



*Norwegian
Meteorological Institute
met.no*

Diana

An Open Source Production and
Visualisation Package

Lisbeth Bergholt and Audun Christoffersen
ECMWF, 15th November 2007



Outline

- Diana
 - An overview
- New forecast production system
 - Field corrections and on-demand production
- New web site for weather forecasts
 - <http://www.yr.no/>
- Web Map Services
 - Diana deliver graphical layers



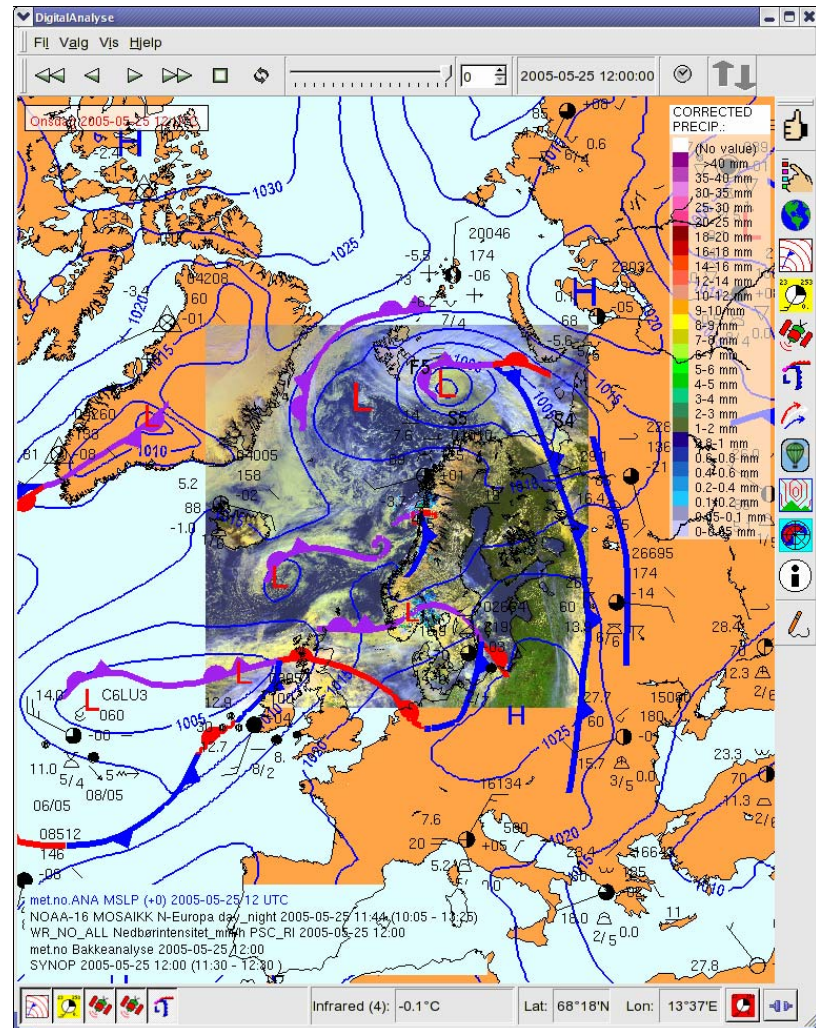
Diana

- Production and Visualisation Package
- Developed at the Norwegian Meteorological Institute, met.no
- Used operationally since 2001
- Also used by researchers
- Released as open source (GPL license)
May 2006



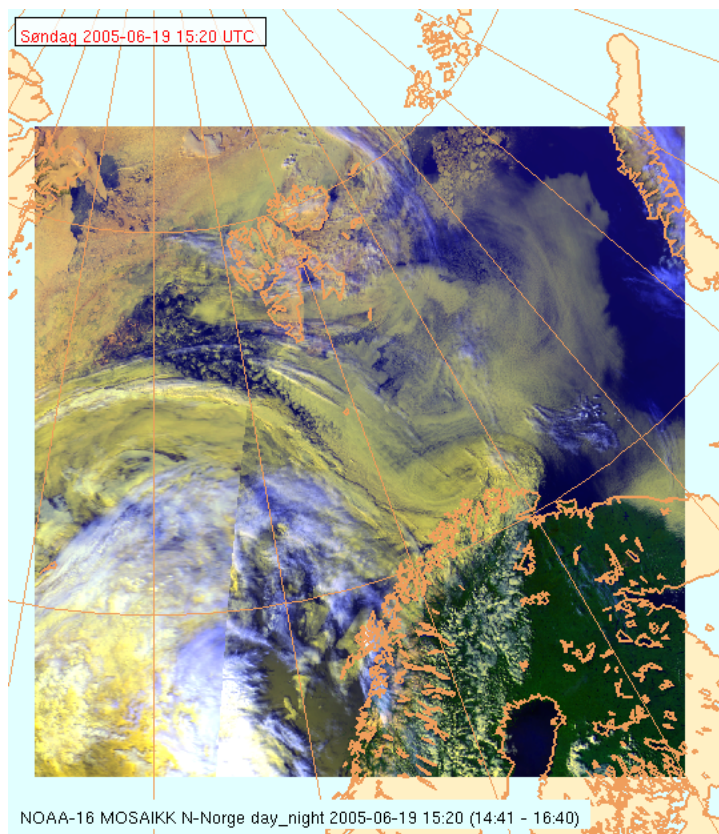
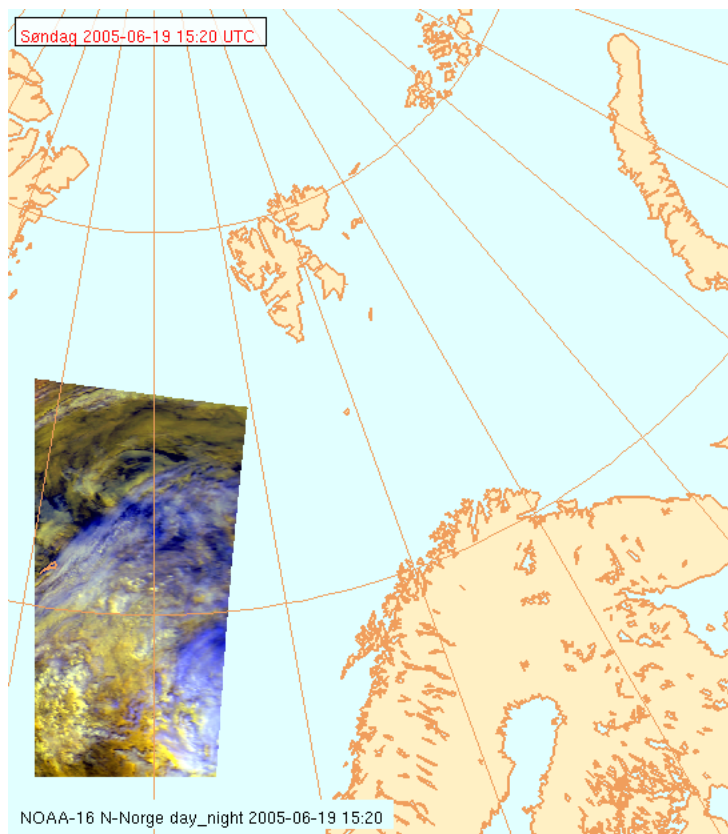
Visualisation

- Fields
- Satellite and radar images
- Surface observations
- Soundings
- Cross Sections
- Trajectories in isosurfaces
- Forecast products





