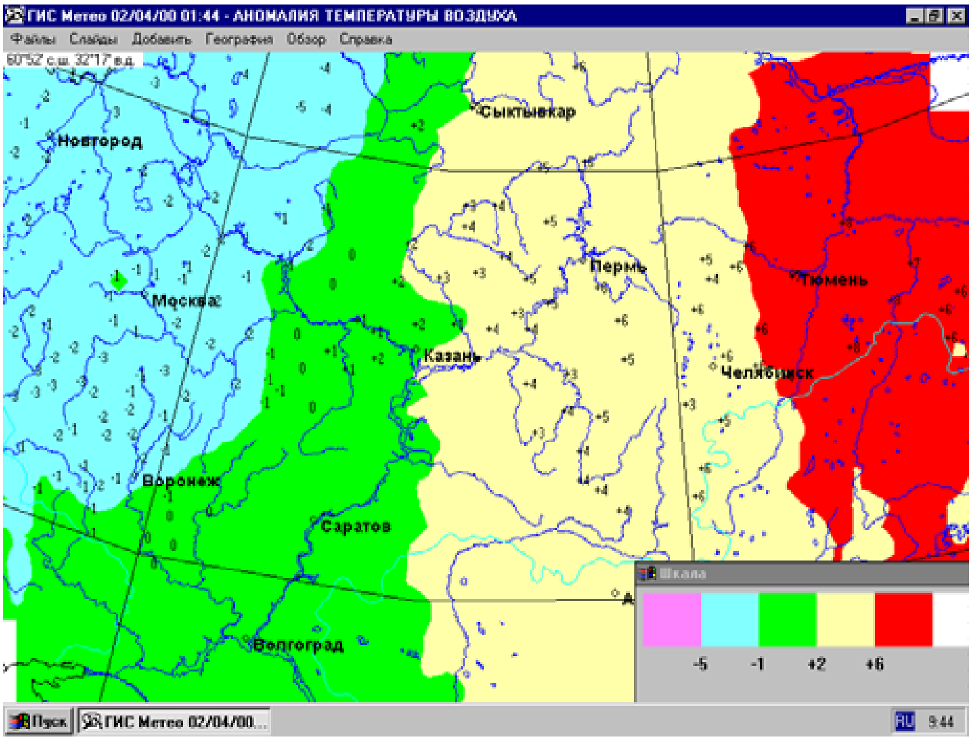
Airport meteorologists



Marine meteorologists



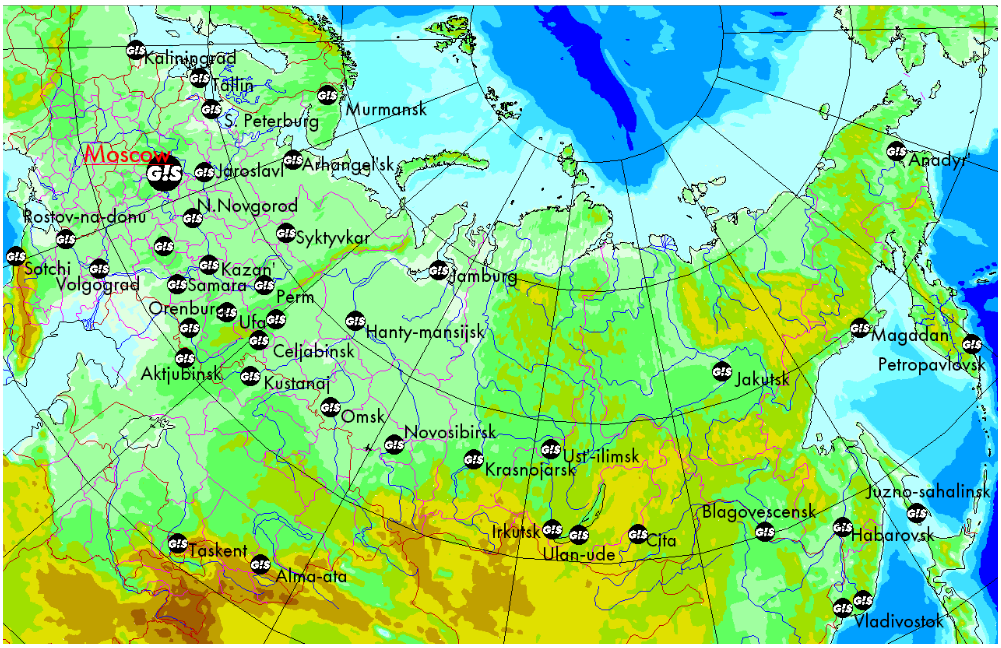
Hydrologists



Agrometeorologists
And Many Others…

Installation Sites

- Regional meteorological centers: Moscow, Khabarovsk, Novosibirsk
- Territorial meteorological centers
- Airport meteorological services
- Military meteorological services
- Railroad meteorological services
- Educational institutions (free of charge)



We installed over 250 GIS Meteo workstations in Russia and former CIS countries

Data Acquisition

- From national communication centers
- From telegraph lines (including AFTN)
- From SADIS receiver
- From Internet sources
- From other GIS Meteo systems
- Supported protocols: TCP/IP, X25, POP3, TG

```
;  AIREP grammar

 S ({arp|ars|airep})
name COORD time LEVEL
(NCOORD ntime) (fuel
ftime)  S1
 S1 TEMP WIND
[xgrup]...
   COORD
{ltlg|ltlgmin|spname|CR
DMIN|CRD}
   CRDMIN latmin
{longmin|longmbad}
   CRD     latc    {
longc |longbad }
   LEVEL
{flev|lev|heim4|heim5|h
eift}
   NCOORD
{nltlg|nltlgmin|nspname
|NCRDMIN|NCRD}
   NCRDMIN nlatmin
nlongmin
   NCRD    nlat
nlong
   TEMP {pstt|mstt}
```

Data Decoding

- Practically all code forms are decoded
- The decoding algorithm is produced automatically from the code form description
- Decoding algorithm implements modern theory of syntactical analyses and fuzzy behavior in case of coding errors
- The module structure of software simplifies the modification after code form changing
- National code forms are decoded and national coding practices are included in code form descriptions
- The separate application is designed to decode binary data (GRIB/BUFR)

Meteorological Database

- Specially designed for building meteorological maps and related calculations
- Based on cyclic data storing method
- Stores decoded data in binary form and optionally source messages in text form
- Provides access to single parameters

- Implements dynamically updated indices (key section) for faster access
- Allocates separate partition for different data types
- Provides an API for developing third-party applications

Other Databases

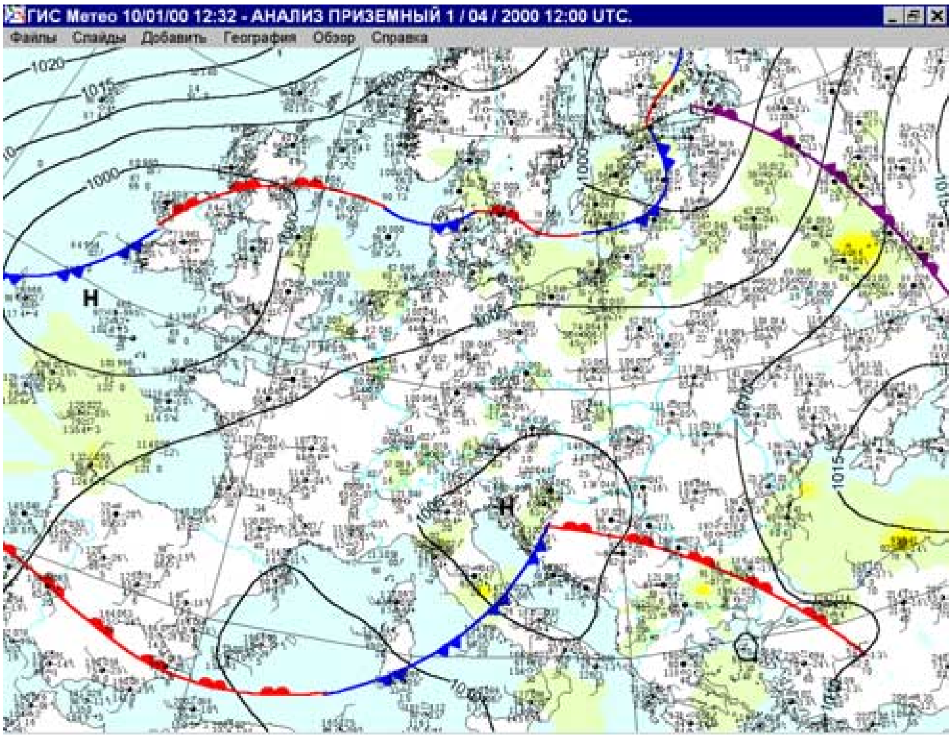
- Geographical database for building maps in various projections
- Earth relief data
- Satellite images in various formats
- MRL data
- Lists of stations, airports, hydrological stations, etc.

GIS Meteo

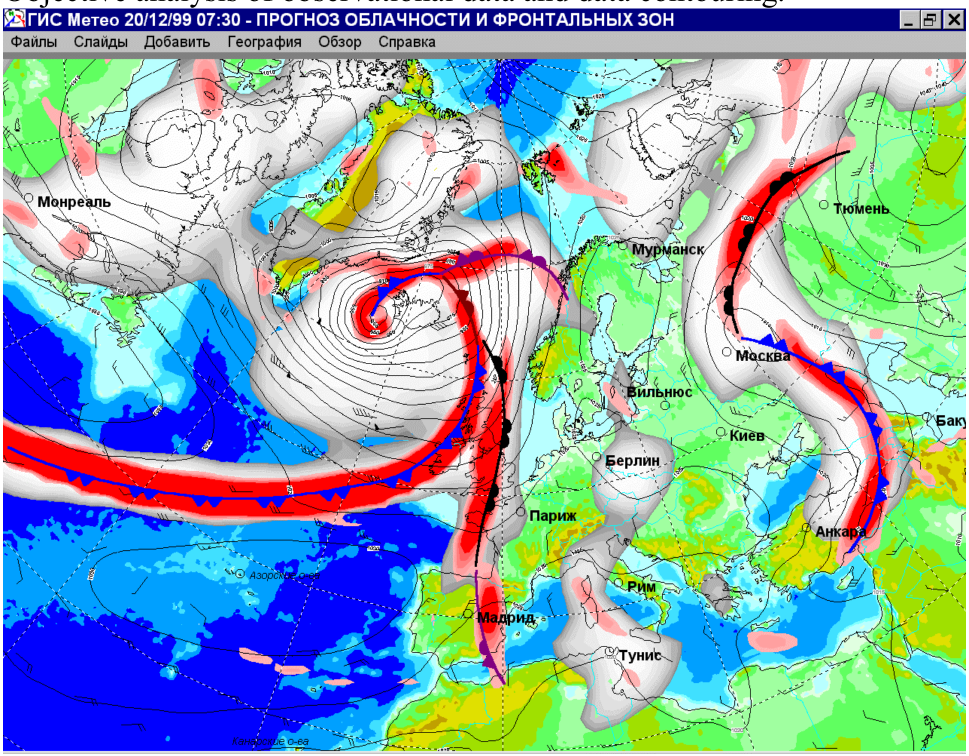
- Specialized geographical information system designed for operational work of meteorologist
- Builds maps of any region in various projections and scales using vector graphics
- Maps or slides consist of layers each representing different kind of data
- There are more then fifty different types of layers

- For making complex multi-layered maps one can use so called “templates”
- Slides can be created by schedule without human intervention
- Provides export in popular formats, can import and export MIF files

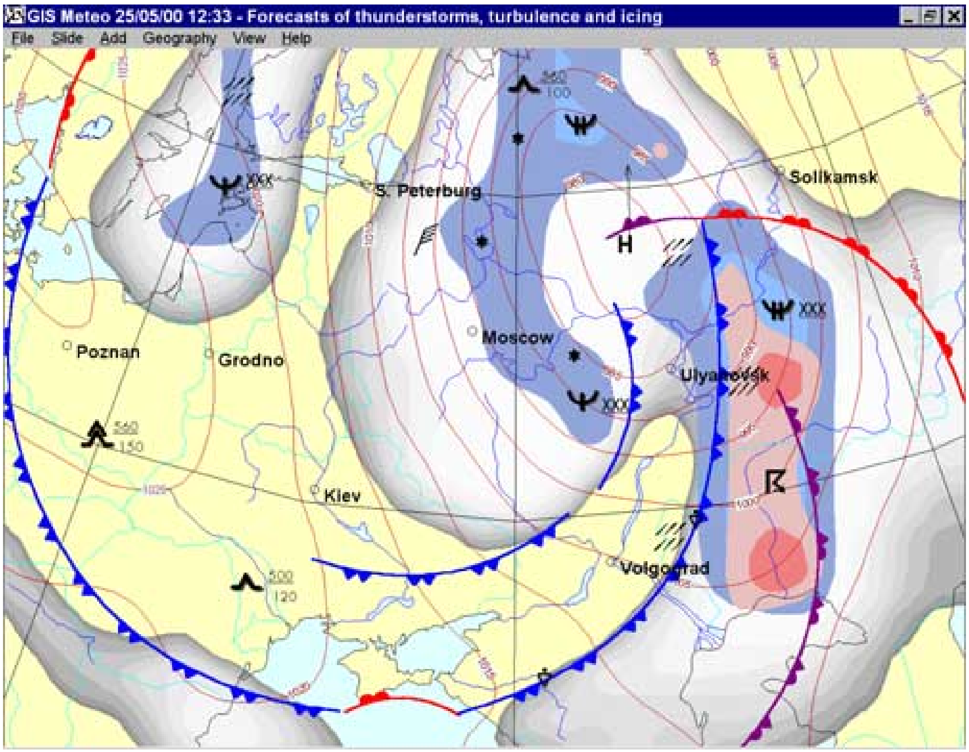
GIS Meteo Layers



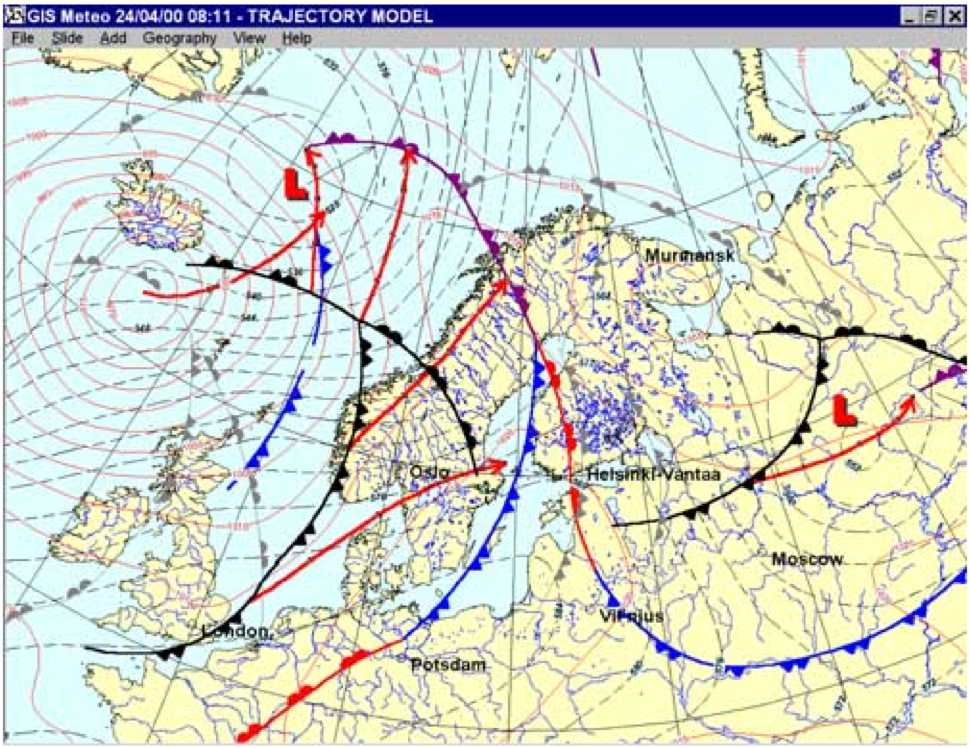
Surface, upper-air, icing, marine, etc. standard model data plotting
Objective analysis of observational data and data contouring.



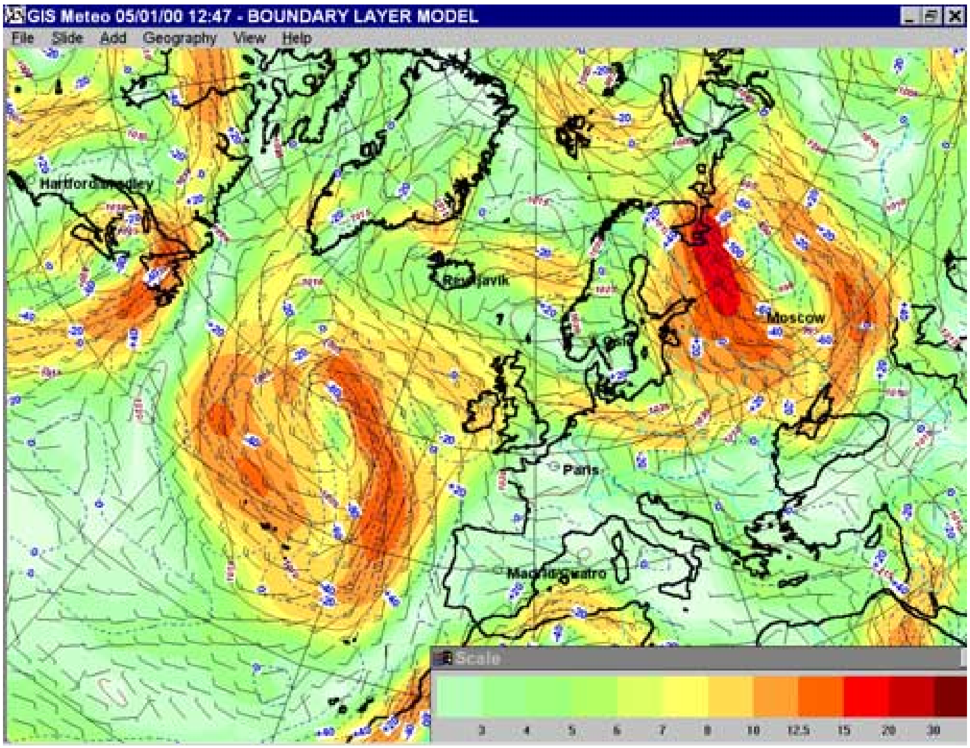
Forecasts of cloudiness, frontal areas and precipitation



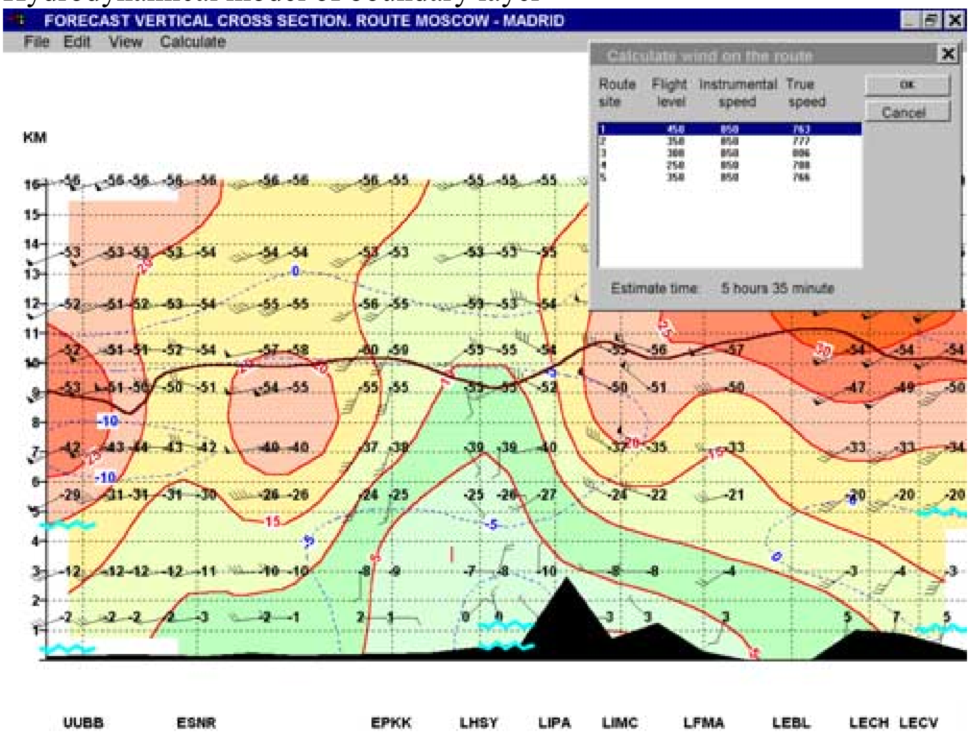
Forecast of icing, turbulence and possible thunder-storm areas



Forward and backward 2D and 3D trajectories



Hydrodynamical model of boundary layer



Vertical cross-sections

Manual drawing of lines, special symbols and texts

Correction of dataSatellite mosaic***Other Applications***

Actual and forecasted T-Skew diagram

Meteorological parameters variation time-plots

T4 format map viewer

TAF, METAR, SPECI, SIGMET messages for aviation

MRL data viewer

Hydrologists

Agrometeolorogists

Static and animated image preparation for TV studious
Our web-site: mapmak.mecom.ru

Also we have:

- Vocal reproducing of METAR messages for ATIS / VOLMET
- Numerous “wizards” for coding telegrams in various code forms
- And many others…

Conclusions

- Our company is the largest developer of meteorological software in Russia
- Our software is rather inexpensive at those huge capabilities on a data analysis, which it gives to the meteorologist
- All our applications are designed for Windows / Windows NT operating systems and can be installed on the most common personal computers
- Therefore our products can be used in meteorological services in countries with economical difficulties, and in educational institutions

Recent developments at HMIS

Metod Koželj

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Introduction

At the moment, there are three major graphical support applications for forecasters at Hydrometeorological institute of Slovenia (HMIS):

- non-interactive visualization tools and routines — GROM
- user interface to visualized products — VisPro
- interactive visualization tool — FrontEditor
- interactive visualization tool — WeatherSlo

GROM

This is a suite of in-house developed functions and routines, written in Fortran. They are based on NCAR graphics library (version 4.1). The suite also includes several shell-scripts. The whole suite is easily portable to any UNIX platform, which meets the following criteria: NCAR graphics libraries are available, Fortran (preferably F90) compiler is available and POSIX-compliant shell is available (GNU bash is adequate). Development of the suite has started in 1997 and has been in operational use ever since.

