DEUTSCHER WETTERDIENST

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MeteoSwiss

Meteorological Service of Canada
Service météorologique du Canada

The Meteorological Workstation NinJo and its Production Tools

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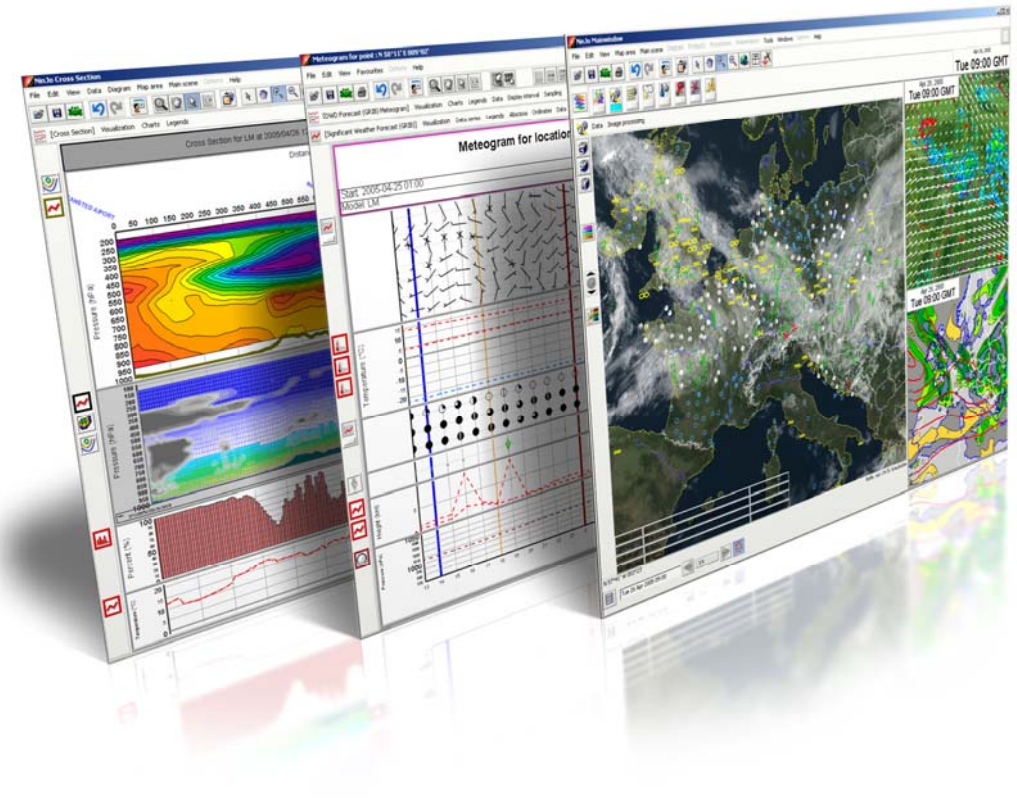
Overview

- Introduction and Goals of NinJo
- NinJo Client Layers and Applications
- NinJo Production Tools
- Current Status and Future Planning

The Meteorological Workstation NinJo



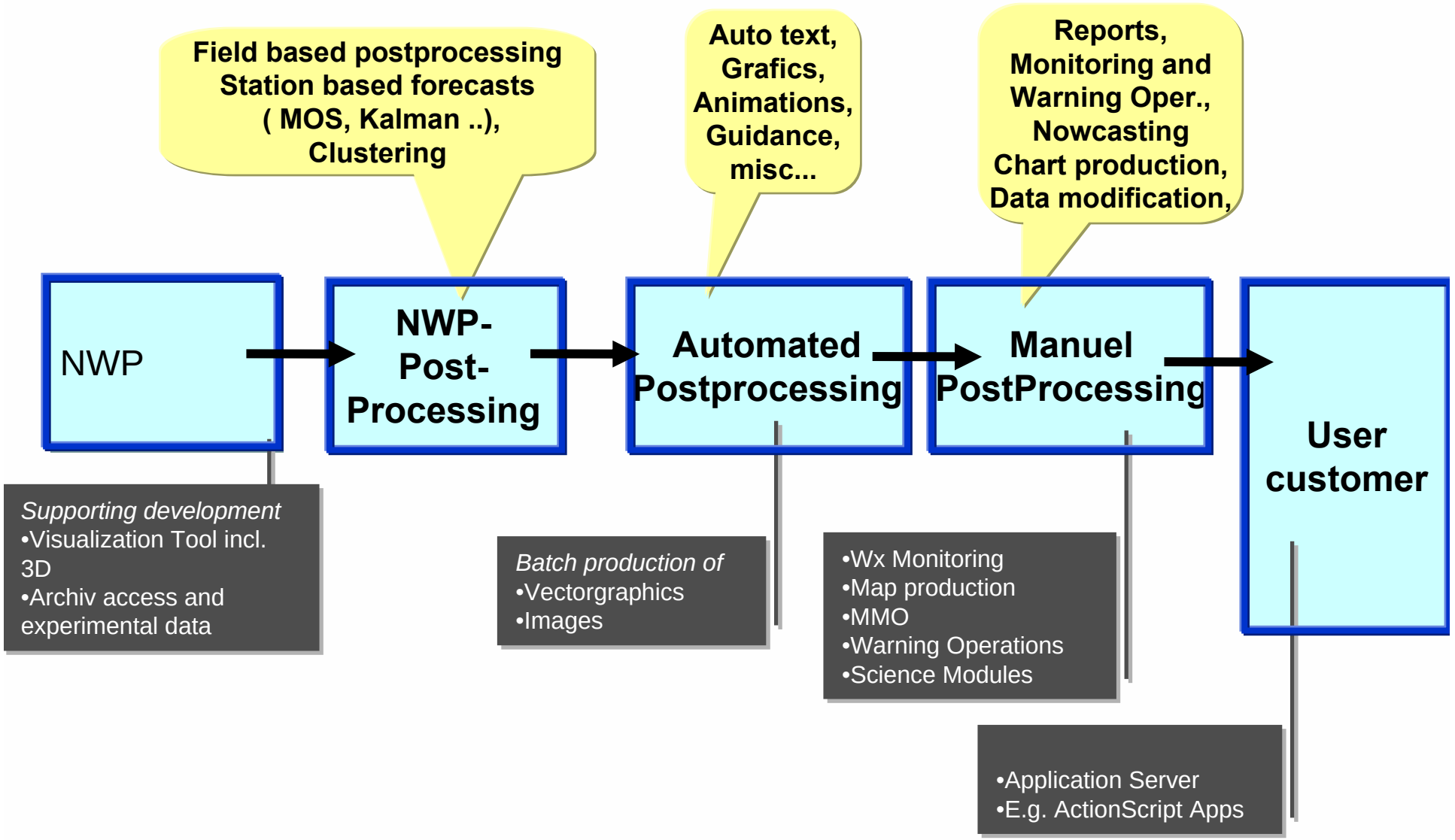
NinJo
Workstation Project
Projet de poste de travail

- Joint project between Weather Services from Germany, Switzerland, Denmark, Canada, and German Military Service
- Replacement of several older workstation systems
- Provide a unified environment to support the entire meteorological process

Meteorological Goals

- **Support the entire forecast and warning process**
  - Interactive visualization of all meteorological data
  - Interactive product generation
  - Batch production
  - Automatic weather monitoring and alerting using observational, nowcasting, and model data; warning management
- **Support other workflows** (lower priority)
  - Research department
  - Meteorological training
- **Access to standard infrastructure (archives)**

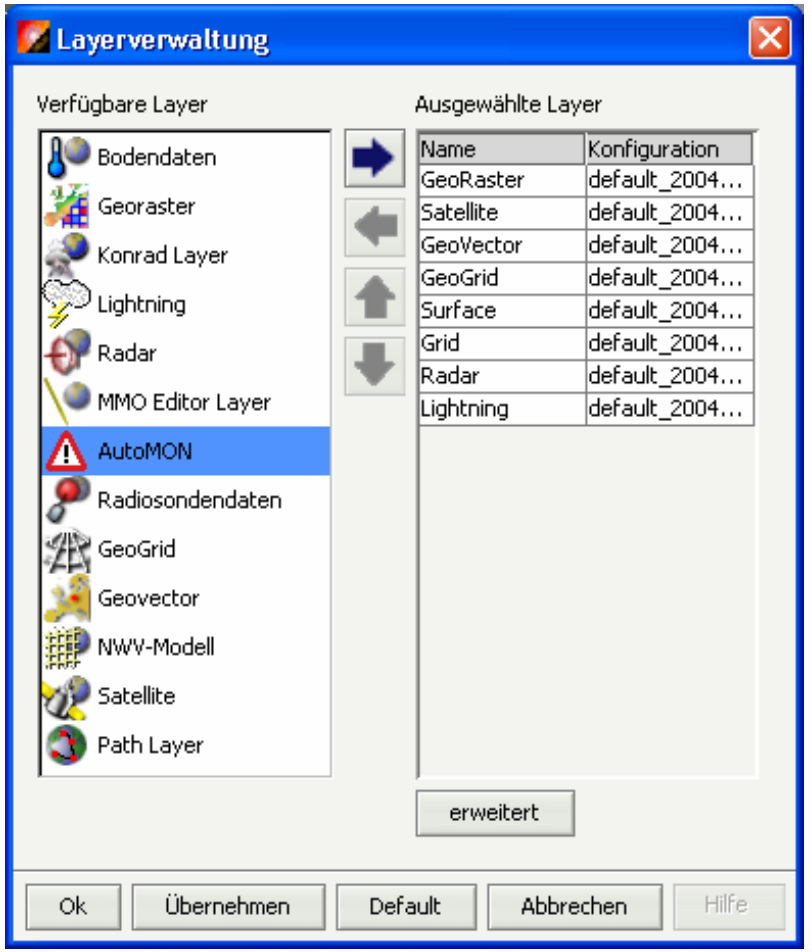
Support of the Entire Forecasting Process



What is NinJo?

- **A building kit in order to assemble applications**
  - ranging from satellite viewers to full workstations
- **A flexible programming model**
  - to allow partners to develop their own application
- **A highly configurable tool**
  - Partners build their “own” NinJo

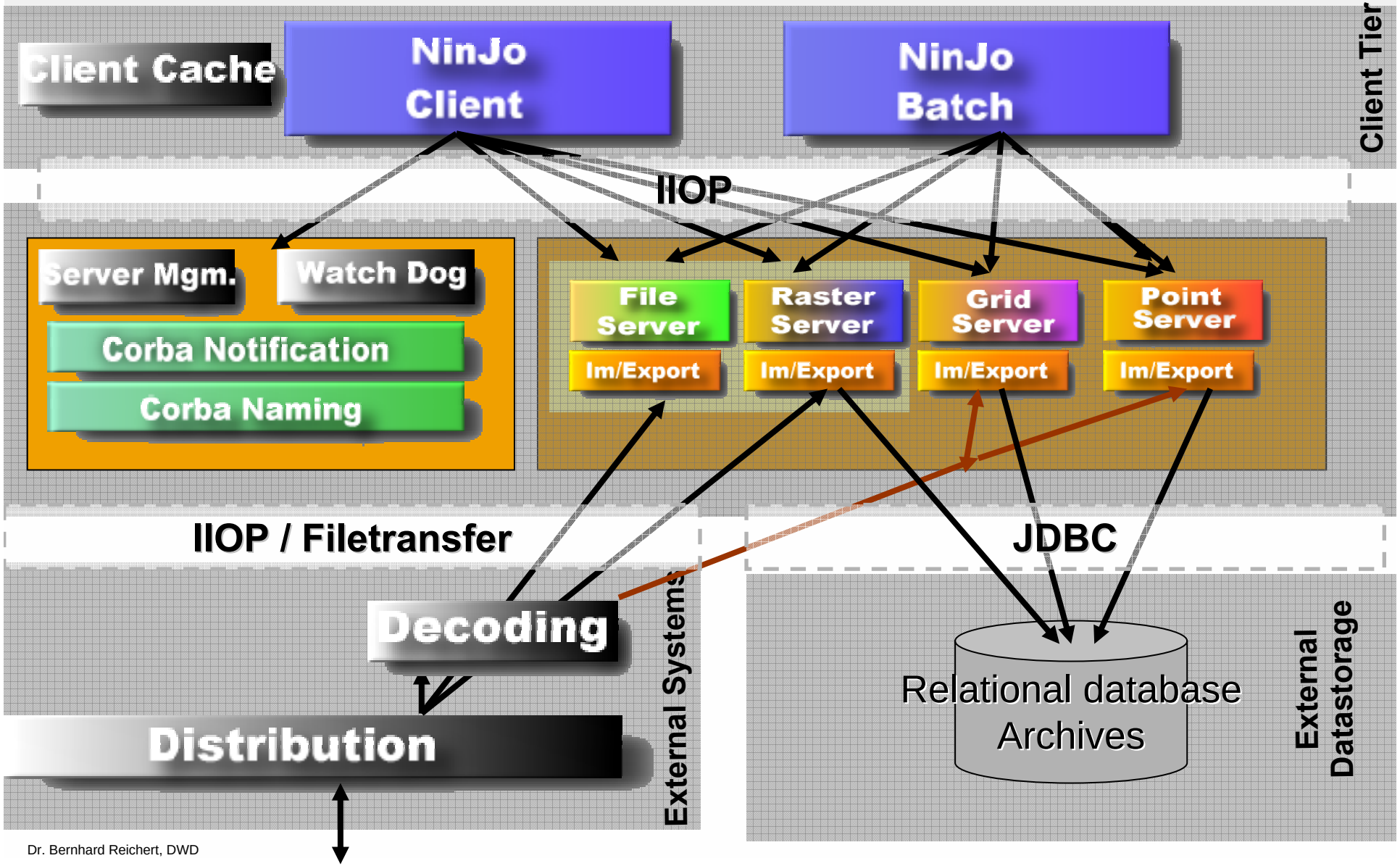
⇨ **A generic Meteorological Workstation**



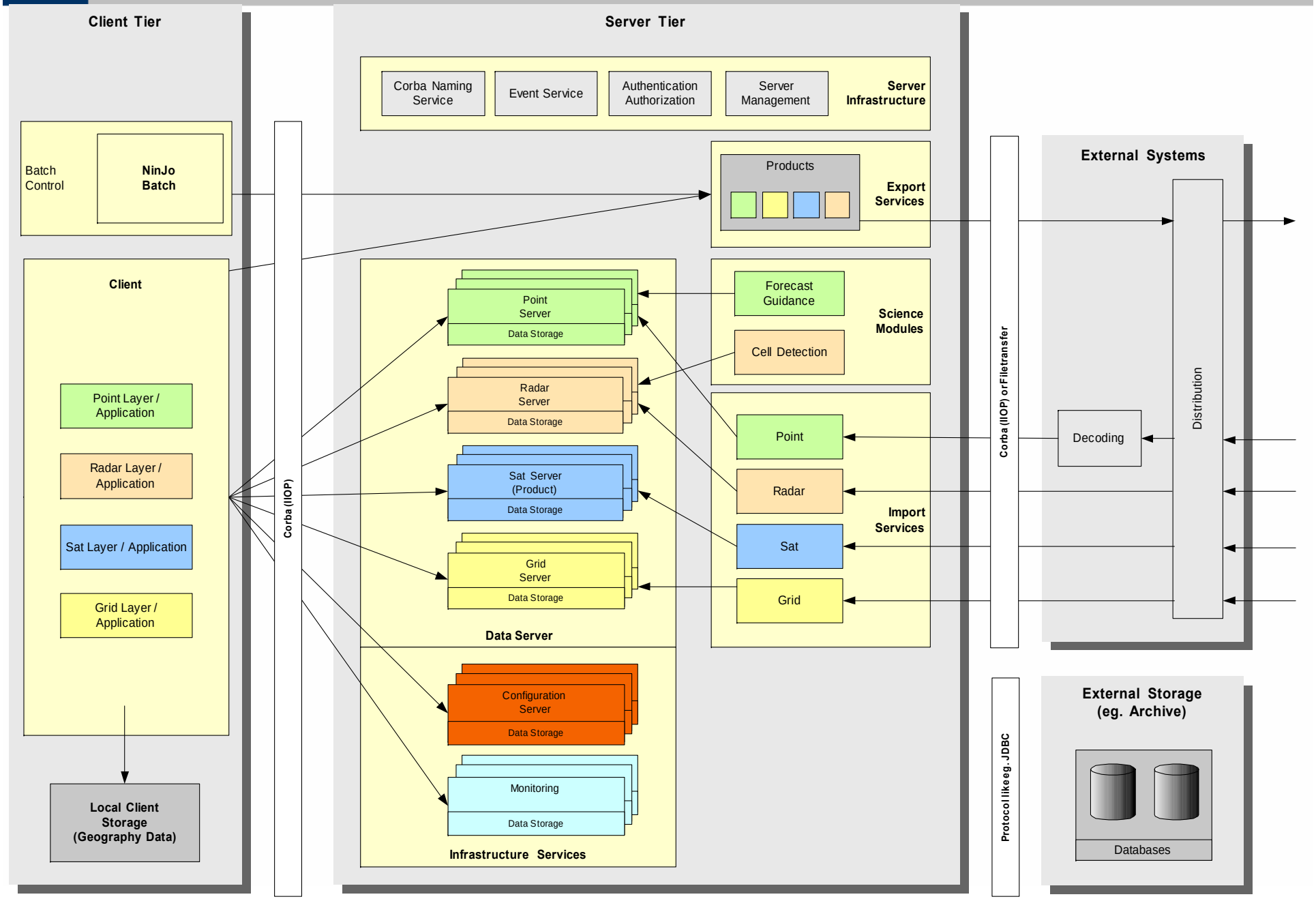
Architecture

- **The architecture of NinJo is open and portable**
- **It's written completely in Java**
- **It can be adopted easily to the needs of organizations involved**
  - **different hardware and OS-infrastructure**
  - **different configuration of clients**
  - **different primary data storage mechanisms: files or database**
  - **different data supply and backend systems**
  - **different communication and middleware infrastructures**
- **It can be easily extended**
  - **new data types**
  - **new storage types (data sources)**