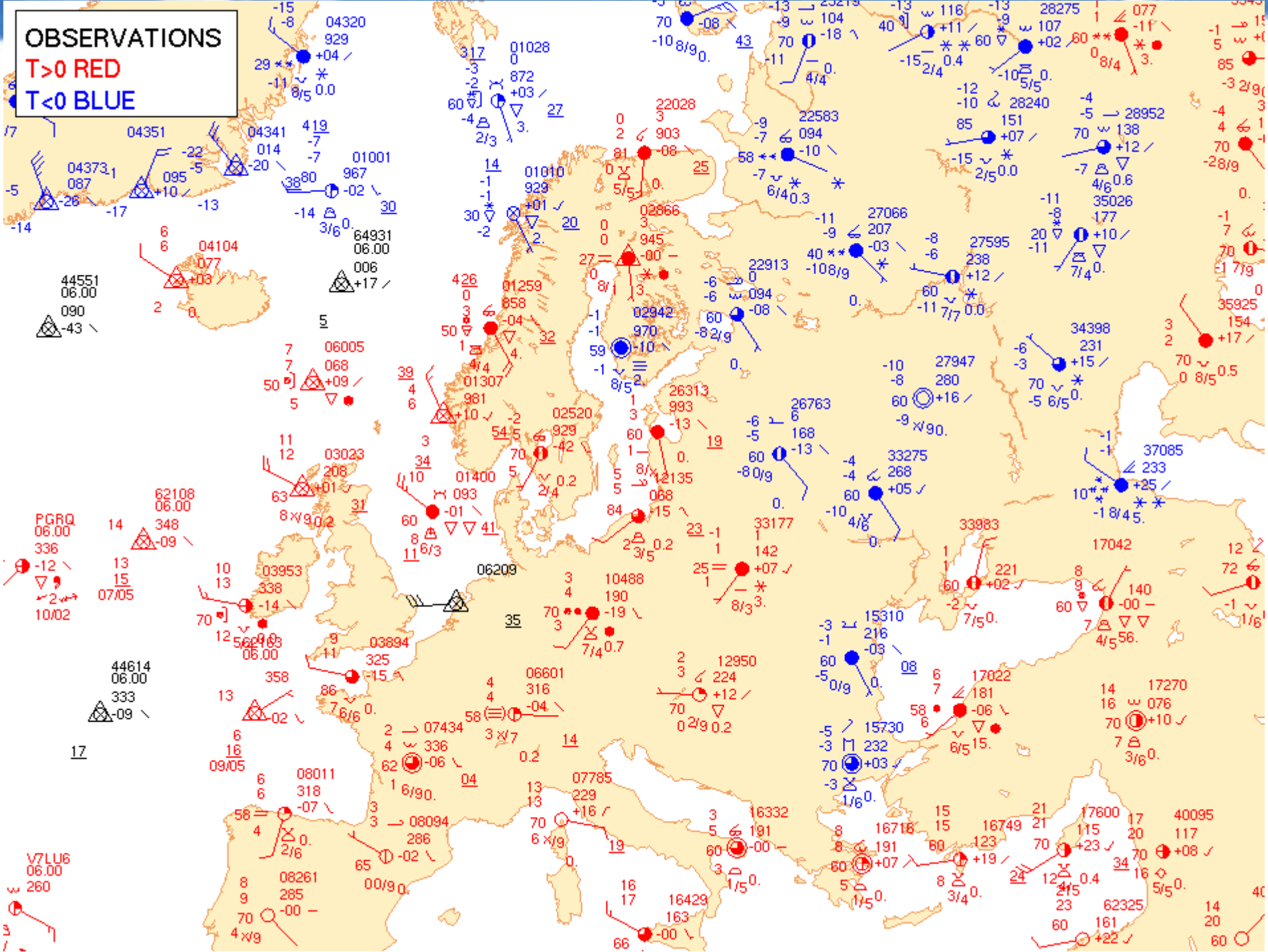
Diana: Image mosaic



OBSERVATIONS

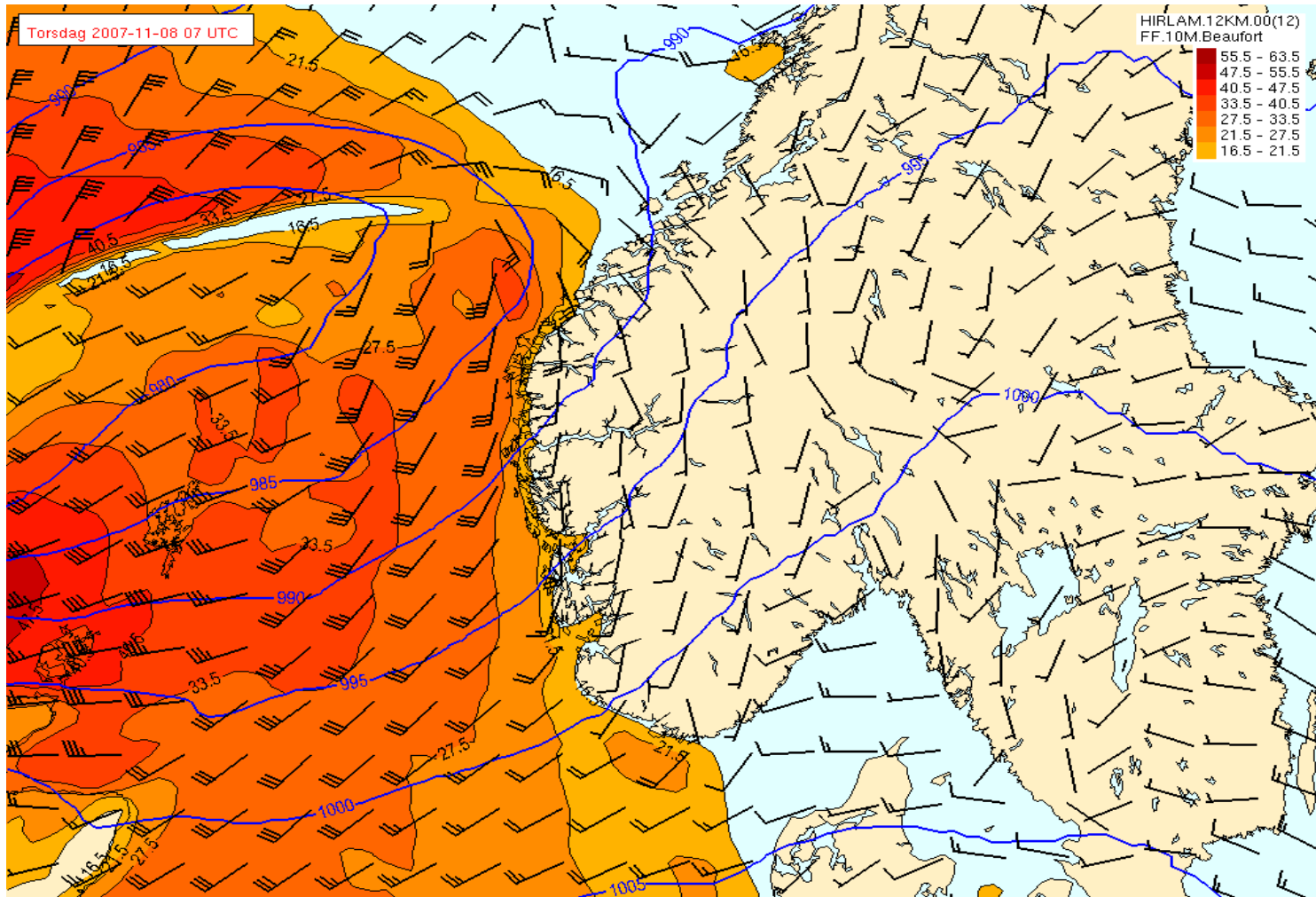
T > 0 RED

T < 0 BLUE





Storm last Thursday





DIANA

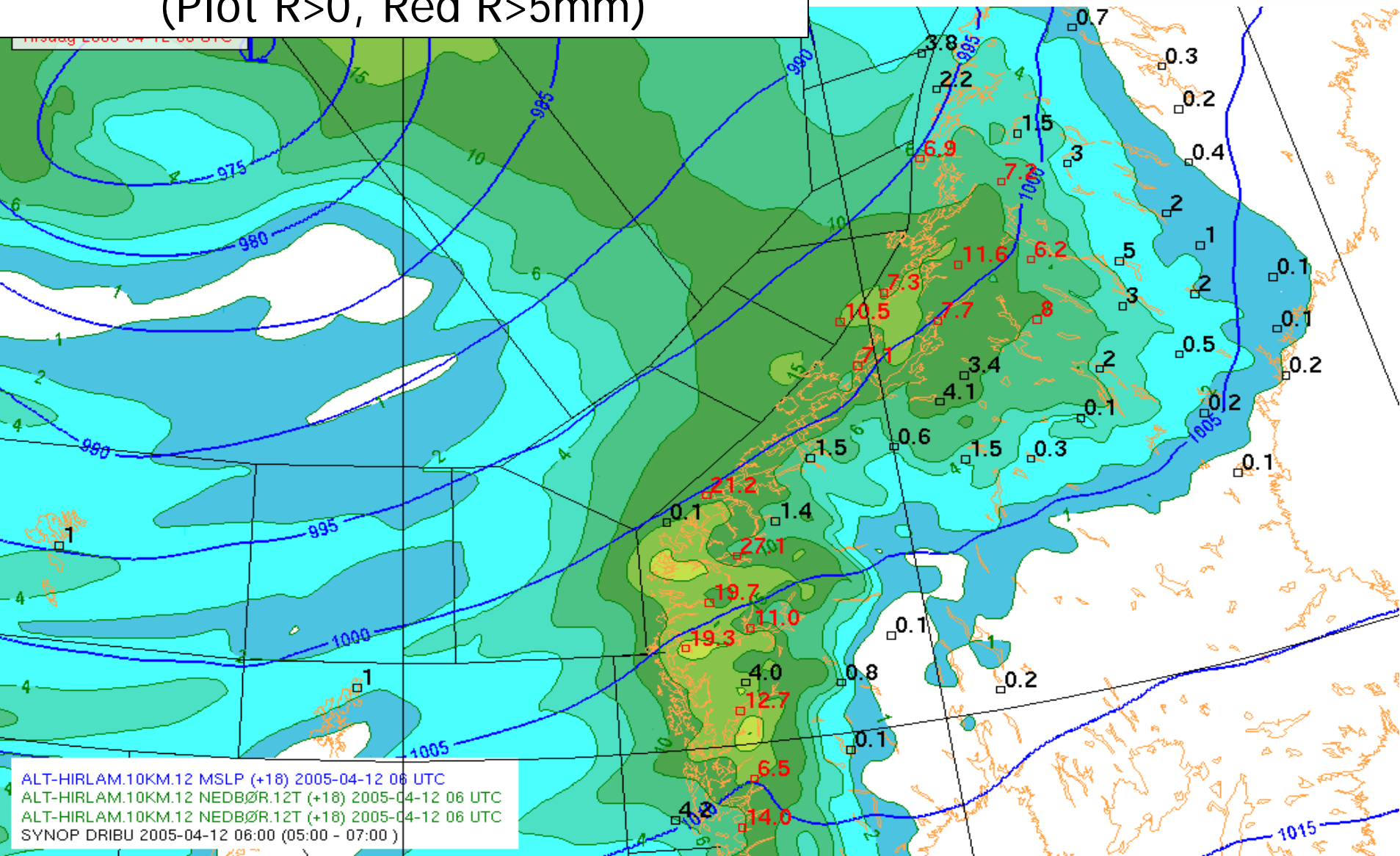
- Tailored for operational use in a forecasting environment
- Small development crew in close cooperation with forecasters
- Fast development cycle - monthly updates
- A formal cooperation with SMHI
 - further development of Diana