The suite is used for uniform visualization of all kinds of input data, e.g. output of different NWP models and various observations. Output images can be in various formats (plenty of raster image formats, PostScript,).

The suite is inherently non-interactive. However, a certain degree of interactiveness is possible through use of Fortran-style namelist files.

The suite is used as back-end visualization engine for VisPro, as well as some other uses.

Recent developments include additions of some new input data formats and some new products (e.g. some composites between observations and forecasts).

VisPro

VisPro is an HTML and JavaScript based application, used as user interface for browsing through already visualized products. It runs on any recent Web browser (JavaScript v1.1 compliant) such as Netscape 4.5 or Internet Explorer 5.

This application is a simple user interface and all products are made available on intranet server in advance.

During spring 1999, it has been installed in all MAP operations centers. It has been extensively used during SOP and it has proved useful. At the time being it is till installed at MDC.

Recent developments include additions of some new charts (model output fields). Recent developments also include preliminary use of XML. So far we use XML for two products: access to data from automatic observation stations and plotting composite of radar imagery and lightning detection data.

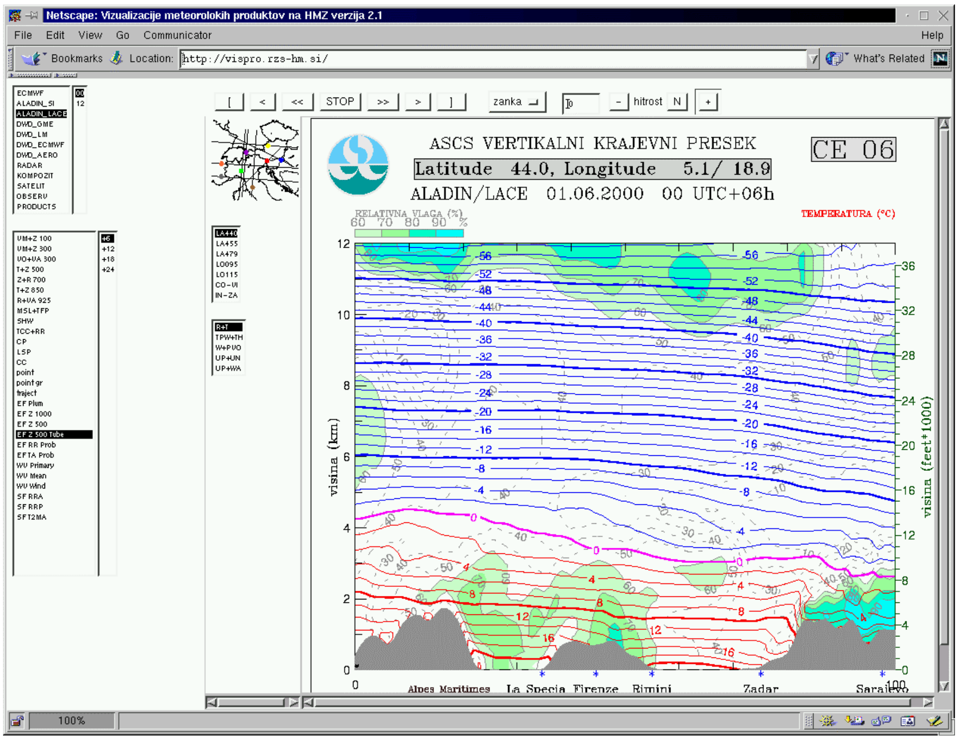


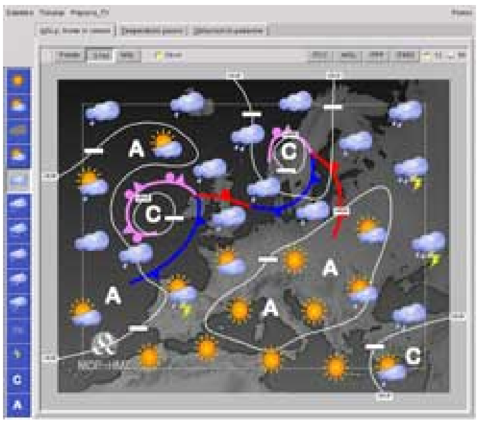
Figure 1: Screenshot of VisPro user interface.

FrontEditor

This application is used for interactive production of weather charts. CHarts can contain following types of objects: fronts, isolines, colored surfaces and weather symbols. Forecaster gets some aid from the application by underlying "helper charts", such as TCC and RR charts, temperature isoline charts and TFP charts.

Objects are used for internal representation and archiving. That way charts are easily editable and redrawn while disk space consumption is kept low.

The application has been developed in 1999 and put into operational use. It is written in Tcl/Tk with some standard add-on packages. The application is easily portable to any platform that has Tcl/Tk and add-ons available.



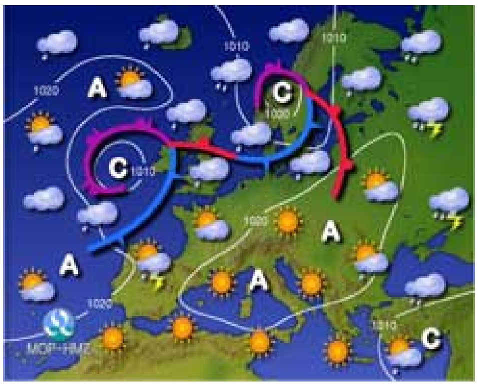


Figure 2: Screenshot of working window (left) and final product (right).

WeatherSlo

This is another interactive application. It is used for production of regional weather charts. Slovenia is divided to 11 regions. For each region it is possible to set low/high temperatures, cloud cover, type and amount of precipitation, wind speed and direction and possibility for thunderstorms. There are several such input tables, one for each output chart.

This application is written in Delphi and runs on MS Windows workstation.

Future plans

We plan to further deploy Internet technologies, such as XHTML, XML, and JavaScript. We found the results of preliminary test very promising by now.

We also plan to further enhance our own developed visualization tools. All the time new NWP products are made available and have to be visualized. All the time, new clients demand new products for their use and they demand graphical products more and more. We will try to supply already visualized products to them.

Our forecasters demand introduction of "visualization on demand" to VisPro system. Some steps have already been taken in this direction.

One of our most important clients is national TV station. New commercial TV stations already made enquiries about available products. TV stations demand more "fancy" graphics, therefore we'll look into possibility to purchase some commercial software for media products.

INM status and future plans

Jorge Tamayo (tamayo@mariola.inm.es)
INM, Spain

Actual status on INM

- **Operative System: McIdas-X Ver. 7.5 (SAIDAS System)**
  - Satellite data reception chains
  - Meteorological data ingestors and decoders
  - Store system
  - Process system
  - Communications
  - Workstations
- **In use for operational forecasting and also for research and development**
- **Distributed System (More than 70 user's workstations)**
  - 11 Regional Forecast Centres (GPV's)
  - 1 National Forecast Centre
  - 1 Army Forecast Centre
  - 15 Regional Meteorological Centres
  - 3 Central Services for development and research
- **Based on Central Servers and Regional Servers**
- **Great data dissemination. WAN at 256Kb/s**
- **National development**
- **Regional development**

Specific commands developed in McIdas environment for derived fields calculation.

Quasi-geostrophic diagnosis

- Geostrophic vorticity
- Geostrophic advection of geostrophic vorticity
- Thickness advection
- Q vector divergence

Frontal Analysis

- Wet-bulb potential temperature and its advection
- Thermal frontal parameter
- Vector components and its projection over thermal gradient
- Total frontogenetical function

Stability Analysis

- Wet static stability
- Differential thickness advection
- Stability index: TT, K, ISOIN
- Pseudo-soundings

Another diagnostic commands

- Temperature advection
- Potential temperature, dew point, equivalent potential temperature, mixing ratio
- Humidity flow
- Humidity flow convergence
- Geostrophic and ageostrophic wind
- High levels unbalanced flow
- Vorticity transfer

- Potential vorticity
- Vertical cross
- Dry and wet-bulb freezing level

Isentropic Analysis
- Fields over isentropic layers
- Isentropic trajectories
- Isentropic trajectories visualisation

Grids management utilities

RECENT DEVELOPMENTS ON AUTOMATIC PRODUCTION

- Extremes temperatures statistical forecasting, D+1 to D+10, based on ECMWF EPS
- Precipitation forecasting based on analogies method
- Multimeteo. Automatic forecast text in different languages (Spanish, English, French and German)

Future plans on INM

- Implementation of an Automatic Production System compatible with the INM operational system (Mcidas or another in future)
- Optimize diffusion network
- Increasing Nowcasting potentiality
- Graphical Interaction System

General system requirements

- To allow all the analysis, surveillance, diagnosis and forecasting techniques supported by the actual system
- To allow data input form another national institutions
- Tools availability for data management
- Ability for special applications development and integration
- Taking in account the National Forecast System structure
- Tools availability for carry out a basic interactive forecast to generates a data base
- Making, in an automatic or semiautomatic way, different forecasting and surveillance products for different users in many formats
- Forecaster decision capability for a direct product diffusion or a man-modified product diffusion
- Data Base numerical and graphical edition, with spatial and temporal consistency (4D)
- Capability for product interchange with NMS
- Automatic verification processes from new available observational data
- Graphical and text edit tools, for making products
- Friendly system
- Interconnection with information diffusion system, transparent to the predictor

XML BASED
VISUALISATION
OF METEOROLOGICAL DATA

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Introduction

Use of Internet based XML technology in operational meteorological environment, especially its relevance for dissemination systems, is explained. Some examples of real-time applications for weather monitoring are presented. Promising implementations of XML for vector graphics and its role in future visualisation system is discussed.

Some XML Basics

XML (eXtensible Markup Language) is object-oriented ASCII format for data storage on Internet. XML documents are made up of storage units called entities, which contain either parsed or unparsed data. Parsed data is made up of characters, some of which form character data, and some of which form markup.
The basic principles of XML (as in the W3C standard) are:

- XML shall be straightforwardly usable over the Internet.
- XML shall support a wide variety of applications.
- It shall be easy to write programs that process XML documents.
- The number of optional features in XML is to be kept to the absolute minimum, ideally zero.
- XML documents should be human-legible and reasonably clear.
- The XML design should be prepared quickly.
- The design of XML shall be formal and concise.
- XML documents shall be easy to create.

Terseness in XML markup is of minimal importance.

XSL (eXtensible Stylesheet Language) is language for expressing stylesheets. An XSL stylesheet processor accepts a document or data in XML and an XSL stylesheet and produces the presentation of that XML source content that was intended by the designer of that stylesheet. There are two aspects of this presentation process: first, constructing a result tree from the XML source tree and second, interpreting the result tree to produce formatted results suitable for presentation on a display, on paper, in speech, or onto other media.

XHTML (eXtensible HyperText Markup Language) is a reformulation of HTML 4.0 as an XML application.

SVG (Scalable Vector Graphic) is XML based vector images format.

Web Standards Historical Review

The story about object oriented web data storage started in late 1997 when W3 organisation introduced 4th generation of HTML language. In this version one can insert XML tag into source code of document and browser loads data from an XML file into an object. At that time also a first version of XML standard was introduced. In mid summer 1998 XSL standard was issued. As Cupertino between major corporations dealing with vector graphics (ADOBE, COREL), a new draft of standard SVG for expressing web graphics based on XML was introduced in 1999. The new standard will be issued in mid 2000.

XML Based Operational Applications at HMIS

Development of XML based applications at HMIS started in early 1999 when Microsoft implemented new web techniques in Internet Explorer 5.0. Since then also some other (preview) browsers are capable to parse XML documents (Netscape 6.0, Amaya, Opera 4.0, etc.). The first prototype of visualisation of automatic reporting stations (in operations since late 1999) was developed in just one month. During fall 1999 new visualisation of composite image between radar images and lightning was developed.

3.1 Visualisation of automatic reporting stations

The main features of visualisation of Automatic Reporting Stations are tabular or graphical visualisation of meteorological data, air pollution data, radiation data and hydrological data (also TAF, METAR and SYNOP data in the near future). The XML data are available for last 90 days. One can get older data by direct access to ORACLE database and request will result as returned XML files.

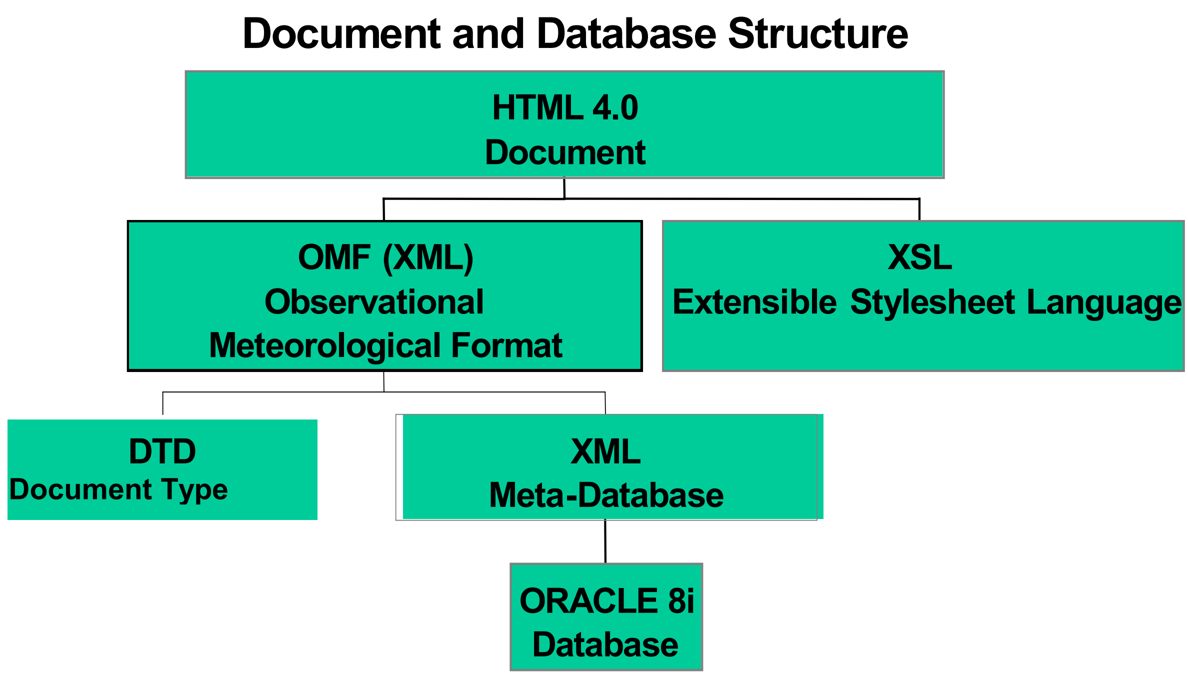


Fig 1: Schematically organisation and structure of XML based application.

On Fig 1 one can see the database and HTML document structure. All available data is stored in ORACLE 8i database. Every minute a script queries to the database and generates XML

files, which are coded according to the definitions in the document type definition (DTD) file, which can be stored either locally or publicly available. The HTML 4.0 document is generated dynamically in browser memory by creating XML data island (object) and combing it with XSL stylesheet. When new type of visualisation of XML data is chosen only new styleheet is applied to the data object.
The OMF DTD is an attempt to use XML for meteorological observations data and new types of data (e.g. point forecasts like TAF, etc.) will be constantly added to the definition files.

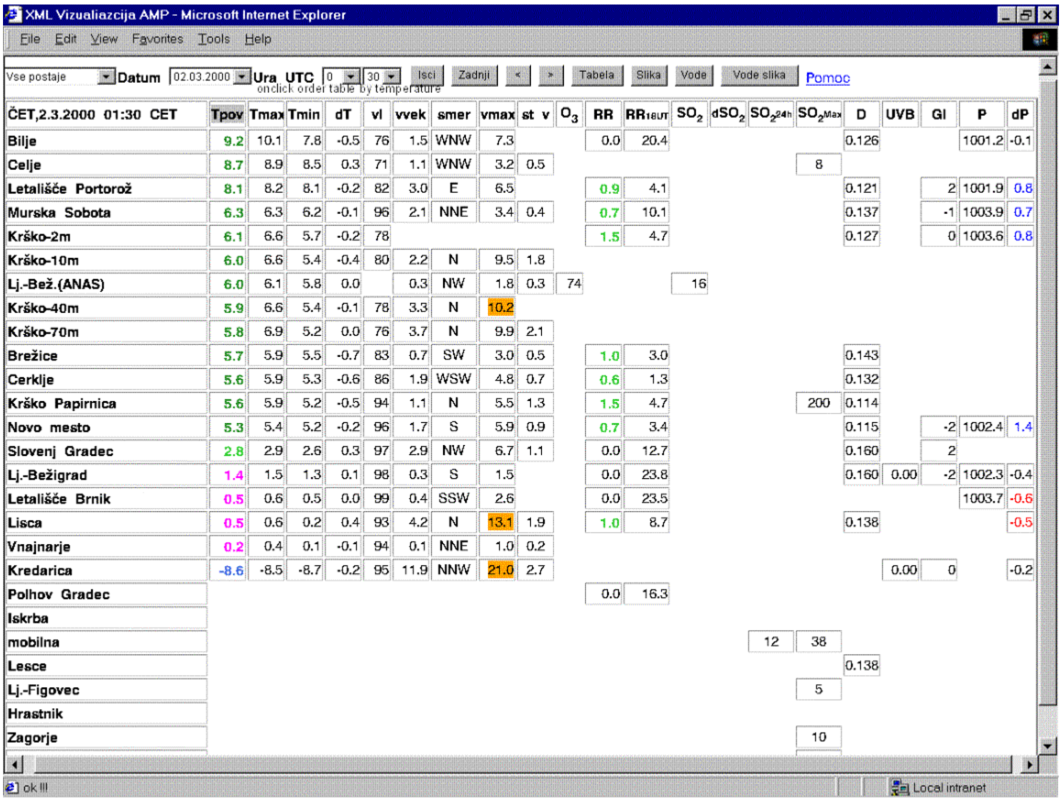
OMF File Example

```
<?xml version="1.0" encoding="Windows-1250" ?>
<!DOCTYPE Reports SYSTEM "somf.dtd">

<Reports TStamp="914456730">
<SYN Title='AAXX' TStamp='908539200'
LatLon='46.035, 14.310' BId='14015'
SName='LJUBLJANA-BEZIGRAD' SType='AUTO' Elev='299'>
  <SYID WS='4'>M05</SYID>
  <SYG  T='-3.1' Hum='95'  P='1000'></SYG>
  <SYR Tx='-3.1' Tn='-3.2' Windff='1.5'
      Winddd='320' WindMaxff = '2.8' Pppp='-0.3'
      RR='0'>
  </SYR>
  <SYAMP dT='-0.0' GSunRad='100' UV-B='0.01'
      Dozav='0.123' O3='0.4' SO2='351' dSO2='33'>
  </SYAMP>
</SYN>
</Reports>
```

Fig 2: An example of XML file.

In the header of XML/OMF file (Fig 2) the version of XML, encoding, name of the highest of branches of data tree object and location of document definition file is placed. Each element starts with "<name>" tag and ends with "</name>" tag. The attributes of element are placed after the element name inside the starting tag.



ČET,2.3.2000 01:30 CET	Tpov	Tmax	Tmin	dT	vl	vvek	smer	vmax	st v	O_3	RR	RR18UT	SO_2	dSO_2	$SO_2$24h	SO_2Max	D	UVB	GI	P	dP
Bilje	9.2	10.1	7.8	-0.5	76	1.5	WNW	7.3			0.0	20.4					0.126			1001.2	-0.1
Celje	8.7	8.9	8.5	0.3	71	1.1	WNW	3.2	0.5							8					
Letališče Portorož	8.1	8.2	8.1	-0.2	82	3.0	E	6.5			0.9	4.1					0.121		2	1001.9	0.8
Murska Sobota	6.3	6.3	6.2	-0.1	96	2.1	NNE	3.4	0.4		0.7	10.1					0.137		-1	1003.9	0.7
Krško-2m	6.1	6.6	5.7	-0.2	78						1.5	4.7					0.127		0	1003.6	0.8
Krško-10m	6.0	6.6	5.4	-0.4	80	2.2	N	9.5	1.8												
Lj.-Bež.(ANAS)	6.0	6.1	5.8	0.0		0.3	NW	1.8	0.3	74			16								
Krško-40m	5.9	6.6	5.4	-0.1	78	3.3	N	10.2													
Krško-70m	5.8	6.9	5.2	0.0	76	3.7	N	9.9	2.1												
Brežice	5.7	5.9	5.5	-0.7	83	0.7	SW	3.0	0.5		1.0	3.0					0.143				
Cerklje	5.6	5.9	5.3	-0.6	86	1.9	WSW	4.8	0.7		0.6	1.3					0.132				
Krško Papirnica	5.6	5.9	5.2	-0.5	94	1.1	N	5.5	1.3		1.5	4.7				200	0.114				
Novo mesto	5.3	5.4	5.2	-0.2	96	1.7	S	5.9	0.9		0.7	3.4					0.115		-2	1002.4	1.4
Slovenj Gradec	2.8	2.9	2.6	0.3	97	2.9	NW	6.7	1.1		0.0	12.7					0.160		2		
Lj.-Bežigrad	1.4	1.5	1.3	0.1	98	0.3	S	1.5			0.0	23.8					0.160	0.00	-2	1002.3	-0.4
Letališče Brnik	0.5	0.6	0.5	0.0	99	0.4	SSW	2.6			0.0	23.5								1003.7	-0.6
Lisca	0.5	0.6	0.2	0.4	93	4.2	N	13.1	1.9		1.0	8.7					0.138				-0.5
Vnajnarje	0.2	0.4	0.1	-0.1	94	0.1	NNE	1.0	0.2												
Kredarica	-8.6	-8.5	-8.7	-0.2	95	11.9	NNW	21.0	2.7									0.00	0		-0.2
Polhov Gradec											0.0	16.3									
Iskrba																					
mobilna															12	38					
Lesce																	0.138				
Lj.-Figovec																5					
Hrastnik																					
Zagorje																10					

Fig 3: Tabular presentation of network of automatic reporting stations. The data values are colour coded according to the threshold values. The table can be ordered (in the memory -without contacting server) by desired parameter by clicking on the parameter field.