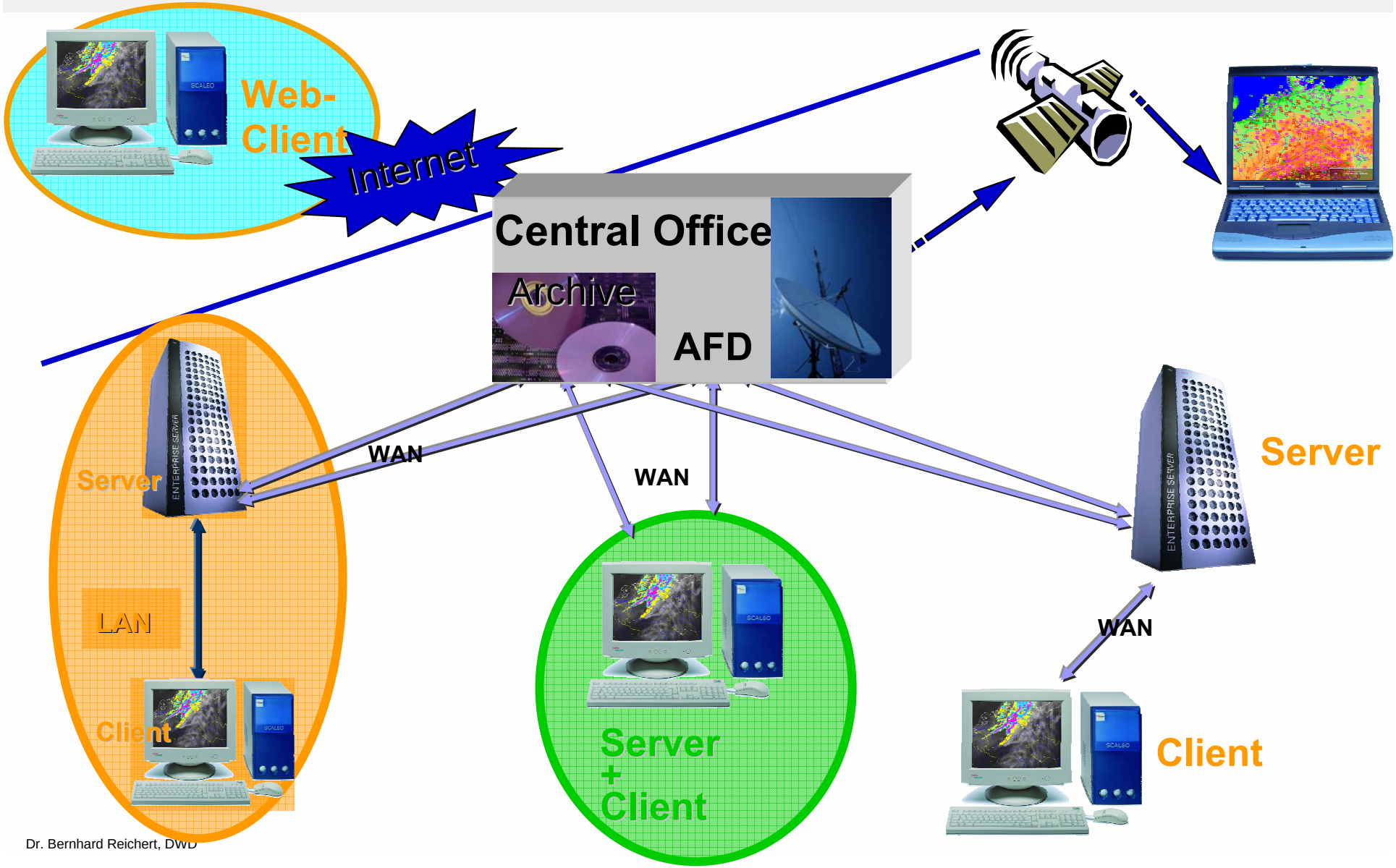
Architecture: The NinJo Tiers



NinJo Architecture

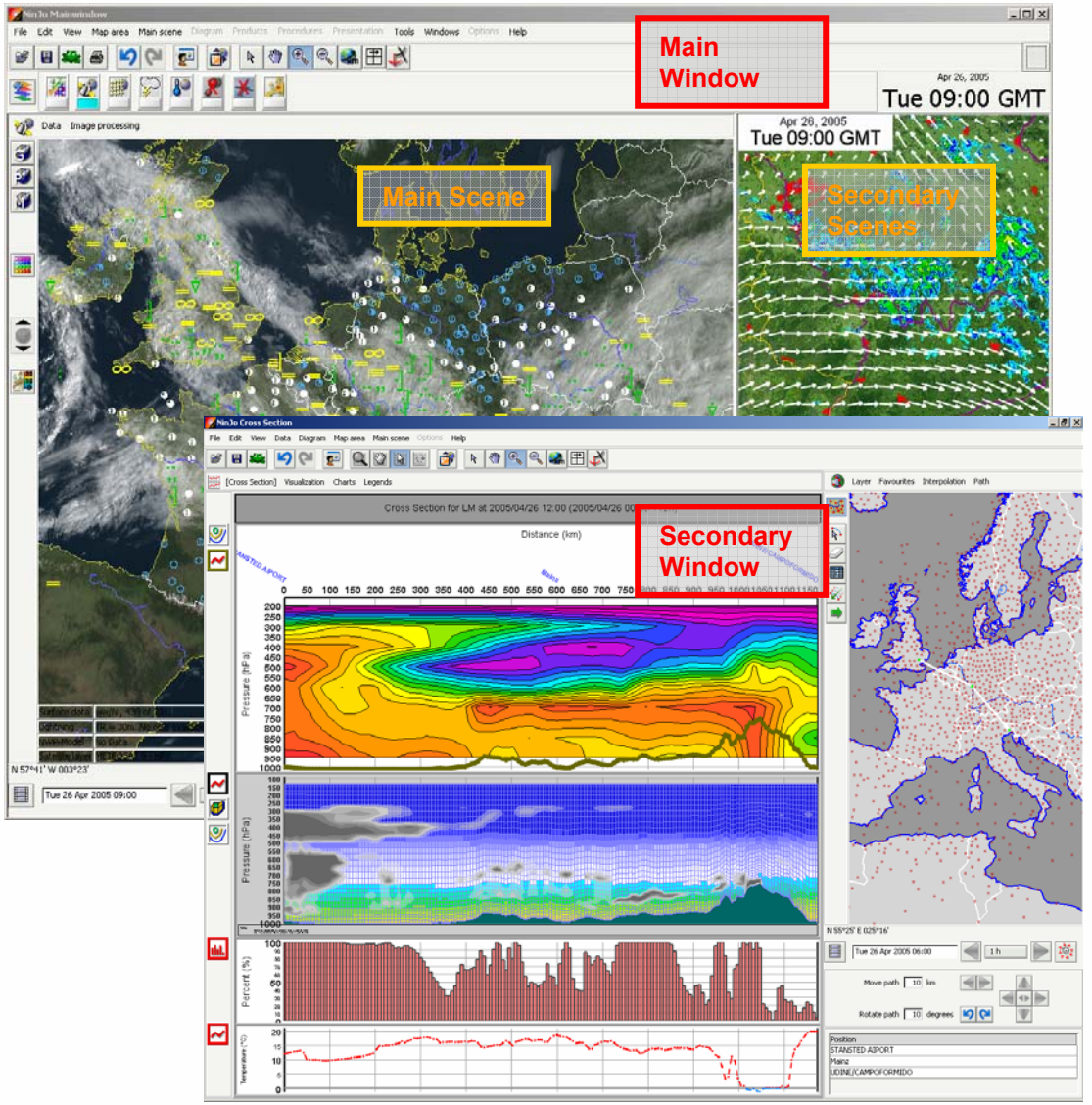


NinJo Communication

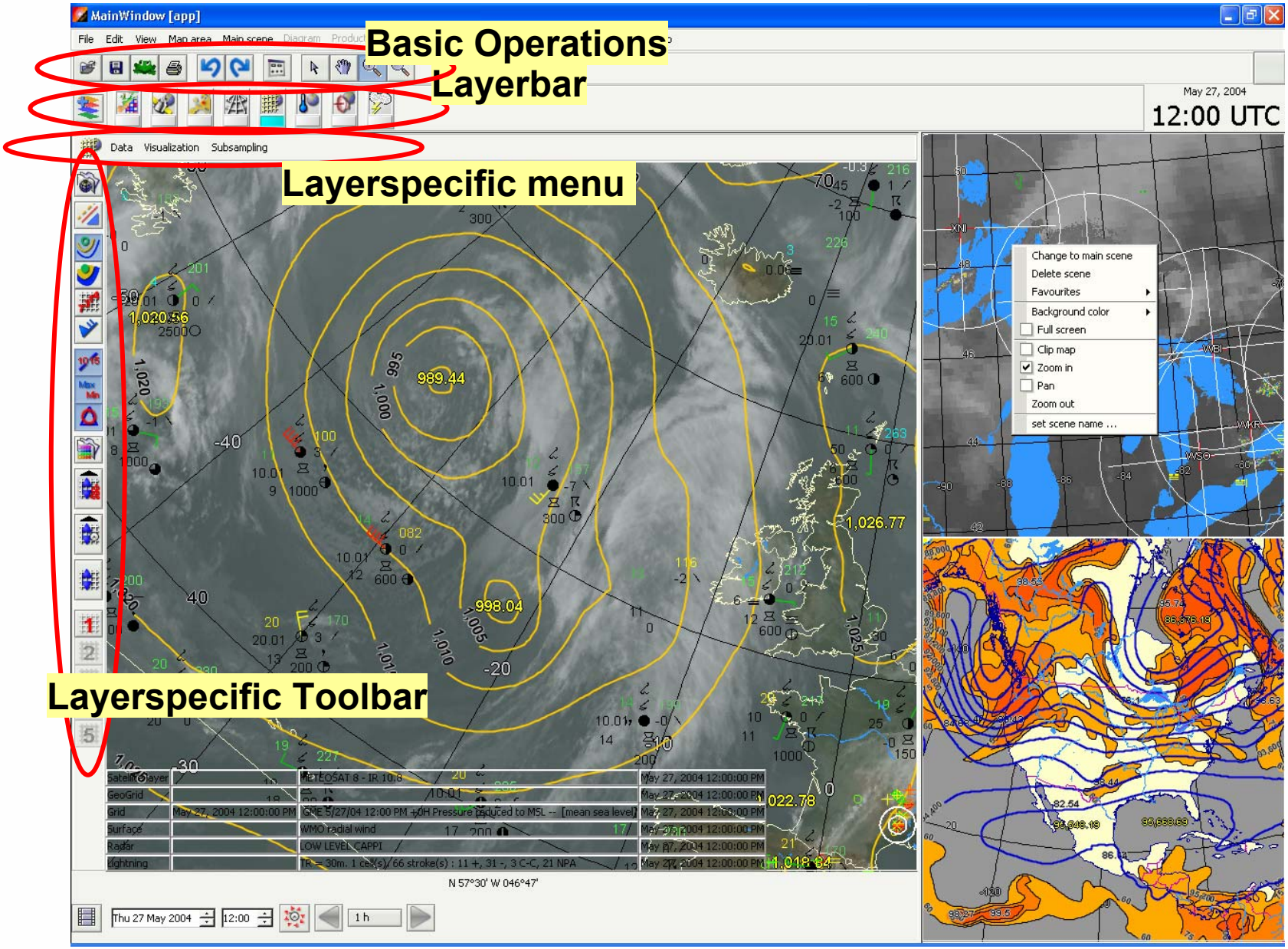


The NinJo Client

- **Main Window**
  - One main scene and up to three secondary scenes
- **Several secondary Windows**
  - mostly specialized applications
  - e.g. Meteograms, Cross-Sections, Aerological Diagrams, 3D ...
- **Basic Functionality**
  - Geographical visualization of data with panning and zooming
  - Overlaying of different layers
  - Animation, automatic update
  - Context menus

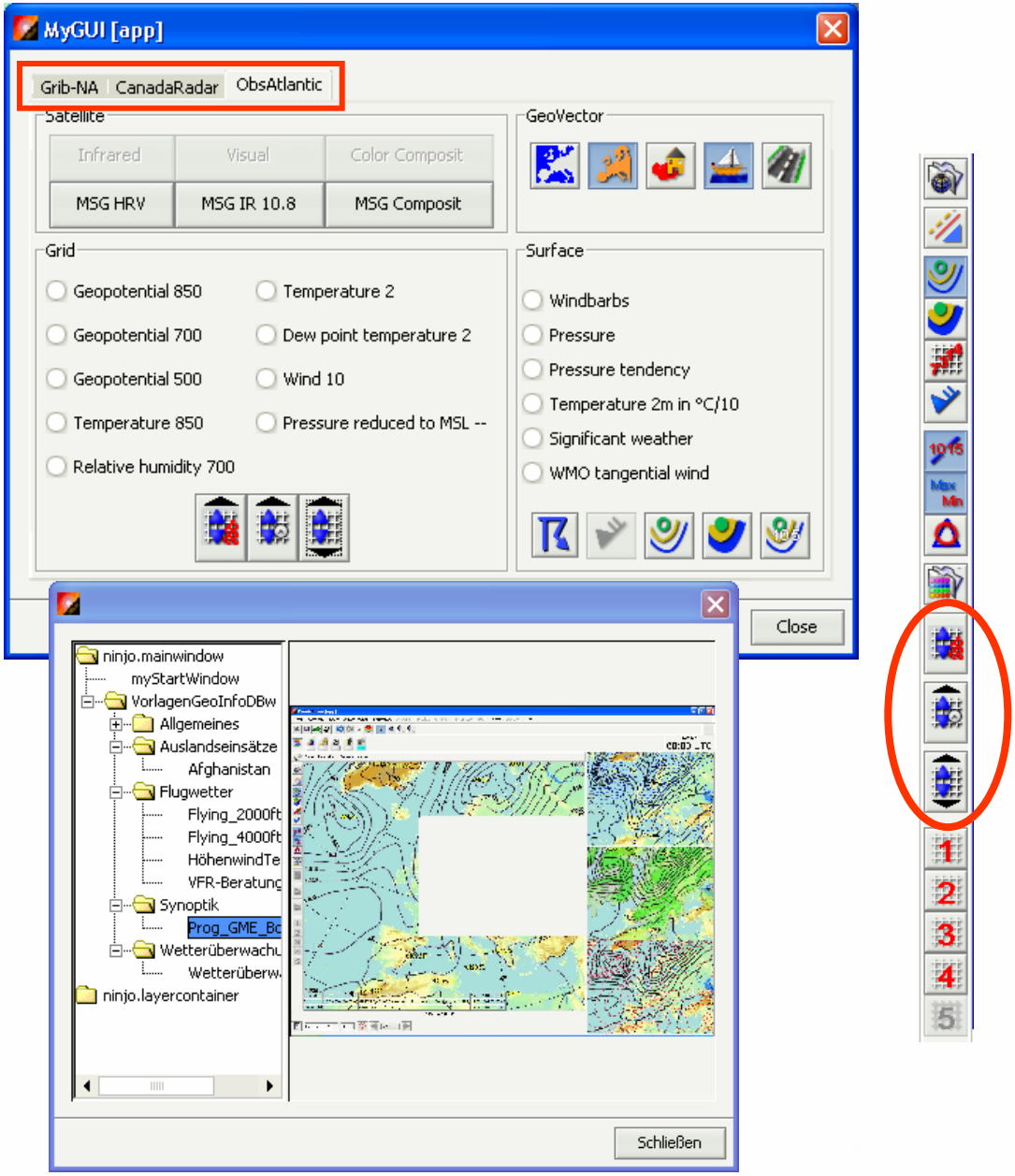


Introduction and Goals of NinJo: Basic Functionality



Introduction and Goals of NinJo: Basic Functionality

- **myGUI**
  - **Every layer provides a panel with most important use cases**
- **Favorites**
  - **workspace**
  - **scenes**
  - **animations and diagrams later**
- **Spinner Buttons**



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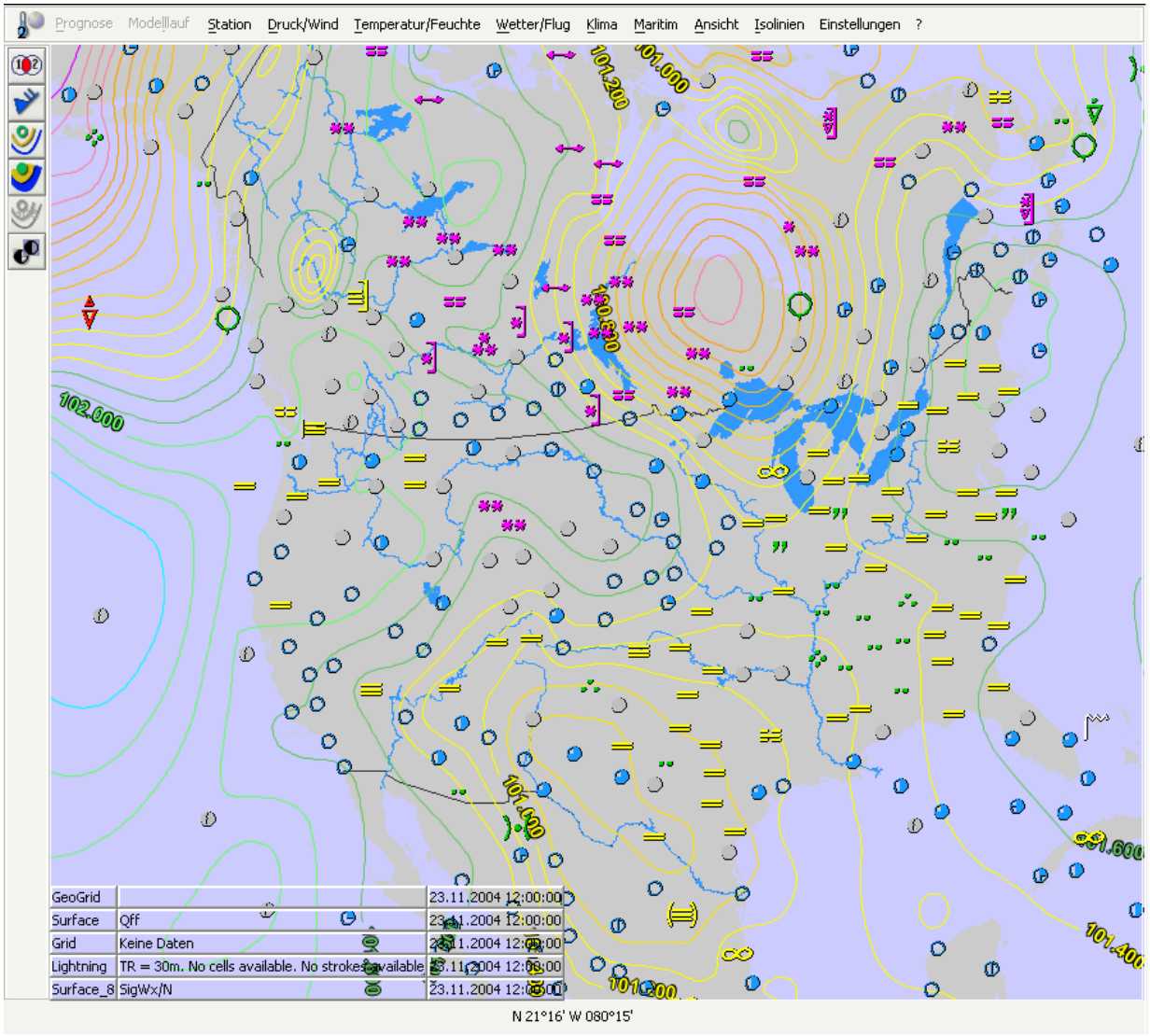
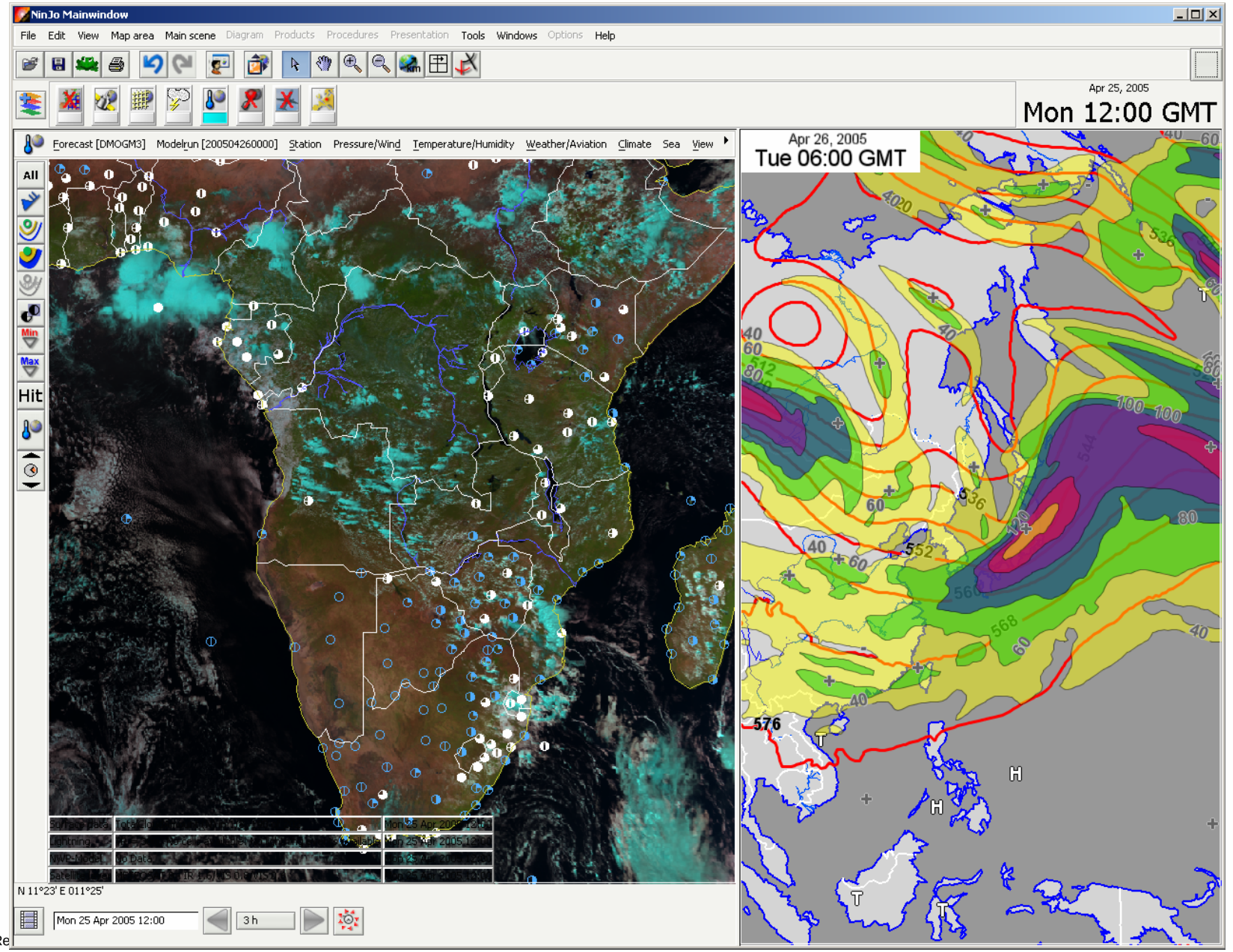
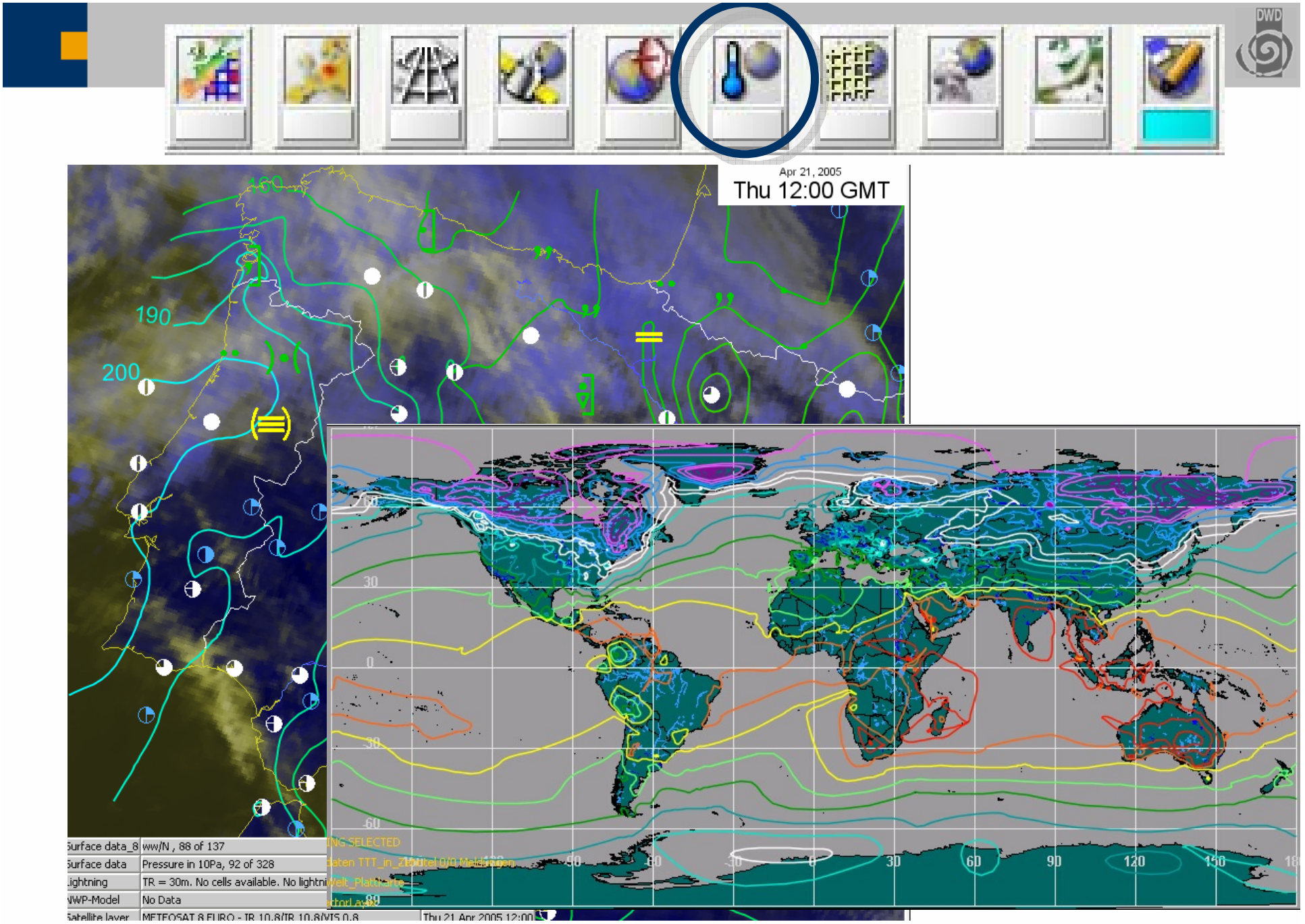
Surface Layer