 - Includes databases and data quality control



DIANA - interfaces

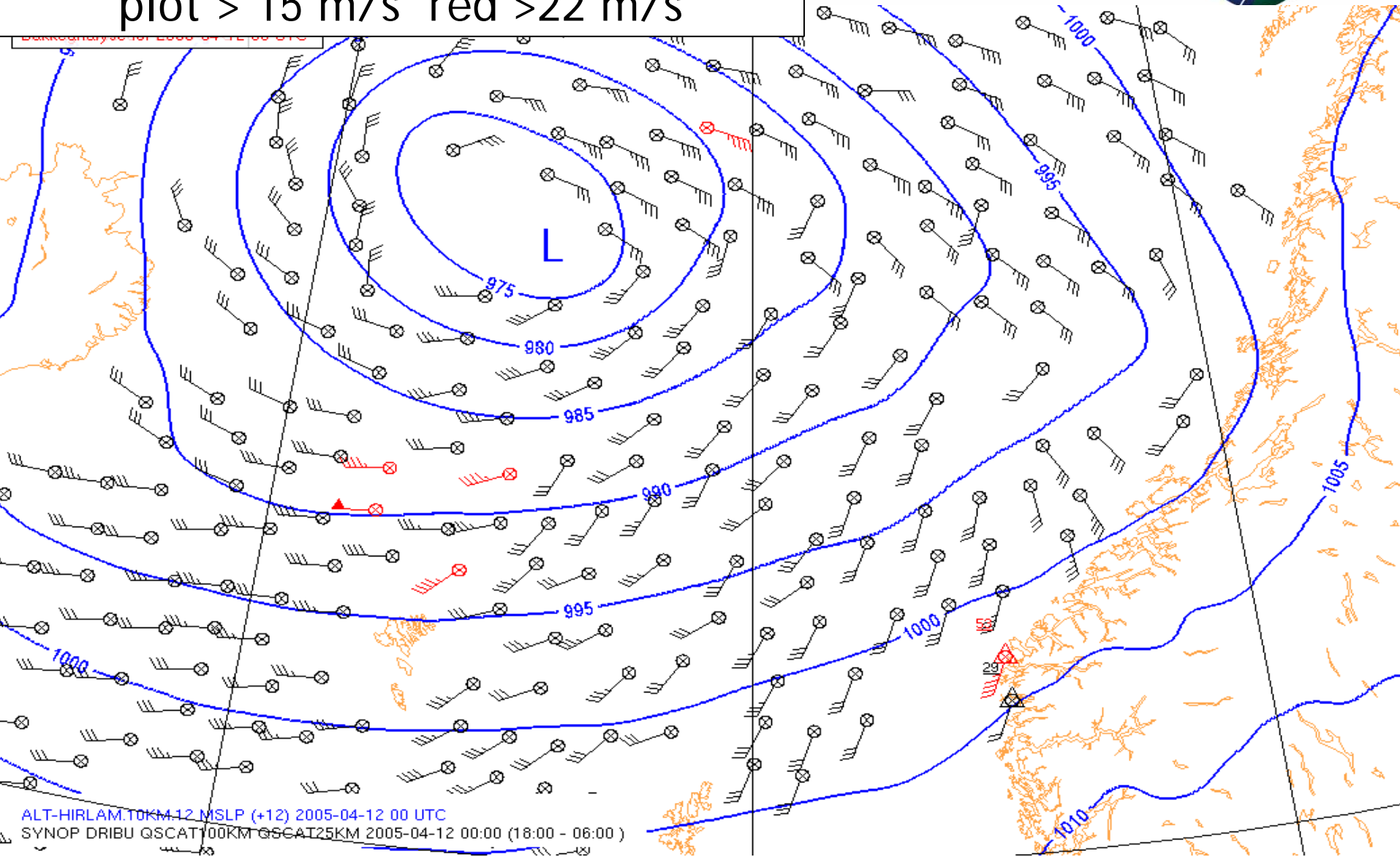
- Flexible user interface
 - suits inexperienced as well as advanced users
- Macros
 - Predefined for specific tasks
 - User defined
- Keyboard shortcuts for all functions
- Batch version - identical code base

Criteria: Precipitation (Plot R>0, Red R>5mm)





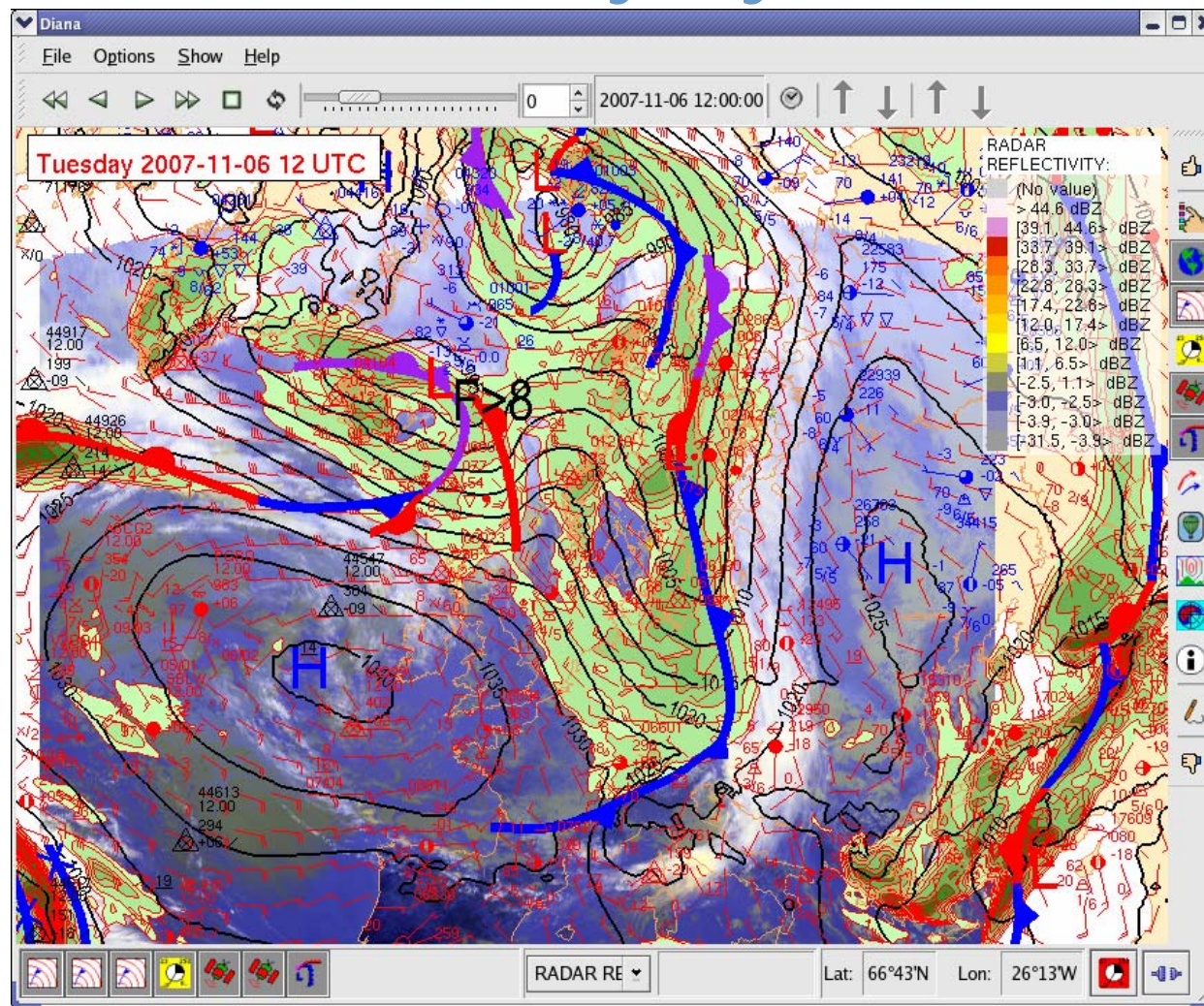
Criteria: Wind
plot > 15 m/s red >22 m/s