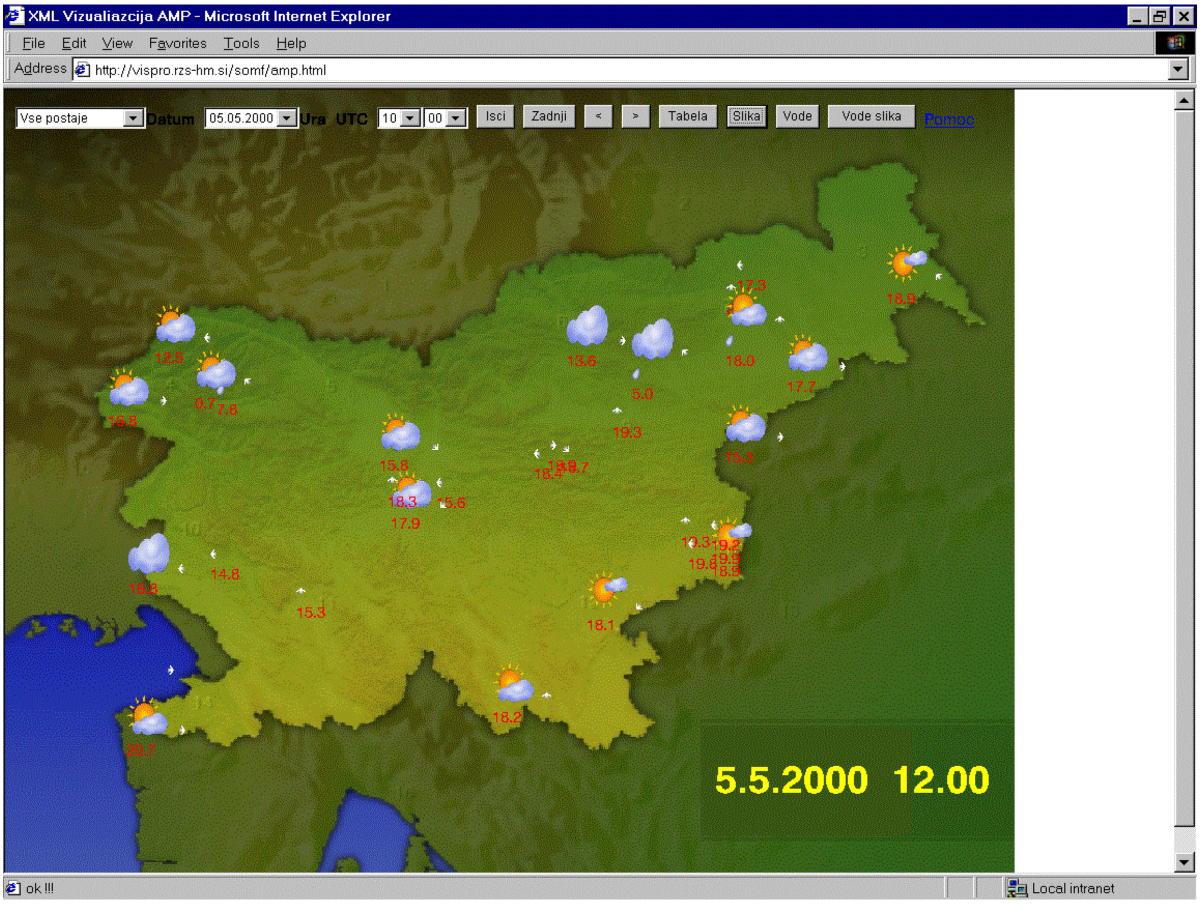


Fig 4: Graphical presentation of network of automatic reporting stations - same data as in Fig 3, already present in the browser cache memory of the client. Only the XSL template (way of presentation) is different. No need to contact server for the same data again.

3.2. Visualisation of composite lightning and radar image

Radar images are stored in a bitmap format, while the lightning data is stored in XML file. The data can be presented as image or also as a table of lightning location and time. Because number of lightning data can be huge, two types of XML files are used: 2 minutes accumulation and 30 minutes accumulation. When we start an application for the first time it loads 30-min. accumulation file, afterwards it loads only fresh data for the last 2 min.

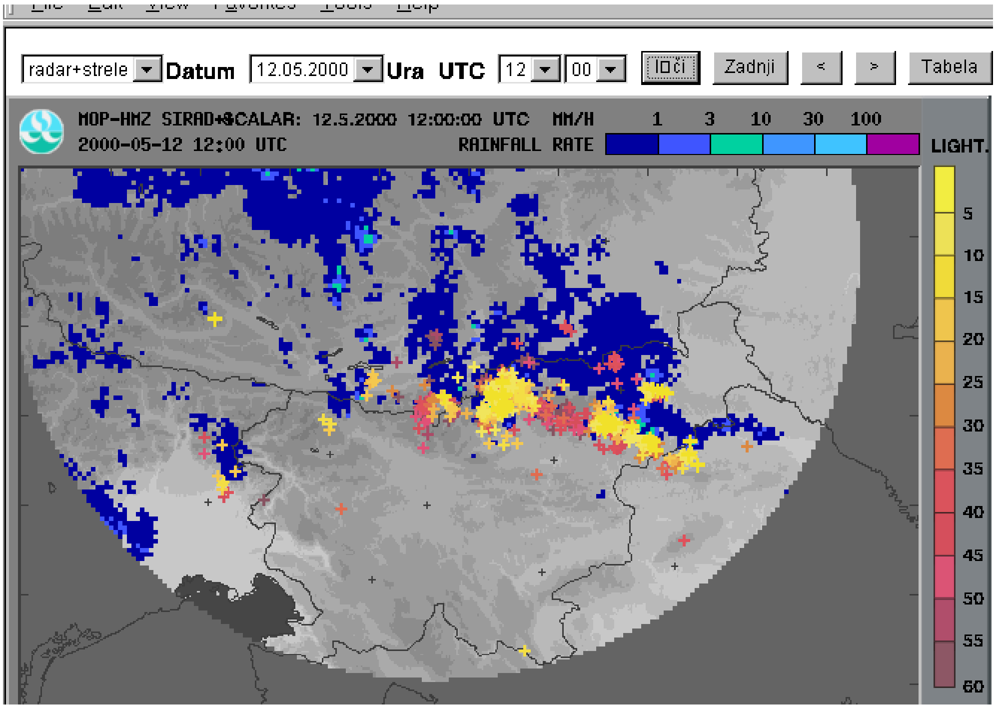


Fig 5: Graphical presentation of composite (done in the browser applying XSL) between radar image (bitmap) and lightning (XML). By pointing mouse over the lightning mark exact location and time can be seen.

3.3 XML Based Applications - Next Generations

Since the XML is well designed and already standardised object-oriented format, especially suitable for data exchange, we expect that all available meteorological data like automatic reporting data, SYNOP, TEMP, METAR, TAF, direct model output, lighting, radar and satellite images, meteorological objects (e.g. SatRep, SAF products, etc.) could be stored in a standard meteorological XML format (standardised at WMO) or SVG format.
For instance, composite European radar image could be created in the browser just by linking to the XML files of national radar data providers.
The next possible use of XML standard is to automatically generate and translate textual forecasts. In this case textual forecast would be stored in a standard XML format and translated in desired language just by selecting appropriate translation XSL stylesheeet (http://www.cogsci.ed.ac.uk/~richardb/project/inland_weather/dev/online/).
The SVG images could be edited on-screen and saved directly into meteorological database.

New applications will base on new formulation of HTML language called XHTML 1.0. This brings more strict regulations while the syntax is similar to XML and all tags must be in pairs.

Also commercially available databases are already supporting XML extensively.

3.4 SVG - 'Superior' Vector Graphics?

The main goal of SVG standard is to store vector graphics information into an ASCII XML format. The SVG images can currently be visualised by installing browser plug-ins, which are capable to zoom in and also to find selected object.
The SVG standard merges the best of some previous XML based vector graphics formats like VML, WebCGM etc. The standard is web oriented and therefore some image parts can be linked via Internet, each object can be accessed by programming language (JavaScript, Java, etc.), image can be created using cascading stylesheets (CSS). Bitmap images can be embedded just by using 'xlinks', also some effects like zooming of image parts, colour filtering is built-in. The plug-ins are capable to load zipped (.gz) SVG images and in this case image size is much smaller then PostScript image. Each object can have attributes, which can be processed by script.

3.5 Discussion and conclusions

The main disadvantage of XML based visualisation is that the standards like XSL, SVG are still developing very rapidly and that by spring 2000 only Internet Explorer was fully capable to browse XML and XSL files. This situation will change with new versions of browsers. Nevertheless this will bring new problems with possible incompatibilities.

Main reasons to use XML based database could be:
- it is standardised tool to produce new standardised web data formats (hopefully also in meteorology),
- it allows us to reduce the server-client data flow,
- there is very strong connection between scripting languages in web browser and XML object; so, access to desired variable(s) is much easier than in usual relational data base,
- the visualisation with stylesheets is very simple, when we load the XML object into web browser memory,
- response time is faster than in usual relational data base and therefore we save on computation time for more important jobs,
- The XML standard is easy to upgrade by adding new variables to DTD file; in this case the new standard is backward compatible.

Links

•http://www.w3.org/ - XML, SVG standard definition
•http://www.oasis-open.org/cover/xml.html – XML standards overview
•http://zowie.metnet.navy.mil/~spawar/JMV-TNG/XML/OMF.html - OMF standard definition
•http://www.cogsci.ed.ac.uk/~richardb/project/inland_weather/dev/online/ - automatic text generation & translation
•http://beta1.adobe.com/svgpreview_alpha/SVG/main.html - SVG plug-in, training course

HORACE – RECENT DEVELOPMENTS

Rob Acker, UKMO
Horace Applications Development Manager

1. INTRODUCTION

The functionality of the Horace meteorological workstation system continues to increase. It is now a mature visualisation and production tool in operational use at:

- the National Meteorological Centre (NMC), Bracknell,
- the Defence Meteorological Centre (DMC), High Wycombe,
- the Royal Navy Fleet Weather and Oceanography Centre (FWOC), Northwood,
- the HQ of the United States Airforce in Europe (USAFE), Sembach, Germany, and
- the Thailand Meteorological Department (TMD), Bangkok, Thailand.

Further systems are in the process of being introduced on around 90 ships in the Royal Navy fleet, and also at the Australian Bureau of Meteorology in Melbourne.

There have been 3 releases of Horace over the last year that has also seen the successful transition over both the millennium and leap year key dates. This paper will highlight some of the specific developments that have been included in these releases as well as discussing some of the semi-automation opportunities that have been introduced. The paper will conclude with a brief summary of two development areas that are anticipated as having a large impact on development over the forthcoming year.

2. VISUALISATION

A new facility that is proving particularly popular with forecasters – who assiduously count the number of mouse clicks! – is the GV Macro. The GV, or Graphical Visualiser, is the

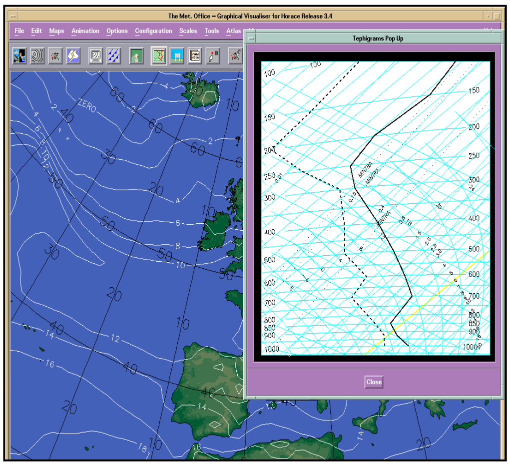


Figure 1. Roaming tephigram

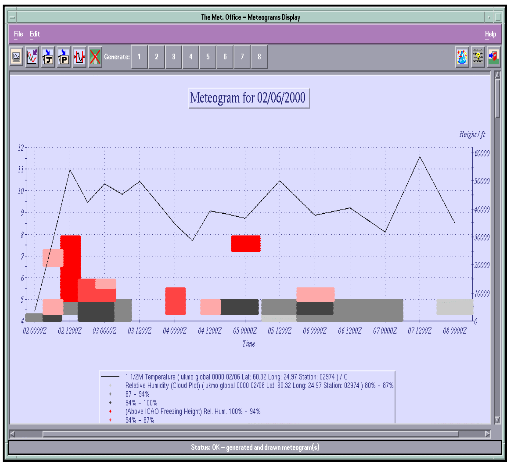


Figure 2. Meteogram display

principal Hora ce application for visualising all kinds of data, e.g. observations, NWP, satellite and radar imagery. These can be overlaid as the forecaster desires and most of the options (e.g. colour, line styles) are configurable. Individual forecasters tend to have their own preferred combinations of fields and GV Macros allow them to be displayed with the minimum of effort.

Also within the GV, a ‘roaming tephigram’ has been introduced (figure 1). This enables the forecaster to click anywhere on an NWP field display and produce a small tephigram of the model’s vertical profile at that point. The tephigram changes dynamically simply by moving the mouse around the map area.

A meteogram is the name given to a time series display of weather parameters extracted from NWP output. This functionality has recently been implemented on Horace and enables the forecaster to easily view the model evolution in a graphical form (figure 2).

3. PRODUCTION SUPPORT TOOLS

There have been three significant developments in provision of support tools for forecasters. These use a variety of semi-automation techniques to provide the forecaster with first-guess products that should require the minimum of quality control before dissemination.

For a couple of years Horace users have had the facility to blend observations and numerical model data in such a way that the result is true to the observed value at the observation site and to the numerical model where observed data is sparse. This tool is known as On-Screen Analysis (OSA). Over the course of the last year this tool has been enhanced to enable it to run as a background process, accessing quality control information that is shared between the users of the interactive version, to create standard analysed files of grid point data that ensure that screen and paper displays show the same information.

Whilst all numerical model data are always provided in grid point formats one of the tasks that forecasters are required to carry out is to "convert" these data to a more object-style presentation. Aviation forecasters indicate cores of strong upper-level winds by jetstreams and public isobaric charts frequently include the location of frontal systems using standard symbols. Now that the tools exist to provide users with the ability to "draw" these features on-screen it is a natural step to provide them with automatically created representations that can be modified. The intention is that the user accepts a large proportion of the features and only applies quality control to those that are significantly different from current thinking.

In order to provide automated jetstreams the forecaster now has the ability to run a tool that scans specified fields on numerical model data for scalar and gradient information that exceeds user-defined thresholds. Once filtered by value the data are further refined to meet certain presentation quality criteria (e.g. depending on the scale of the chart jets must exceed a certain physical length to avoid clutter). The final set of points can then be displayed in the standard format and modified further using the same tools that are provided for user-drawn features. A similar technique can be applied to thermal fields in order to suggest the location of fronts.

Ensemble data from ECMWF are being used as a source for providing the forecaster with improved notice of possible synoptic development that might require warnings (of gales, heavy rain or snow events) to be issued to the general public. A scanning system has been developed that searches the ensemble set for cases when warning criteria are met and a message raised that alerts the forecaster. This message takes a form similar to that already used for operational issue, allows the forecaster to amend the suggested probabilities associated with the event and add supplementary text, before being passed electronically on to the main dissemination system. The intention is that this approach will improve the lead-time before the event although some issues remain over the feasibility of this technique. Currently warnings need to be issued if the likely occurrence of the event exceeds 60% anywhere in the UK. Initial investigations suggest that at lead times of 72 hours or more it is unlikely that 60% of the members will produce a strong signal of such an event occurring. Therefore the system is undergoing tuning to correlate realised events with lower probabilities based on past cases. The other challenge for the project has been to develop a verification scheme that can be used to both compare issued warnings with those raised by the objective technique. By their very nature warnings are a function of the likely impact on the general public rather than purely on the meteorological conditions being forecast. A short-range forecast (known as a flash message) is therefore being used as the "truth" as it obeys the same rules of issue.

4. HORATIO

The last year has seen the completion of the Horatio project, a sub-project of Horace to meet future Navy specific requirements. As part of the project a significant number of enhancements have been made to much of Horace to improve its ability to store and display ocean-related data and to increase the flexibility and availability of production tools. Major additions to the visualisation facilities have included the display of the UK's Forecast Ocean Atmosphere Model (FOAM) using all the standard presentation styles, contours, streamlines, profiles and cross-sections. It is now also possible to compare these data to corresponding climatological fields and to overlay with oceanographic fronts as line objects. The atmospheric On-Screen Field Modification application was also adapted to apply the same techniques to the ocean fields, providing the end-user with the capability of modifying these data to add further quality to the production process.

Due to the limited communications that are available to ocean going vessels text products are still a vital medium for transmission of information. This project therefore explored the possibility of automating the production of some of the standard worded text forecasts. It is now possible to generate worded time-series forecasts of wind, weather, visibility and wave and swell speed and direction for either standard or user-defined areas.

5. THE FUTURE

Developing meteorological applications in the IT environment continually brings new challenges. The next year will not be any different. It is anticipated that two areas that are likely to receive considerable attention include the provision of applications on the linux operating system and the presentation of amdar data.

The Linux operating system has been available as freeware in the public domain for a few years now, but in the last year seems to have been taken more seriously as a competitor to Windows© on the Intel© platform. Some initial steps have been made to port Horace applications to this operating system. The main difficulty has been with the format of the underlying data. Different data are stored using a mixture of generic variable types (integer, real and character). Whilst some of these types are readable on both platforms others require the byte order reversing and the mix has required specific programmes to be developed for each data source. A useful set of developer tools are available making linux an encouraging developer environment, however the default settings for GNU compiler are not consistent with those that are used on the base development system (Hewlett Packard) and caused some unexpected problems. These problems aside it has been possible to prove the feasibility of porting Horace to linux and further work will be carried out to provide a more extensive range of tools.

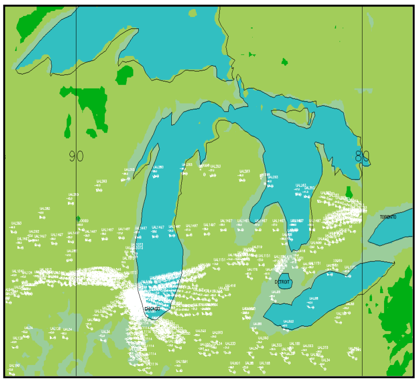


Figure 3. Plan display of AMDAR reports

The second area involves the expected increase in data volumes associated with the increased availability of reports from civil airlines (AMDAR reports). Current figures suggest that it will be possible for aircraft to report temperature, wind speed and direction every 5-7 minutes during level flight and up to every 200 feet during ascent and descent. The challenge will therefore be to provide means of presenting these data in a meaningful way to the forecaster so that they gain a better understanding of the structure of the atmosphere. Standard displays (fig. 3) can be used however as they are designed for synoptic timescales the result is typically cluttered.

Recent development and future plans
Israel Meteorological Service
(IMS)

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Background

The IMS is a small governmental institution with very limited resources.

- staff: 110
- annual budget: $4M
  - -- current: $3.85M
  - -- development: $0.15M

For about 20 years CDC Cyber computers were used as a main computing backbone.
A changeover to a UNIX-based production environment was made on July, 1998.
The conversion took about 2.5 years and the total cost was about $1M.
The concept of a change was to concentrate in a first stage on the main computing backbone: the hardware and communication, the basic software, the database and adaptation of the IMS application software - avoiding too much change on the users end. Hence - up to now the users view of the system is pretty much as it had been.
At the second stage a significant improvement of the users interface was planned.
The aims for a first version were: to provide all functional capabilities a user has at the moment adding some new features and "goodies" that could be incorporated without too much effort.
The work on it was started at 1999 along with the adjustments to Y2K. As for today - the preliminary version of forecasters interface is almost completed.

1. Basic infrastructure

- Hardware: SGI Origin 2000, Origin 200
  SGI O2, INDY
  PC

- Operating systems: IRIX 6.4/6.3/6.2
  WINDOWS 95/98

- Communication: Ethernet
  International and domestic Frame Relay links
  National public network

- Data Base: INFORMIX 7.23

- Languages: Fortran 90, Fortran 77, C, ESQL, Shell scripts
  JAVA (*used in a new interface development*)

HTML, JavaScript (*used in a new interface development*)
PERL (in CGI) (*used in a new interface development*)

- Graphics: Tektronix 4107 emulation package, ImageMagick,
  GrADS, in-house developed software for HP compatible plotters

2. Main features of the present operational system

- A real-time data processing system is almost fully automated and ime-scheduled by "cron-like" tool or by event triggers.
  It includes a monitoring of observational data and NWP products on arrival.

- Observational data and metadata of NWP gridded data are stored in a real-time data base, while GRID/GRIB coded products are decoded on arrival and stored in files.

- A stand-alone MS-DOS based system takes care of CDF (T.4 format) products.

- Access to data is enabled by a set of applications developed at IMS.

- A number of different interfaces are available, including:
  - Dynamically updated supervisor's interface
  - Forecaster's interface
  - Special purpose interfaces

- PCs with a MS DOS based software, emulating them to Tektronix 4107 terminal, enable graphical visualization.

- There is no graphical interaction and a real-time data base modification by forecasters.

- Products derivation in digital format or hardcopy is carried from the various parts of a real-time DPS.

