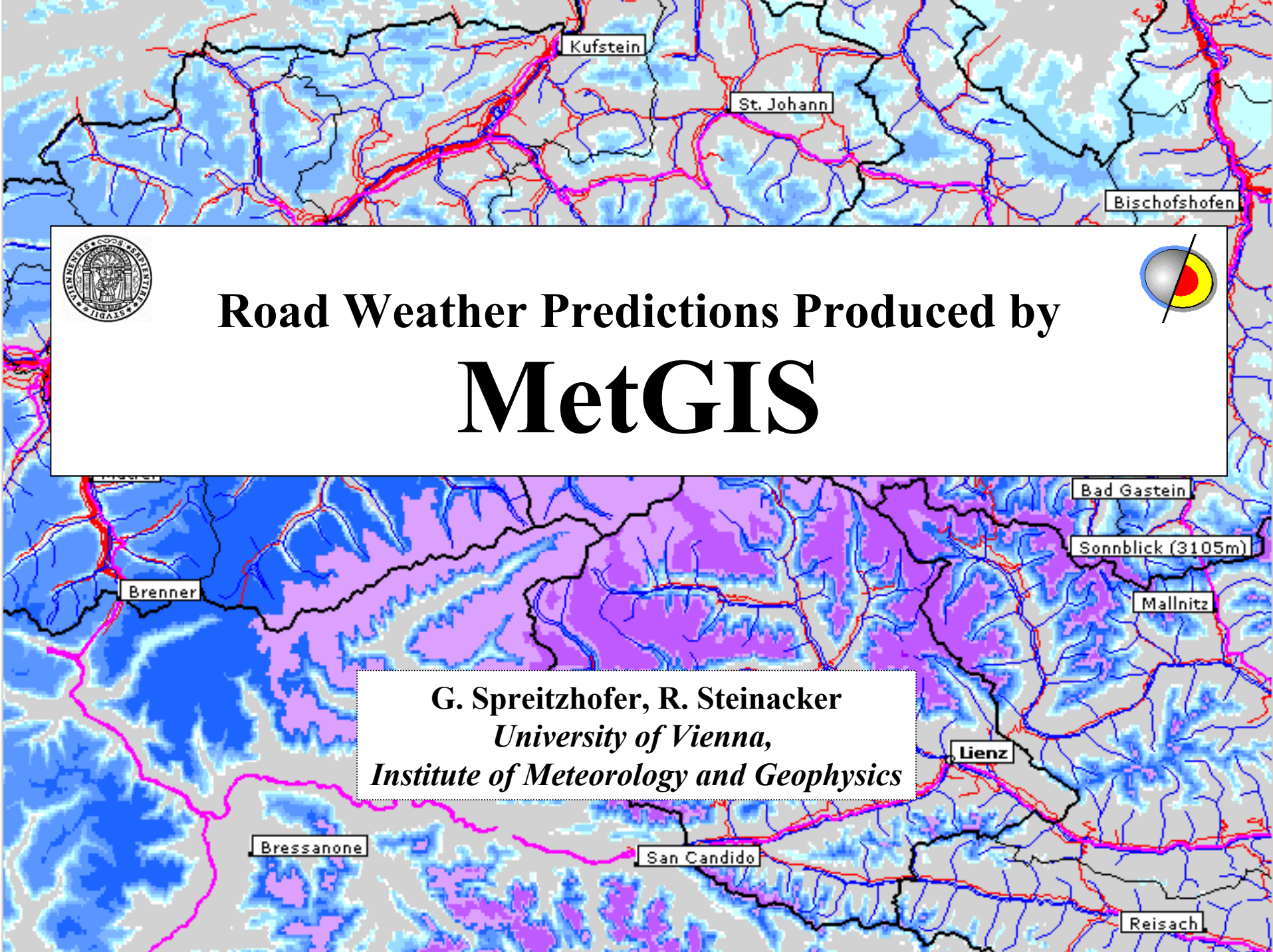



# Road Weather Predictions Produced by

# MetGIS

**G. Spreitzhofer, R. Steinacker**
***University of Vienna,***
***Institute of Meteorology and Geophysics***

# Structure of Talk

1. MetGIS basics
2. MetGIS Java GUI
3. MetGIS web interface
4. Operational application and experiences
5. Upgrade plans

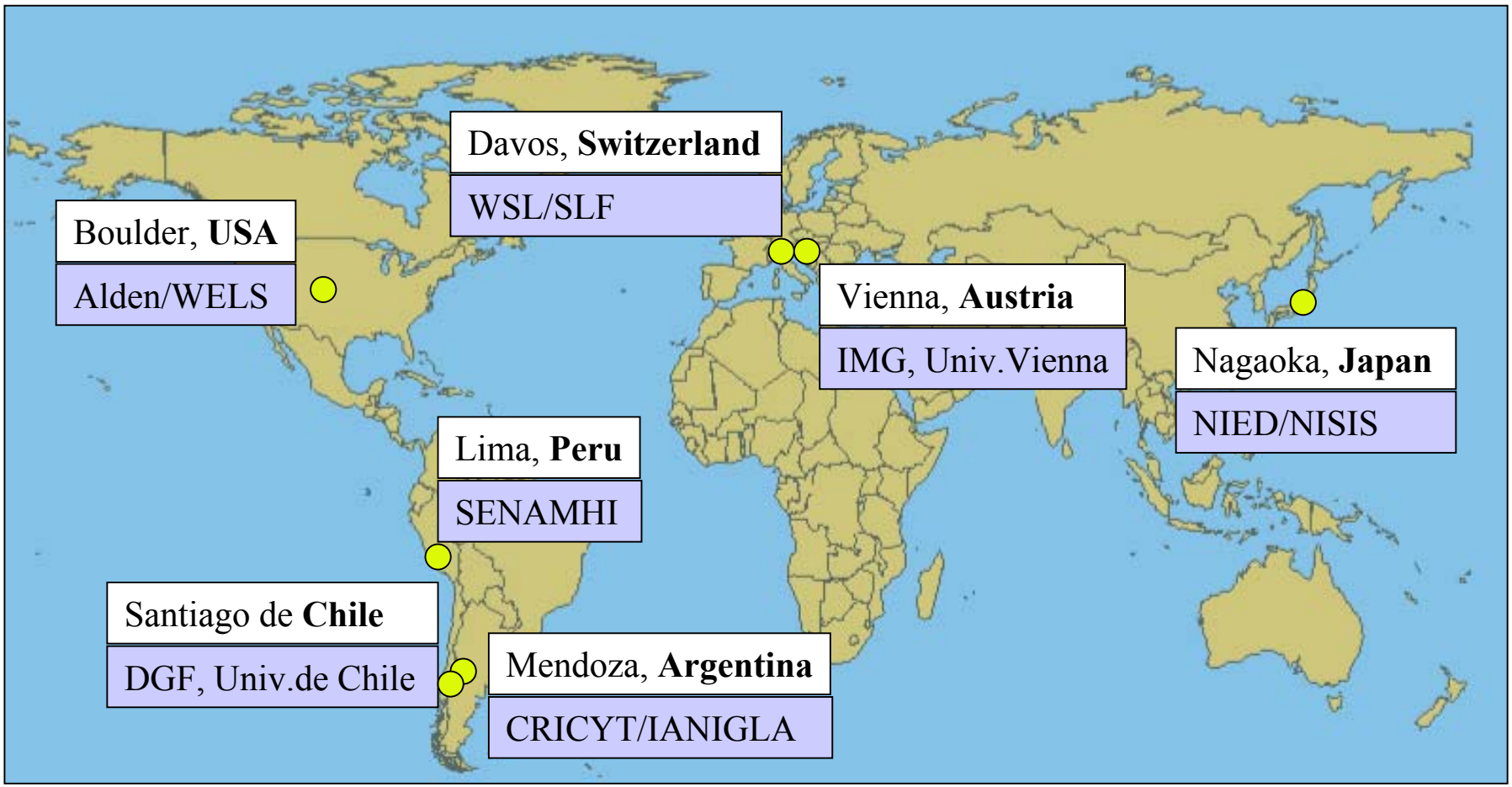
# MetGIS Basics

What is MetGIS?
Combined **met**eorological and **g**eographic **i**nformation **s**ystem with a specific focus on snow, mountain areas and the traffic system in alpine terrain.

Principal features:

- Efficient downscaling procedures of meteorological forecast fields over complex terrain, included into an operational system
- Easy international application through use of standard meteorological and geographical data formats
- Excellent graphical user interface allows traffic operation managers easy access to forecasts