- Displays surface observations
- analysis based on triangulation
  - Won‘t miss extremes
- Sorting algorithms
  - Min/Max only
  - rating
  - Later: formula support
  - Hit lists
- Original bulletin (left clicking on Station)



Surface Layer





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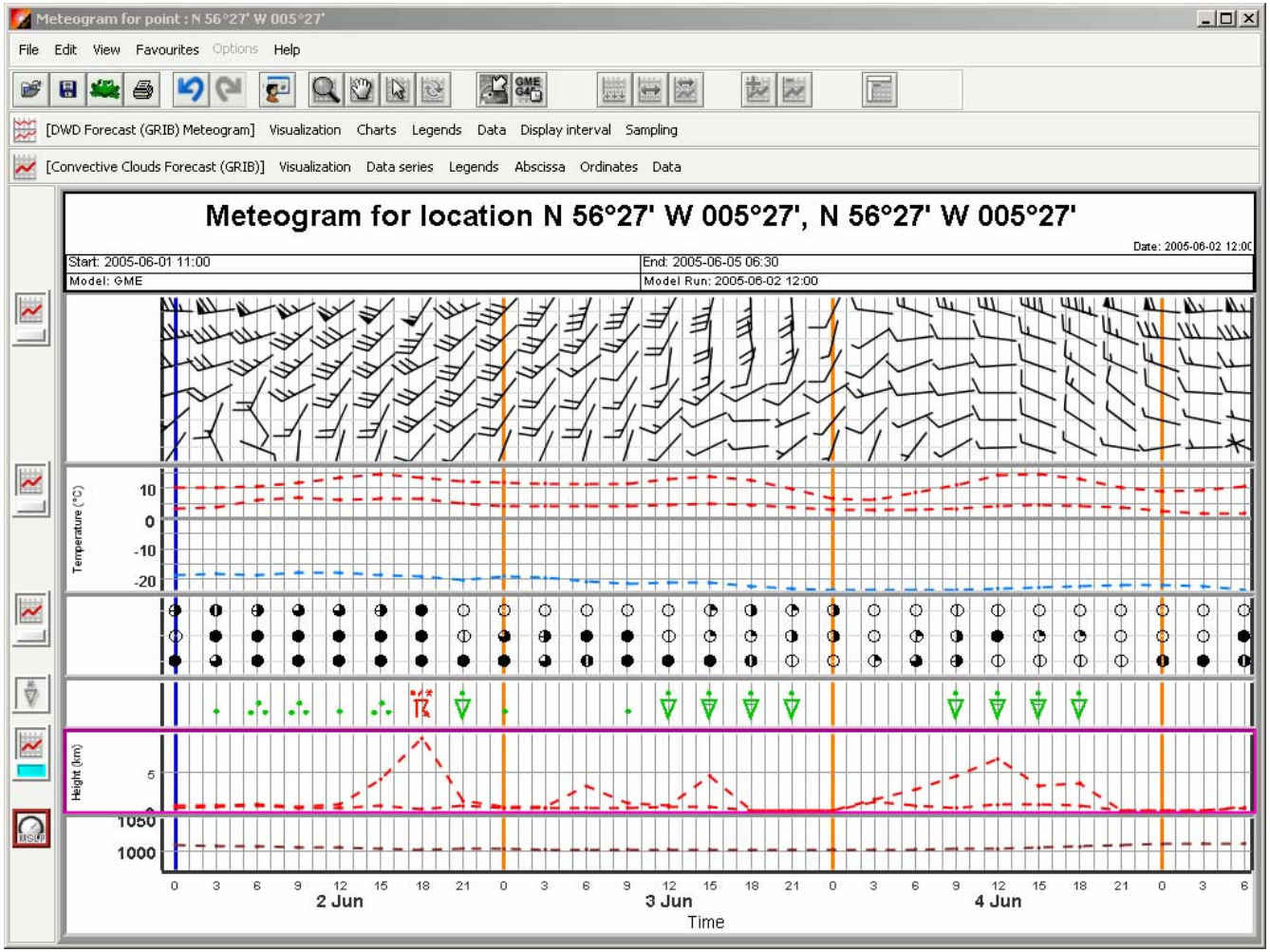
Meteograms

Meteograms display

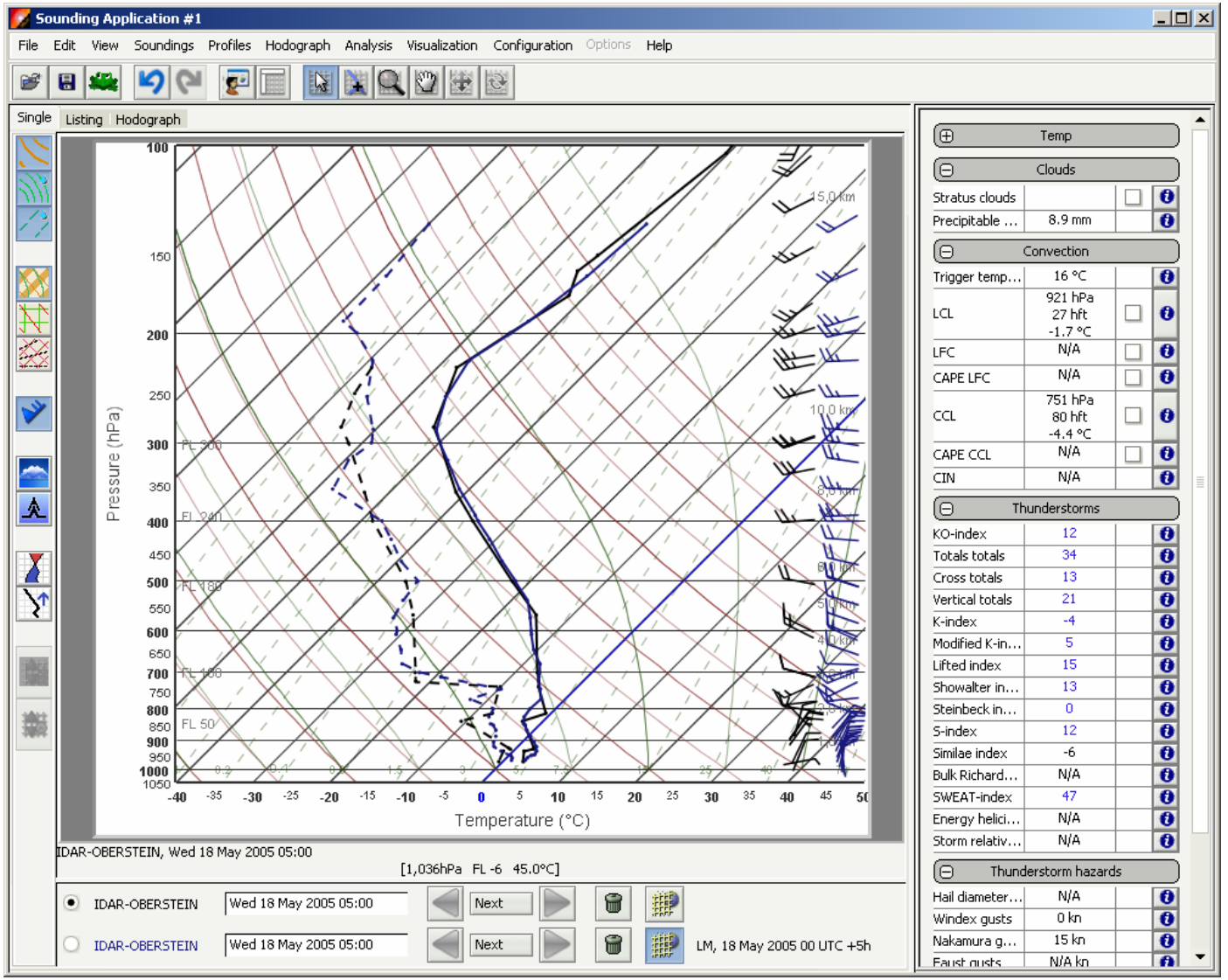
- Surface Observations
- Statistically processed Point forecasts
- GRIB parameters of available models
- Highly configurable



Meteogram of DWD's global model GME

Aerological Diagrams

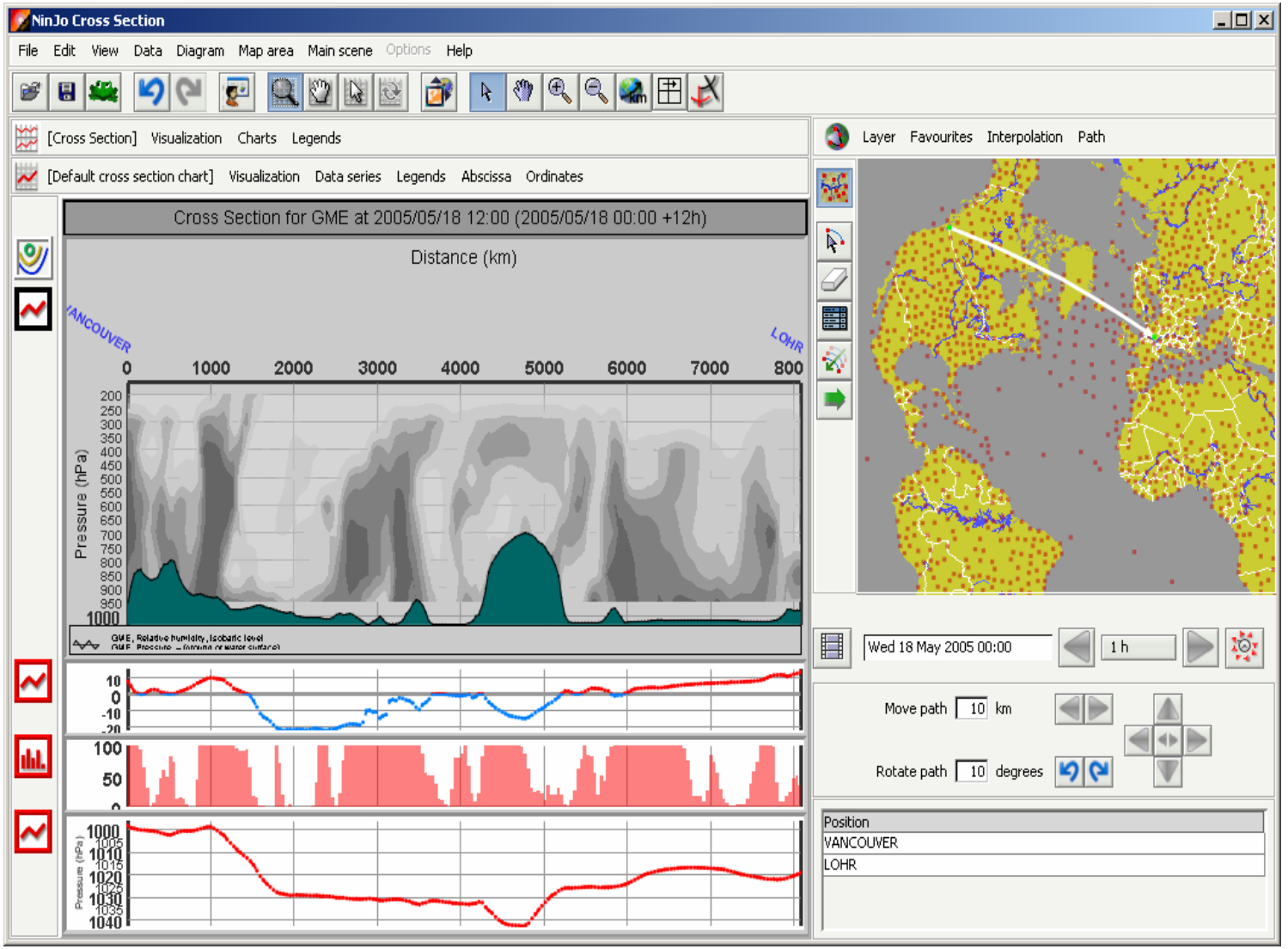
- **Multiple soundings in one diagram or multiple diagrams**
  - **Profile view**
- **Table View**
- **Hodograph**
- **Many algorithms available**
- **Both observation and model**



Sounding diagram with observation and model profile

Cross Sections

- **Work both with model and p-levels**
- **Relatively Fast**
- **Channels and time cross section**



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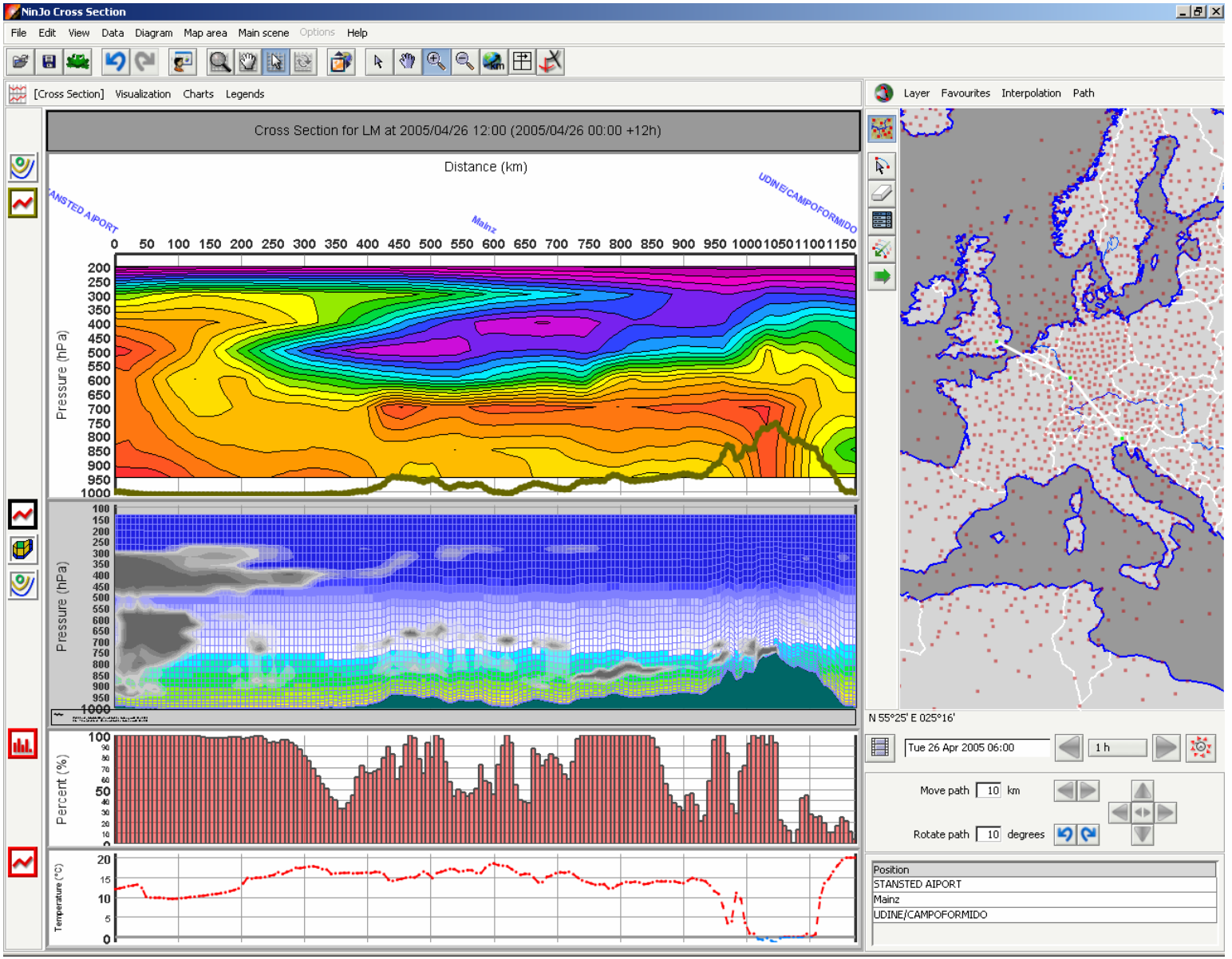
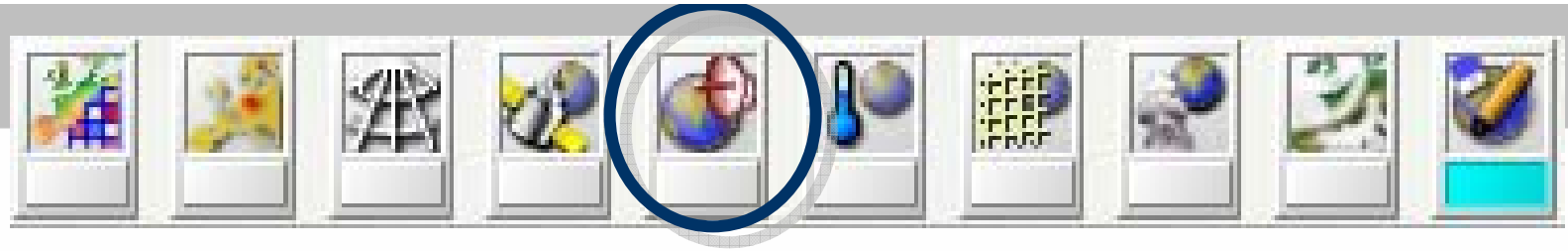
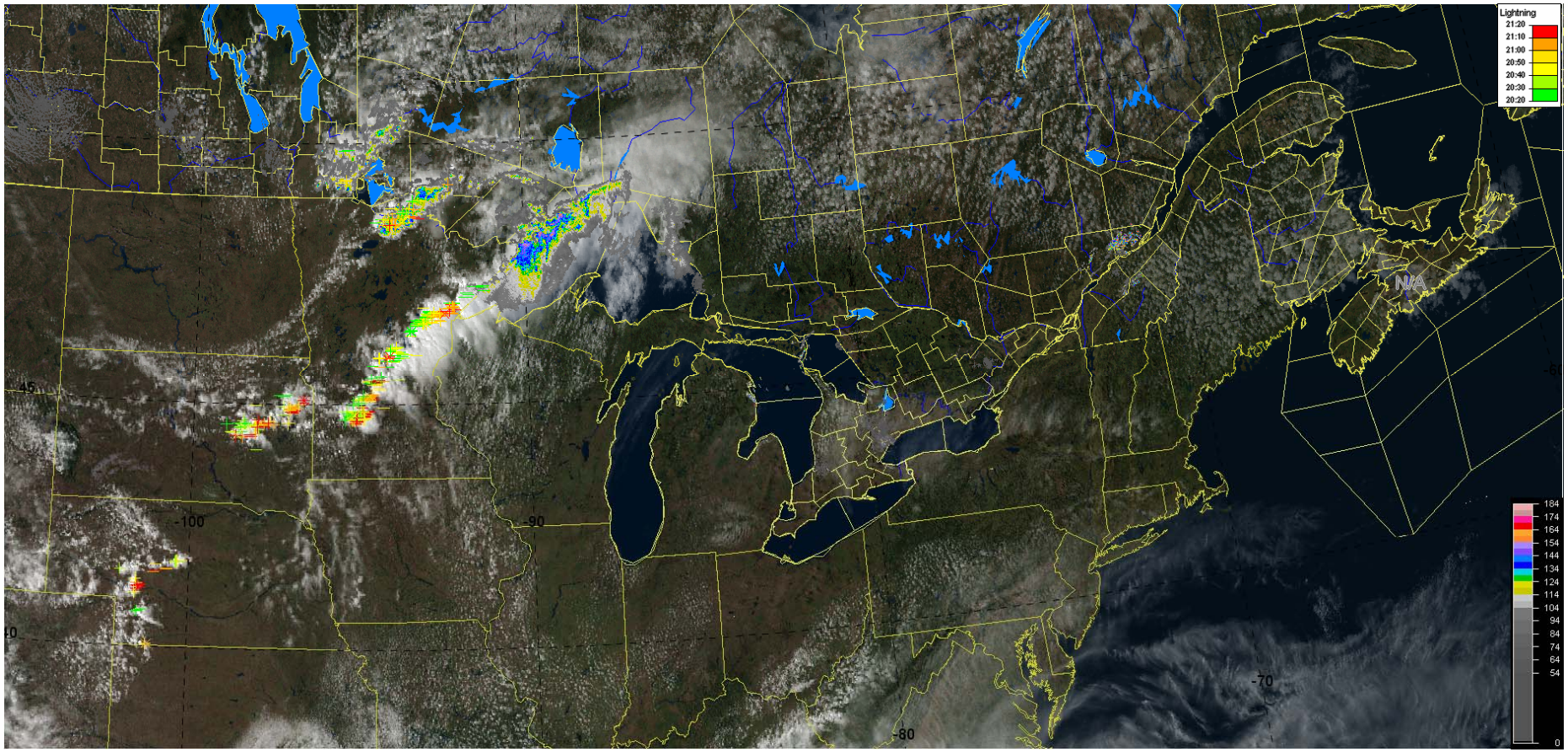