- A stand-alone system, Windows bounded, assists the forecasters in producing about a 100 specialized forecasts for the IMS customers. These products are automatically distributed from the system them via fax, E-mail or FTP.
  This system uses a local Sybase db in order to manage the various forms, distribution lists and "first guess" of the forecasts.

3. New Interface - Goals and Development

- GOALS
  - new interface for forecasters (and other real-time data users), replacing outdated technology

- use standard end-user equipment
- make use of standard display formats and applications (PS, GIF,…)
- make use of existing server-side software (in UNIX)
- make efficient use of software developers' learning time
- ease of use

- DESIGN CONSTRAINTS and OPTIONS
  - end-user equipment: PC
  - development team: 2 (part-time because of the current support of the operational systems and software administration tasks)
  - no manpower hired from private software companies

    approach 1: use X/Motif, requires X-on-Windows or LINUX
    approach 2: multiplatform environment, use Web technology

- FINAL DECISION on DESIGN APPROACH
  - use Web technology: HTML, JavaScript, Java applet, CGI/PERL and,may be, XML and SVG.

- TIME FRAME
  - initial analysis and design: 1Q 1999
  - development started 3Q 1999
  - expected completion 4Q 2000

4. Examples of new interface and products

See appendix.

5. Future plans

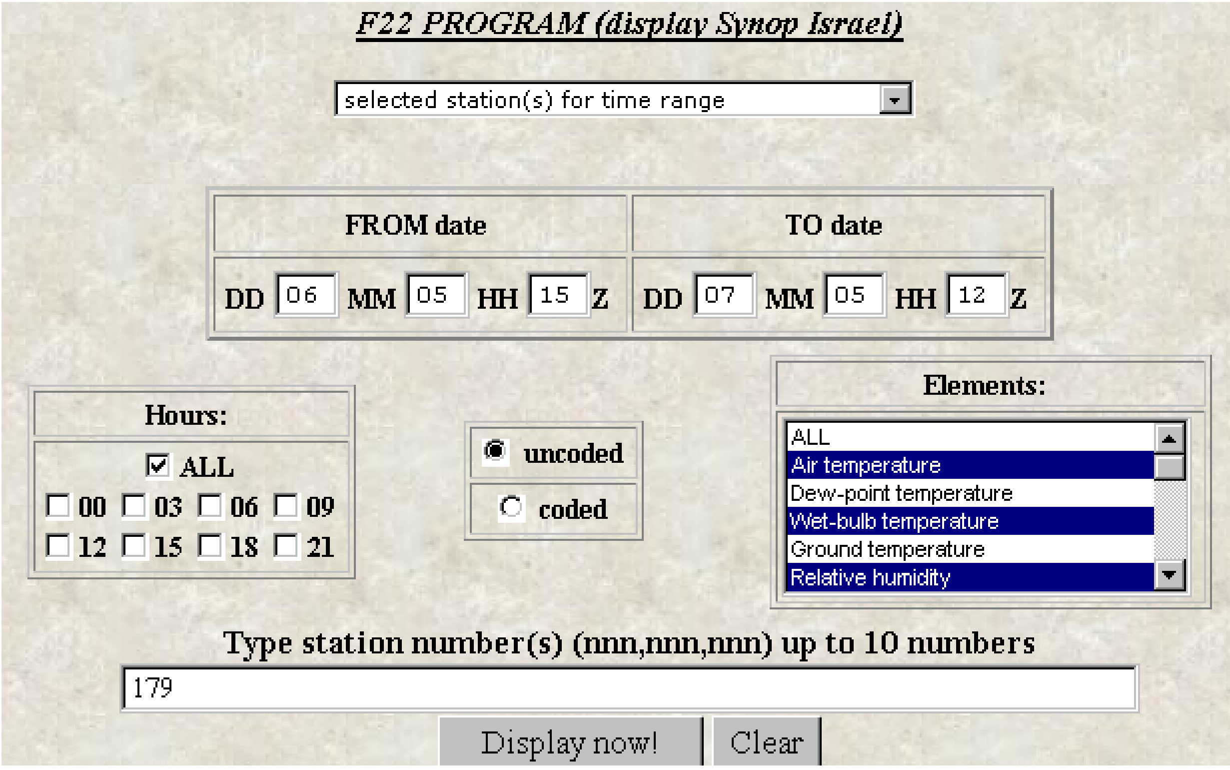
- complete and test a first version of new interface
- learn the lessons
- extend functional features
- investigate possibility of improved simultaneous view of data

Israel SYNOP observations viewer

Main features:

- display of observations is enabled in SYNOP code or in decoded format

- user options include data retrieval by:
  - observation periods
  - specific hours
  - reporting stations
  - elements
- some administration tools are available to report data inventory of observations from various reporting stations


F22 PROGRAM (display Synop Israel)

selected station(s) for time range

FROM date	TO date
DD 06 MM 05 HH 15 Z	DD 07 MM 05 HH 12 Z

Hours:
ALL
00 03 06 09
12 15 18 21

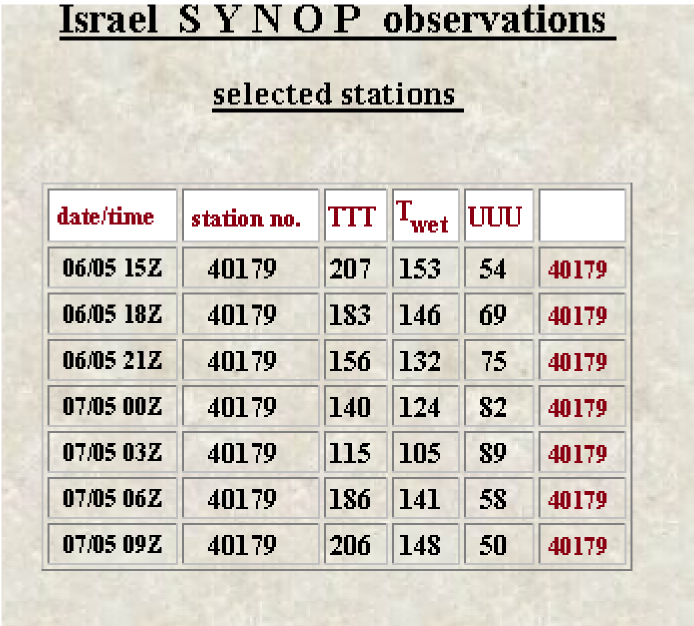
uncoded
coded

Elements:
ALL
Air temperature
Dew-point temperature
Wet-bulb temperature
Ground temperature
Relative humidity

Type station number(s) (nnn,nnn,nnn) up to 10 numbers

179

Display now! Clear

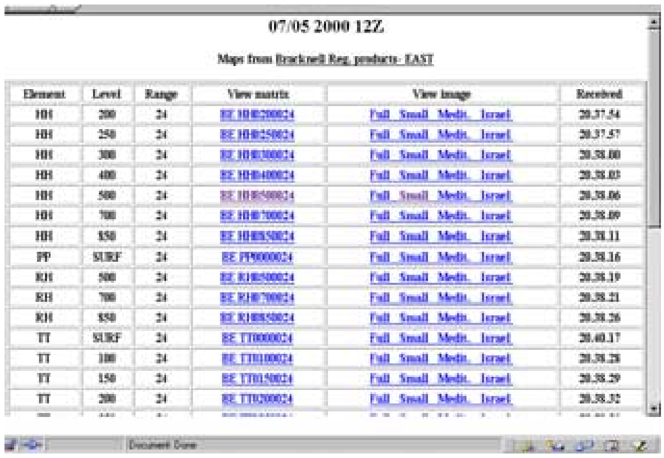

Israel S Y N O P observations

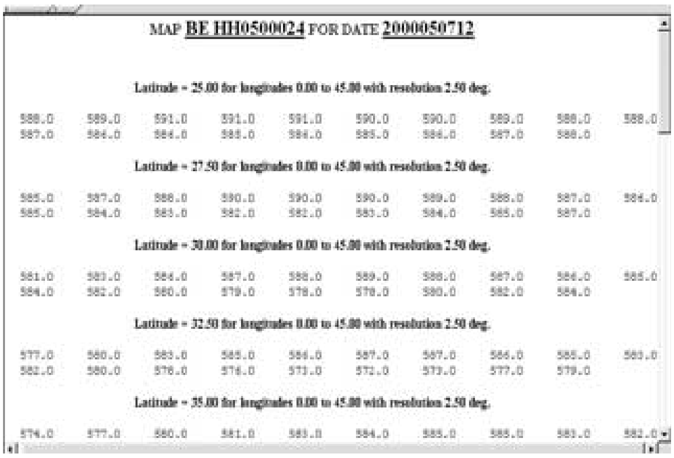
selected stations

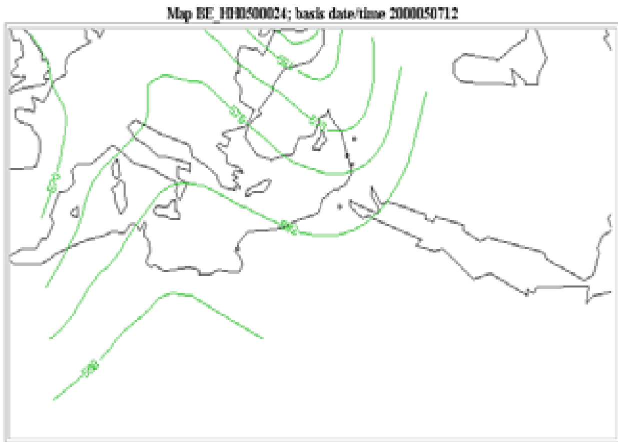
date/time	station no.	TTT	T_{wet}	UUU	
06/05 15Z	40179	207	153	54	40179
06/05 18Z	40179	183	146	69	40179
06/05 21Z	40179	156	132	75	40179
07/05 00Z	40179	140	124	82	40179
07/05 03Z	40179	115	105	89	40179
07/05 06Z	40179	186	141	58	40179
07/05 09Z	40179	206	148	50	40179

An example of a form and the retrieved data

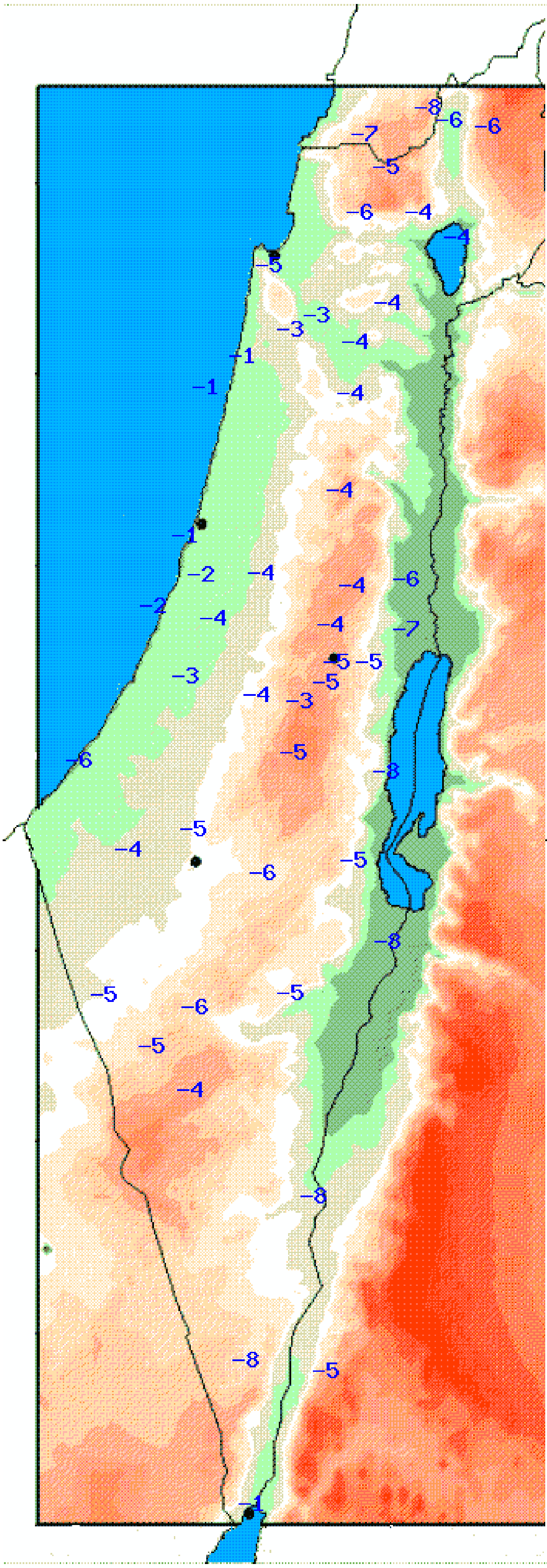
NWP products inventory

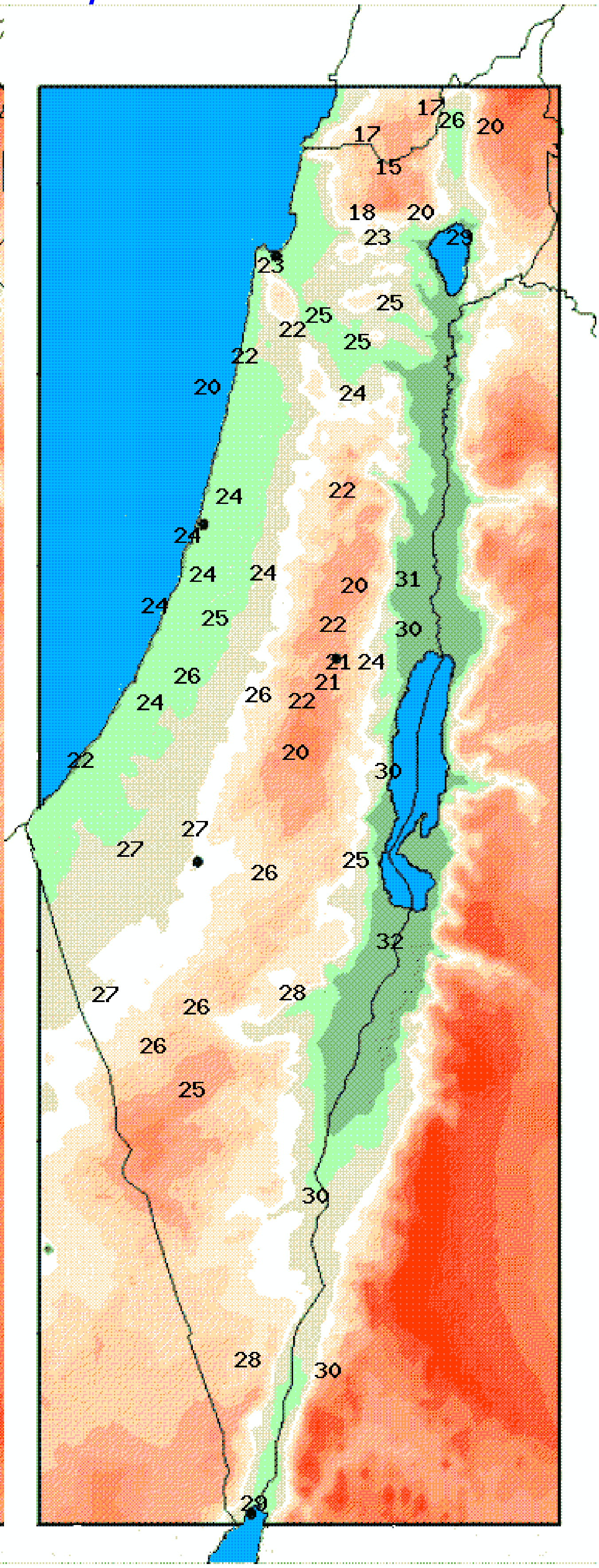






Maximum Temperature





An example of a sounding

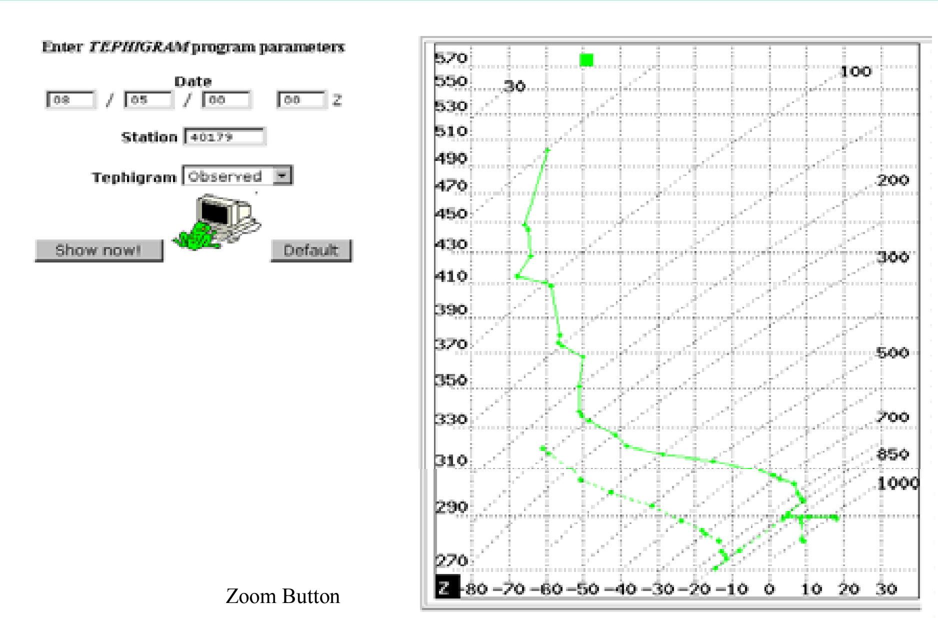
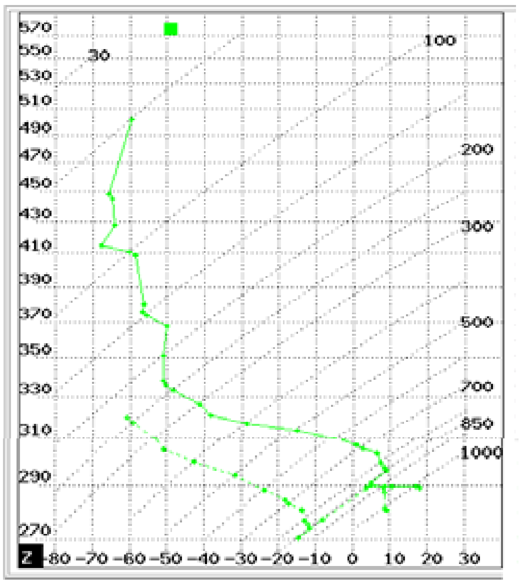
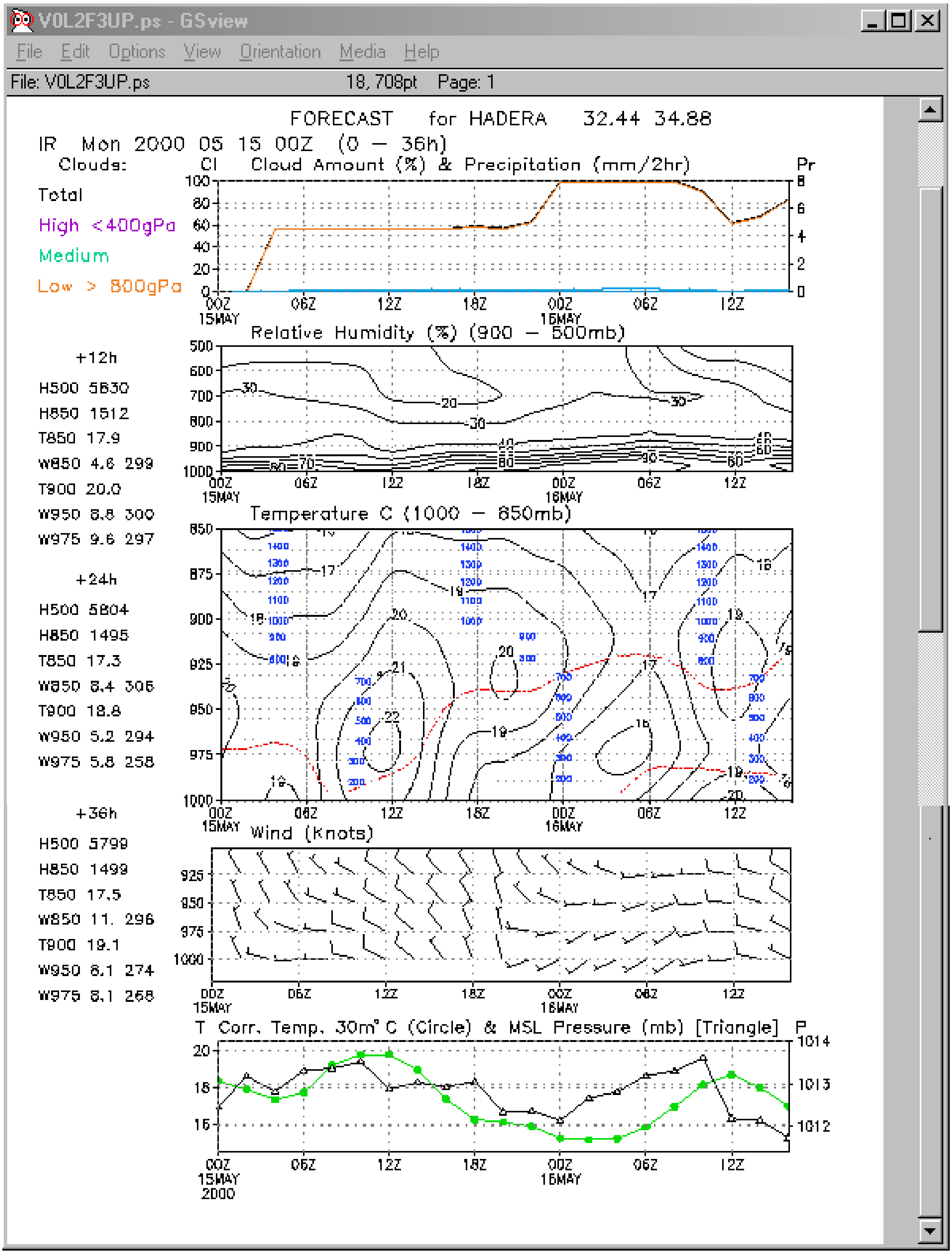


Table of data associated with tephigram obtained by clicking on the green square

Obs. for 40179 08/05/00 00Z				
P	H	WIND	T	TD
1013	35	306/ 5	17.6	9.0
1000	148	304/ 7	16.7	8.3
925	805	292/ 11	10.4	8.2
900	1032	282/ 11	8.2	7.9
858	1421	288/ 13	4.9	4.9
855	1454	288/ 13	3.5	-8.1
850	1501	288/ 14	4.8	-14.8
843	1566	287/ 15	8.9	-11.8
826	1732	286/ 17	8.2	-12.3
800	2000	280/ 17	7.3	-13.1
755	2474	262/ 24	6.4	-13.9
700	3090	257/ 28	2.4	-17.2
676	3373	256/ 30	1.0	-18.5
600	4316	250/ 37	-5.2	-23.8
500	5719	245/ 47	-15.5	-31.6
400	7358	244/ 59	-28.8	-42.7



Local forecast based on the Israel Regional Model



RECENT DEVELOPMENTS IN THE USE OF WORKSTATIONS AT MET EIREANN

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Met Eireann -- the Irish Meteorological Service,
Glasnevin Hill, Dublin 9, Ireland

1. INTRODUCTION

This paper summarises recent developments in the use of workstations at Met Eireann - the Irish Meteorological Service. The first part concentrates on a description of **xcharts** -- an X-application used for displaying meteorological fields and observations -- and the second part discusses issues involved in porting it to Linux.