ALT-HIRLAM.T0KM.12.MSLP (+12) 2005-04-12 00 UTC
SYNOP DRIBU QSCAT100KM QSCAT25KM 2005-04-12 00:00 (18:00 - 06:00)

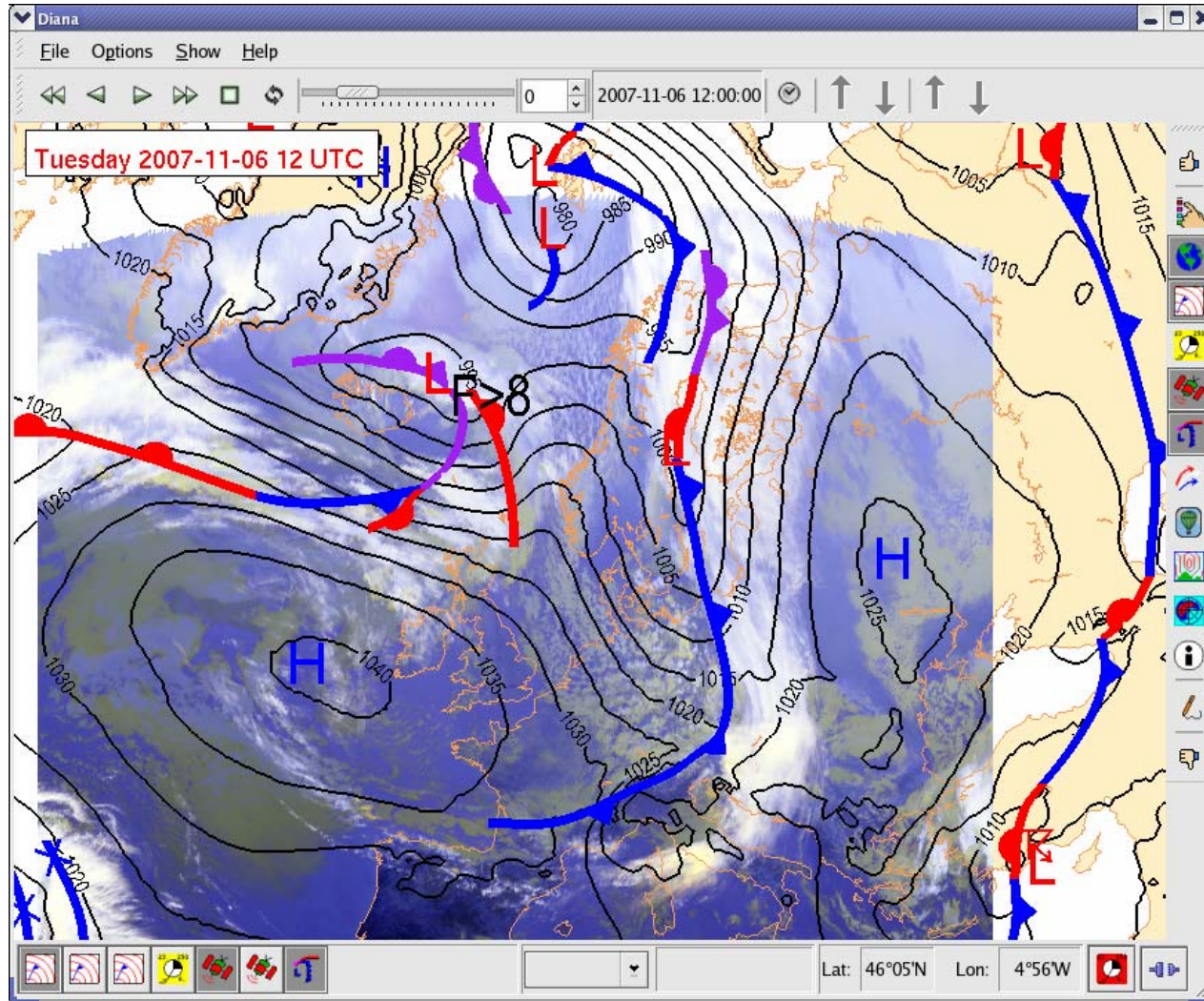


Diana with too many layers





Diana with some layers

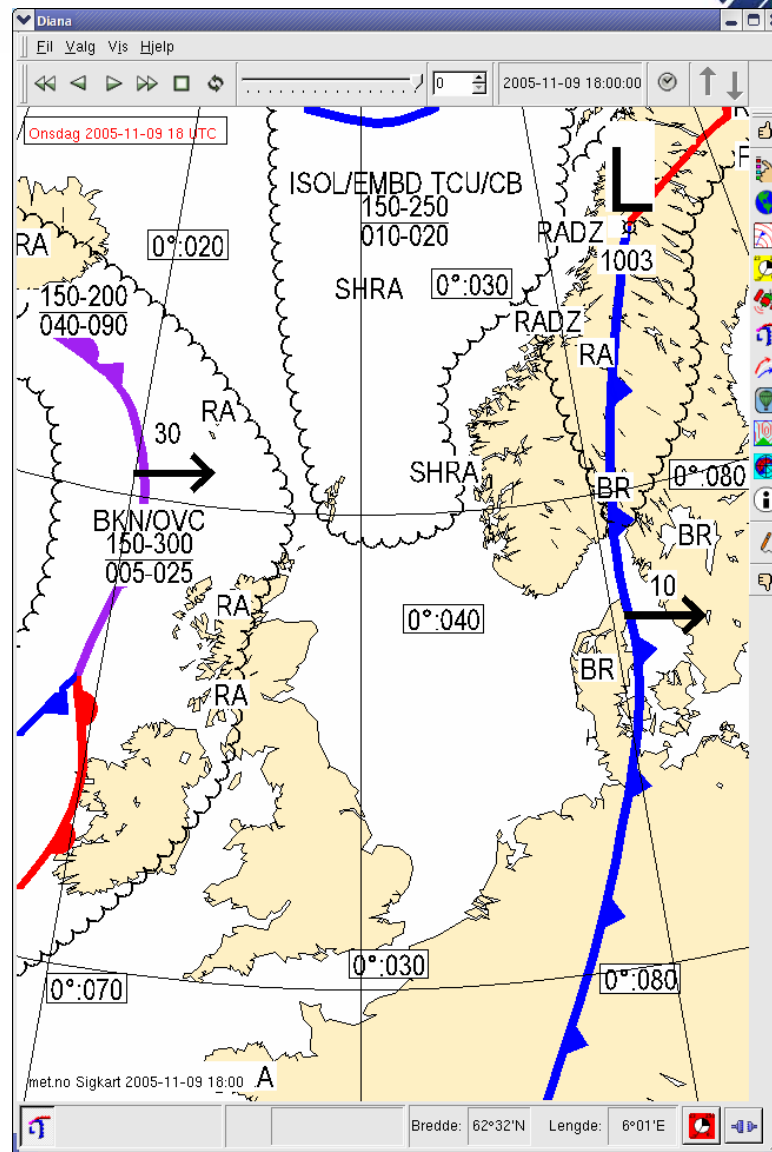




DIANA

Interactive tools

- Field modification
- Drawing of fronts, weather symbols, etc.
- Data visualisation is fully available