# MetGIS Development



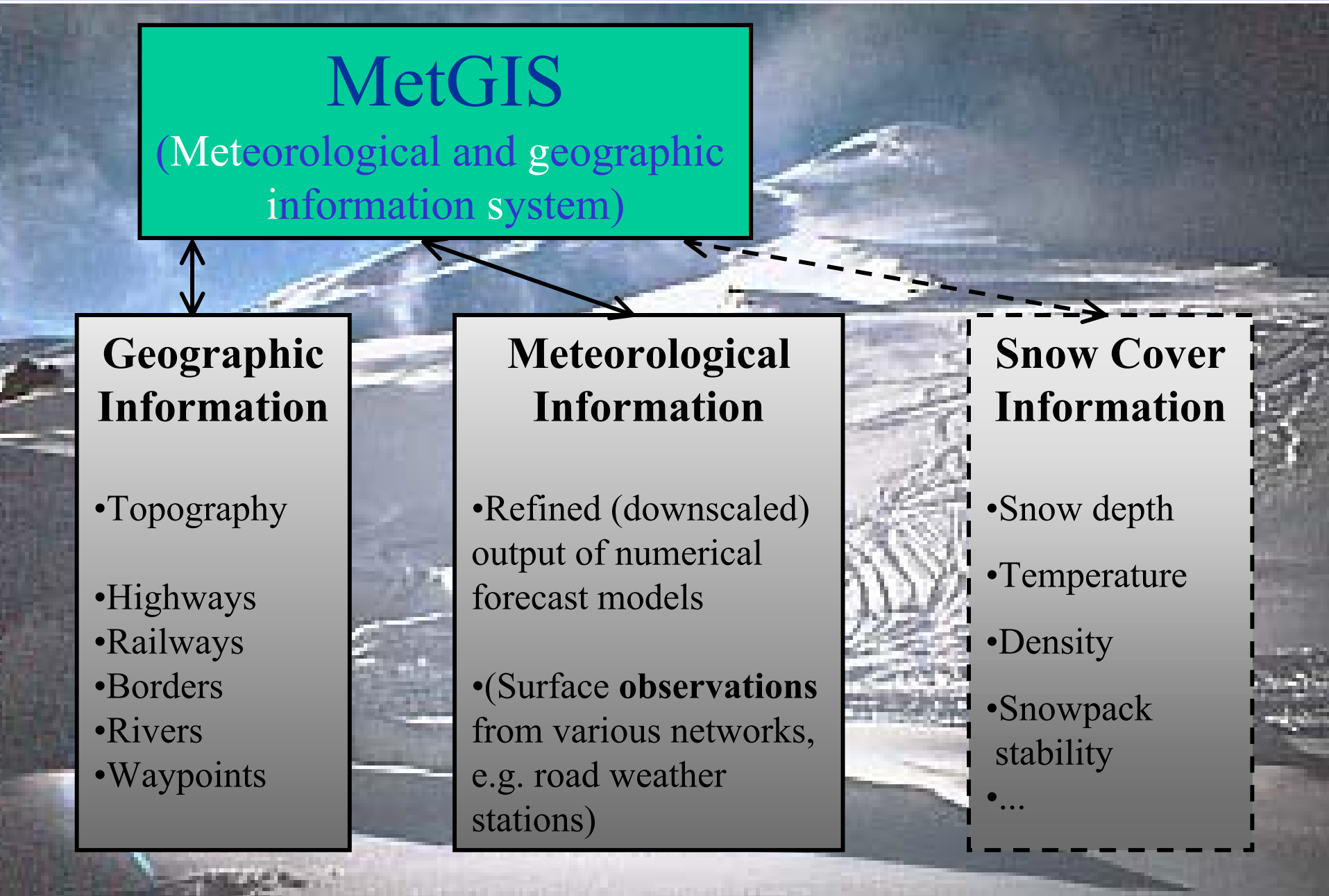

Why global involvement?

- Use diversified know-how
- Tune MetGIS with different meteorological input models under varying geographic conditions