2. MAIN FEATURES AND MENUS OF xcharts

Until 1993, the main forecaster interface to NWP data was via a command driven interactive system called CHARTS [Hamilton, 1984]. This ran on a DEC 2050 computer and displayed output on a DEC VT-340 graphics terminal. This system is still in use [although it now runs on SGI hardware] but nowadays the main forecaster interface is through the GUI-driven **xcharts**. The latter was originally developed using SGI hardware but, at the moment, we are in the process of porting it to Linux.

The CHARTS program uses a command language, which has been designed to be as easy to use as possible. Commands can be abbreviated; there is an on-line HELP system, a hardcopy option, a script option [*viz.* the so-called 'obey' files], and ambiguous or incorrect commands produce meaningful error messages. The system remembers the parameters entered with previous commands and these become the defaults for subsequent commands -- this reduces typing to a minimum.

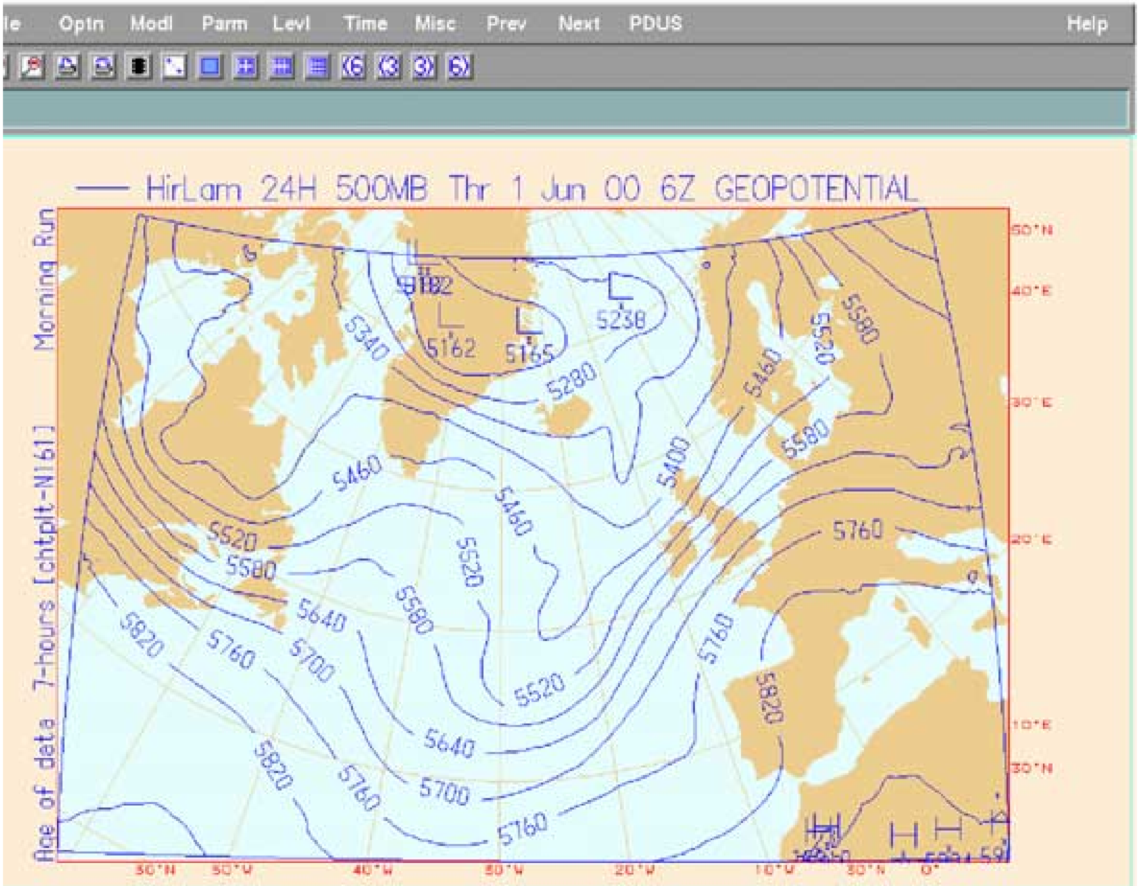
Using CHARTS the forecaster can access NWP output from the Hirlam model as well as the models of ECMWF, DWD and UKMO. Wave-model output is also available [from the local WAM model and the wave models of ECMWF and UKMO]. Finally, observation plots are available both at standard levels and as tephigrams. Model data is stored in standard GRIB code and observational data is stored in standard BUFR code. The user can display but cannot modify the data.

The forecasters are very familiar with the old system and so the new **xcharts** system was designed to be as compatible as possible with the old, but it also includes extra options such as cross-sections, animation and the display of satellite images [PDUS data from Meteosat]. Recent descriptions of **xcharts** are given by Nishimura [1995] and by Hamilton [1997 and 1998a].

The user interface in **xcharts** combines a command line with menu buttons and icons. This allows for continuity between the old and new systems; it also allows the use of the current set of scripts [*i.e.* 'obey' files]. Ideally, all features should be available using either the command interface or the menu interface but, in fact, some of the more obscure features are only available through the command line. However, in practice, the users almost always use the menu buttons.

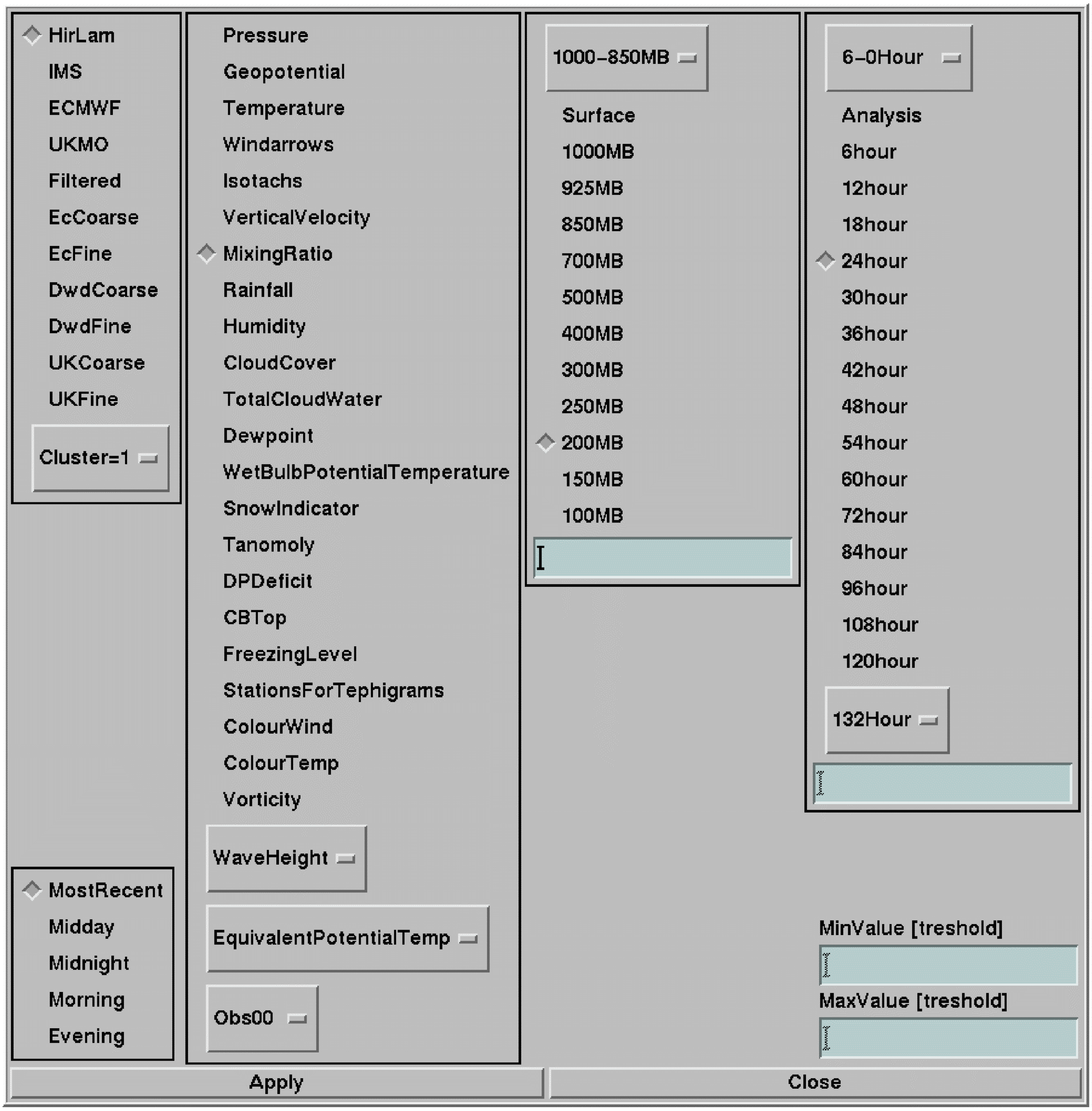
Pressing a menu button or icon generates a text string [*i.e.* a command], which is then sent to the command processor for parsing.

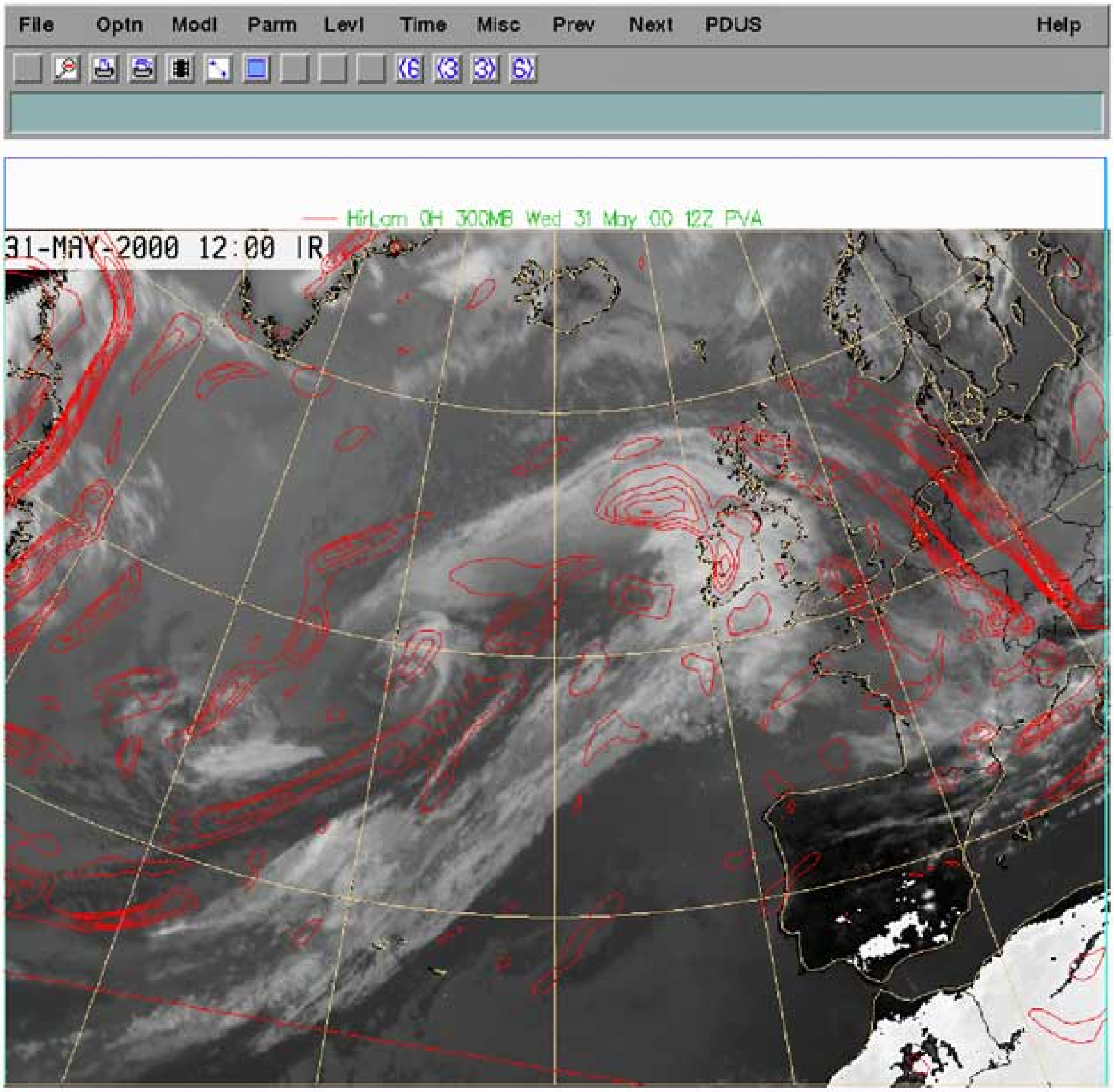
The following figure shows the menu interface and a typical plot:



The menu buttons, on the top line, are used to specify script ['obey'] files [File]; various display options [Optn]; choice of model, parameter, level and forecast length [Modl/Parm/Levl/Time]; miscellaneous options [Misc]; previous and next forecast chart [Prev/Next]; satellite image data [PDUS] and Help [Help]. The icons, middle line, specify zooming and un-zooming, single and multiple hardcopy, animation, cross-sections, various page-layouts and the selection of the next and the previous plot. [See Nishimura [1995] for a discussion of the icons]. Finally, the text box on the lower line allows the user to enter a command.

The main 'Plot/Overplot' buttons are available as a pop-up menu when the user presses the *right-hand mouse button* in the drawing area. They produce the following main menu:


HirLam
IMS
ECMWF
UKMO
Filtered
EcCoarse
EcFine
DwdCoarse
DwdFine
UKCoarse
UKFine
Cluster=1
MostRecent
Midday
Midnight
Morning
Evening
Pressure
Geopotential
Temperature
Windarrows
Isotachs
VerticalVelocity
MixingRatio
Rainfall
Humidity
CloudCover
TotalCloudWater
Dewpoint
WetBulbPotentialTemperature
SnowIndicator
Tanomoly
DPDeficit
CBTop
FreezingLevel
StationsForTephigrams
ColourWind
ColourTemp
Vorticity
WaveHeight
EquivalentPotentialTemp
Obs00
1000-850MB
Surface
1000MB
925MB
850MB
700MB
500MB
400MB
300MB
250MB
200MB
150MB
100MB
6-0Hour
Analysis
6hour
12hour
18hour
24hour
30hour
36hour
42hour
48hour
54hour
60hour
72hour
84hour
96hour
108hour
120hour
132Hour
MinValue [treshold]
MaxValue [treshold]
Apply
Close



The procedure is for the user to specify a model, parameter, level in the atmosphere and length of forecast. Then, clicking on the 'plot' button will produce a new plot; clicking on the 'overplot' button will superimpose the chart on the previous plot. The system remembers previous values [which are highlighted] and it is unnecessary to specify any value, which has not changed. Difference charts and thickness charts are specified by means of drop-down sub-menus [not shown].

The 'Optn' [option] and 'Misc' [miscellaneous] buttons on the main menubar allow the user to specify various options, such as the colour of the plot, which are of secondary importance.

The 'Modl', 'Parm', 'Levl', and 'Time' buttons are 'short-cut' buttons, which are designed to reduce the amount of typing required. Thus, the 'Modl' button is used to change the model [*e.g.* from Hirlam to ECMWF] and plot immediately. So, for example, if a 24-hour Hirlam forecast of surface pressure is displayed and the user clicks on the 'ECMWF' option in the 'Modl' menu then a similar ECMWF chart will be displayed, without the need to click on anything else.

The 'Prev' and 'Next' buttons are used to retard or advance the time of the plot. Thus, if the plot consists of a number of superimposed charts, these buttons will retard/advance all the charts. The 'Prev' button has the options '-3hours', '-6hours', '-12hours', '-18hours' and '-24hours' with the corresponding options for 'Next'. In addition there are arrow icons corresponding to 'Prev-6', 'Prev-3', 'Next+3' and 'Next+6', respectively.

The 'Zoom' icon implements a zoom where the zoom cursor is defined as a latitude/longitude intersection *i.e.* as a circle of latitude and a straight line of longitude. The new area is defined by the lower-left and upper-right corners in latitude/longitude. All charts are recontoured after the zoom; if observations are being displayed a 'de-clutter' algorithm is applied.

The 'UnZm' icon cancels a zoom [*i.e.* it displays the entire chart]; the 'Hard' icon produces a hardcopy and the 'Help' button displays a help menu with some simplified help on various options.

The 'Animate' icon allows the user to animate the display. This option was developed by E. Nishimura [1995]. The 'Cross-section' button is used to select two points to define a track and the cross section along the track is then displayed in another window.

The user can divide the screen into sections and plot four, six or nine charts.

Finally, the user can display tephigrams by first selecting a plot of the data available and then pointing at the required station.

3. DESIGN CONSIDERATIONS IN xcharts

The program is based on the earlier command driven CHARTS program. Consequently, it still allows users to use a command line. In fact, clicking buttons actually generates command strings, which are sent to the original CHARTS command interpreter.

The 'obey' file option has been retained and users can write scripts to display charts. The following file will display a set of Hirlam forecasts [with the screen divided into quarters]:

```
Underplot Quarter=1 Hirlam surface press 6Hour
Underplot Quarter=2 12Hour
Underplot Quarter=3 18Hour
Underplot Quarter=4 24Hour
Display
```

The 'Underplot' command stores a chart for later plotting. Thus the first four commands define and load the 6-hour, 12-hour, 18-hour and 24-hour Hirlam forecasts of surface pressure in the four quarters of the screen. The 'Display' command then displays the plot.

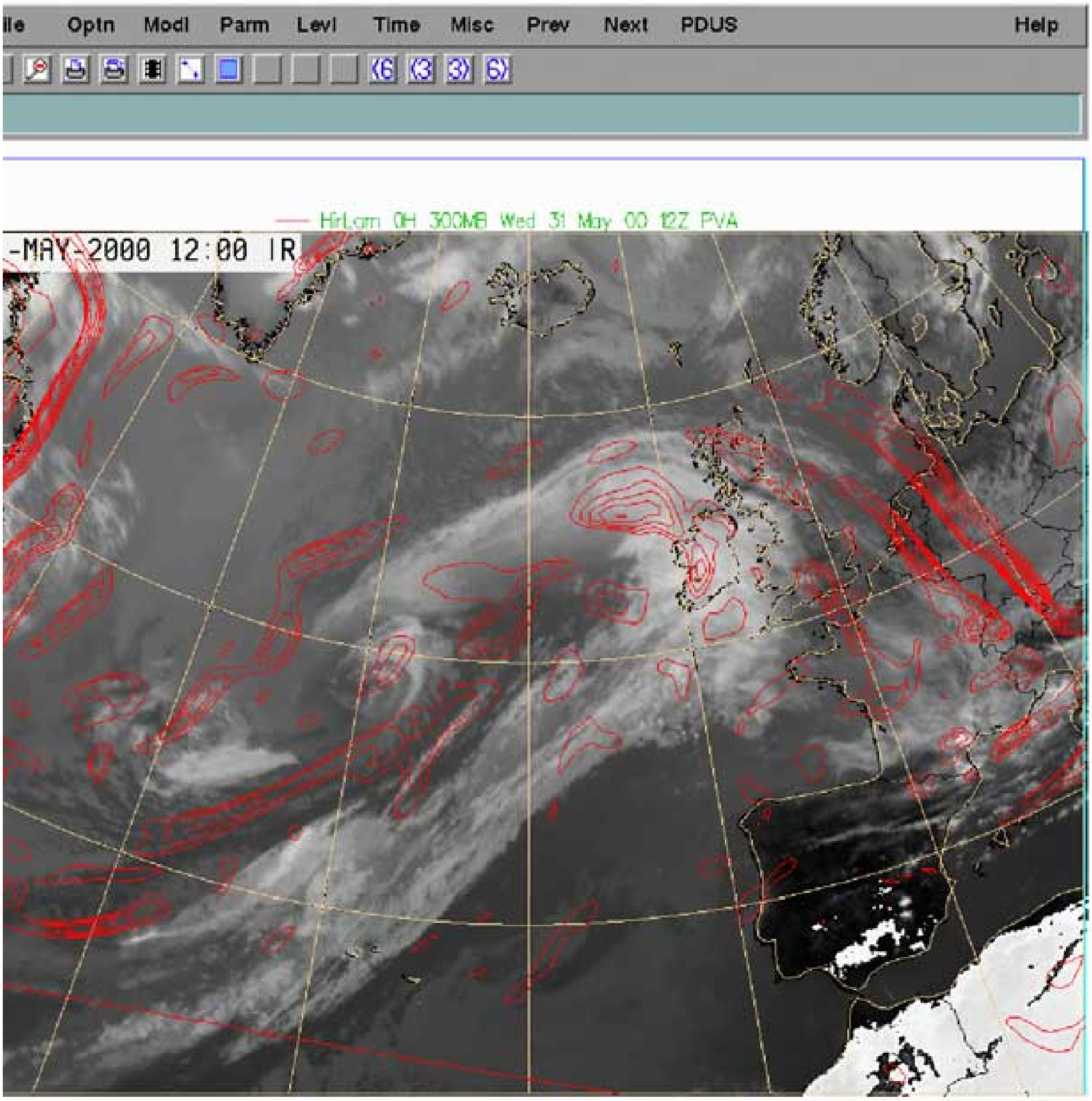
The user can use the main 'Plot' menu [or the command line] to select non-existent products [*e.g.* Hirlam 3-day forecasts are not available]. In such a case the system prints a warning message.