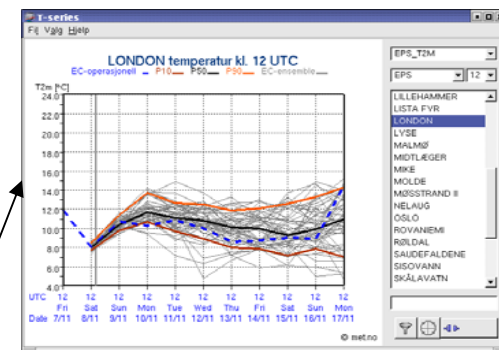
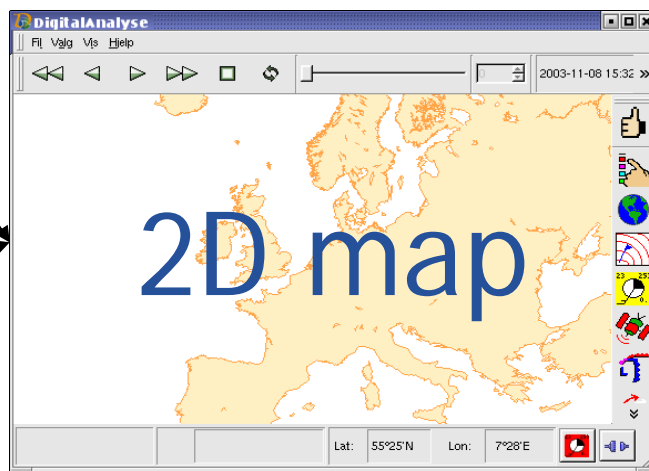
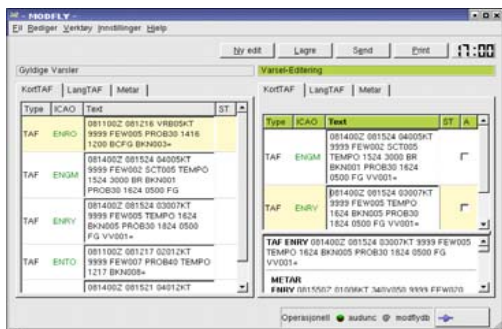




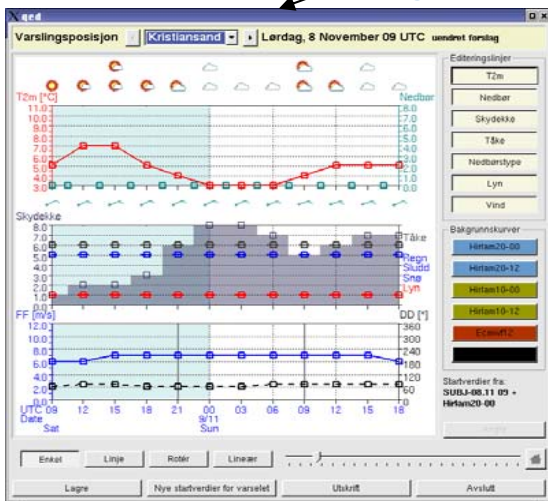
Visualisation model

Time series

Taf monitoring



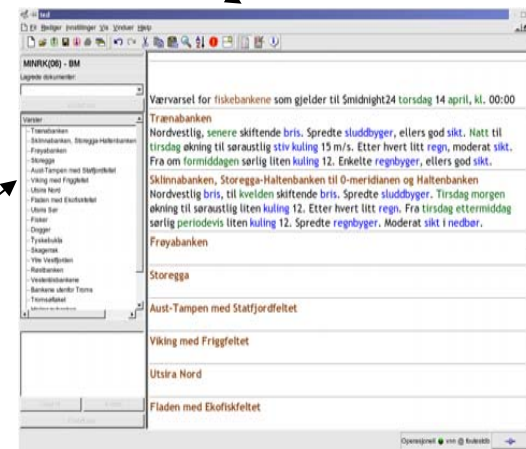
Time series editing



Point verification

Observasjon	DD	FF	TT	BIAS	RMS	MAE
220	1.00	20.6				
Subjektiv kl.12+24	240	3.0	20.6	2.0	7.5	2.7
Hilfam20 kl.00-36	248	2.9	21.0	2.2	7.7	2.6
Hilfam10 kl.00-36	240	3.2	20.7	1.8	7.2	2.4

Text editing





Programming environment

- Linux (Red Hat Fedora Core 5 and Debian sarge)
- C++ (g++)
- Trolltech Qt for GUI and window handling
- Mesa3D OpenGL
- MySQL databases
- A few other open source libraries (fonts etc.)
- Connections between applications by Qt QSocket
- Available under the GPL-license



Still working at:

- Diana available as debian packages
- More standard field formats:
 - NetCDF, GRIB and database



New forecast production system

- Product generation from a gridded database
- Possible to manually correct the database
- Fulfil, and enhance, user needs and demands
- Work as a tool for finding systematic model errors



Human forecaster today

- >80% of time used for end product generation
 - Mainly writing text forecasts
- Not enough time to monitor models
 - sometimes caught off-guard when models are incorrect
- Verification is difficult
 - Hard to compare human and computer forecasts