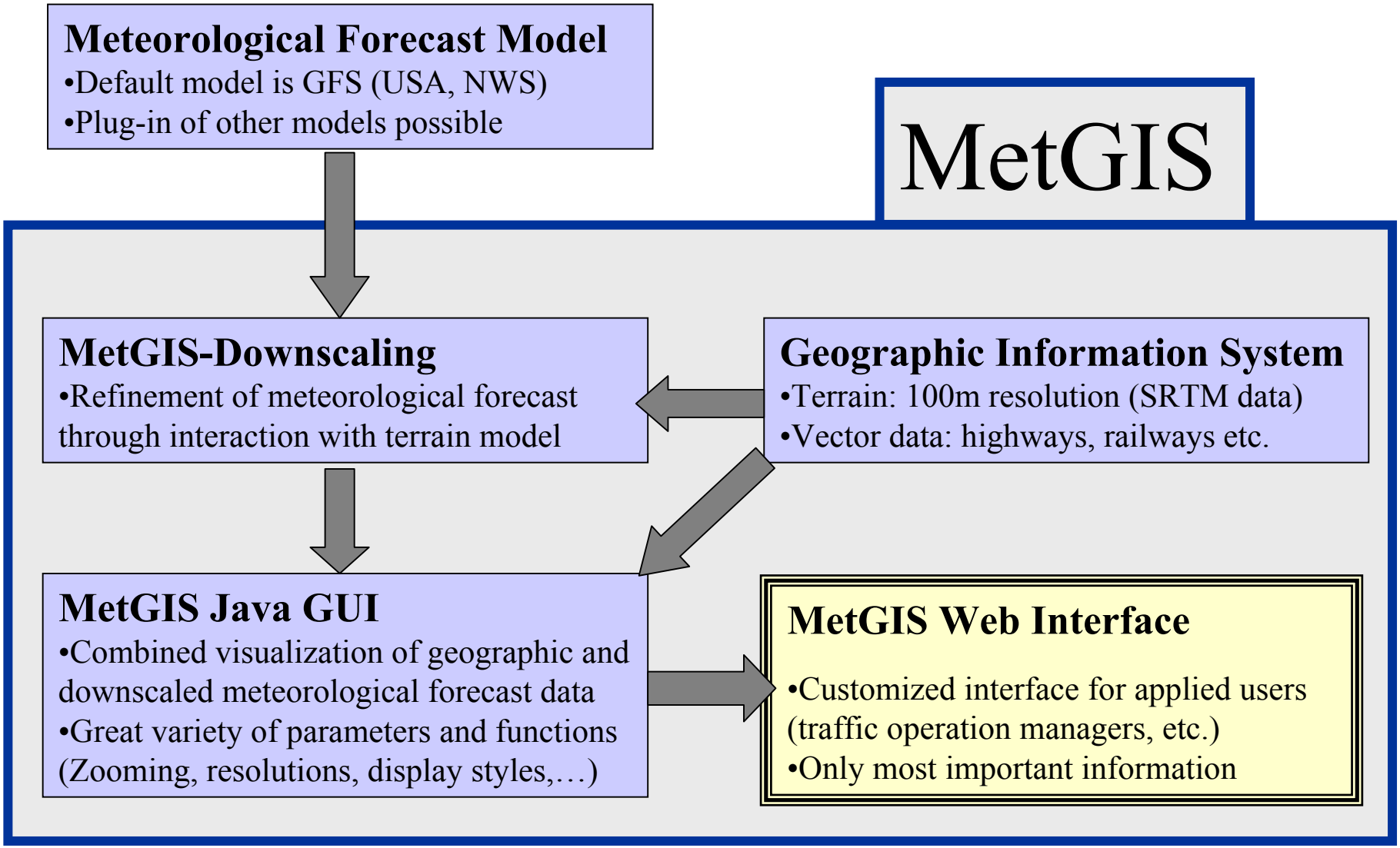
# Research Contributions

| Country/City | Research Institution | Contribution/Achievement |
|---|---|---|
| **USA** (Boulder, CO) | **WELS** Research Corporation/ Alden Electronics | Basic ideas about combination between GIS and meteo forecast |
| **Switzerland** (Davos) | **SLF** (Swiss Federal Institute for Snow and Avalanche Research) | Java technology for GUIs, SNOWPACK visualization |
| **Peru** (Lima) | **SENAMHI** (Servicio Nacional de Meteorología e Hidrología) | Start programming Java-based GIS |
| **Japan** (Nagaoka) | **NIED/NISIS** (National Research Institute for Earth Science and Disaster Prevention) | Continue GIS, Start programming interface for meteorological forecast models |
| **Argentinia** (Mendoza) | **IANIGLA** (Instituto Argentino de Nivelogía y Glaciología) | Integration of SRTM terrain data |
| **Chile** (Santiago) | **DGF** (Departamento de Geofísica, Universidad de Chile) | MM5 forecast integration, WRF forecast integration (in progress) |
| **Austria** (Vienna) | **IMG** (Institute of Meteorology and Geophysics, University of Vienna) | Display of observation data, downscaling, GFS fc. integration |