Versions of **xcharts** has been installed in the general forecast office [*viz.* CAFO] in Dublin, at the headquarters of the national TV station [RTE] in Dublin and in the aviation forecast office [*viz.* CAO] in Shannon Airport. The latter is approx. 200 Km from Dublin.

The raw field data, used by **xcharts** in CAFO, is stored as a set of GRIB fields on a server machine. The data disks are nfs mounted on the workstation. Tests with routers and/or bridges and with 64-kilobit/128-kilobit lines have shown that this approach is too slow for Shannon or RTE. So, in these cases, as soon as the GRIB products become available [either from a run of Hirlam or from one of the sets of model output received over the GTS] they are copied to Shannon or RTE where they are stored locally on the workstation. This makes the response time much faster. It also makes the system more resilient to line outages, server breakdowns *etc.* [Note: A similar scheme is used for the BUFR files and for the PDUS data].

4. SATELLITE IMAGE DATA

Met Eireann acquired a PDUS [Primary Data User Station] receiver for Meteosat data in 1997. The system [built by VCS] receives data on the satellite projection but it can make data available on a polar-stereographic projection by performing its own grid transformations. This greatly simplifies the interface between the PDUS system and **xcharts**.



A polar-stereographic map is defined for the image data and the transformed visual/infra-red/water-vapour files are prepared by the PDUS and copied to a disk accessible to **xcharts**. A new menu button [called PDUS] was added to **xcharts**. When this is pressed the program looks at the disk and makes a list of the eight most recent visual, eight most recent infra-red and eight most recent water-vapour images. The dates/times of these 24 images are displayed as the PDUS menu [plus a 25th entry -- 'Switch Off PDUS'] and, by clicking on one of these entries, the user resizes the window to the size of the PDUS image [actually 900x700 pixels] and draws the image as an underlay for the current NWP chart. Subsequent NWP products will be displayed on this image until the user either asks for a new image or selects the 'Switch Off PDUS' button.

The ZAMG SATREP satellite analysis procedures have recently been implemented [Hamilton, 1998b]. It is possible to overlay the satellite images with various derived fields such as equivalent potential temperature, advection of vorticity, various frontal parameters *etc.* The figure on the previous page shows a PDUS infrared image with a superimposed chart of PVA, *i.e.* positive vorticity advection *viz.* advection of relative vorticity with just the positive values plotted field at 300MB.

Hardcopies of the PDUS charts are available [*via* Postscript files, which are generated, on request, by **xcharts**]. However, at present, there is no zoom or animation option for the image data.

5. EXPERIENCE WITH Linux

Xcharts is written directly in C/Fortran/X/Motif and this made it relatively easy to port to Linux. So far, it has been ported to Caldera OpenLinux [Base Version 1.2] and to RedHat Linux [Versions 5.2 and 6.0]. In all cases RedHat Motif was used. [However, as discussed later, we are investigating the GNU version of Motif called LessTif].

Experience with Linux has generally been very good. The compilers are of high quality but are stricter than the SGI compilers [*e.g.* the Linux C compiler often requires casts where the SGI compiler does not]. But, once various syntax errors were fixed, it was easy to get programs to run. However, the run-time diagnostics from the compilers are not very good.

Experience with porting to Linux indicated that one should pay particular attention to the following:

(a) Rounding of REAL numbers to INTEGERS -- it is best to use NINT

(b) Variable length strings can cause problems -- it is best, in subroutine calls, to explicitly include an integer giving the length of the string

(c) Use of uninitialised variables is more likely to give problems with Linux than on the SGI
(d) Executables for Caldera and RedHat versions of Linux are not interchangeable -- programs have to be rebuilt for different versions of Linux

(e) The allocation of colour-tables under Linux and SGI-Unix [Irix] are different. With SGI the colour index increases, with Linux it decreases.

(f) The use of the Gnome desktop environment can complicate the allocation of colour tables

(g) Drop down menus under Linux do not generate an 'ExposeEvent' so it is necessary to issue a 'ForceRedraw' command.

(h) Big-endian/Little-endian issues arise when moving from an SGI platform to a PC.

(i) The use of RedHat Motif requires purchasing a licence for each machine, which is an addition cost. We are investigating the use of Lesstif, which is free, but there have been a few problems using it, so more investigations are needed.

6. FUTURE PLANS

The Linux version of **xcharts** is working but it is not yet operational. However, the first Linux workstation [an 800Mhz Pentium III] should be installed at Shannoin Airport by the end of June-2000 and there are plans to replace the rest of the SGI workstations later in the year with similar Linux PC's.

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EGOWS 2000

Synergie Program in Météo-France

Overview, Evaluation and Plans

Magali STOLL
Synergie Program Manager

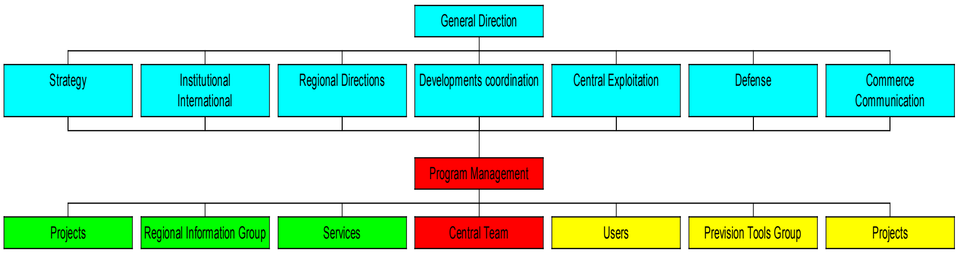
METEO FRANCE

Synergie Program Objectives

- Developments
  - Valorisation of **all** the meteorological data
  - Tools **for** the forecasters and forecasting activities
- Operations
  - Deployment on national and international sites
  - Administration within a common framework
- Regulation
  - Optimisation of Human and Financial investment
  - Coordination of Development, Operations, Training…
- Strategy
  - **Support** Météo France Strategy and Organisation
  - Contribution to cooperation and commerce

METEO FRANCE

Horizontal Organisation



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Program Working Mode

- *Program Committee : orientations*
- Program Manager : organisation and planification
- Central Team : system integration and management
- Developers : software analysis and encoding
- Administrators : system deployment and operation
- *Operators : operational supervision*
- *Computer department : technical support*
- *Users group : specifications and acceptance*
- *Forecasters – teachers : local training deployment*
- *Services and Projects: users and actors*

METEO FRANCE

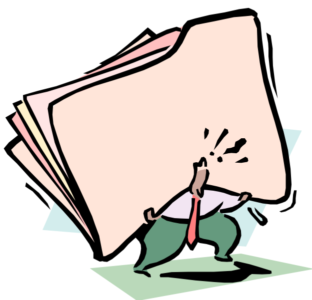
Synergie realisations

- 100 men years of investment in 10 years
- 50% Development / 50 % Industrialisation in 1999
- 90 % home made
- 100 % meteorological and computer standards
- 10 new releases (3.3 today)
- 1 364 000 Code Lines
- New platforms in MF since 1999
- Quality insurance manual for developments

METEO FRANCE

50% Development / 50 % Industrialisation

- 1Program Manager
- 1Developments Coordinator
- 1Technical Coordinator
- 1 Operations Coordinator
- 1 Quality responsible
- 10 full time Developers
- *5 full time Administrators*



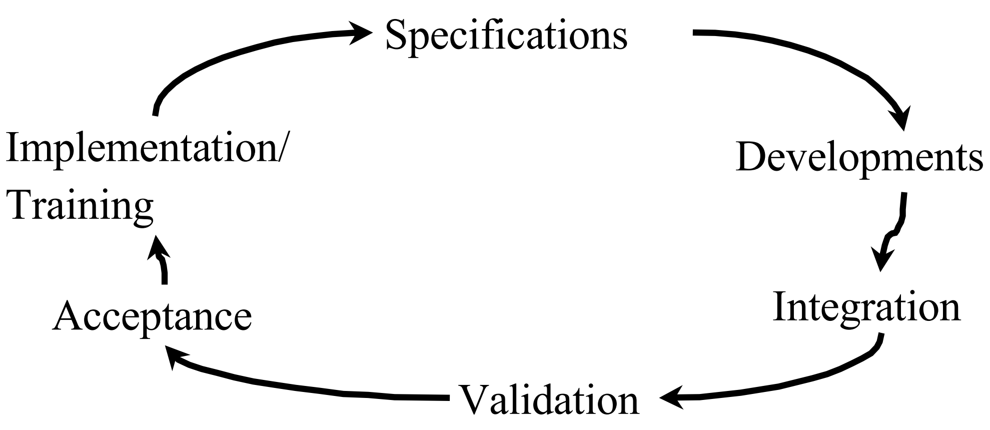
METEO FRANCE

Synergie : a useful Forecasting System

- Gives a support to visualize meteorological data
- Helps the operational forecasters in their tasks :
  - Watch the meteorological data and situation
  - Manage the basic meteorological data in « 7D »
  - Build a conceptual model of the weather situation
  - Elaborate a forecasting scenario
  - Adapt to specific using
  - Communicate and cooperate
  - Input expertise into a numerical data base
- Produces final documents and images for end users or systems
- Archives for studies on special meteorological situations

METEO FRANCE

Improvements by cycles



METEO FRANCE

Synergie Results

- **Deployment**
  - 42 sites in the world (23 in MF)
  - 160 Clients platforms (110 in MF)
  - Between 800 and 1000 users
- **Success factors**
  - Fast, Interactive, Easy to use
  - Efficient, Robust
  - Tailorable
  - Evolutionnary, Flexible
  - Easy to maintain

METEO FRANCE

Recent realisations

- Developments
  - More data : satellite, radar, lightning, ground, aero, marine
  - New parameters : indices, flux, accumulation, MOS
  - New domains : Marine, Over sea
  - New diagrams : air mass pictures, profiles
  - New modules : Weather Watch and EPS
  - New functions : data and tasks management
  - Production Scheduler : Preiso, Premar, Temsi (SIGWX)
  - Optimisations : visualisation, interaction, production, diffusion
  - Experimentation : RDT module (Saf Nowcasting)

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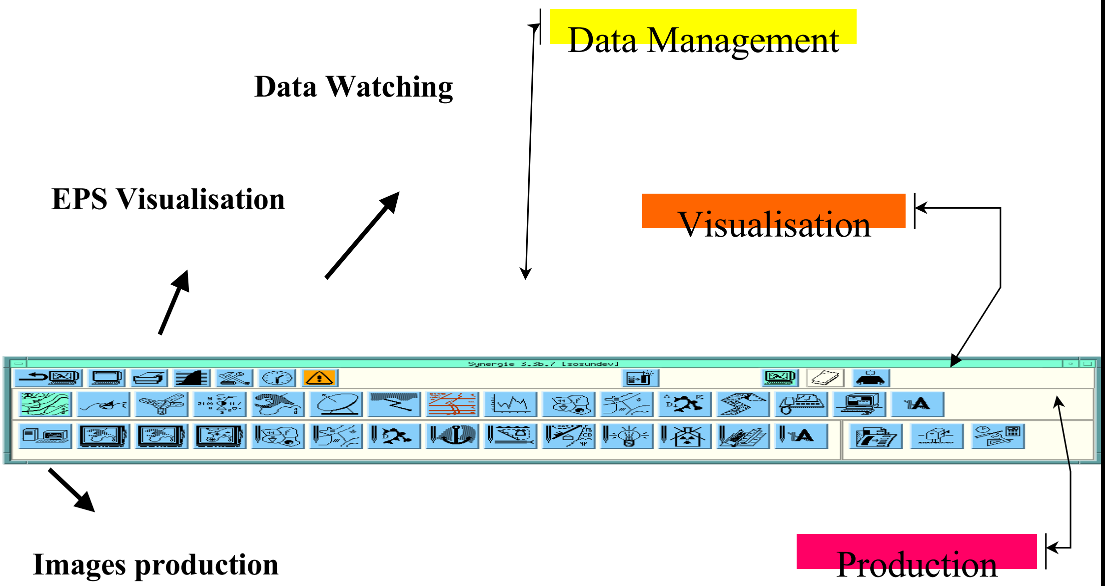
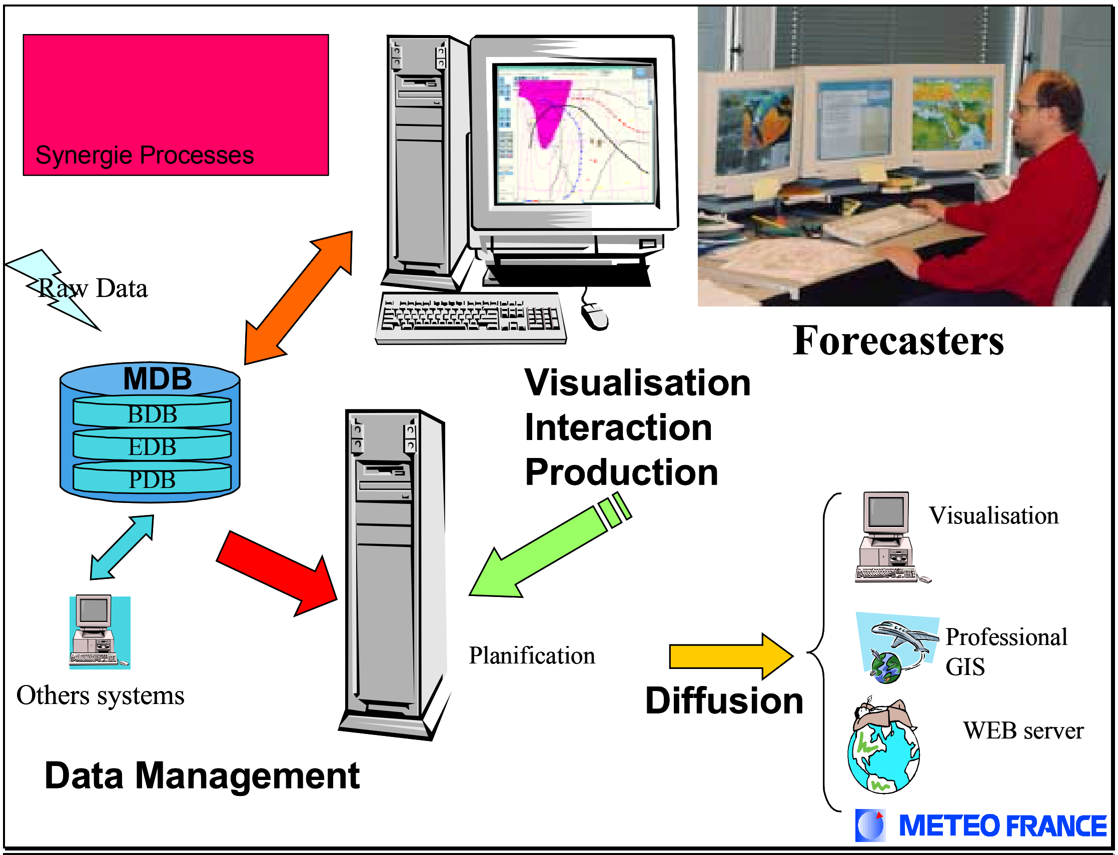
Main Menu and New Modules



Recent realisations

- Operations
  - End of hardware renewal in MF
  - Y2K appliance
  - Preparation for MSG data management
  - Soft protection and kits for installation
  - Specifics versions : batch (xwd, ps, gif…), archive
  - Packages for autonomous sites
  - Interfaces for BUFR International radars format
  - Cooperative work tools : forum with 1 to N clients
  - Technical tests for continue validation



Recent realisations

- Regulation
  - Training : developpers, administrators, users
  - Creation of coordination functions
  - Quality control for outside developments
  - Integration of Synergie into MF organisation
  - Generalisation of Synergie for studies
  - Beginning of reflexion on MF systems convergence

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Recent realisations

- Strategy
  - Consistency with the Forecasting Organisation
  - Contribution to Sympo II project
  - Contribution to MF forecasting actions
  - Contribution to cooperation : workshops, demos
  - Faisability of Synergie Linux
  - Management of Synergie export actions

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Synergie 2000

- **Developments of a 3.4 release for a deployment in mars 2001**
  - Improvement of 3.3 « revolutionary » features : data watch, cooperative and silmutaneous work, production scheduler
  - Support to MF nowcasting projects
  - Renewal of modules :observations
  - New application : cyclones forecasting
  - Integration of new data : mesoscale analysis, MSG, Automatic network
  - Data Bases Documentation to easy Connex Developments
- **Quality Insurance and control for the operations**
  - Hot line, automatisation, supervision, documentation, validation
- **Quality Insurance for the Synergie Program Organisation**
  - Demand organisation, actions planification, actors and interfaces identification, external assistances
- **Capitalisation / Communication / Commercialisation**
  - Intranet / Extranet / Internet

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Cooperation suggestions

- **Exchange of informations on the previous experiences**
  - Communication by email lists on specific subjetcs
  - Sub groups of EGOWS with permanent animators
  - Status and redundancy of EGOWS and ECMWF workshops ?
- **Definition of common languages, concepts and formats**
  - Data bases management : MDB, BDB, EDB, PDB
  - Forecasting processes : Visualisation, GI, Expertise, Production
  - Meteorological Objects
- **Reflexions on the evolution of forecasting systems**
  - Cooperation inside and between meteorological services
  - Towards systems independant of organisation and platforms

METEO FRANCE

THE GRID RDITOR

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1. INTRODUCTION

A new meteorological information and visualization system is under development at Finnish Meteorological Institute (FMI). The database has been the most important part during the past but during the past few years most effort has been given to the workstation part. The automatic product generation has also been an important part of development work.
Since the last EGOWS meeting most effort has been given to development of an editor for grid data. The methods were tested with a prototype editor since November 1998 and the first operational editor was ready on May 1999. Many new features have been implemented since that and the work is still continuing.

The software is developed using Microsoft's Development Studio and C++.

2. THE GRID EDITOR

The forecasters are able to edit the grid data with the new editor. The user can get model data or previously edited data for editing. Both HIRLAM (High Resolution Limited Area Model) and ECMWF data can be used operationally. At the moment **also radar data can be edited and combined with model data**. After editing is finished the data can be stored locally or to the database. Once the data has been stored to database it is available for those application that are connected to database.

At the moment the data is edited using both **time-series editing tool** (see Figure 2.) and the **two different paintbrush tools** (Figure 4.). Also time and spatial shifting and smoothing tools are available (Figure 2.). The **mask** can be combined to any of these tools. A mask is a kind of dynamical filter, which allows conditional changes in time and space.

The masks can be used in several ways. For instance one can first increase the amount of cloudiness on the daytime on the chosen area and keep it unchanged the rest of the time. Then one can decrease the temperature within the mask area and chosen time interval by some amount. With these few changes of parameters the forecaster can change data in hundreds of grid points and tenths of time steps while the consistency will also be sustained. New mask for different purposes or for different phenomena can be created.

Using the time-series-editing tool a forecaster can make changes to several time steps. Different masks are used to make the editing fast and to keep the meteorological consistency between the edited parameters (e.g. temperature vs. cloudiness and cloudiness vs. rain).

After that a paint brush tool has been added. The limitation of this is that it has effect only to a single hour. So the forecaster has to make the changes to very many fields separately. This is the weakness of this tool.

The paintbrush has been developed further and a new tool has now the ability to spread the influence also in time. The dialog box of this tool is in Figure 4.