Radar Layer

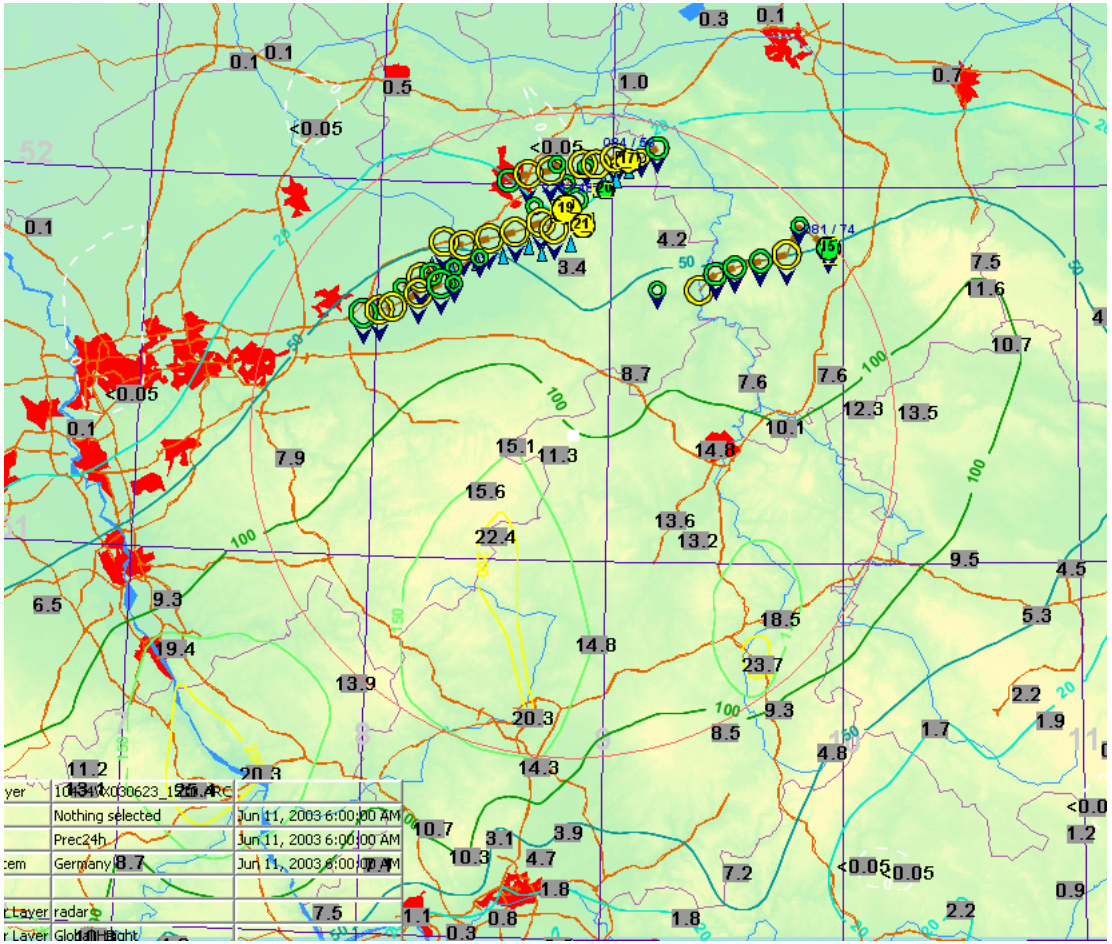
- Handles cartesian and polar radar data
- Single radar drill down, single cell drill down



SCIT - Layer

Storm Cell Identification and Tracking

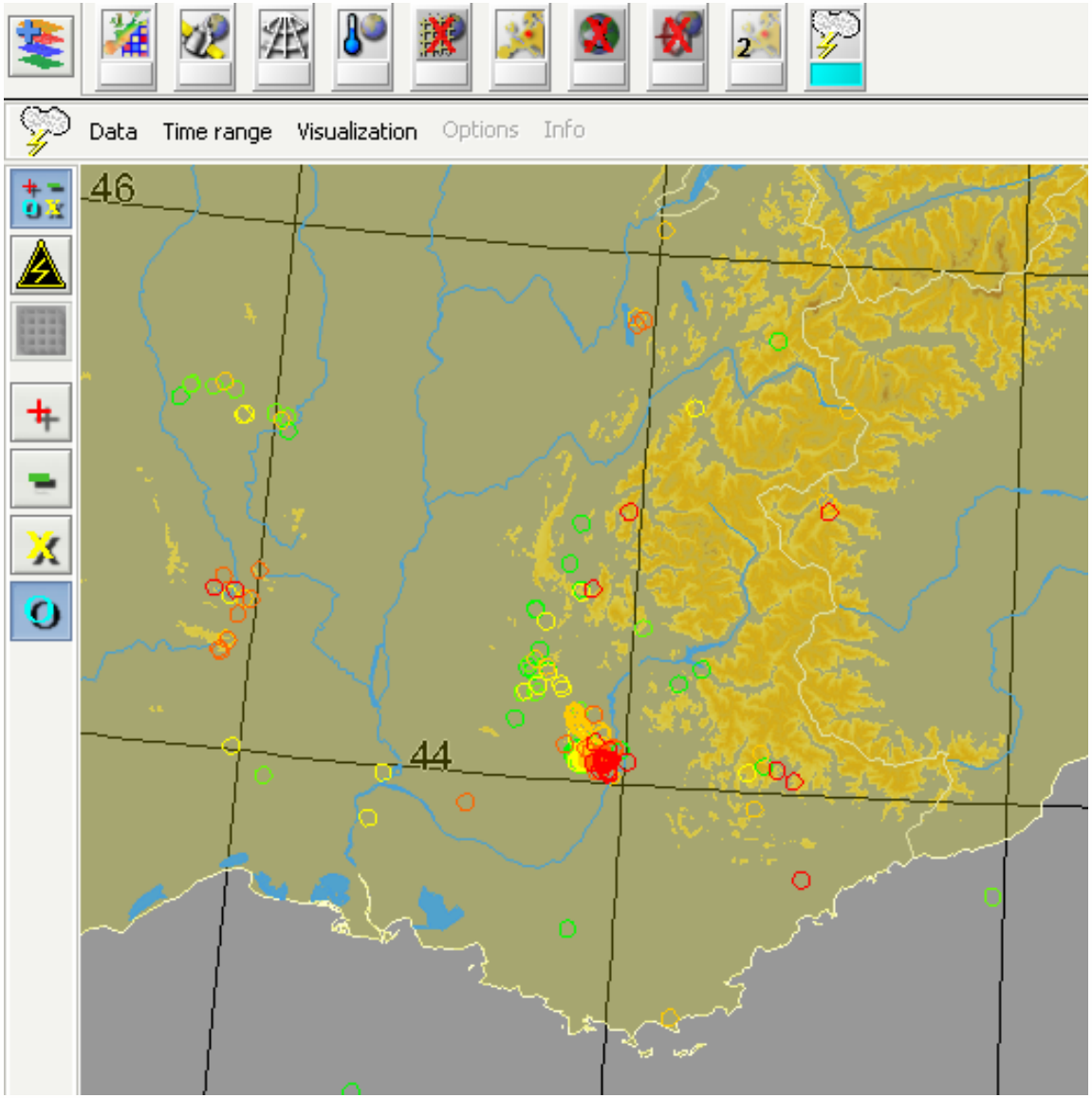
- Displays the ouput of cell based radar algorithms
  - tracks
  - properties
  - treated as point data
- In NinJo 1.1
  - Konrad-Composite DWD
  - MSC SCIT
  - Meteosuisse-TRT,
  - (SAF RDT product)
  - Table view



Konrad and Synop-Precipitation incl. Analysis

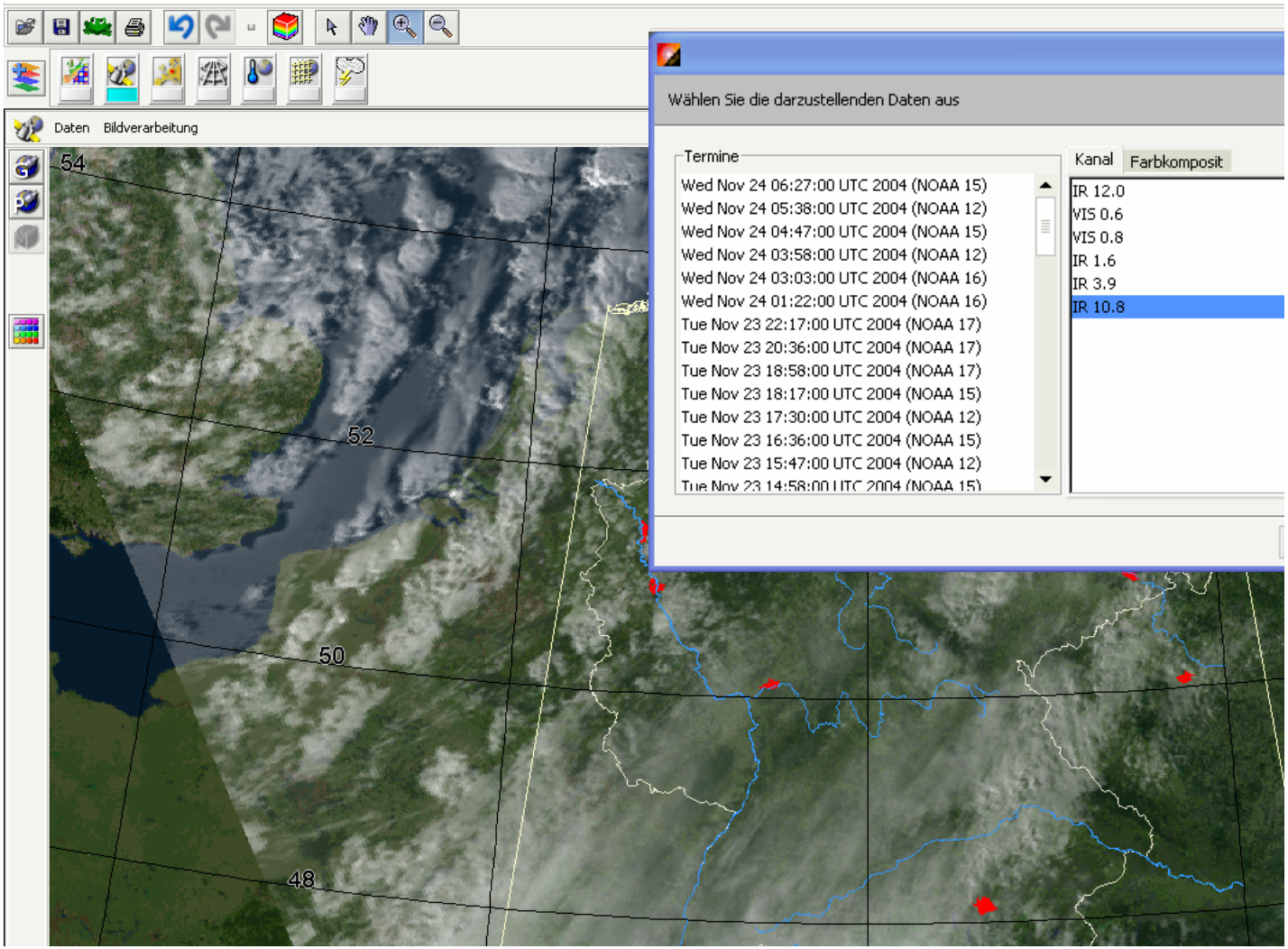
Lightning Layer

- **Several lightning detection systems implemented**
- **Different time ranges and visualizations available**

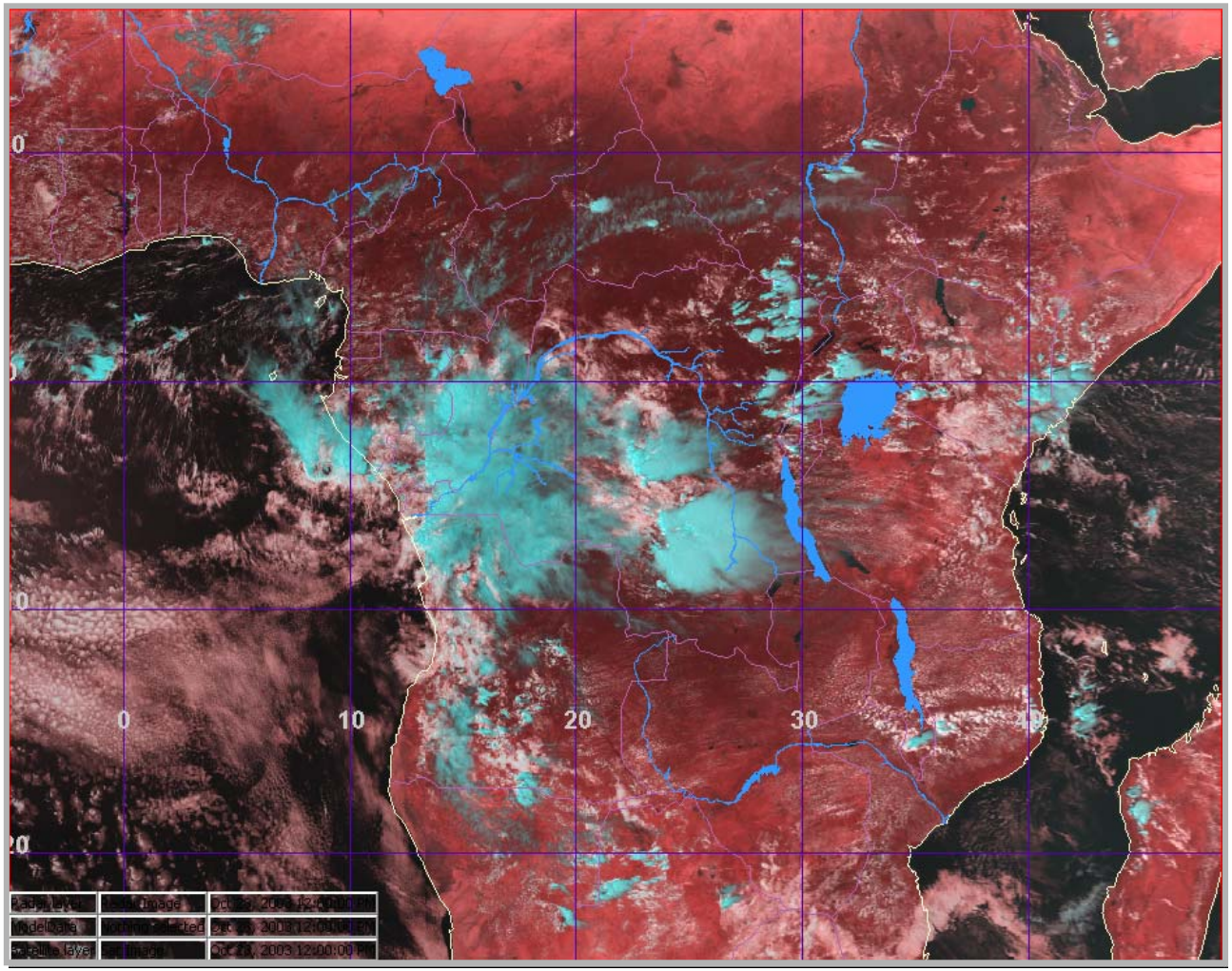


Satellite Layer

- All geostationary satellites including MSG
- Polar Orbiters
- Mosaic
- Color scheme editor
- Base data stored in multi-resolution-multi-tile-Geotiffs