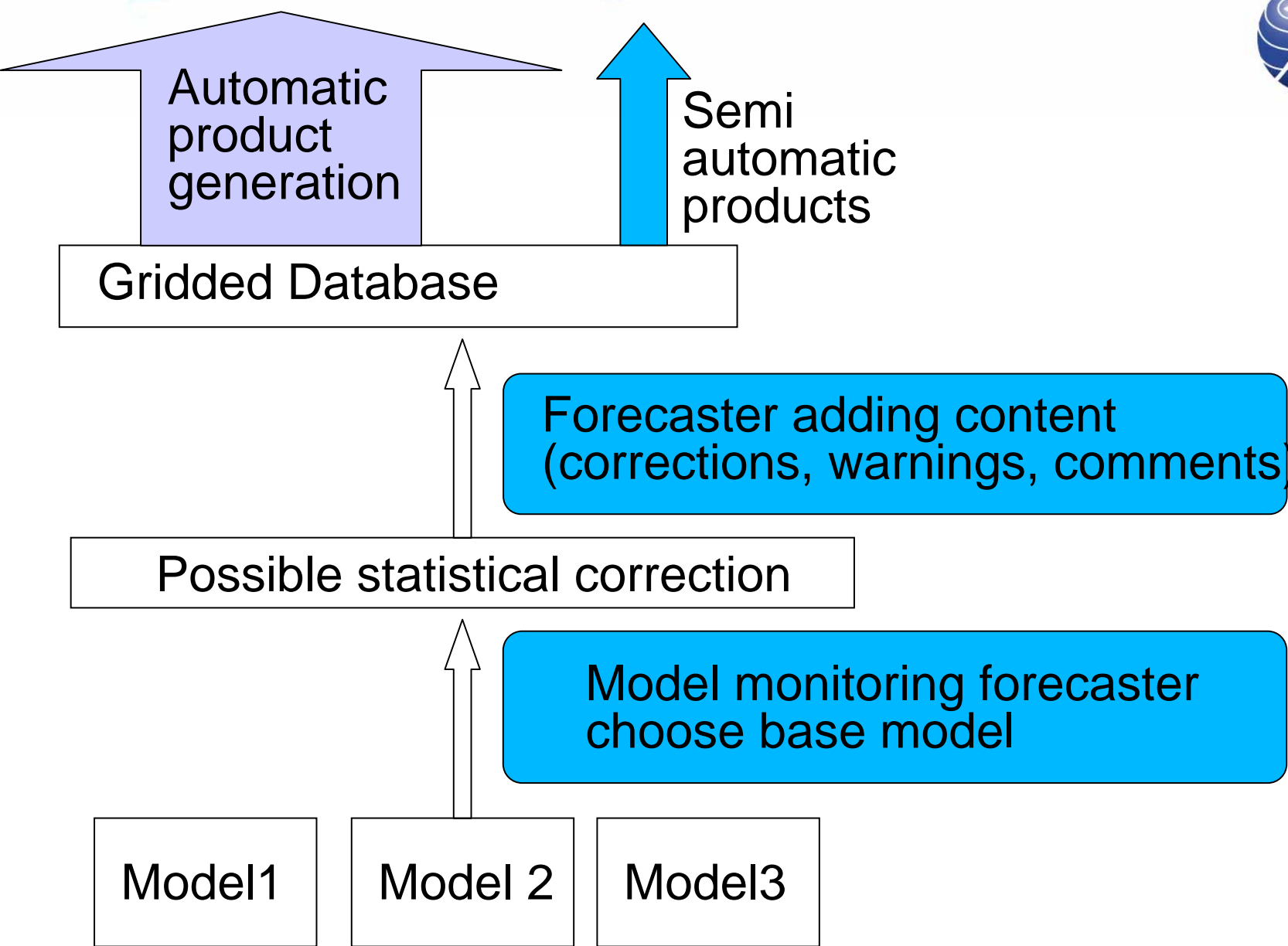
Human forecaster in the future

- Monitor models against observations
- Find sensitive areas in analysis and prognosis
- Choose NWP model
- Determine expected development
- Add warnings, corrections and content to the grid
- Work with “weather” not “text editing”



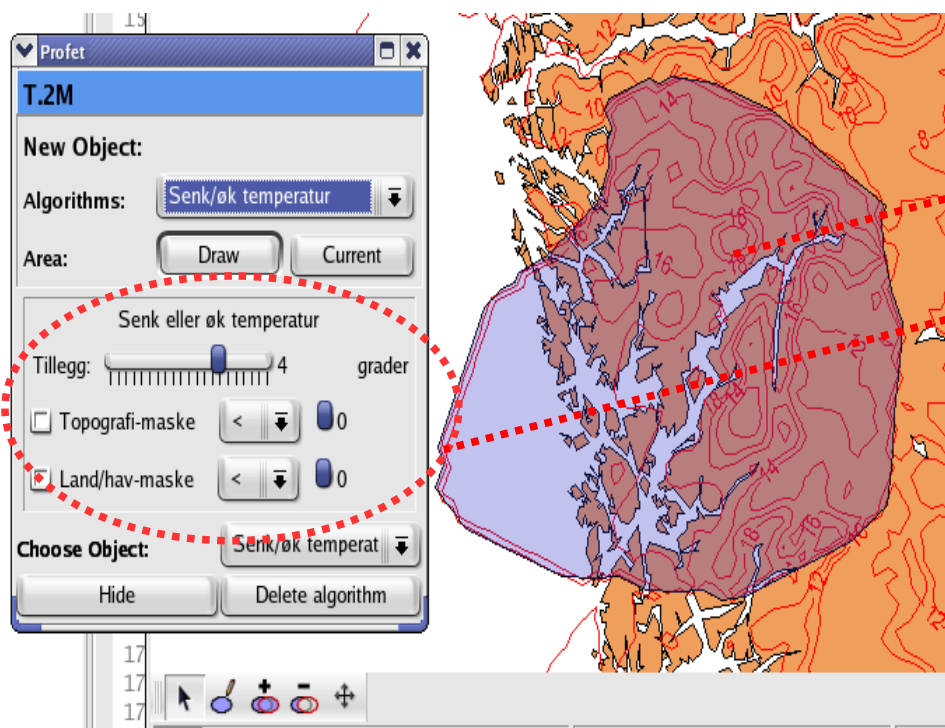
The forecast will be based on:

- High resolution deterministic model
 - to resolve severe weather features in complex topography
- Ensemble prediction system
 - probability forecasts
- Human forecaster
 - compare models
 - find sensitive areas
 - check observation
 - determine risk of severe weather
 - Make corrections when the models are wrong





Field corrections

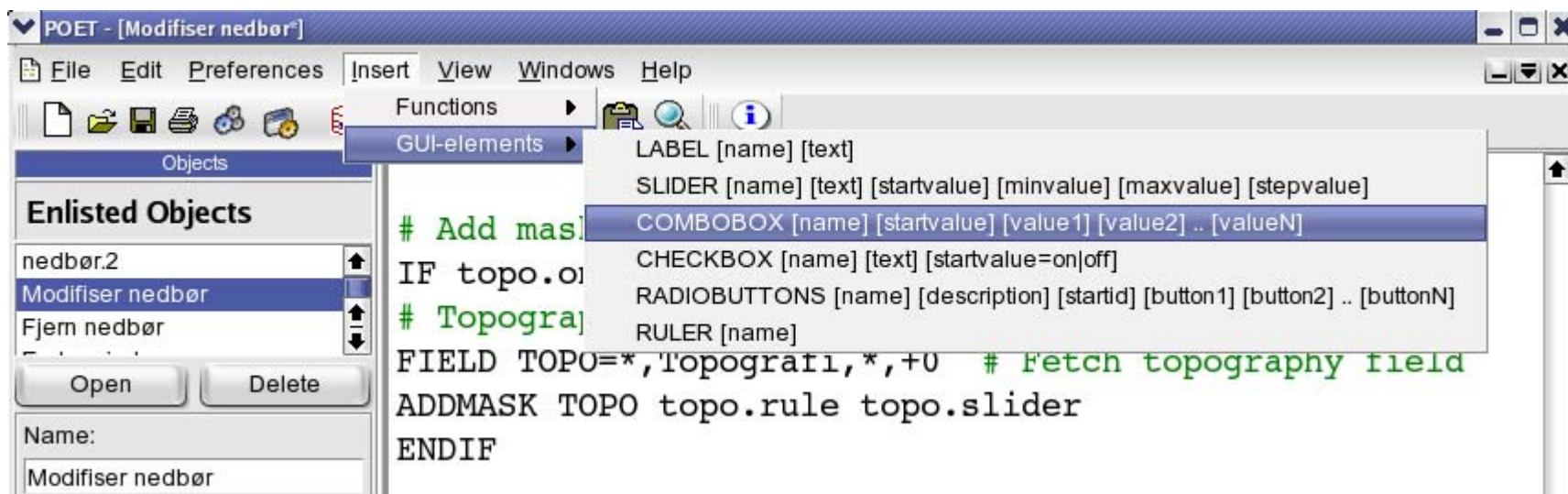


- A part of Diana
- Corrections realized through reusable and traceable entities
 - Selection of affected area
 - Algorithm and GUI defined using script language
- Instant visualization of changes
- Spatial smoothing
- Topographic and land/sea masking
- Interpolation in time



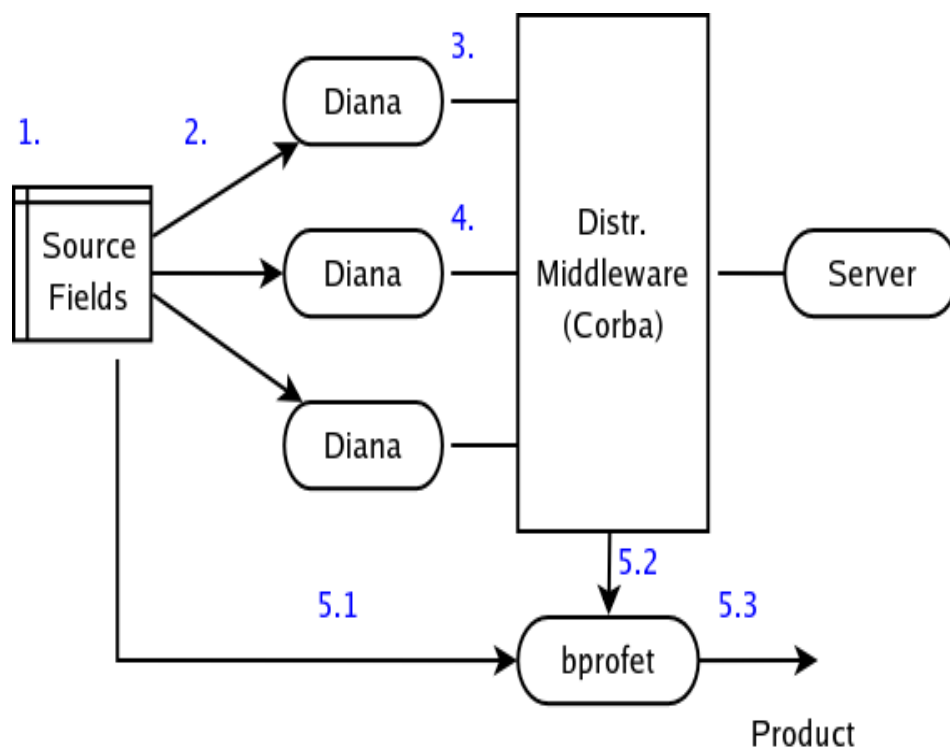
Field Corrections - Script language

- Script language developed for field editing
 - Algorithm defined by calls to methods from a dynamic method library
 - Defining GUI for managing algorithm input data
 - Field data can be accessed in order to define your own masks
 - Script editor developed





The planned forecast production system



1. Select model
2. Load fields in Diana
3. Make corrections
4. Correction approval
5. Product generation
 - 5.1 Load fields
 - 5.2 Apply corrections
 - 5.3 Submit products (fields)



New web site - yr.no

- Weather service for the public; free access
- Joint effort by met.no and NRK
 - (the Norwegian Broadcasting Corporation)
- Forecasts (10 days) and observations
 - text, symbols and graphs
 - advanced (WMS) map clients
 - download as XML
 - Searchable by geographic location

Skriv stadnamn, f.eks. [Stavanger](#), [Røst](#) eller [Beijing](#).