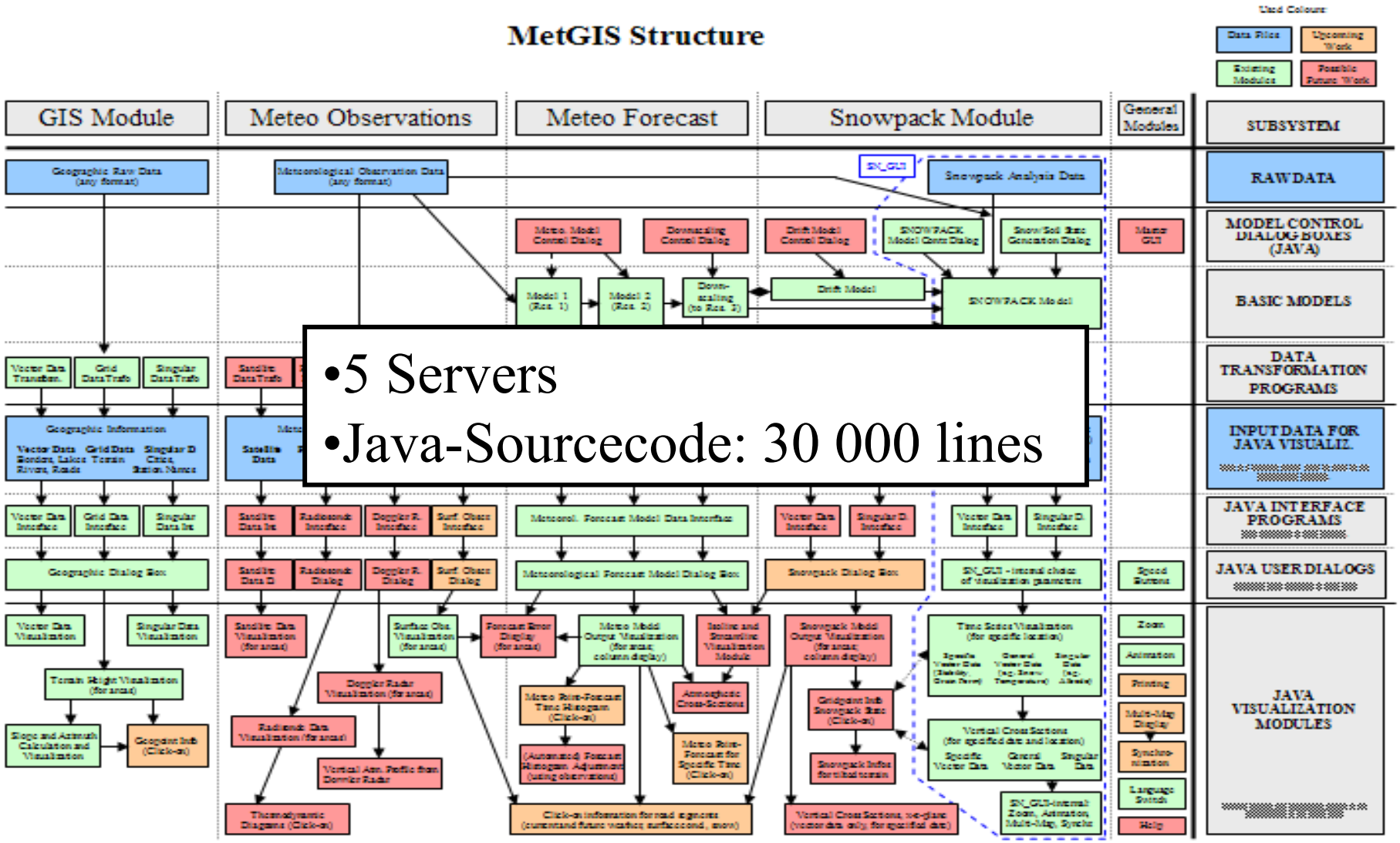
# MetGIS Components

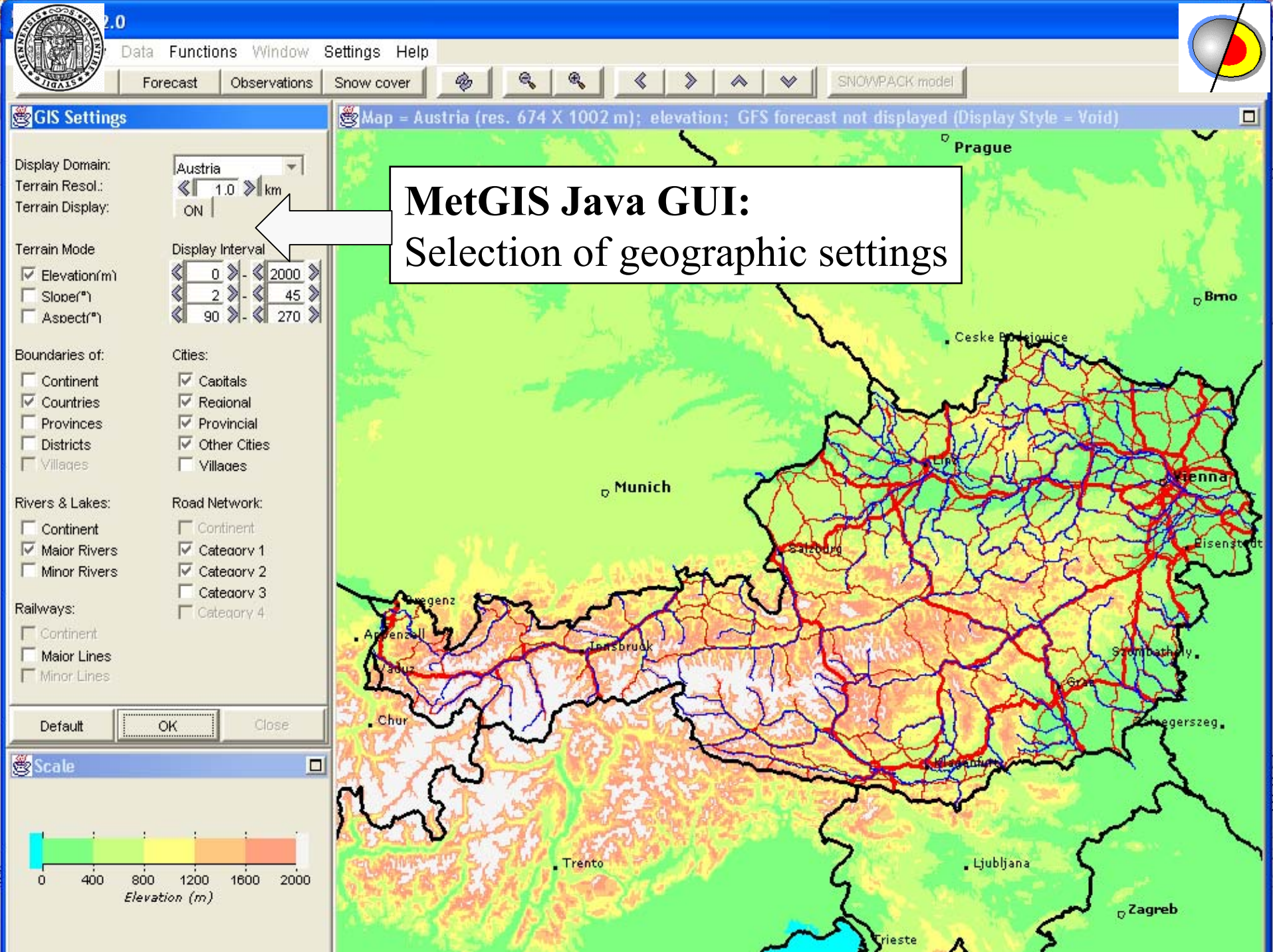


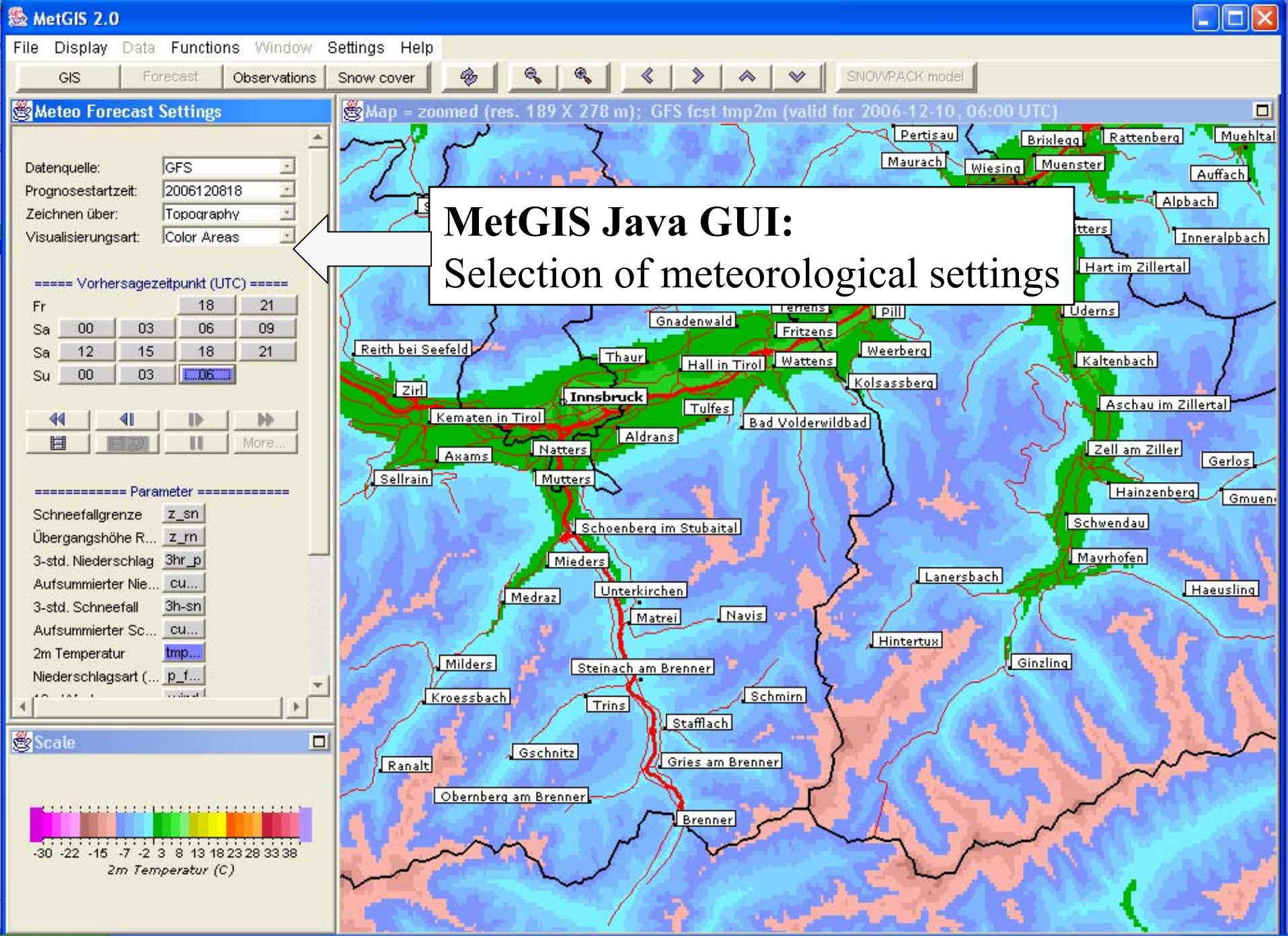
# MetGIS Subsystems



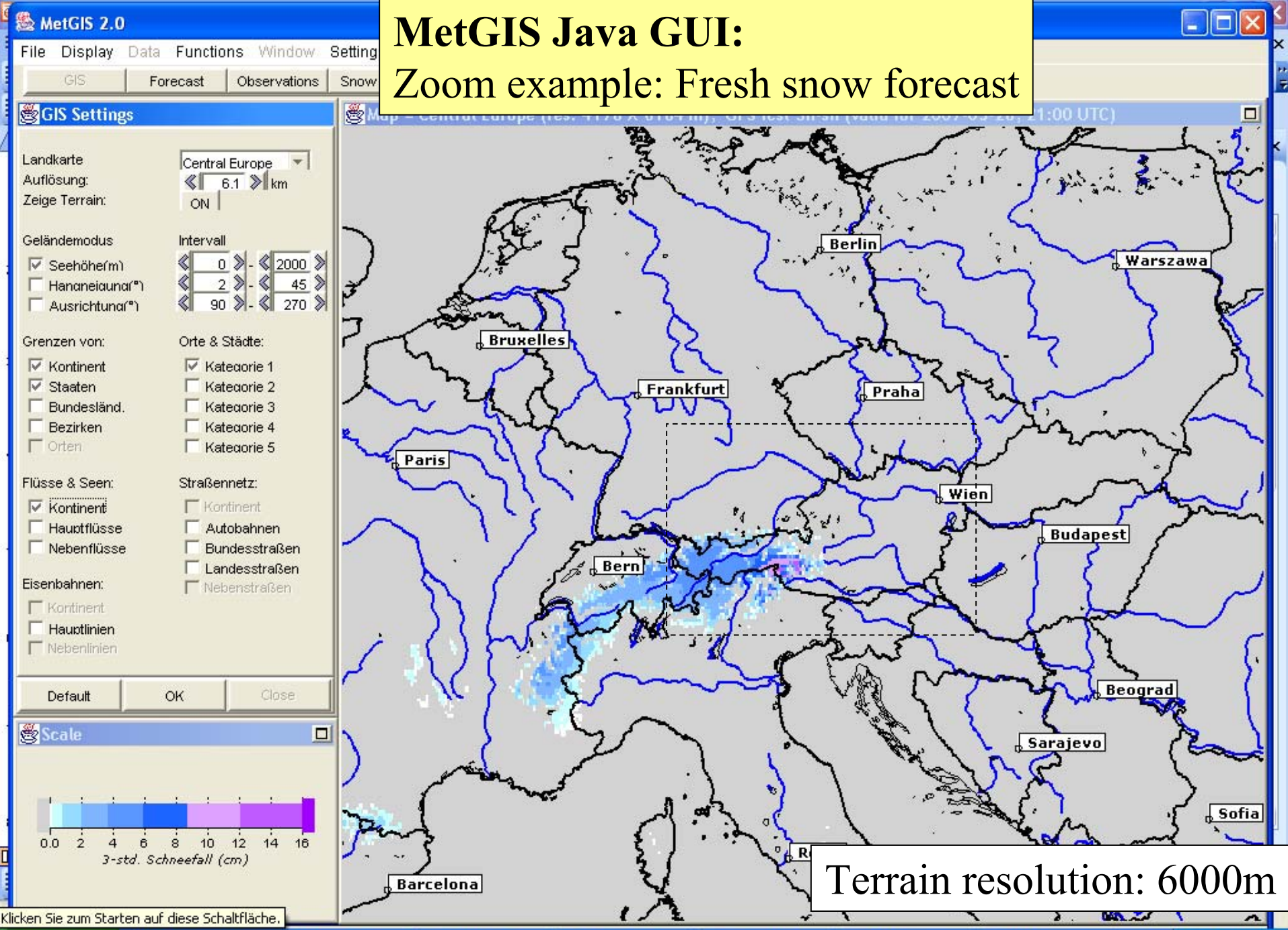
# Java


MetGIS Structure
GIS Module
Meteo Observations
Meteo Forecast
Snowpack Module
General Modules
SUBSYSTEM
RAWDATA
MODEL CONTROL DIALOG BOXES (JAVA)
BASIC MODELS
DATA TRANSFORMATION PROGRAMS
INPUT DATA FOR JAVA VISUALIZ.
JAVA INTERFACE PROGRAMS
JAVA USER DIALOGS
JAVA VISUALIZATION MODULES
•5 Servers
•Java-Sourcecode: 30 000 lines