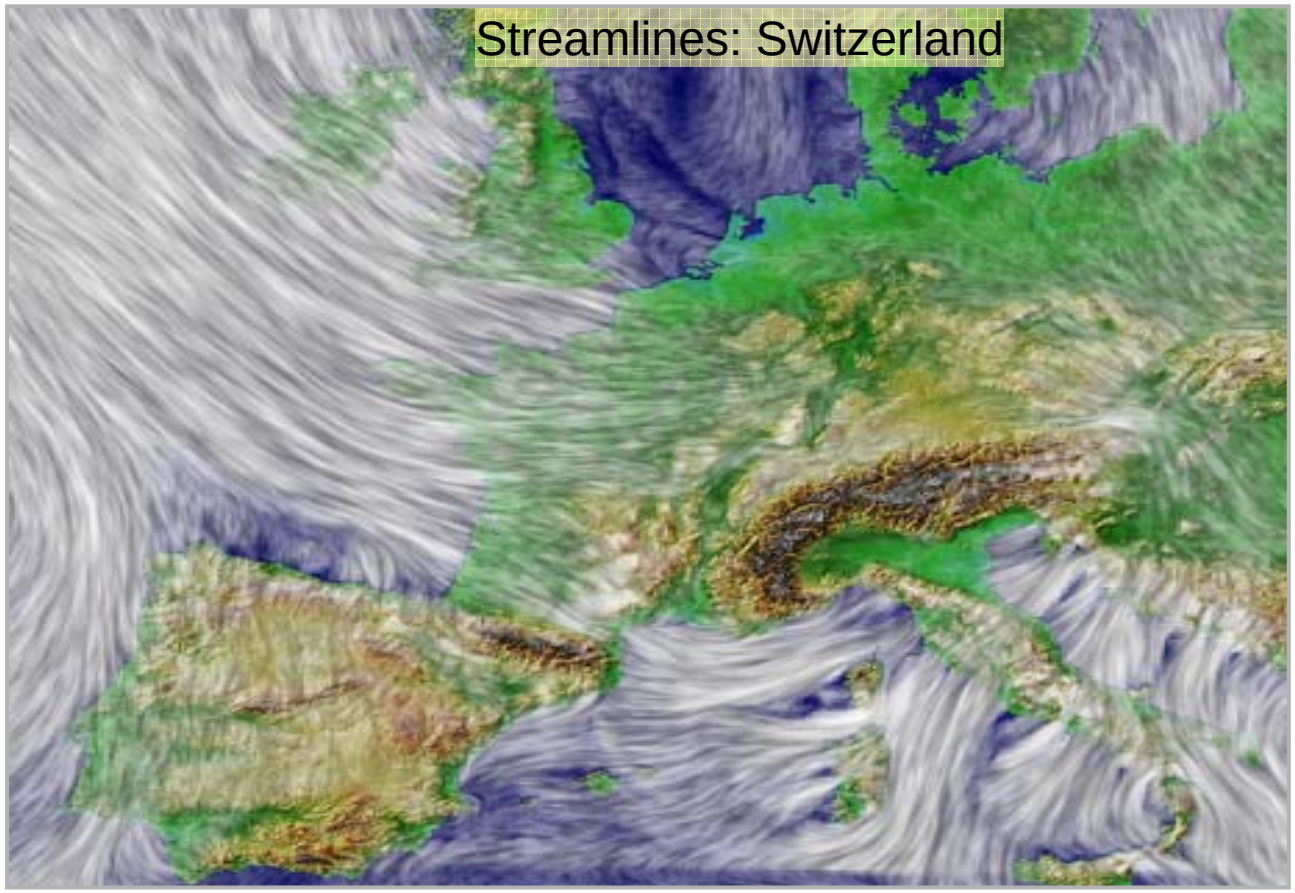


Satellite Layer

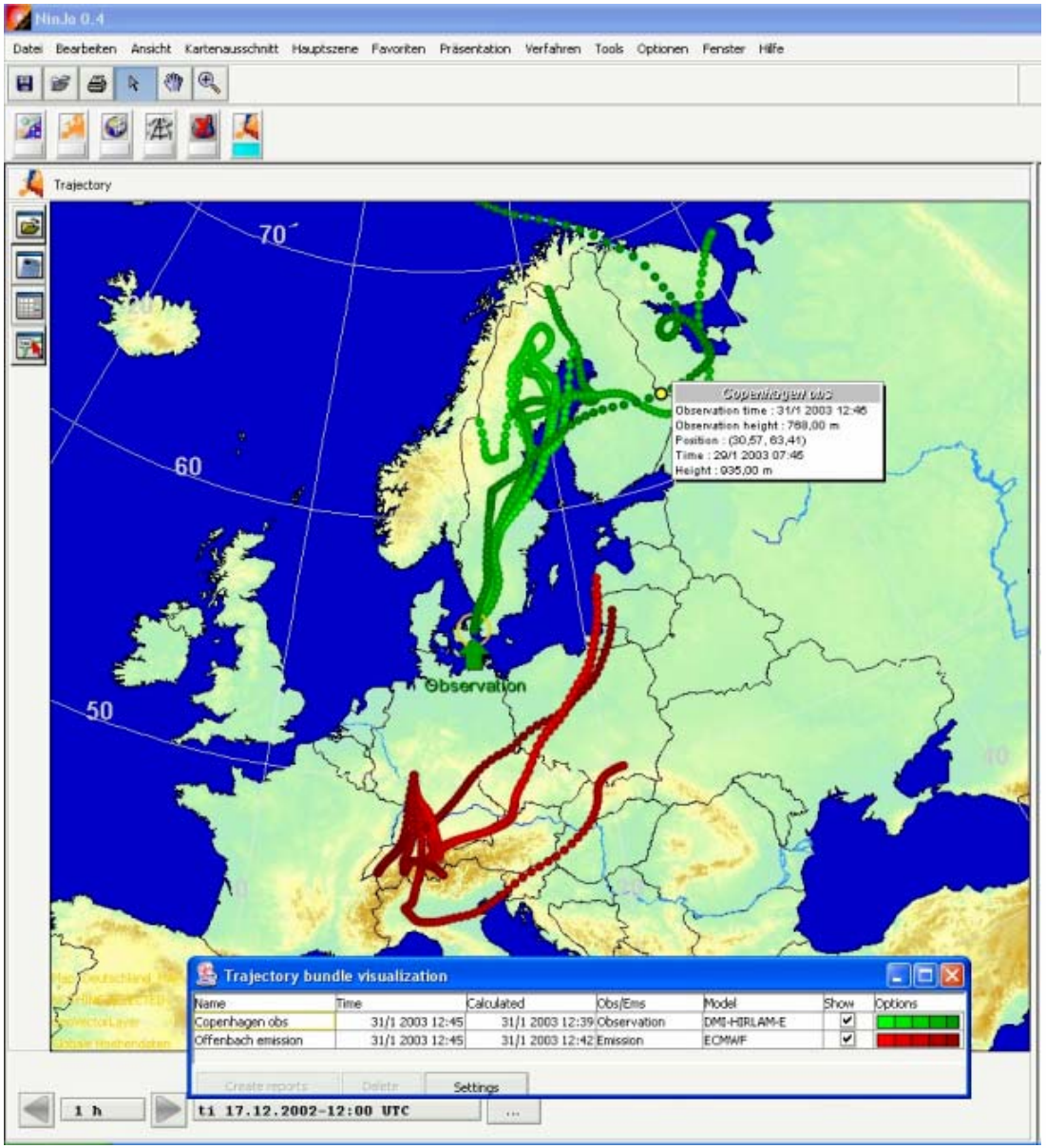


MSG 3 channel composite , Mercator

Prototype: Streamlines



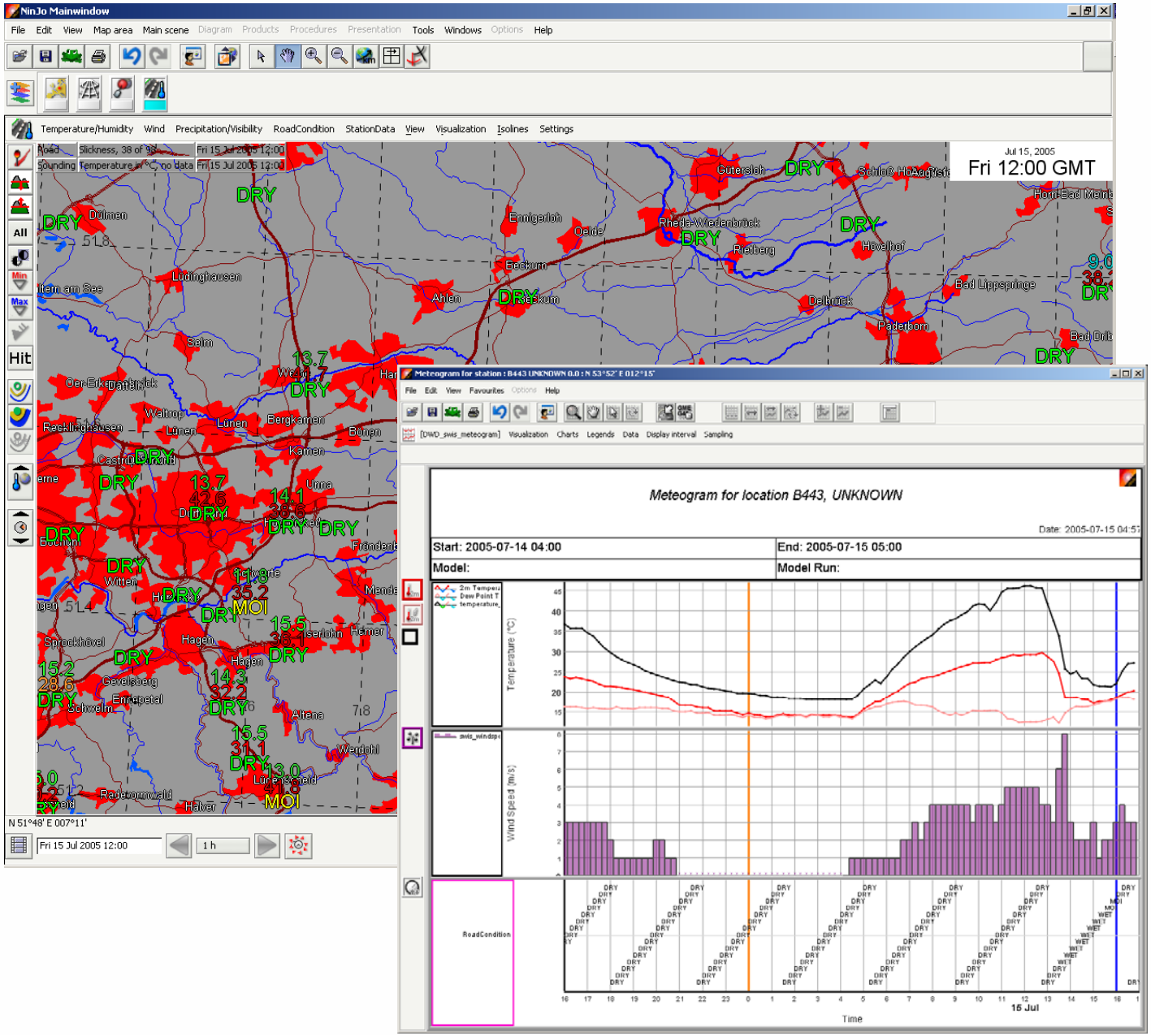
Prototype: Trajectories



Prototype: Road Weather Information system

Road weather

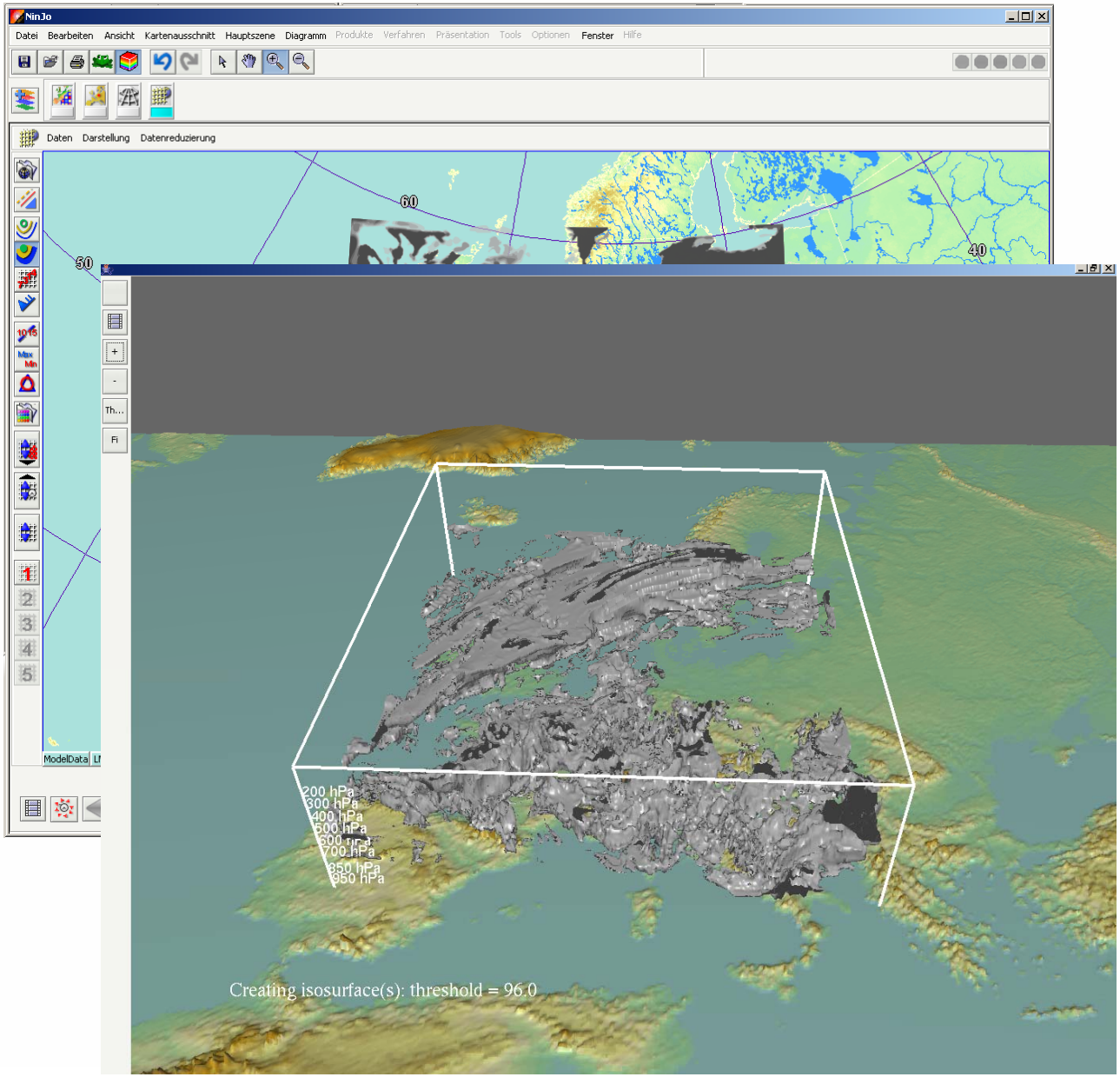
- **Layers and Meteograms**



Prototype: 3D Visualization

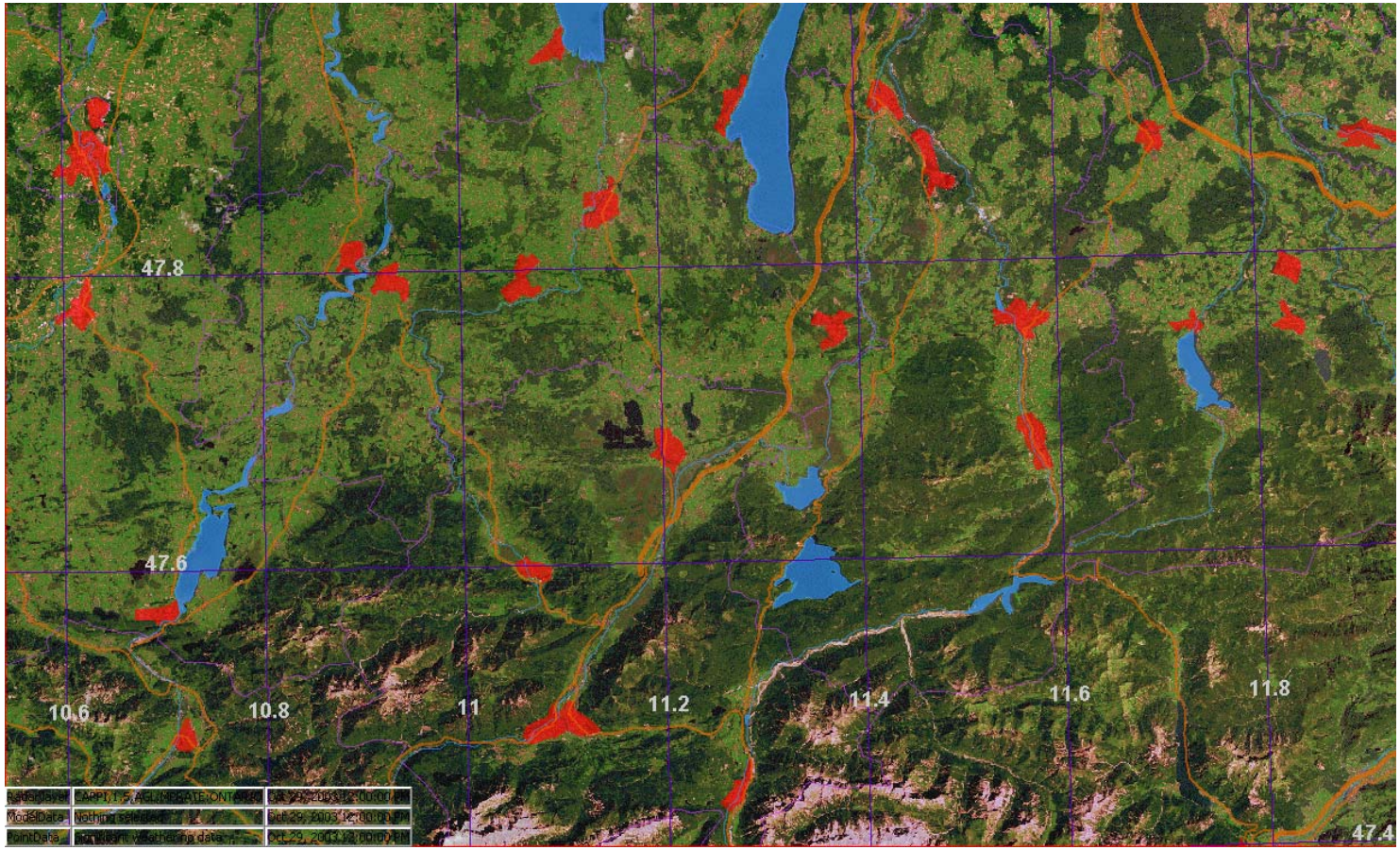
Instant 3D

- First prototype
- automated mapping of 2D-Paramaters on a 3D-Scene



Georaster

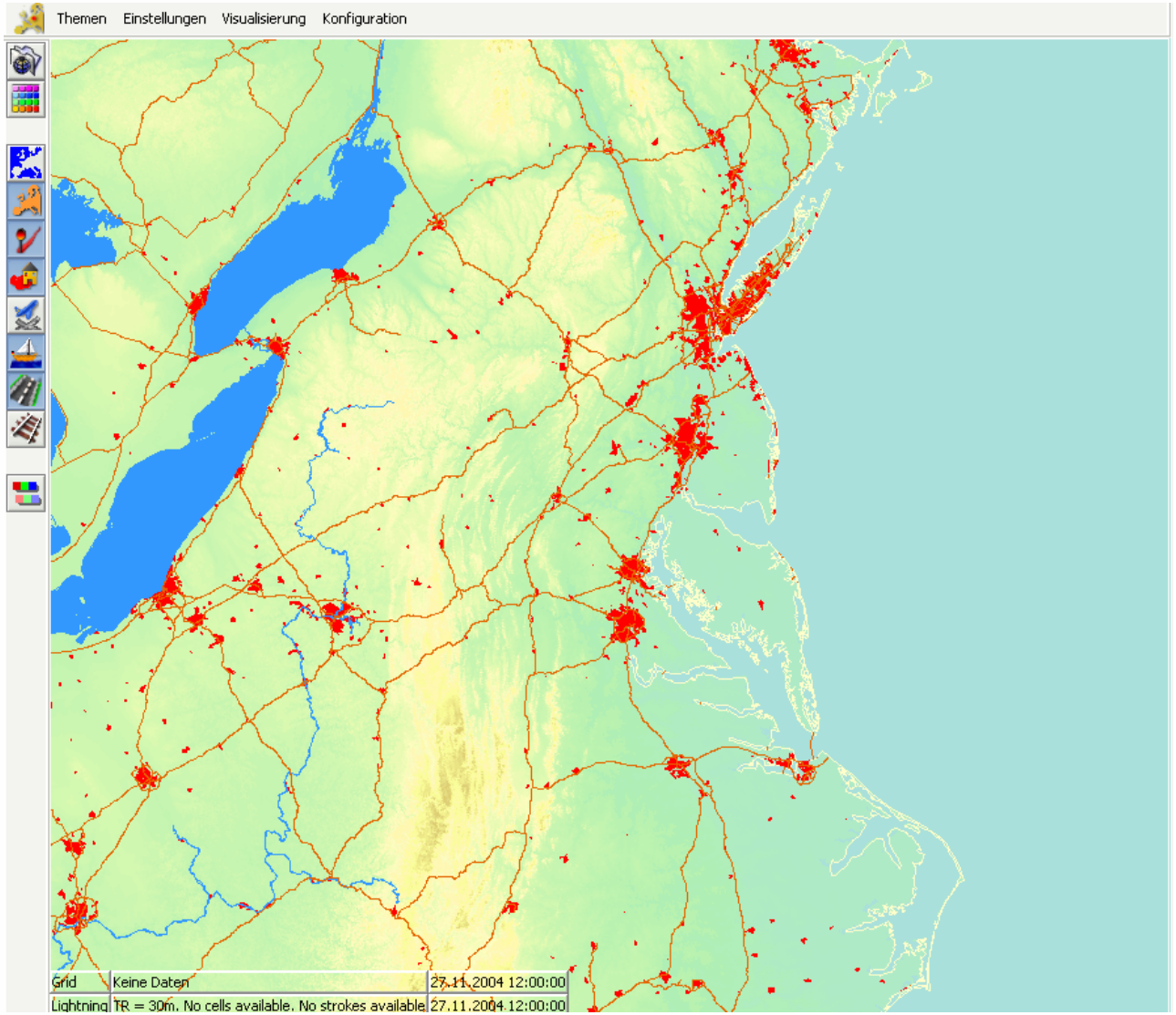
- Based on multi resolution - multi tile Geotiff imagery
- Data ranges from elevation data to street maps or aerial photographs
- Data is static.
- High quality data mostly not available for free



Landsat (50m Resolution), with geovector data

Geovector

- Vector based geo data.
- Data has different priority and accuracy
- Manual preprocessing based on shape files to create accuracy and priority hierarchy
- Depending on the scale of the map the most appropriate resolution and number of objects will be displayed
- Several themes provided: coastlines, rivers, borders, roads, airfields, FIRs...
- But high quality data usualy comes from local mapping agency
- Static data set



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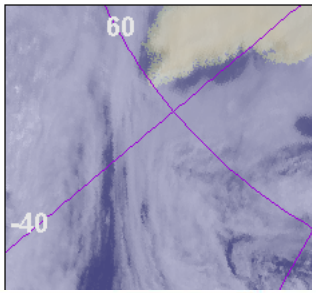
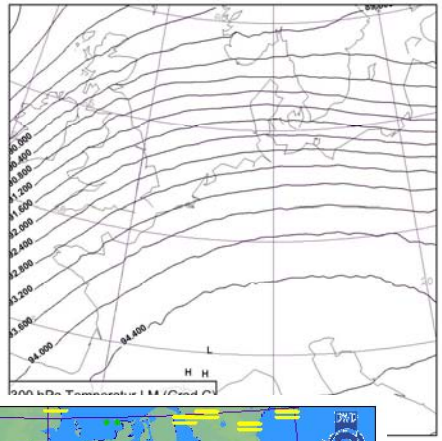
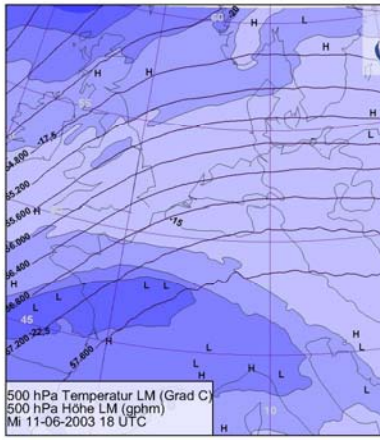
- **NinJo Point Data Modification (MMO)**