Varsel for Norge

- Østlandet
- Sørlandet
- Vestlandet
- Trøndelag
- Nord-Norge
- Pollenvarsel

Varsel for utlandet

- Europa
- Asia
- Afrika
- Nord- og M-Amerika
- Sør-Amerika
- Oseania

Ekstremværeruka

- Ekstremværeruka 2007
- Regnsjekken
- Værgøy
- Viten
- Klima og natur
- På radio og tv
- Klimabloggen
- Nett-TV

Ekstremværeruka 2006

Radar

- Søraust-Norge
- Sørvest-Norge
- Trøndelag
- Nordland/Troms
- Sør-Norge
- Norden

Sist besøkt	Onsdag	Torsdag	Fredag
Oslo	4°	3°	4°
Gela	14°	17°	18°
Palermo	14°	16°	16°

Andre steder	Onsdag	Torsdag	Fredag
Oslo	4°	3°	4°
Bergen	5°	8°	3°
Stavanger	7°	9°	4°
Trondheim	5°	2°	2°
Tromsø	-1°	-1°	-1°
København	9°	8°	8°
Stockholm	3°	2°	8°
London	12°	12°	8°
New York	9°	7°	9°



VARMEST-KALDAST-VÅTAS

6. november kl 7 til 19	
Jomfruland	8,7
Tynset-Hansmoen	-11,2
Tafjord	10,3 n
6. nov. kl 19 til 7. nov. kl 7	
Lista Fyr	10,5
Suolovuopmi Lulit	-22,9
Nedre Vats	25,6 n

Kva er yr.no?

Meteorologisk institutt og NRK står bak yr.no. Dette er fyrste versjon av tenesta, som vil bli utvida fortløpande.

- HEILE SAKA: [Kva er yr.no?](#)
- [Kontakt og hjelp](#)
- [Dette kommer på yr.no](#)
- [Få gratis værdata](#)

Meteorologi-leksikon

Alt om vær og meteorologi fra A til Å.

- HEILE SAKEN: [Meteorologi-leksikon](#)

Værvarsel i radio og TV

Sjekk ut oversikten over sendetider i radio og TV.

- HEILE SAKEN: [Værvarsel i radio og TV](#)

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 - Ekstremværeruka 2006
- Radar
 - Søraust-Norøe

yr.no > Norway > Oslo > Oslo > Oslo

Last updated at 8:30 AM. Next update is expected at 4:00 PM
 When are the different forecasts updated?

Long term forecast for Oslo

- Overview
- Hour by Hour
- Weekend
- Long term forecast
- Radar
- Advanced Map

The meteorologist's forecast (in Norwegian) for Oslo

Wednesday and Thursday: Nordvestlig bris. For det meste pent vær. Torsdag sørvestlig bris. Tiltykning til regn.

Friday to Wednesday: Fredag nordlig frisk bris utsatte steder. Lettskyet oppholdsvær. Lørdag nordvestlig bris. Stort sett pent vær. Kjøligere. Søndag nordlig frisk bris utsatte steder. Lite eller ingen nedbør. Senere for det meste bris av skiftende retning og forbigående stort sett oppholdsvær. Omtrent uendrede temperaturforhold.

			Tomorrow 08.11.2007	Friday 09.11.2007	Saturday 10.11.2007	Sunday 11.11.2007
			3°	4°	3°	2°
			Rain. Gentle breeze, 4.3 m/s from south.	Cloudy. Fresh breeze, 10.3 m/s from north.	Sun. Gentle breeze, 4.9 m/s from northwest.	Sun. Gentle breeze, 3.8 m/s from north-northwest.
Monday 12.11.2007	Tuesday 13.11.2007	Wednesday 14.11.2007	Thursday 15.11.2007	Friday 16.11.2007		
4°	0°	2°	0°	-1°		
Sun. Moderate breeze, 5.9 m/s from north-northwest.	Snow. Light air, 1.4 m/s from southeast.	Heavy rain. Fresh breeze, 8.6 m/s from east-northeast.	Snow. Moderate breeze, 6.7 m/s from northeast.	Snow. Moderate breeze, 5.7 m/s from northeast.		

The forecast shows the expected weather for the afternoon hours.

The 10 day forecast is based on weather data from the European Weather Center (ECMWF). The forecasts are very accurate the first days, but become less reliable further into the period. The forecast is updated twice daily. Read more about the forecasts (in Norwegian).

yr.no > Norway > Oslo > Oslo > Oslo

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When are the different forecasts updated

Weather map for Oslo

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Radar

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- Sørvest-Norge
- Trøndelag
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- Norden
- På met.no**

Tekstvarsel

- Overview
- Hour by Hour
- Weekend
- Long term forecast
- Radar
- Advanced Map**

Tidspunkt

Help (in Norwegian)

Europe

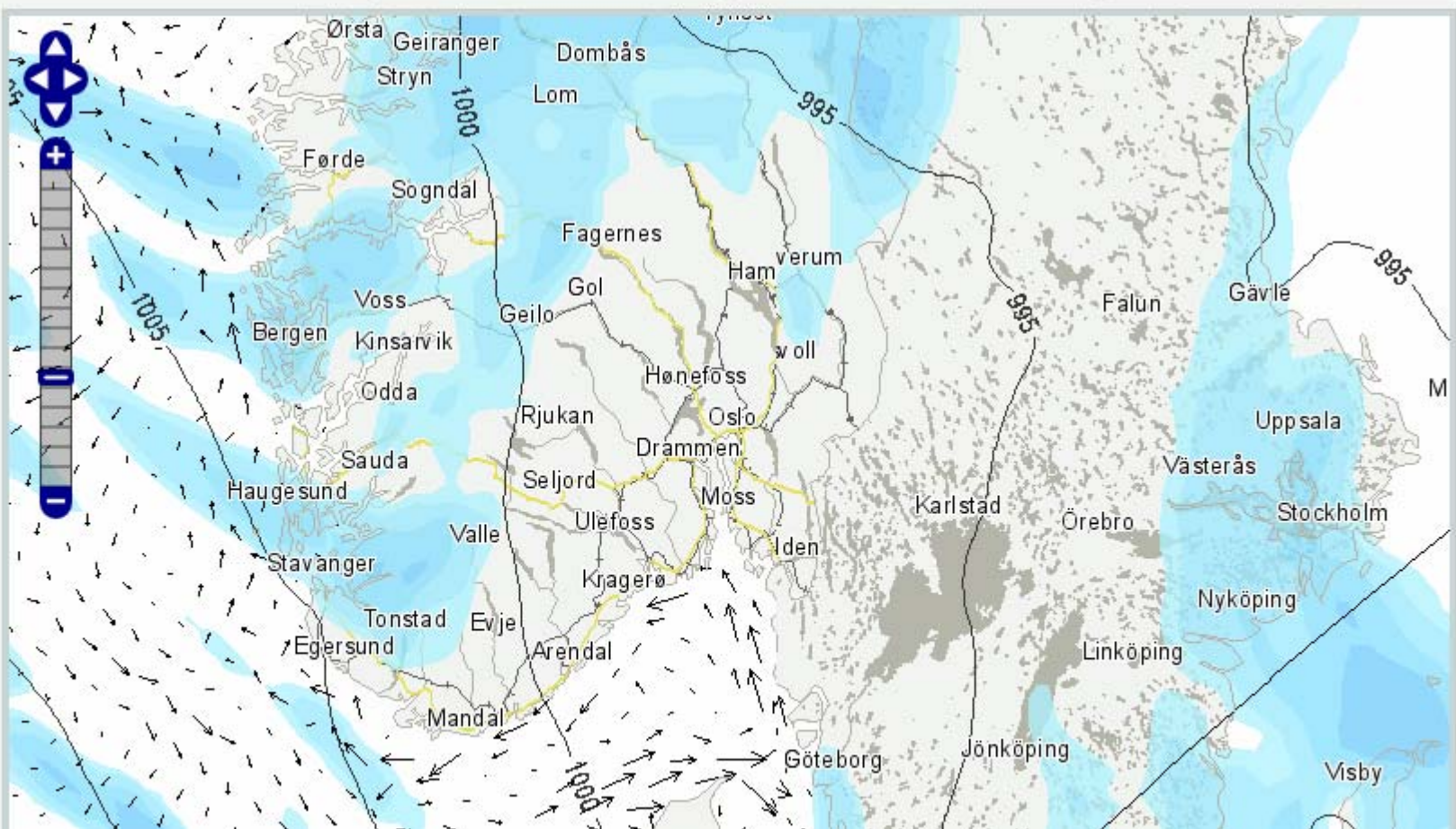
<input checked="" type="checkbox"/> Precip. 1h	<input checked="" type="checkbox"/> Pressure
<input type="checkbox"/> Precip. 3h	<input type="checkbox"/> Wind
<input type="checkbox"/> Precip. 24h	<input type="checkbox"/> Temp.