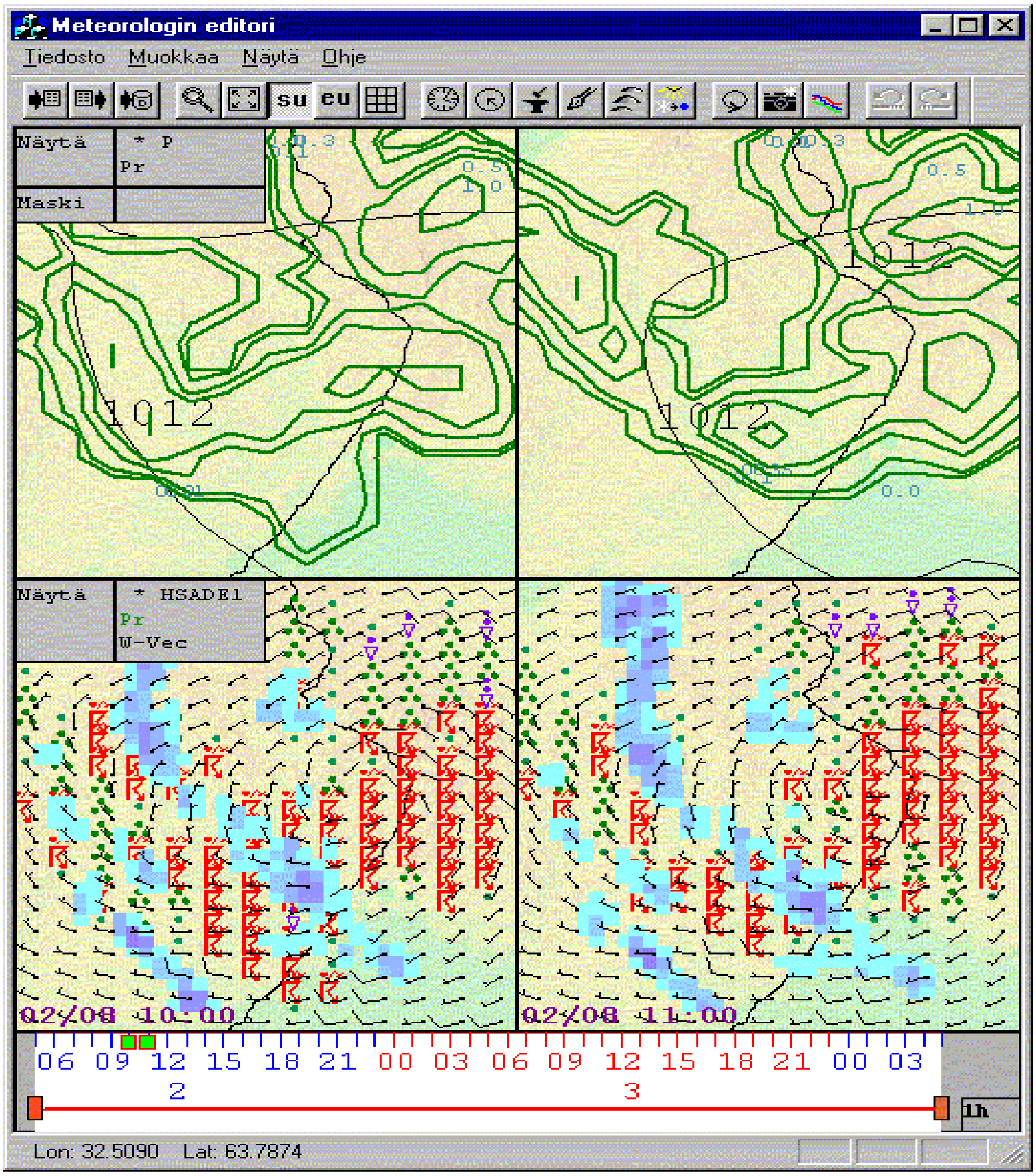

Figure 1. Map display of the editor with isoline and text/symbol representations of different data. At lover panel there is also the control of time (time ruler). The different menus are located at the upper part of the window.

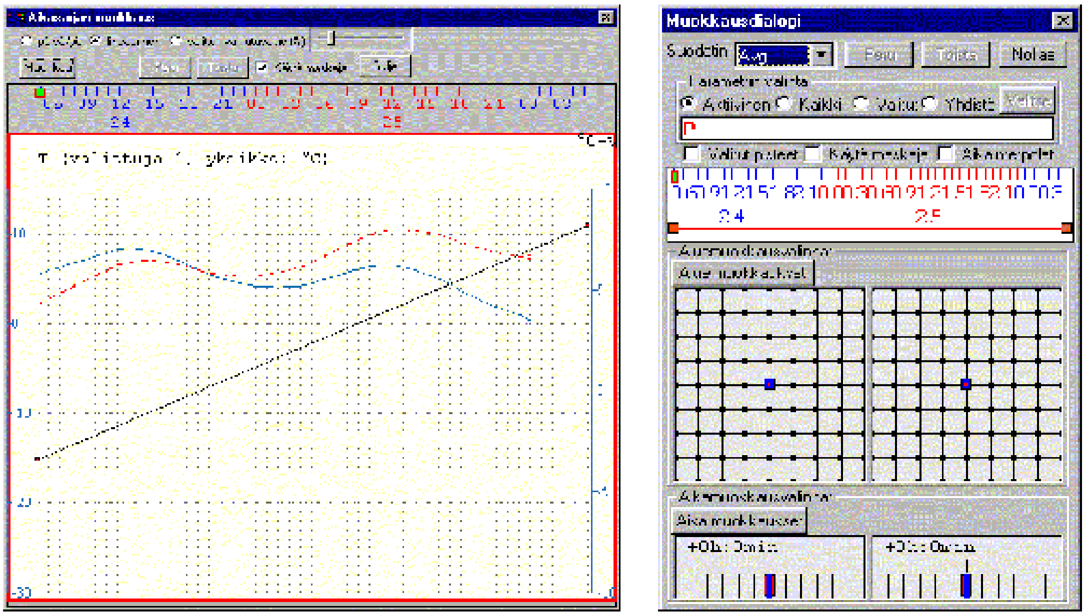

Figure 2. The time-series-editing window of the grid editor is presented in this figure. The continuous line (on the left) represents the original temperature, the thick line with dots represents the magnitude of change and the dashed line shows the corrected temperature. On the right hand side is the editing dialog box for time shifting/smoothing and area shifting/smoothing as well as the data combining tools.

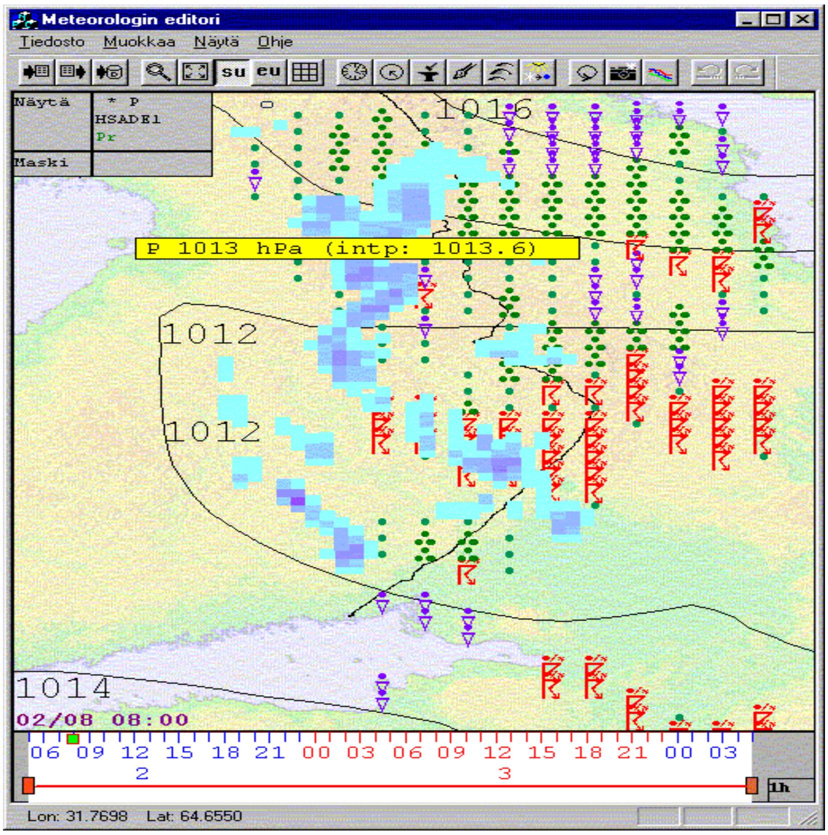

Figure 3. Display of extrapolated radar echoes and the significant weather forecasted by HIRLAM model.

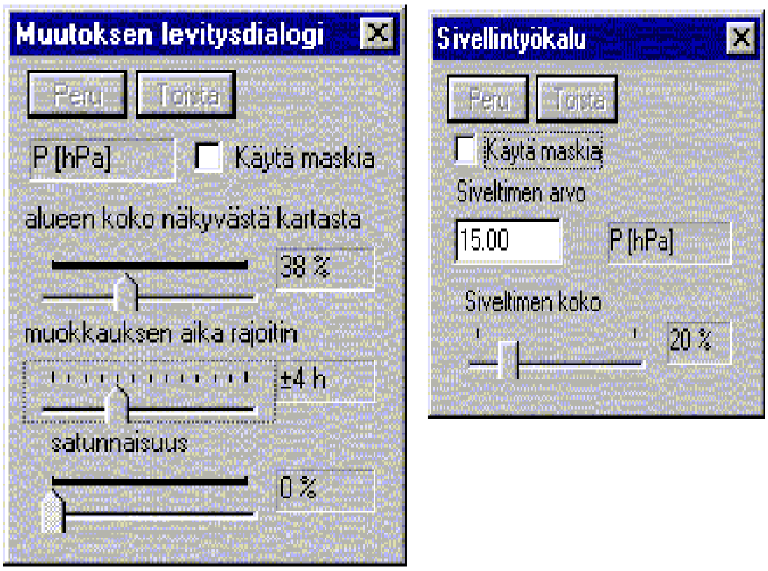

Figure 4. The old pain brush on the right (Sivellintyökalu) and the new spread tool on the left (Muutoksen levitysdialogi). In the new tool the user can choose the area coverage of the paintbrush and also the time coverage as well as some other features.

The user can see the data on text format (as symbols or number values) or as isolines (Figure 1.). The presentation outlook can be chosen from a large variety of options.

The system is used operationally at the moment in two offices. The development continues and the most important part is to develop the nowcasting and visualization features of the editor. The interface should also be developed more user friendly.

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Operational Workstations at the Hellenic National Meteorological Service & A Windows NT based Briefing System

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T. Karanikas, P Skrimizeas
HNMS Regional Forecast Center T.A.C,
Larissa, Greece, June 2000

1. INTRODUCTION

The DEDALOUS system is a Hellenic National Meteorological (HNMS) project for the weather monitoring and forecasting, aimed to be used at all levels of operational weather forecasting for the support of both, national economy and military meteorological needs. This project started at 1993 and since the begging of 2000, DEDALOUS ver 2.0 has been installed and is operational in three (3) Weather Centers, ten (10) principal and more than thirty (30) remote Met. Offices.

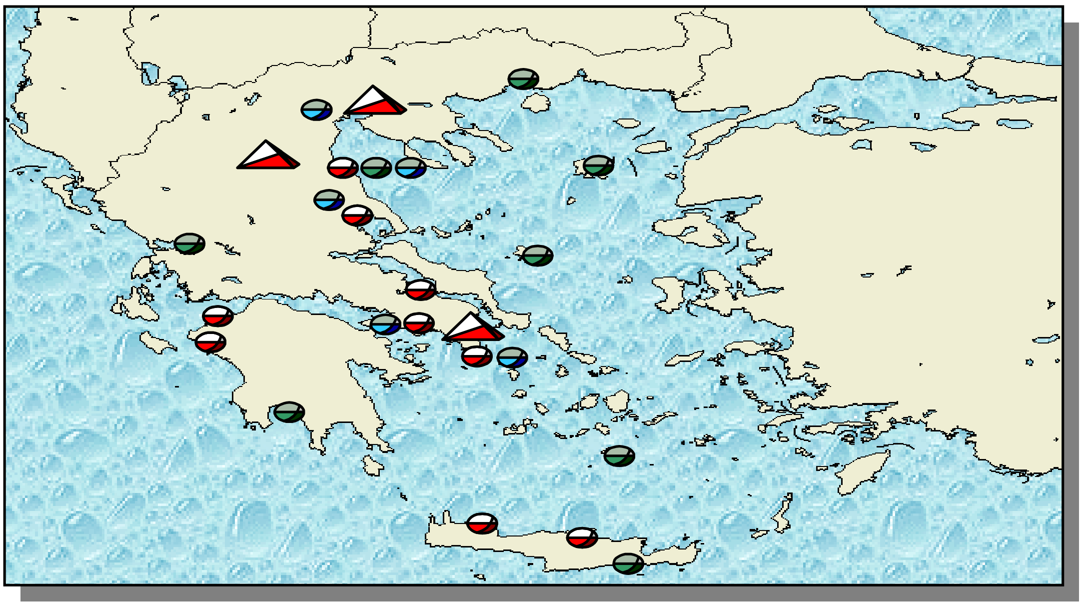

FIG. 1. Current installations

The DEDALOUS system is capable of providing meteorological support to three (3) Level of access . These Levels are define according to the user needs and the type of access (Private or Public). As we can see from figure 2 the first level (intergraded support) enable forecaster to have access and to process all the available Meteorological Data in order to be able to produce detail forecast for the Public Economy and the Defence.

The Second Level is mainly use for briefing purposes for Aviation and for user that don not need so detailed data in order to produce forecasts. The Third Level is Applied to the Public and for people that wants to be informed about the General Weather Forecast.

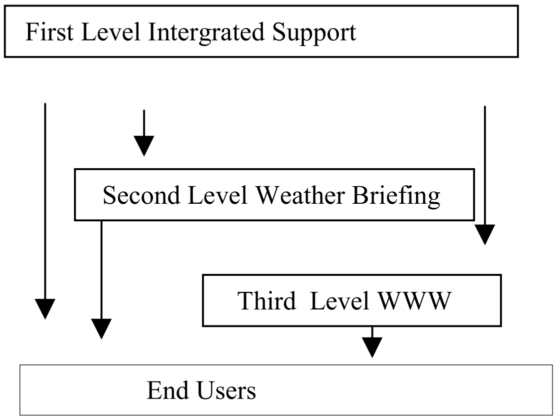

FIG. 2. Three Levels of Access

DEDALOUS (Level 1) enables operational forecasters to interactively access, manipulate and visualise meteorological data on UNIX workstations.

The same architecture has been used for Level 2 developed on PC platforms running WINDOWS NT, a smaller display system for local Weather Offices and for Aeronautical Use (Weather briefing offices) .

2. FEATURES OF DEDALOUS (Level 1)

DEDALOUS features are :
To select, process and visualize (2D) meteorological data so forecasters can access all kinds of information in useful formats, for their daily work through a friendly graphical user interface.

- Classical functionality's such as superimposition, animation and zooming of data.
- Tools for the production of various products for the forecaster or customers (Greek Electricity, shipping, TV etc.)
- The transparent distribution of the raw data to other workstations that are in operational use.

2.1 DEDALOUS INPUT DATA (Level 1).

The DEDALOUS system ingests the following data types :
- Global Telecommunication System (GTS) Data. (Classical alphanumeric surface and upper air data, GRID format NWP data)
- Satellite Data. (METEOSAT, NOAA, TOVS).
- Binary, T4 and BUFR data.
- NWP GRIB data.

It is notable that DEDALOUS can also handle Radar Data but this feature is not operational since the Greek radar network has not been up to now installed.

2.2 SOFTWARE (Level 1)

The systems main design has been developed by HNMS personel and its features are based on open architecture and HNMS standards :

- UNIX platforms
- S-GKS
- Programming languages C, C++ and some FORTRAN when necessary.
- Communications with TCP/IP, NFS.
- X-WINDOWS, OSF/Motif, X-Designer interface generator.
- TCL, TK
- MAGICS

a. McIDAS ver 7.6

For research purposes METVIEW and Vis5D is used.

The development of the application software has been separated from the GUI and the amending or improvements of the applications do not always effect the performance of the user. The code is modular and thus new features of the software can easily be ingested into the system. DEDALOUS works both on SGI and SUN workstations.

2.3 HARDWARE

The main system hardware consists of SGI Indy R4400 or R4600, O2 and SUN ULTRA Spark 140 with 2 GB disk and 64 MB RAM . The present and future installations are shown in fig, 1. By the and of 2000 all the SGI installation will be replaced be SUN Ultra 10 with SOLARIS 2.7.

2.4 COMMUNICATIONS

The distribution of the raw data to the local outstations is done via the Message Switching System (MSS) for the GTS Data and the system itself for the binary and image data.
The local workstations are connected with the main HNMS DEDALOUS system via synchronous communications using 64 Kbits or 28800 bps lines depending on the user category and the Greek Telecom capabities. The protocols that are used are IP, PPP.

2.5 GUI TOOLS

The main features that are available on screen (2 D x,y - cross sections) or hard copy layouts (Laser A4 - A3, PLOTTER A0) to the forecaster are :

- The display of surface plotted or analysed charts in various projections.
- The METAR display as in the complete bulletin or according to the desired variable (weather, wind, etc.).
- Tephigram display and analysis (CAPE, instability indexes, LCL etc.).
- NWP data display from various centres.
- The display of surface plotted or analysed charts in various projections (Interpolated Fields).
- The METAR display as in the complete bulletin or according to the desired variable (weather, wind, etc.).
- Tephigram display and analysis (CAPE, instability indexes, LCL etc.).
- NWP data display from various centres.

- Dynamic variable chart display (PV, Q-Vectors, CSI, other instability charts, omega equation terms, vorticity, divergence, thermal and vorticity advection, thermal wind, geostrophic/ageostrophic wind, thickness,).
- HNMS wave model output display.
- ECMWF ensemble forecast products.
- ECMWF fields.
- ETA SKIRON field
- Satellite display
- Significant weather chart editor.
- Meteograms
- Verification of daily forecasts.

2.5 FUTURE PLANS

For the future are planning to port the whole system on LINUX platforms. The big question is concerning the selection of Linux integrator. Some effort has all ready been made, and the result are quite satisfactory. The main problems with the LINUX OS are mainly:

- Security.
- Support.

As from its origin, Lunix did not started as a commercial package, so little has been done about security. The problem of support is closely related with the above issue. It is very difficult to get reliable support (you have to search a lot in the Internet) The only thing that is going to improve these problems is the adaptation form a big corporation in order to have constant support and updates.

The benefit we are expected to obtain are, low cost hardware, and software

The next issue concerning the future of the DEDALOUS system is the development of the software and mainly three major components:

- Interface
- Graphics
- Processing

We planning to replace entirely the MOTIF interface with TCL/TK, primary tests and efforts shows that with its behavior is stable enough, it is very portable and provides very good flexibility in the development phase, finally it provides a very good and quick prototyping interfaces and interoperability with other extensions such as graphics (BLT, OpenGL etc) and communications.

For the Graphics part we are planning to replace GKS, the main reasons for this decision are that it is very difficult to combine GKS with interactive environments and it is heavy enough in the processing procedures all though the hard-copy or metafiles products provide very high quality. The selection of the Graphics Library will be based on who smooth these Libraries cooperate with TCL/TK, with the performance and the ability to create graphics Metafiles (Postscript etc).

A grate effort has to be made in the processing part of the System. We are planning to change the whole structure of the DEDALOUS system based on modular design. It processing task has to be in the form of module, each module must able to perform a single task. The user should be able to activate specific modules in order to produce forecast. Multiple modules could perform the same task but with different approximation or methodology (multiple interpolation schemes etc).

All these tasks are going to be used in order to introduce a bit of Intelligence in the System in the fields of Grid Editing or in the creation of Digital Forecasts.

3. FEATURES OF DEDALOUS (Level 2)

The reasons, which lead us in the development of low end Weather Support System, are presented below:

- Low Cost
- Easy to Install
- Easy to Use
- Novice Use
- Portable

When we first install DEDALOUS Level 1 system at various locations (Weather Center's and Airports) we face from the remote users the need to have access to a subset set of Meteorological Data for various reasons (Information, Flight crews, Aeronautical Forecast etc). We have two ways to handle this needs: to install more than one workstations in each location (6-8 in each airport or center) but with great expense or to create a low cost system attached to the main system which will be able to display and present a subset of all the information in a processed manner.

The Hardware Platform we select is an Intel Based System with Windows NT 4.0 Workstation as an operating system. The reasons we select Windows NT is that it is more stable than Windows 95 or Windows 98 and provides some advanced feature for security.

The System should be able to display processed data for:

- Satellite Images
- NWP Products
- Aeronautical Charts T4

Process and handle Raw Aeronautical Data:

- METAR
- TAF
- WARNINGs
- Reports

to create significant Weather Charts.

The Logical design of the System is presented in figure 3

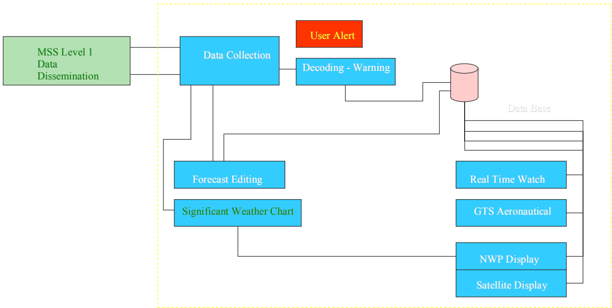

FIG. 3. Logical Design Diagram

The main components of the System are:

- Communication Subsystem
- Decode & Archive
- Alert
- Real Time Watch
- Metafiles Display
- Bulletin & Routes
- Significant Weather Editor
- Forecast Editor

The Communication Subsystem is responsible to receive and send Meteorological Data to and from DEDALOUS Level 1 System. The implementation is based upon FTP protocol and Sockets. At the begging we use FTP protocol for the transfer but because the huge amount of data send the system continuously the system could not handle all this traffic efficient the other problem we encounter was the message priority, so we decide to create a TCP Socket based Service, using two separate ports one for Alphanumeric Aeronautical Data and the other for the graphics metafiles and also a UDP socket port for monitoring and control. This Communications Subsystem is continuously communicate with the Data Dissemination Entity on Dedalous Level 1 and reports near-real time any errors or the progress of the data transfer.

The Decode & Archive Subsystem is responsible to decode and organize the Raw or Processed Data in a DataBase for easy access from the other subsystems. We use Microsoft Access libraries in order to organize these data. This Subsystem is also responsible to check for extreme events in the aeronautical observations (Thunderstorms, Fog, Wind Gusts etc) and to report these extreme events to the user.

The Real Time Watch Subsystem is responsible to visualize aeronautical information in a graphical format automatically. METARs are displayed in a SYNOP form, which is easy for anybody to have a quick image for the current weather conditions for a specific region. The data are presented in a click-able map (Fig 4.), all the extreme events are presented in red color (for example if the wind speed is greater than 25Kts). From this click-able map the user can view previous recorded observations, to select the display only one specific weather element (such as wind).