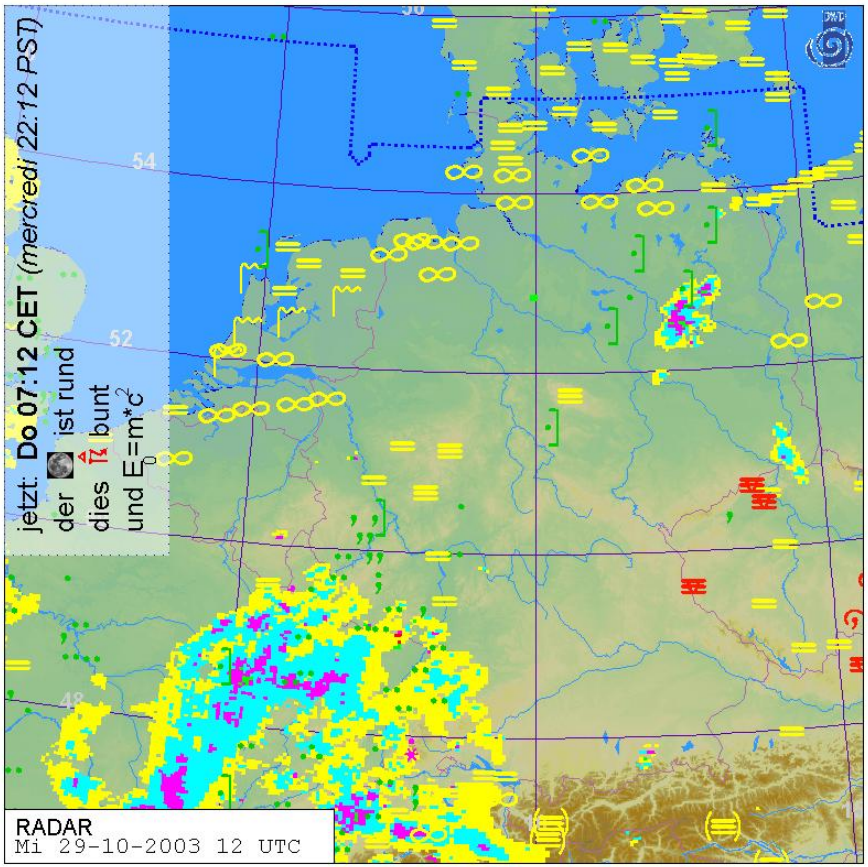
Prototype: NinJo Batch Production

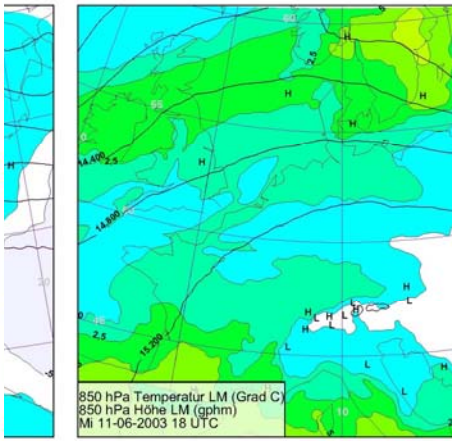
- **Image and vector products can be created**
  - **jpg, png, tiff...**
  - **PDF, SVG, FLASH, PS incl. Animations**
- **Flexible legend with html-style language**
- **ECMWF's SMS-based scheduling**
- **Sophisticated layout and NinJo scheduler**
- **Basis for application serving (NinJo 1.2)**

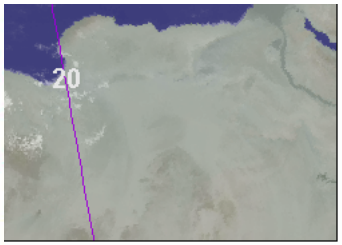












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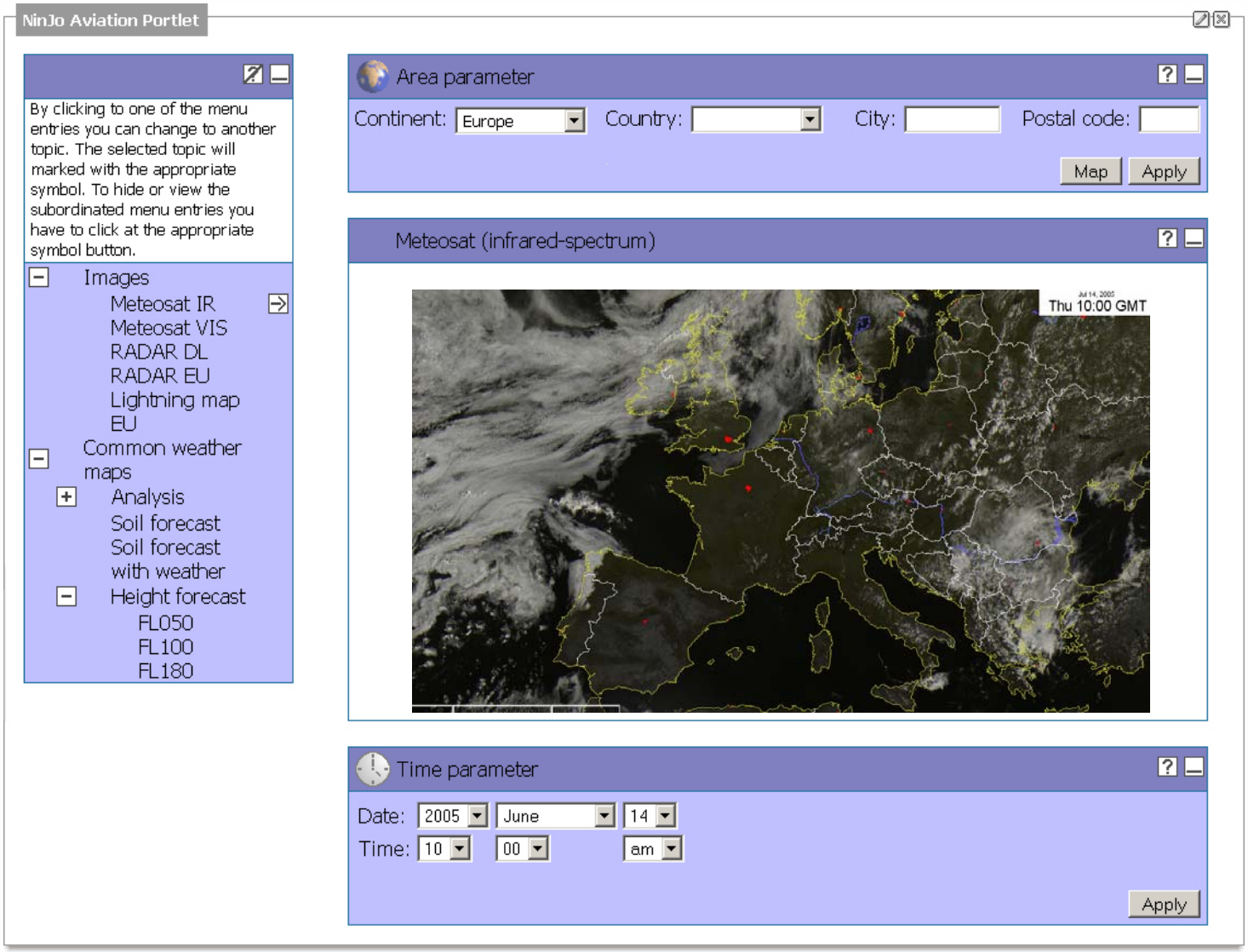
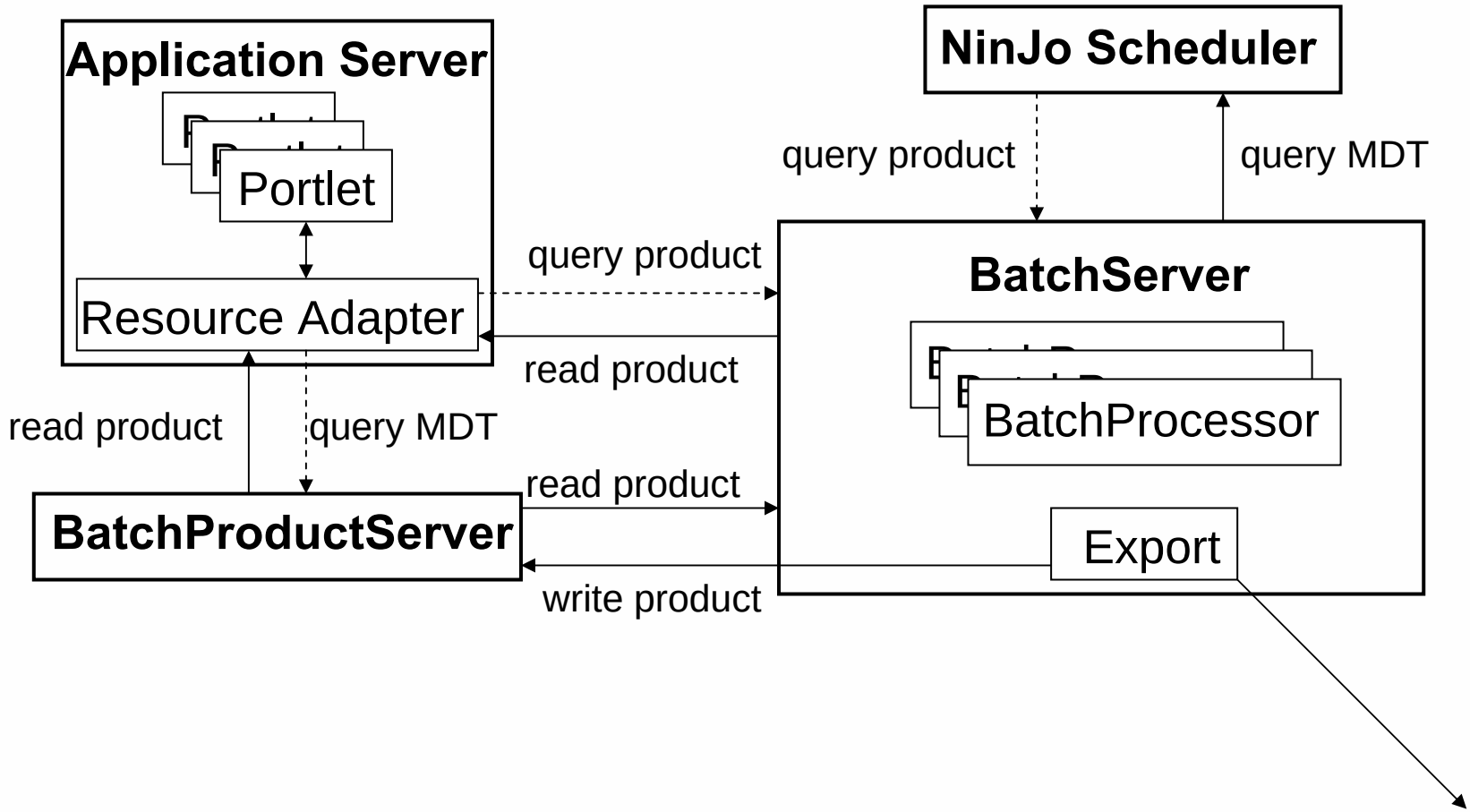
Web Application Server Overview

- **Graphics and text data produced by the NinJo BatchServer displayed with portlets**
  - **Prerendered products**
  - **Interactively requested products**
- **Simple clients show „Static“ products:**
  - **RADAR and satellite images and movies**
  - **Standard prognostic charts and diagrams**
- **Interactive clients should allow for**
  - **toggling the visibility of data layers**
  - **zooming and panning**
  - **Selecting paths for cross sections on demand**

Prototype: Web Application Server Example



Web Application Server Architecture



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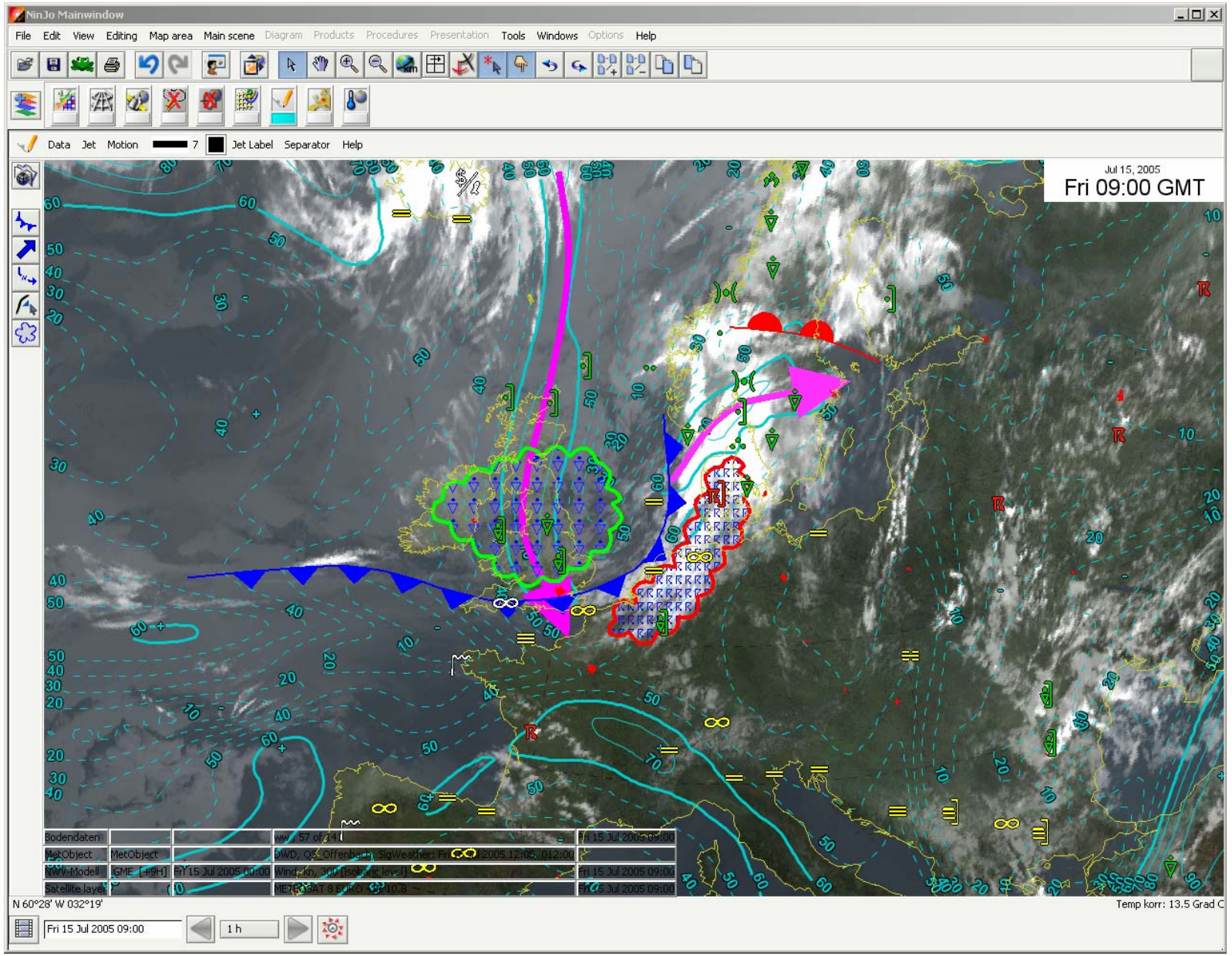
Goals

- **Primary objective is the creation and modification of Graphical products**
- **Graphical products are made up of graphical meteorological objects**
  - **Objects can be created, deleted, moved and grouped**
- **Graphical objects are stored on servers and may be shared between products**
  - **even among weather offices**
- **Future direction: Multiple product generation from one instance of a graphic**
  - **The display of shared objects may differ (graphical attributes)**

Met Object Layer - Examples



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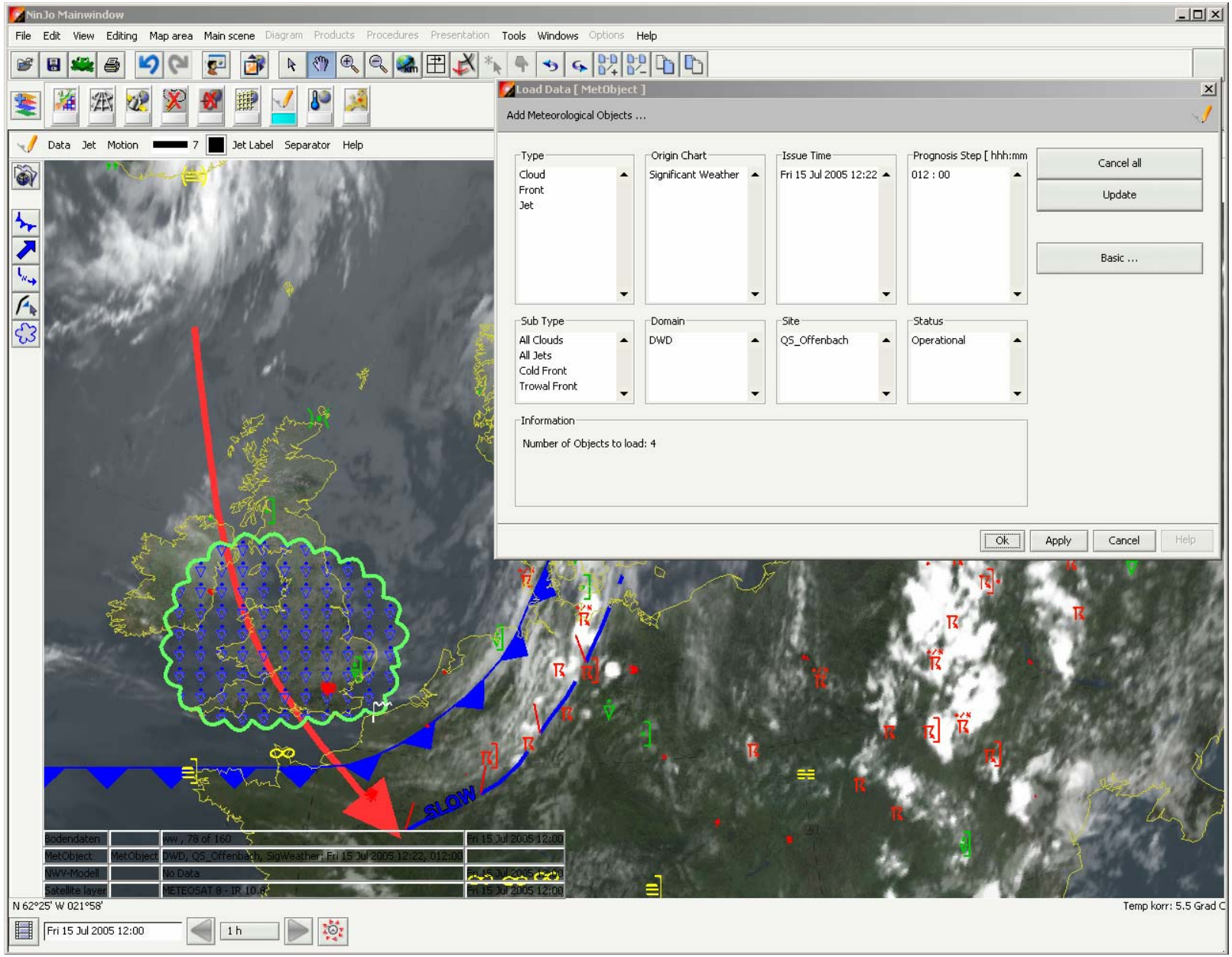
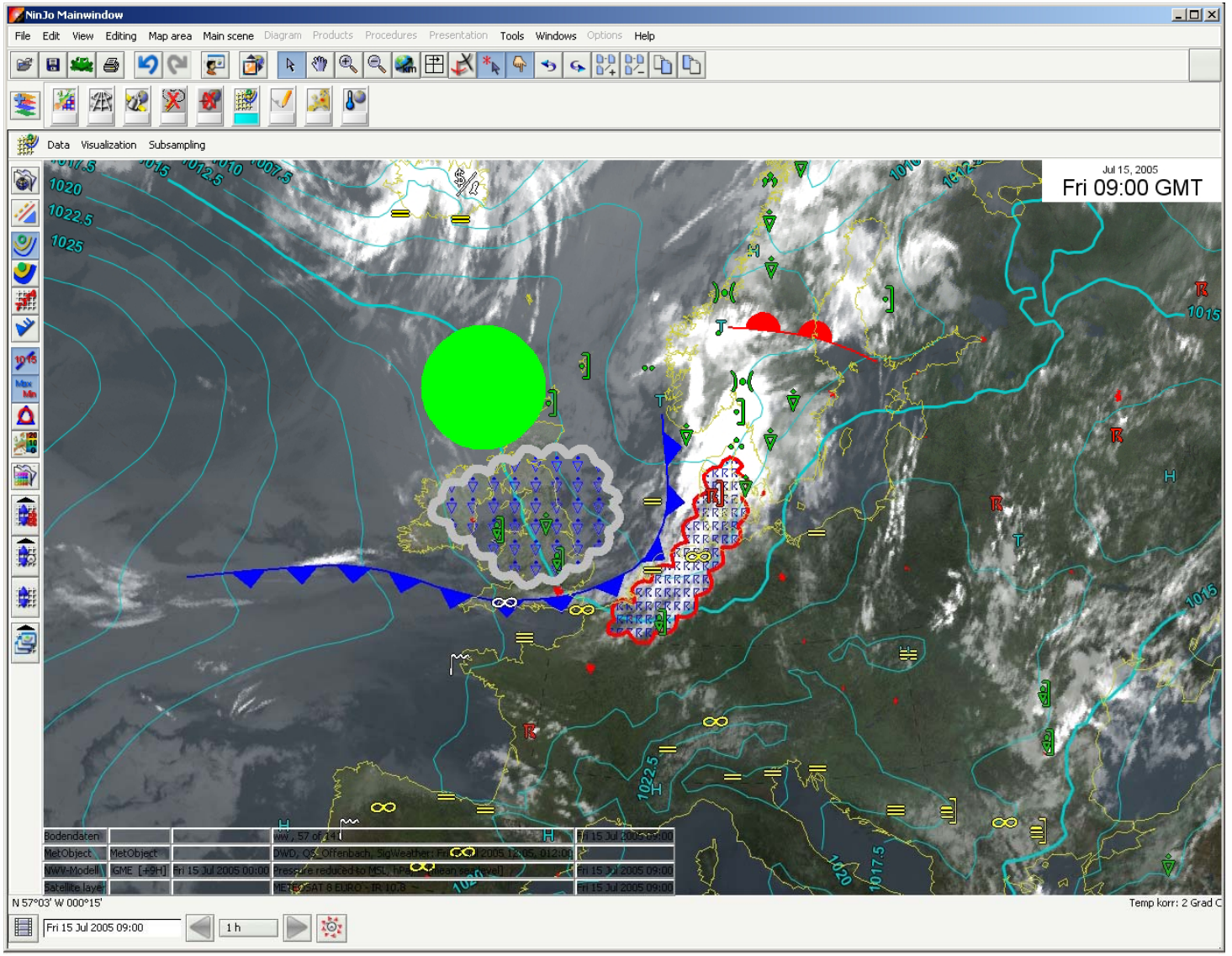
Met Object Layer - Saving Objects