Rest of world

<input type="checkbox"/> Precip. 3h	<input type="checkbox"/> Pressure
<input type="checkbox"/> Precip. 6h	<input type="checkbox"/> Wind
<input type="checkbox"/> Precip. 24h	<input type="checkbox"/> Temp.

Sea (Northern Europe)

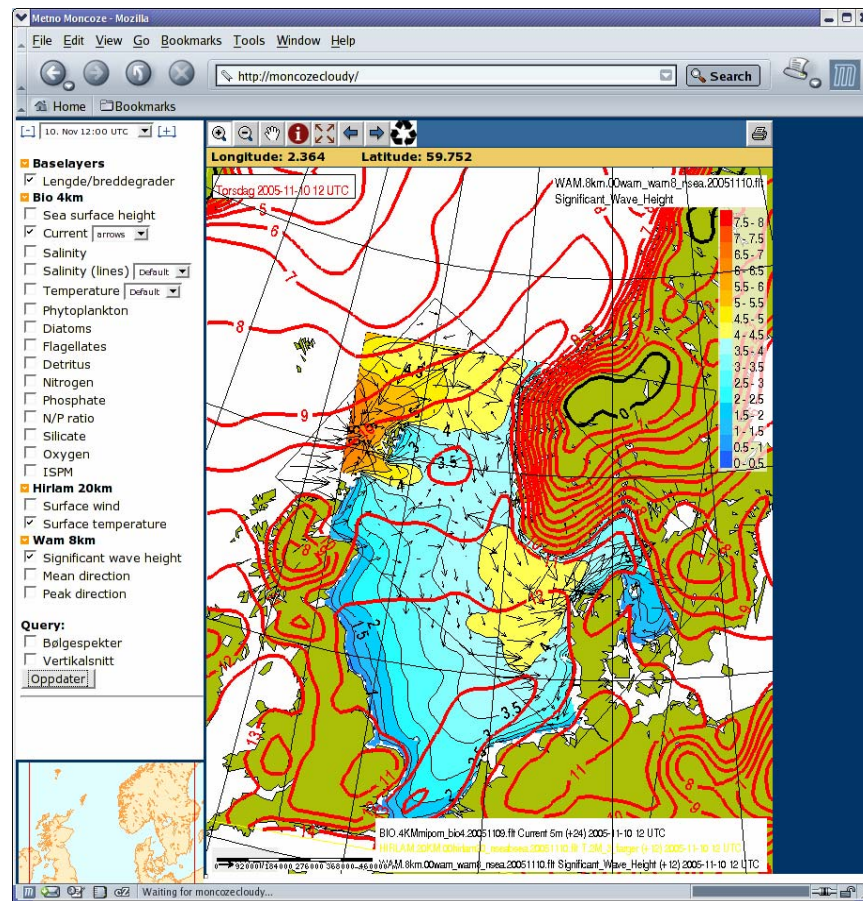
<input type="checkbox"/> Sea temperature
<input checked="" type="checkbox"/> Sea currents
<input type="checkbox"/> Wave height and direction





Web Map Service

- A standard for showing maps in a web browser
- Defined by Open Geospatial Consortium (OGC)
- Maps can be requested from different servers
- Clients can build customized maps





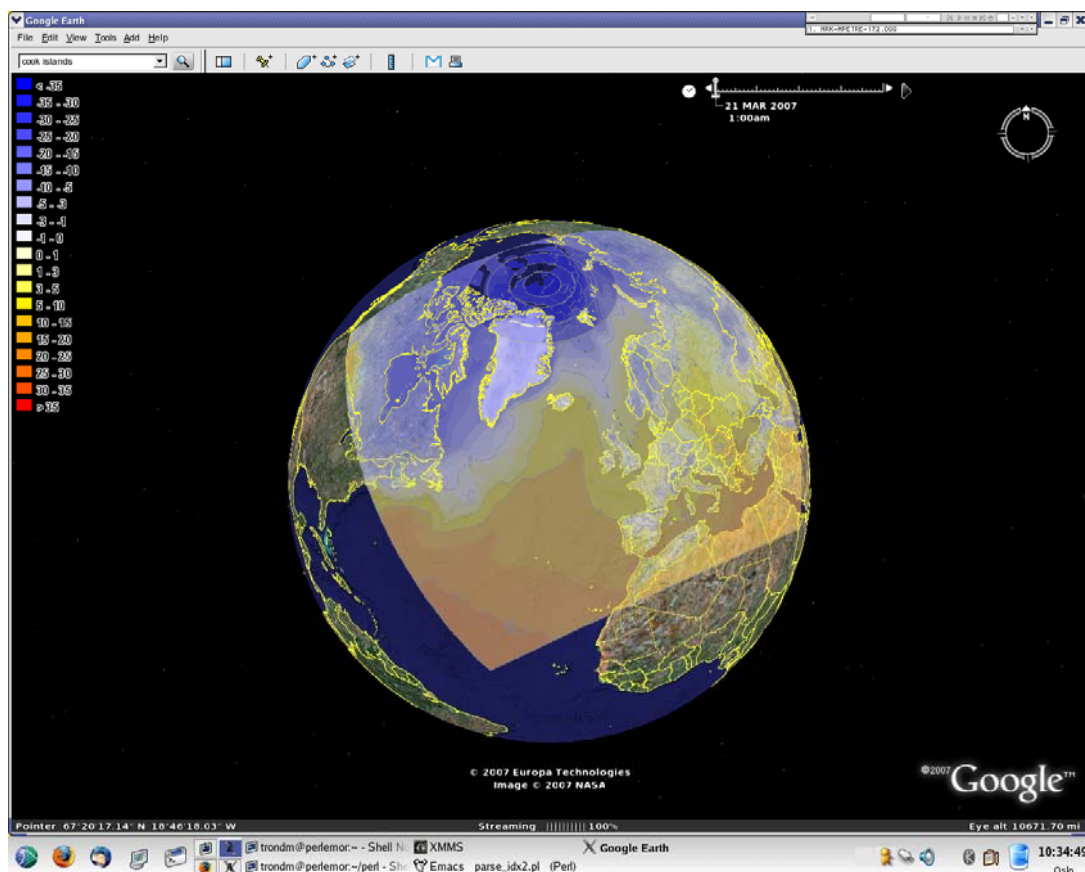
Web Map Services

- WMS-diana
 - CGI-wrapper for batch-Diana
 - Receives WMS-request
 - Generates input-file for batch-diana
 - Batch-diana creates image
 - WMS-Diana returns image to client
- Diana makes new plots when zooming or panning the map
- Full support of every format Diana supports



Web Map Services

WMS-layers from diana can be exported to KML for use in Google Earth (with time-support)





Download Diana?

- Available under the GPL-license
- Available from
<http://www.met.no/diana/>
<https://svn.met.no/>

Questions:

E-mail: diana@met.no



Summary

- Diana available under the GPL-license
- New forecast production system
 - Based on manually corrected gridded database
- yr.no
 - Weather forecasts to the public