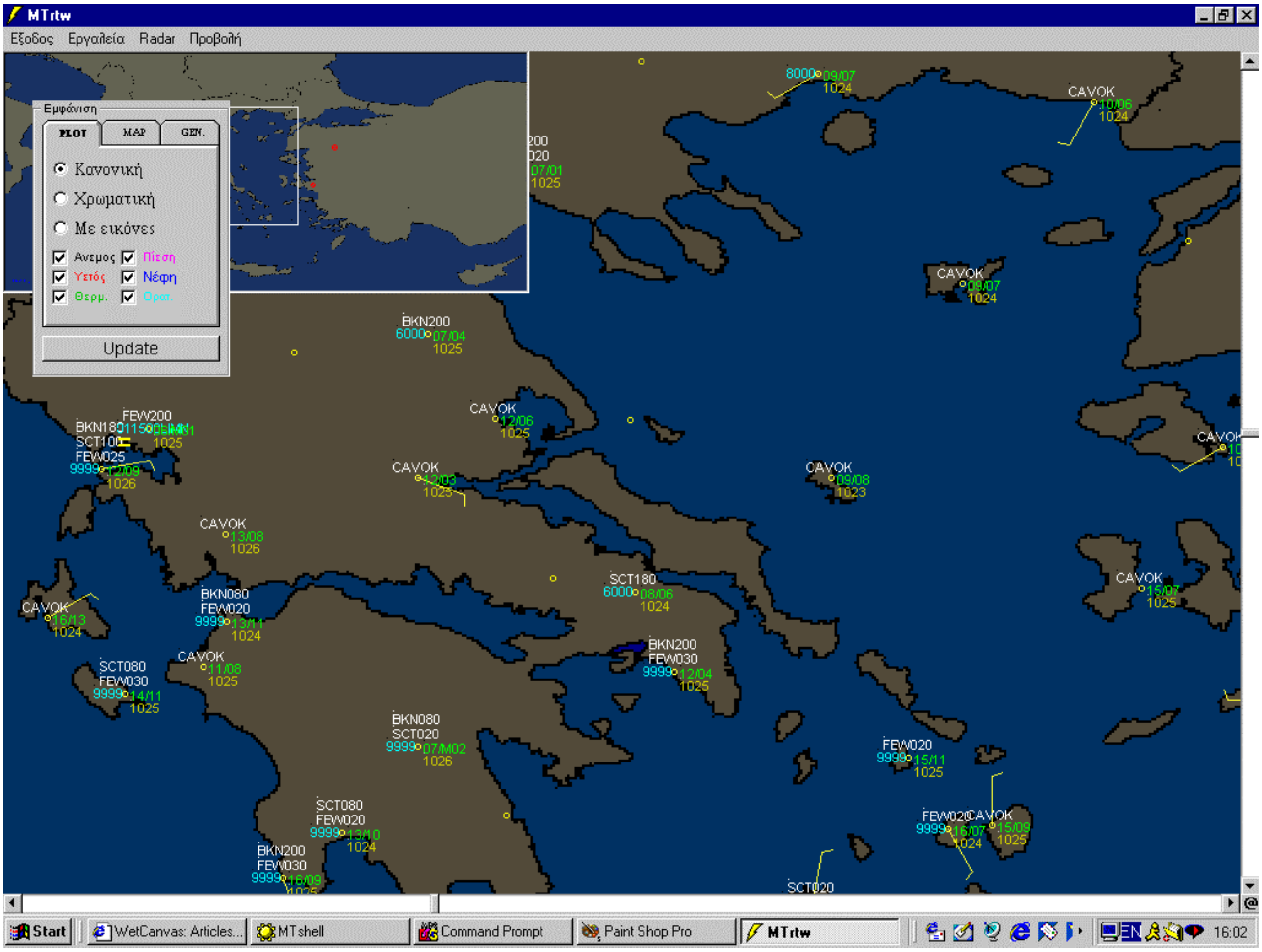

FIG. 4. Real-Time Watch

With The Metafile Display Subsystem multiple Metafiles are presented to the user. These Metafiles are:

- Satellite Images
- NWP products
- Aeronautical Charts

The system allows the use of frames. The main display windows can have multiple frames each displaying a different information. Each frame has the capability of animation, zoom, pan and printing (Figure 5a & b).

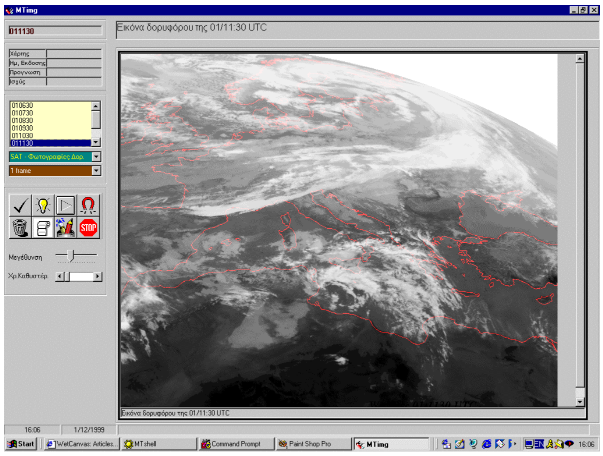

FIG. 5.a. Metafile Display Subsystem

In Fig. 5.a a Meteosat IR image is displayed to the user in gray-scale. The user can zoom at any portion of the image or to create custom animation loop from previous images.

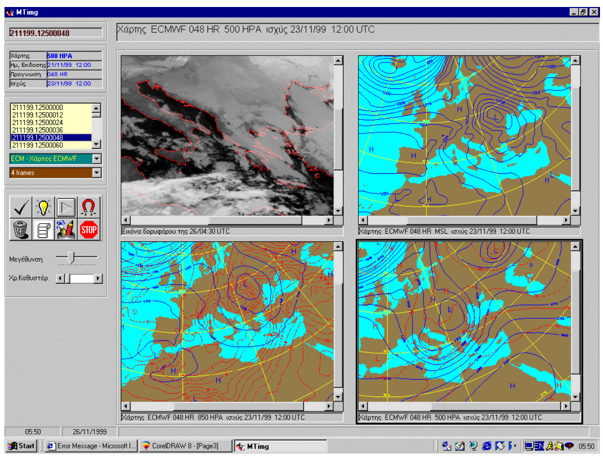

FIG. 5.b. Metafile Display Subsystem

In Fig 5.b a Meteosat Image is display in conjunction with NWP forecast data (MSL, 850 HPA Temperature and 500 HPA Height and Temperature).

The Bulletin & Routes Subsystem collects and display Alphanumeric Raw Aeronautical Data. The user can retrieve any data using any combination according to message type, country, date etc. He/She can create also custom routes. A route is a collection of Airports which will be used of International of National flights. For each route all the available information is presented and printing (Figure 6).

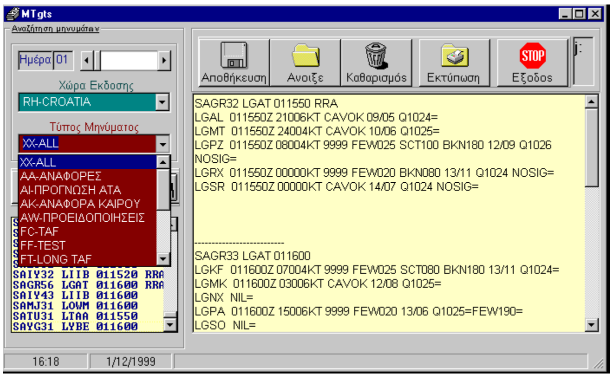

FIG 6. Bulletin & Route Subsystem

The Significant Weather Editor Subsystem is a Simple Custom Graphics Package, which allows the user to create Significant Weather charts. It has embedded Weather Symbols used for Aeronautical Charts, a library of pre-defined map regions. The charts are saved in an ASCII or a graphics format (GIF etc). The ASCII data are used to reproduce the map or to stored in reduced space for historical reasons (Figure 7).

FIG. 7. Significant Weather Chart.

3.1 FUTURE PLANS DEDALOUS LEVEL 2 & 3.

We are planning to combine DEDALOUS Level 2 & 3 in a single Entity based on WWW access. These two Levels are going to be replaced by an application developed in JAVA. The reason for this selection is that we want to maintain only one application which will be portable among different type of OS and Hardware, also the low-end users are more familiar with common used browsers such as Netscape or Explorer. The main future plans in brief are presented below.

- WWW Based System
- Development Tool JAVA *
- Processing of NWP Data
- Processing of OBS Data
- Extended Aeronautical Support

PS

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GROUP 1

Working Group on Visualisation Techniques

General remarks, 2D

The Working Group identified 3 user groups

- expert forecasters
- expert users
- lay persons

All of these have to be supplied with specialised graphics. The visualisation should give them a graphical solution to their problem. (E.g. don't give relative humidity and temperature to a general aviation pilot instead of icing/turbulence areas, because the primitive fields can hardly be interpreted). So tailored products are very important.

While forecasters can use "scientific- visualisation style" products, lay persons have to be supplied with simple, easily perceivable and appealing images (e.g. anti-aliased lines, shadow casts…). Don't confuse them with things (probabilities), they don't understand.

Also the group reviewed last years report. Little progress was achieved during the last year regarding "More intelligence in the forecast process". But still the group considers this to be a very important issue. Only a few innovative products have been implemented, e.g. colour coded jetstreams/icing areas (according to their height), pop-up tephigrams. It was considered necessary to make more use of first guess fields.

3D

3D is still not well accepted in an operational forecasting environment. Forecasters are only trained to use the software itself. But meteorological concepts are still missing. Also it is thought, that the user interface is a serious problem. There are better UI's developed (FSL interface to VIS5D, but it is still unclear, if it will be freely available).
The main point of forecasters using 3D in an operational environment is the lack of connection between the 3D and the production.
Still it is believed that there are considerable advantages to the 3D-technology (ensemble-visualisation, plumes and Xsections.)

Recommendations concerning visualisation

GKS and CGM were deleted from the list
Java2D, Java3D and XML/SVG were added

GROUP 2

Graphical interaction (GI)

Experience:

DNMI:
- Time series editor tested for temp, wind etc.
- Used for producing time series for newspapers etc.
- Field editor: Interacts with one field at a time.
- The field editor is not operational for the moment, but will hopefully be in Sept. 2000.

UKMO:
- Editing time series of data.
- Many different systems, ex:
    - Press media
    - Road surface temperature.
- On screen field modification (OSFM) is operational for a number of products.
- Site specific forecast model (SSFM) – modification of model output.
- A principal idea is to feed SSFM with data from OSFM

HMIS:
- No experience of GI for the moment.

INM:
- No experience of GI for the moment.

FMI:
- The grid editor (GE).
- About 15 parameters available in GE today.
- Mostly three parameters edited in GE: Precipitation, TCC, 2Tm
- Masks and area selections can be made.
- Many options in the editor to edit in different ways:
    - Time series
    - Area: Move field in space.
    - Time: Move field in time – fastening or slowing down weather scenarios.
- Interpolation is made in time and space.
- Some parameters are interacting with each other, ex: precipitation and cloud coverage.
- The GE is not used very much for the moment. Forecasters are not used to the GE, and it is not very easy to use.
- Plans: Use of four-hour radar image predictions for nowcasting. The radar image predictions will be weighted and combined with model output.

IRELAND:
- No experience of GI for the moment.

Meteo France:
- Graphical interaction in both end products and pre- product data.
- ”Symposium 1” – Experience with editing in the end production line.

- Simultaneous work: The general forecaster and local forecasters work on the same display on different screens at their own locations. Modifications can be made by different forecasters in their own areas, at the same time. In this way all the meteorologists can se what the other forecasters are doing. The general forecaster has the responsibility for approval.
- Working on meteorological objects, and interaction/editing of these.
- Interpolation of objects in time is in the experimental stage.
- Trying to evaluate what the meteorologists are adding.
- Would like to edit observations that is input to the numerical models.

SMHI:
- Graphical editor is part of the new production system.
- Editing of one parameter at the time.
- Different type of influence etc built in.
- Two masks are used for interpolation in space: Land/Sea and geopotential.
- Interpolation in time possible.
- Plans: Add more parameters to the editor. For instance precipitation.

DWD:
- In the startup with a model output editor in MAP.
- Seven offices with responsibility for their regions will work on their own areas.

Users involved in developing inteeractive tools

UKMO: Positive effects in having forecasters in development projects. Some forecasters have been working 50% in projects and 50% as forecasters.

MF: Experimental versions of new tools will be displayed, so that the forecasters can use the tools during development.

HMIS: At HMIS developers are also forecasters, so it is easier to know how to build systems that will fit the users.

INM: In 1994 developers and forecasters were separated in different departments, and there has been problems. Now developers and forecasters are working close together when developing new systems, and there are less problems.

DNMI: In one of our latest systems we also implemented the ”old style” editor, so that the users would have the possibility to work in a way that they are used to do. Hopefully the users will see the possibilities with the new featurs also.

FMI: Problem with the GE is that the users are not using the tool very often, and the system is not so ”user friendly”, mostly due to lack of time for developer.

MF: Forecasters think of weather systems – fronts etc, so it is unnatural for them to see/think of separat parameters, one at the time. We should be able to build systems that fits the forecasters view in a better way.

UKMO: There are difficulties in knowing what ”product parts” of a system that the users realy are using. Sometimes the user has windows open with automatic updating, but is not looking at it/using it, so you can't use db access counting as info for what is used.

FMI: In the GE users would like to be able to set a value at a specific point, and from this the value would be interpolated in both time and space.

CONCLUTION: It is very important that the users are involved in developing new systems.

Does anybody use any commercial tool for moving lines and other image objects?

FMI: The problems with such tools is that the can not interfere with the actual data the lines etc. are built upon. No editing of the real data is there for possible with these tools.

UKMO: Why do we make so much effort to build all these expensive tools when there is so much free weather data on the internet?

DNMI: We have to be prepared for competition on the internet. We have to make nice and good products that the customers will be willing to pay for.

FMI: All different sources of data is stored into one db, and from this the products are produced. The DMO that often is on the internet does not have the quality that products made by good systems and GI tools have.

CONCLUTION: It is important to have tools that can increase quality from DMO.

HMIS Will the forecasters in five years be able to add value to the DMO or will they only be an interface between the public and the model?

UKMO: Graphical interaction will show if forecasters will be able to increase quality on models

SMHI: In significant situations forecasters adds important information to the numerical model. This has been shown when evaluating edited TAFs in Sweden. If one only looks at the statistics it looks loke the forecaster has not increased the quality, but in significant situations the quality was increased in an important way.

FMI: It is difficult to build systems that can ”see” the difference between what is important and what is just ”noice”.

CONCLUTION: DMO will probably not be as good as that editing by meteorologists will be necessary.

FUTURE?

Rerunning of models with edited input data is wanted at many weather institutions now, but for the moment it takes far too long time to do this.

QUESTIONS:

Is interaction between parameters something that should be done by the system?
Will it be possible to use graphical interaction for nowcasting?

GROUP 3

Working group on Meteorological Objects in Interaction with Gridded Fields

Report of the 2nd Meeting Helsinki – 7 June 2000

The wgMO had its second meeting in Helsinki during EGOWS 2000.

List of participants :

- Rob Acker, UKMO
- Matt Arris, UKMO
- Dick Blaauboer, KNMI
- Eric Brun, MF
- Audun Christoffersen, DNMI
- Lukas Gröbke, SMA
- Dirk Heizenreder, DWD
- Ove Kjaer, DMI
- Vesa Nietosvaara, FMI
- Uros Strajnar, HMIS
- Christophe Voisard, SMA

Dan Pillich from ECDIS had been invited to the wgMO meeting.

Members of the WG presented their response to the questionnaire on the present use of Meteorological Objects in their National Meteorological Service. Dan Pillich, from ECDIS, gave a presentation on the use of Marine Objects for the dissemination of electronic charts in the frame work of the International Maritime Organisation.
Then the WG discussed its future objectives and its status. Conclusions on these topics have been summarised in the following report which has been presented to EGOWS participants:

History
The group was erected after the Workshop on Graphical Interaction in December 1998 at Helsinki. It had its first meeting during ECAM 1999 in Norrköping. It was decided to prepare a questionnaire for inventorying the present use of Meteorological Objects (MO) at European national weather services.

The questionnaire resulted in 8 responses from which in 6 cases MO are used or under development. Additional responses are waited during next weeks. It can be concluded that right now MO are considered in various contexts and various systems. Some examples:

- **aviation charts (SIGWX) (UK, France, Germany)**
- **SatRep (Finland, Netherlands, Austria)**
- **frontcharts (France, UK)**
- **graphical user products (UK, France)**

The responses confirm the assumption that MO is a way complementary to gridded fields to represent weather forecast and analysis.

During the current wg meeting questionnaire responses were presented and following discussions resulted in the definition of MO and Terms of Reference below. XML appeared to be a format well designed to represent MO. However, other formats like BUFR could also be used.

Definition: A meteorological object is a feature limited in space and time (point, line, area, volume) with certain attributes representing a meteorological phenomenon or concept. Examples: cloud system, precipitation area, front, pressure centre.

Terms of Reference (ToR):

- **The goal of the working group is to define a common list of MO with their attributes and to propose it as a standard to WMO. To that purpose the wg will have links with met services outside Europe.**
- **This goal should be reached within a relatively short time period because some user applications are already using MO with their own definitions.**
- **The wgMO will act as a permanent subgroup of EGOWS and have annual meetings in parallel with EGOWS.**
- **Between meetings information exchange will take place using email and a website that will be set up shortly.**

Participants of EGOWS 2000 have accepted that the wgMO becomes a permanent group of EGOWS.

To prepare the common list of MO, Dick Blaauboer and Eric Brun propose the following work plan:

- Eric Brun lets circulate by the end of June a template for the list of objects corresponding to the list of objects already diffused by MF with the questionnaire
  - wgMO members propose modifications to this template by the end of August
  - Dick Blaauboer and Eric Brun summarize the proposals and diffuse a final version of the template by the middle of September.
  - wgMO members complete the list of MO according to the template by the end of November
  - Dick Blaauboer and Eric Brun synthesize the responses and produce a first version of a common list before the end of February 2001
  - According to the reaction of the wgMO members, a final version of the common list should be prepared by the middle of May and presented during EGOWS 2001

ANNEX 1, Agenda

Agenda/June 5, 2000

European Working Group on Operational Meteorological Workstation System, EGOWS

FINNISH METEOROLOGICAL INSTITUTE (FMI),

HELSINKI, June 5-8, 2000, Unioninkatu 37 (University of Helsinki)

Monday	**8:45**	**Registration (Unioninkatu 37)**		
	9:15	**Opening of the meeting**		
		Welcome by Prof. Erkki Jatila, director general, FMI		
		General Information and introduction to FMI by Juha Kilpinen		
		Session 1 Chair: Juha Kilpinen		
	9:30	**SMHI/Sweden**	**Ripp etc.**	**Anders Larsson**
	9:50	**HMS/Hungary**	**HAWK-": Development of a new meteorological workstation system at HMS**	**Sandor Kertesz**
	10:15	**DNMI/Norway**	**Recent developments at DNMI**	**Audun Christoffersen**
	10:30	**Coffee break**		
	11:00	**ECMWF**	**Recent Developments**	**Jens Daabeck**
	11:30	**UKMO/UK**	**The problems of a manager having responsibility for HORACE and NIMBUS**	**Billy Moores**
	12:00	**Lunch**		
		Session 1, continued	**Chair: Pertti Nurmi**	
	13:20	**FMI/Finland**	**Recent Developments**	**Juha Kilpinen**
	13:40	**DMI/Denmark**	**Recent Developments**	**Knud Christensen**
	14:10	**DWD/Germany**	**DWD - Recent Developments**	**Dirk Heizenreder**
	14:30	**Coffee break**		
	15:00	**KNMI/Netherlands**	**Recent Developments**	**Dick Blaauboer**
	15:30	**SMA/Switzerland**	**Meteorological application: a forecaster view**	**Cristophe Voisard**
	16:00	**End of day 1**		
	16:00	**Visit to FMI forecast office (Vuorikatu 24 6th floor)**		
	17:00	**Welcome cocktail at FMI (Vuorikatu 24)**		
Tuesday	**9:00**	**Session 2 (Unioninkatu 37) Chair: Kristiina Soini**		
	9:00	**Mapmakers/Russia**	**The GIS Meteo Application**	**Yuri Shmelkin**
	9:30	**HMIS/Slovenia**	**Recent Developments at HMIS**	**Metod Kozelj**
	9:45	**INM/Spain**	**INM status and future plans**	**Jorge Tamayo**
	10:00	**HMIS/Slovenia**	**XML based visualisation of meteorological data**	**Uros Stajnar**
	10:30	**Coffee break**	**Group Photo**	
	11:00	**SMA/Switzerland**	**FCE: ForeCast Editor**	**Lukas Gröpke**
	11:30	**UKMO/UK**	**The Met. Office/UK Recent Developments**	**Rob Acker**
	12:00	**Lunch**		
	13:30	**Demonstration session at FMI building (Vuorikatu 24)**		
	16:30	**End of day 2**		
Wednesday	**9:00**	**Discussion Session (Unioninkatu 37)**		
		Group 1: Working Group of Meteorological Objects, Eric Brun		
		Group 2: Visualisation Techniques		
		Group 3: Graphical Interaction		
	10:30	**Coffee break**		
	11:00	**Visit to FMI forecast office/Demonstration session at FMI building (Vuorikatu 24)**		
	12:00	**Lunch**		

	13:30	**Demonstration session at FMI building (Vuorikatu 24)**		
	16:30	**End of day 3**		
	19:00	**Dinner at FMI cafeteria (Vuorikatu 24)**		
Thursday	**9:00**	**Session 3 (Unioninkatu 37) Chair:Kari Niemelä**		
	9:00	**IMS/Israel**	**Recent Developments and future plans**	**Tamar Ben-Amran**
	9:20	**FMI/Finland**	**The Grid editor**	**Juha Kilpinen/Marko Pietarinen**
	9:45	**Met Eireann/Ireland**	**"Porting of xcharts from SGI to Linux"**	**James Hamilton**
	10:15	**Coffee break**		
	10:45	**MeteoFrance**	**An overview of the Synergie Programme ..**	**Magali Stoll**
	11:15	**Report of sub-groups and plenary discussion; Chair: Juha Kilpinen**		
	12:30	**Closure of the meeting**		

The actual meeting is held at Unioninkatu 37 (University of Helsinki), just 200 meters east from FMI building.

Annex 2: List of participants

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