Met Object Layer - Editing Objects

- **Line features**
  - **Fronts with symbols and movement**
- **Isolines/areas**
- **Jet axes**
  - **Jets with Jet line labels and hyphen**
- **Frame area**
- **Hatched areas**
  - **Raster and symbol hatching**
- **Indexed Areas**
  - **with borders , labels and legends**
  - **SWC's as the most cmplex case**
- **Station plots**
  - **Including icons and pictograms**



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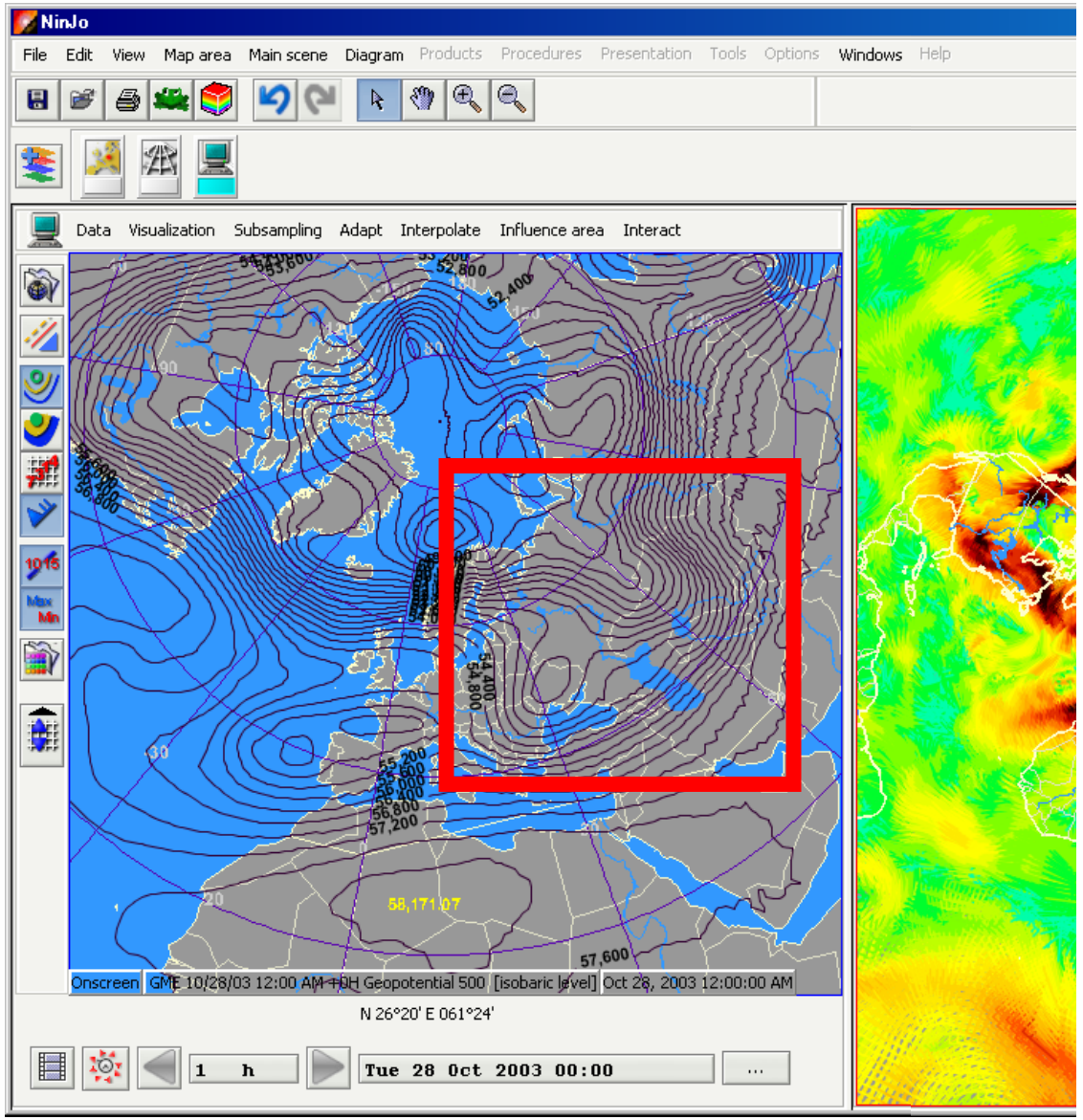
Modifying a model first guess to replace handish analysis

- **Situation:**
  - A map has to be drawn including fronts and other MetObjects
  - The models analysis is used as a first guess
- **Modification**
  - Interaction is based on ingestion of point data
    - Actual observation are available
    - Bogus observations can be used as well
    - Observations will me merged with the first guess field
    - This approach is considered as the most natural approach by our forecasters
    - Modifications performed on a grid
    - Grid gets stored on servers and graphics handed over to the MOL
- **Beautifying of the modified field with the Met object layer**
  - The modified graphics will get “beautified” by bending of iso-lines, moving labels, adding front kinks...
  - Results can be saved as vector or pixel graphics only

Prototype: On-Screen-Analysis

- **Modification of GRIB Fields**
- **Point Values**
  - **inject values**
  - **force use of an individual or a set of observations**
- **To be achieved: consistenty in the vertical / with other parameters**



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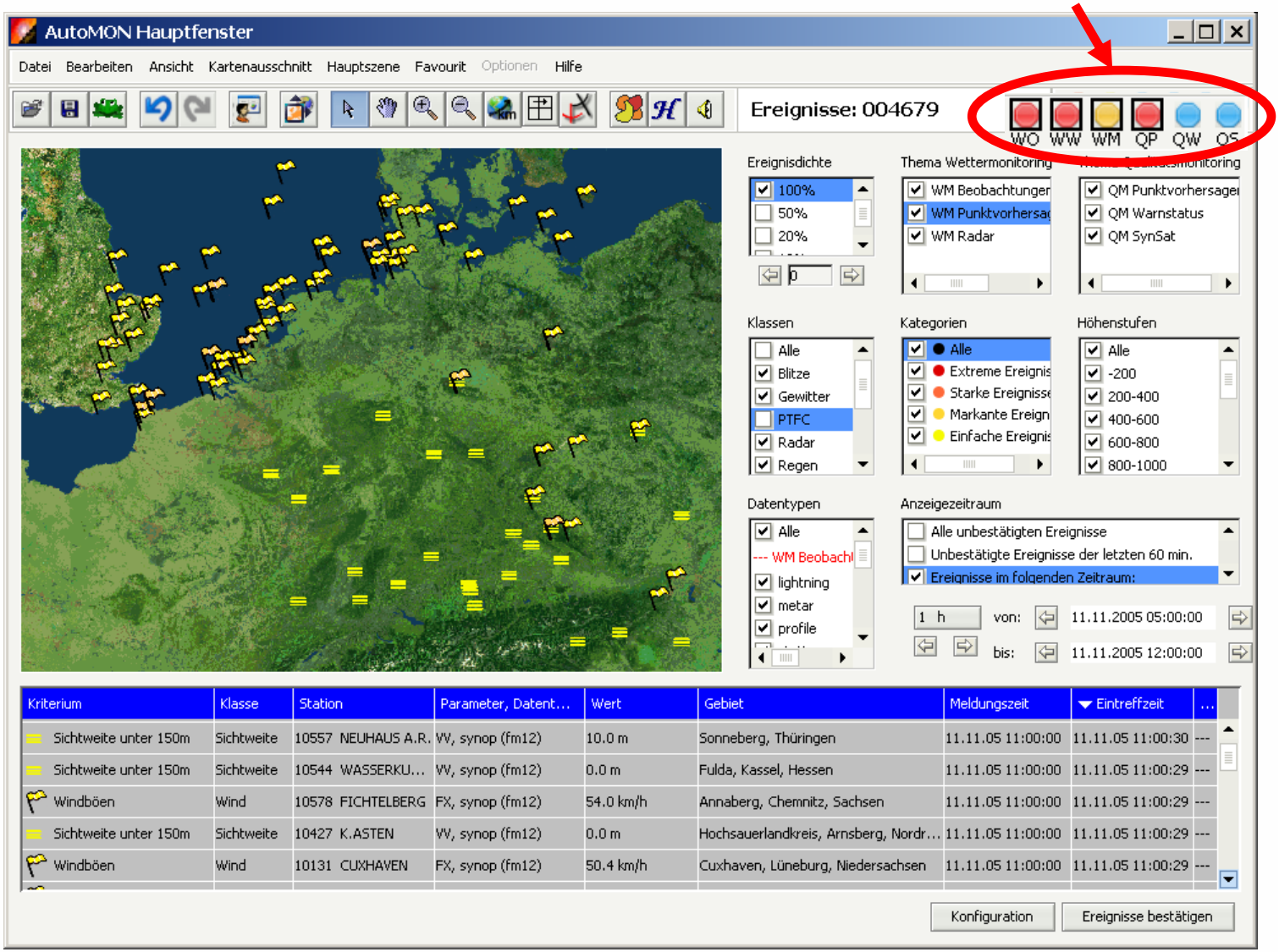
AutoMON Objectives

- **Weather monitoring:** Direct support of the shift-working Forecaster working in warning service through permanent, automatic monitoring of current and forecasted significant weather events
- **Quality monitoring:** Permanent monitoring of the quality of model forecasts and issued products, i.e. the continuous monitoring of deviations from observations
- **Alerting:** The Forecaster is alerted when significant events occur and may react appropriately (e.g. by issuing a weather warning)

⇨ Help forecaster to cope with enormous amount of data available, filter out relevant information for forecast and warning process

AutoMON: Automatic Monitoring and Alerting

- **Permanently monitors incoming observational-, radar-, lightning-, and model data**
- **Alerting based on threshholds, rules, and combinations of threshholds for configurable areas**
- **Status: operational in NinJo 1.1**



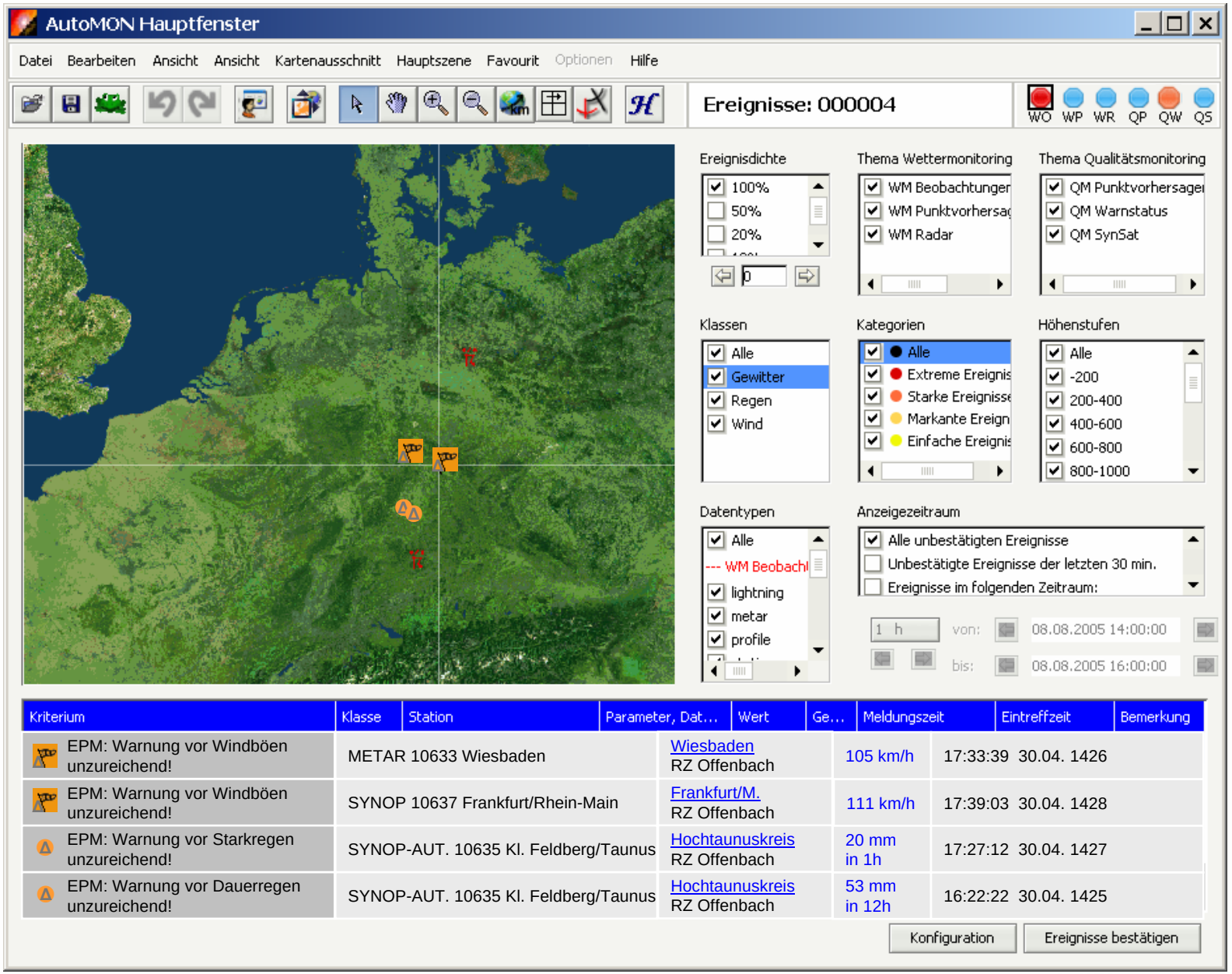
The NinJo monitoring application with the possibilty to set filters. Tabular and map based display of alerts.

Data Types Monitored

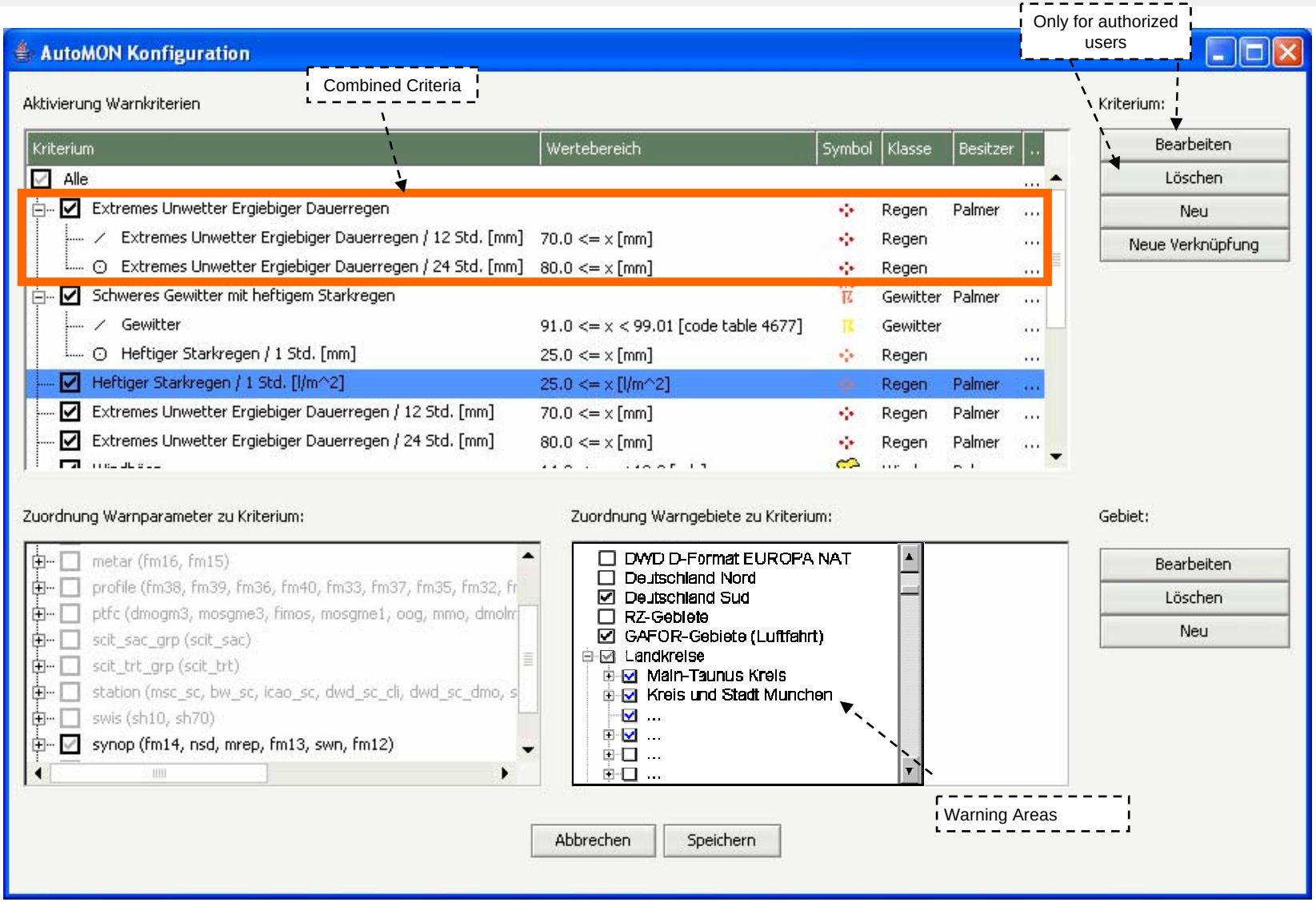
- **Weather Monitoring („Threshold Values“)**
  - Observational Data (e.g. SYNOP, METAR, SPECI, MREP, SWN, Lightning)
  - Radar reflectivity and significant cells from SCIT/KONRAD cell tracking system
  - Point Forecasts from statistically processed NWP model output (e.g. GME MOS), WarnMOS-Data (Spatial probabilities)
  - Direct NWP gridpoint model output (e.g. LM, GME)

- **Quality Monitoring („Deviations Model – Reality“)**
  - Deviations between the current state of issued weather warnings and current observations
  - Deviations between Point Forecasts from statistically processed NWP output and observations
  - Deviations between synthetic satellite images from the Limited-Area Model LM and observed satellite images

AutoMON: Monitoring of current Warning Status



Activation and Assignment of Warning Criteria



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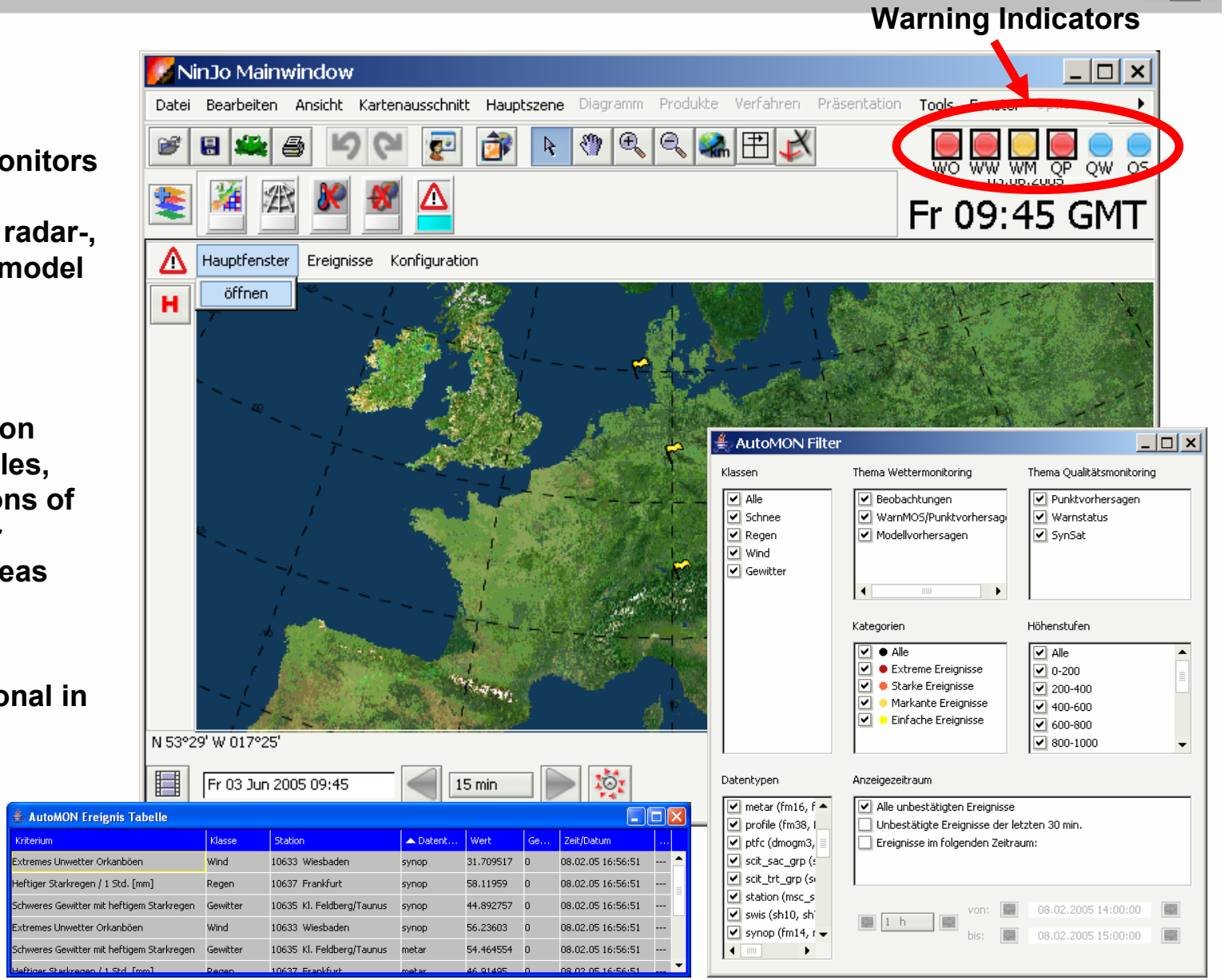


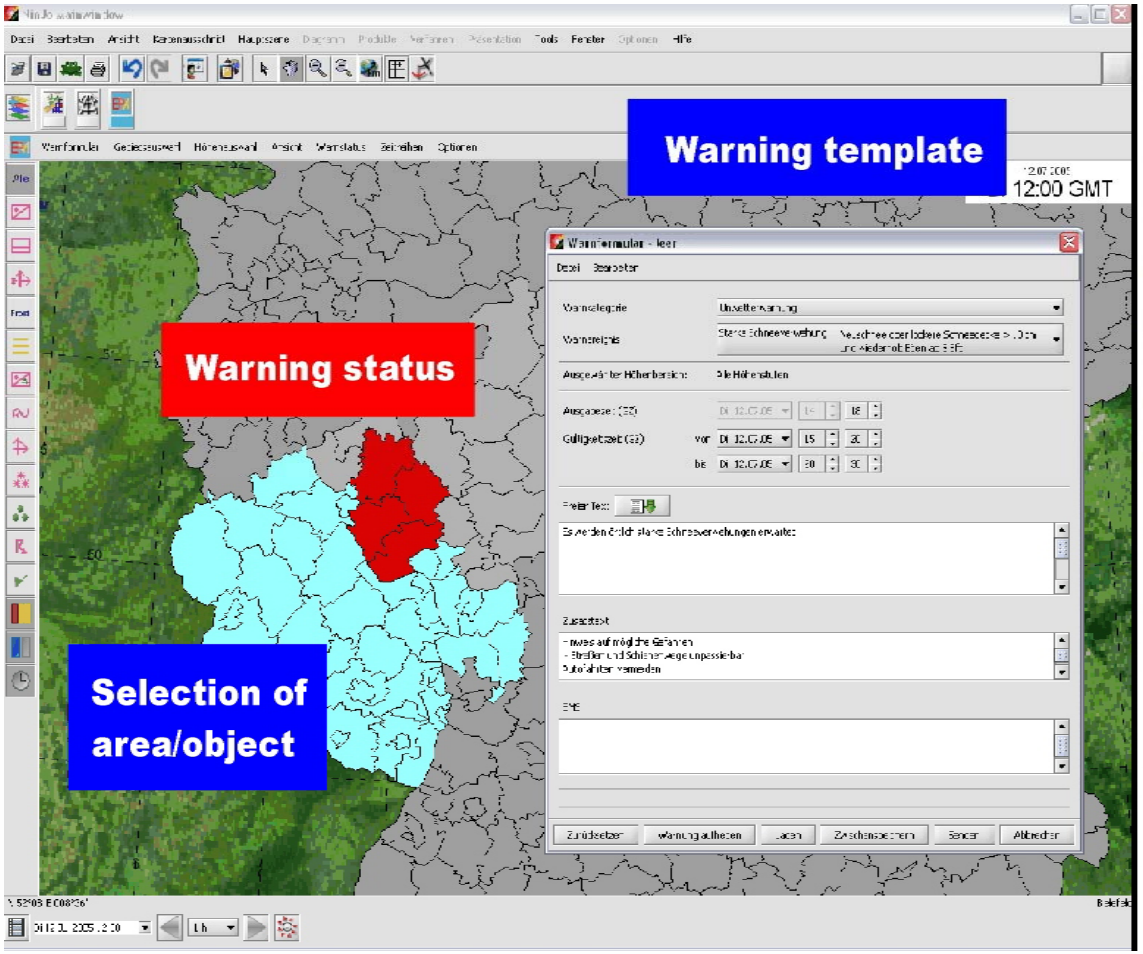
The NinJo monitoring application with the possibilty to set filters. Tabular and map based display of alerts.

Overview

- NinJo Batch
- NinJo Web Application Server
- NinJo Meteorological Object Layer
- NinJo On Screen Analysis
- NinJo Monitoring and Alerting (AutoMon)
- **NinJo Warning Creation (EPM)**
- NinJo Point Data Modification (MMO)

NinJo Warning Creation (EPM)

- Graphical/ alphanumerical selection of areas/objects
- Editing of a warning template
- Production of warning content (dissemination to OMEDES)
- Production of warning status data (dissemination to AutoMON)
- Monitoring of warning status (warnings issued)



Warning category
Warning event

Time of issuing
valid time

Free worded text/
standard text

Additional text

SMS

Overview

- NinJo Batch
- NinJo Web Application Server
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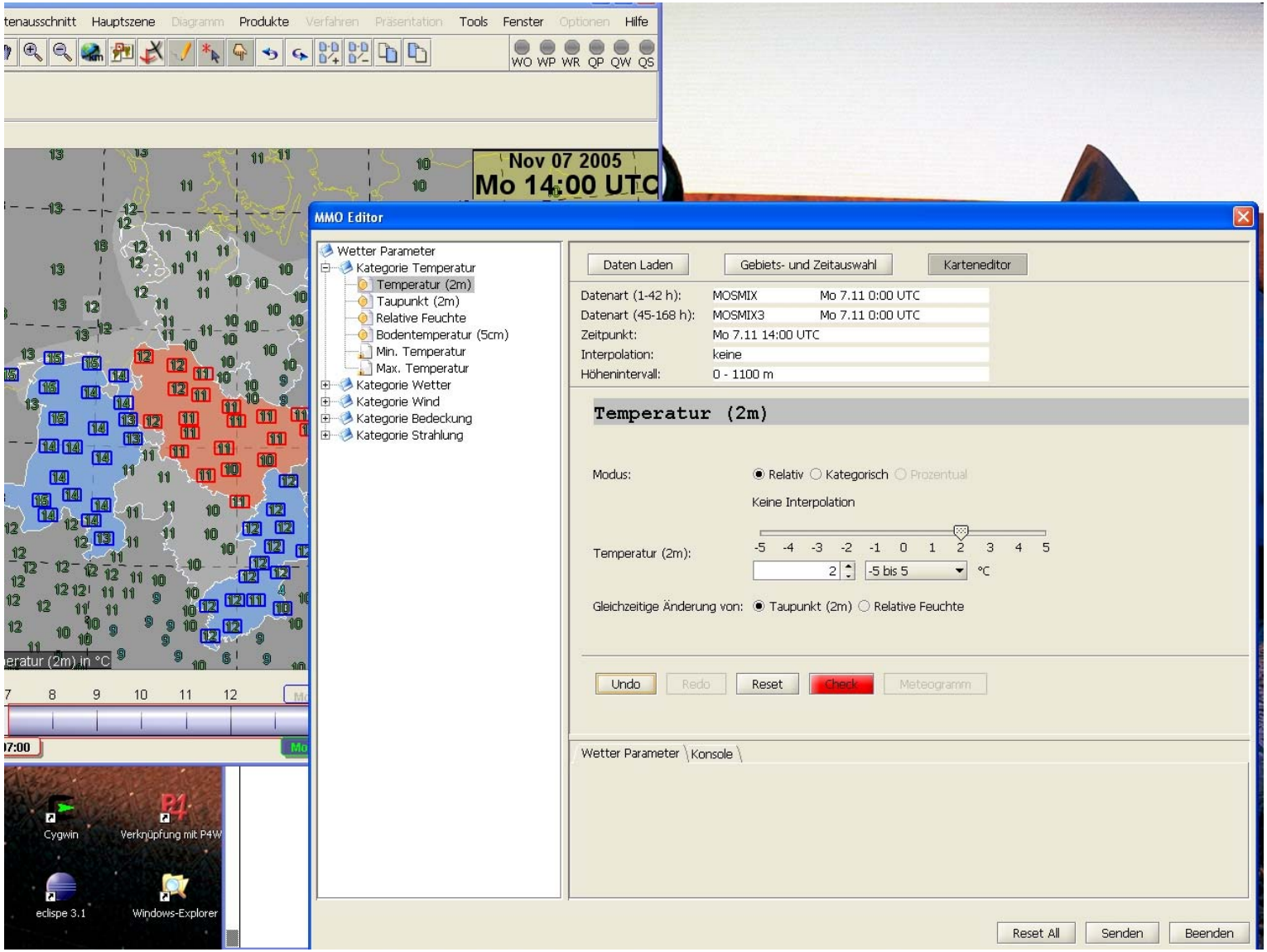
- NinJo Warning Creation (EPM)
- **NinJo Point Data Modification (MMO)**

Point Data Modification (MMO)



Overview

- Introduction and Goals of NinJo
- NinJo Client Layers and Applications
- NinJo Production Tools
- **Current Status and Future Planning**

NinJo Implementation Plan

Basic Concept

- **Currently: Parallel operation NinJo 1.0 and MAP (legacy workstation)**
  - Both workstations running in parallel on the desk of the forecaster
    - Getting aquainted in the operational environment
  - Make NinJo stable in a distributed regionalized environment
    - Detect and solve issues that might pop [We don‘t know of any at the moment :-)]
- **NinJo 1.1 (January 2006)**
  - Will replace MAP on those seats that need only to view data
    - Approximately 50% of the MAP workstations will be decommissioned
    - After approval by forecasting department
  - Interactive components will be tested in the operational and distributed environment.
    - Especially important for those components with regionalized responsibilities (EPM, MMO)
  - Enhance and stabilize interactive components
- **NinJo 1.2 (Summer 2006)**
  - Will replace MAP completely
  - Final Approval by Forecasting Department

NinJo 1.0 Features (Since April 2005)

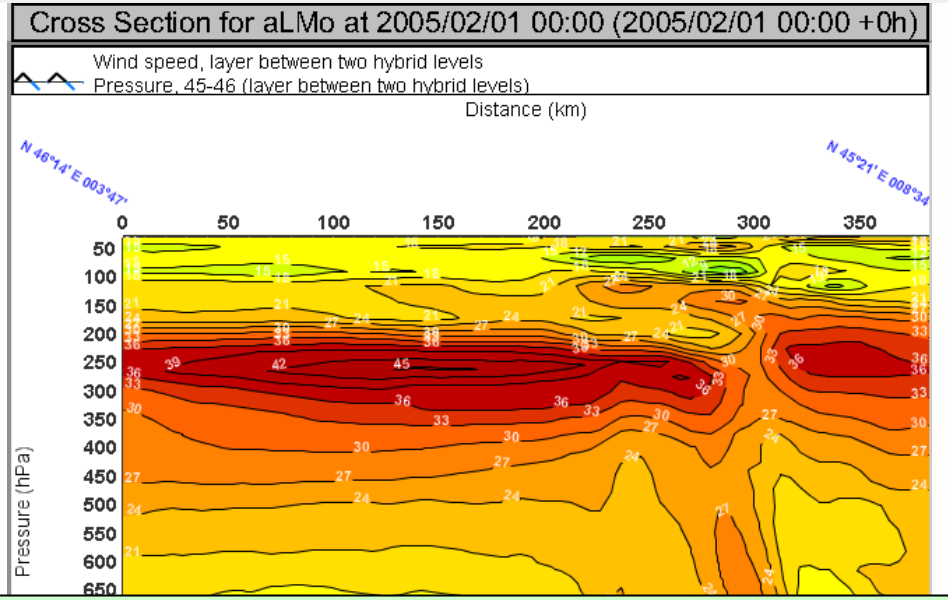
- **Servers**
  - Point data incl. Lightning & TAF
  - Grid
  - Radar
  - Satellite incl. Polar orbiters
- **Layers**
  - GeoVector and GeoRaster
  - Point data incl. Metars
  - Grid incl. Adwice
  - Satellite incl. Polar orbiters and Mosaics
  - Radar incl. Mosaics
  - Sounding layer
  - Lightning
  - Automatic Monitoring (AutoMON) for Observational Data (DWD CFO only)
  - Prototype of the Interactive graphical editor MOL (no point data)
  - Prototypes of EPM, MMO, OOG
- **Secondary window application**
  - Meteograms
  - Soundings
  - Cross Sections
- **GUI - Components: myGUI, Favorites, Navigator**

NinJo 1.1 Features (January 2006)

- Met Objects Layer (Graphical editor, but no editing of point data)
- Surface Layer
  - Interactive WMO-Plotmodel, Complex Rating
- Automatic monitoring and alerting (AutoMON)
- Ready for operational evaluation
  - MMO
  - EPM
  - OOG
  - On Screen Analysis
- Satellite
  - Eumetsat Nowcasting SAF
- Radar
  - Enhanced BUFR-Format to handle volume data, prototype of cell drill drown
- SCIT-Layer
- Aviation Layer
  - TAF, Metar, Gafor, flight routes...
- Formula Editor
  - Complete formula language for complex calculations with meteorological data

NinJo 1.1 Features (continued)

- **Formula Editor**
  - Complete formula language for calculations with meteorological data
  - Prototype implemented for cross sections




```
<gridMergeConfig>                                <!-- compute Wind speed -
   <mergeEntry outputID=”Wind speed" replace="false">
      <element id=" u wind "/>
      <element id=" v wind "/>
      <formula>
         uwind = grid1.getData();
         vwind = grid2.getData();
         mag = sqrt(uwind*uwind + vwind*vwind);
         return new Field(mag, grid1.getGrid(), grid1.getProp());
      </formula>
   </mergeEntry>
</gridMergeConfig>
```

NinJo Implementation Plan

Milestones

06.07.2005 **Start of parallel operations NinJo 1.0 –date depends clients**

30.10.2005 **Acceptance NinJo 1.0 by business area WV**

30.10.2005 **Start of test NinJo 1.1 by CFO Frankfurt and AFO Frankfurt**

(only for the non-interactive components)

1.12.2005 **Start decommissioning of the old SGI workstations.**

Start of test NinJo 1.1 interactive components

30.01.2006 **End Bugfix of the interactive components in NinJo 1.1.**

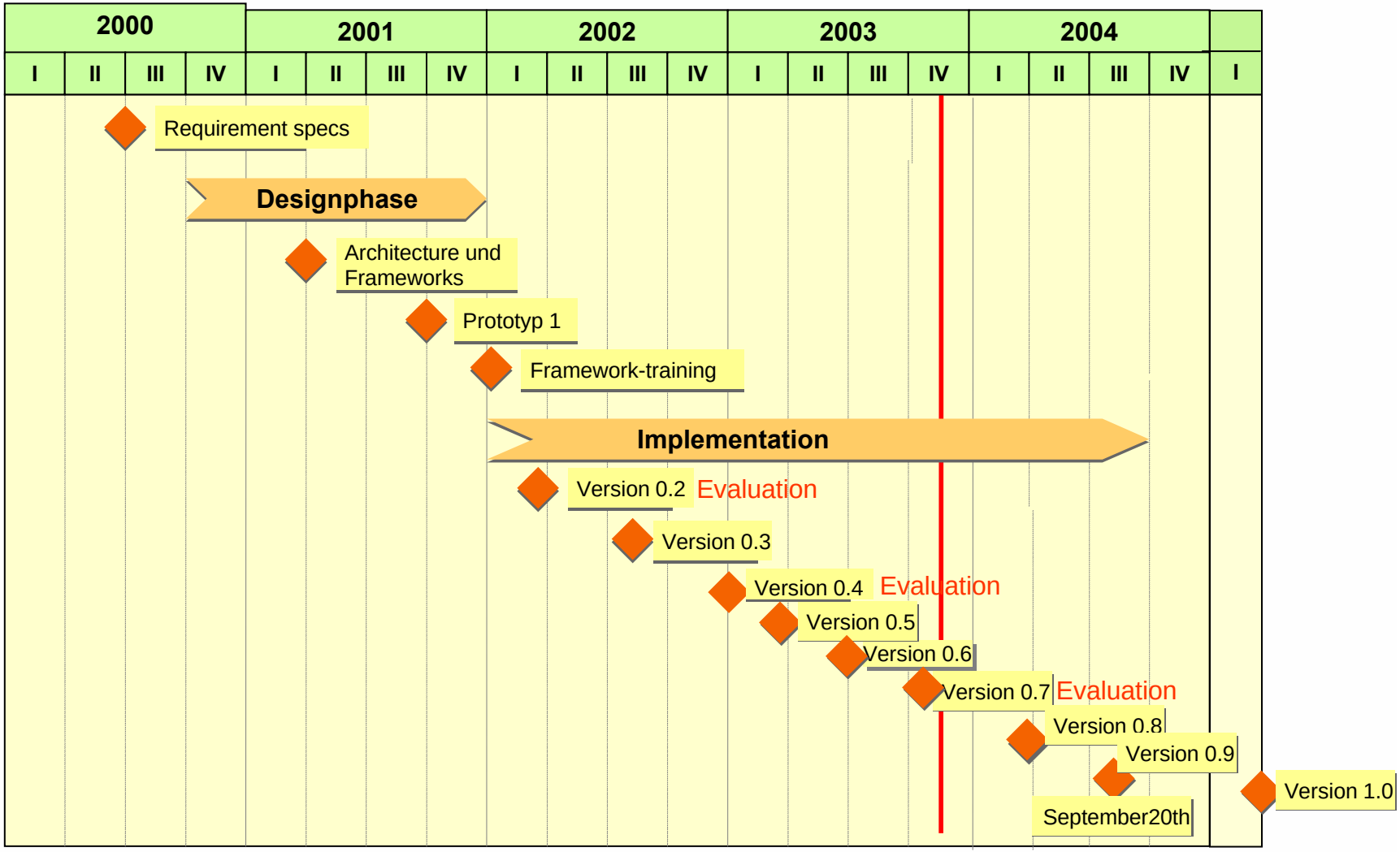
30.01.2006 **Start testing revised/bugfixed interactive components**

03.05.2006 **Installation NinJo 1.2**

21.05.2006 **Acceptance of NinJo 1.1 by business area WV - including the interactive components of NinJo 1.1**

24.05.2006 **MAP completely decommisioned**

Milestones


2000
2001
2002
2003
2004
I
II
III
IV
Requirement specs
Designphase
Architecture und Frameworks
Prototyp 1
Framework-training
Implementation
Version 0.2
Evaluation
Version 0.3
Version 0.4
Evaluation
Version 0.5
Version 0.6
Version 0.7
Evaluation
Version 0.8
Version 0.9
Version 1.0
September20th