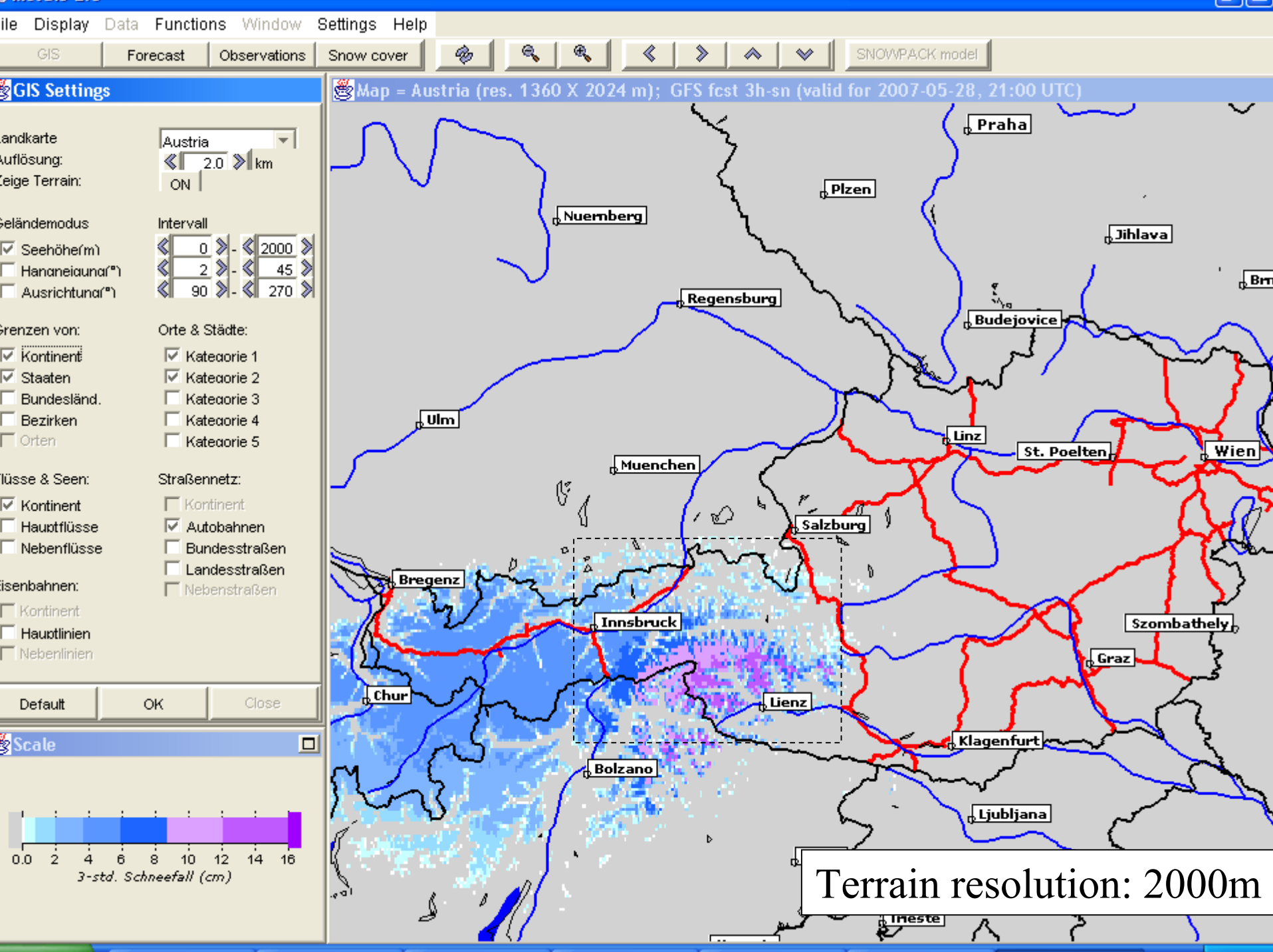

2.0
Data
Functions
Window
Settings
Help
Forecast
Observations
Snow cover
SNOWPACK model
GIS Settings
Display Domain:
Austria
Terrain Resol.:
1.0
km
Terrain Display:
ON
Terrain Mode
Display Interval
Elevation(m)
0
2000
Slope(°)
2
45
Aspect(°)
90
270
Boundaries of:
Continent
Countries
Provinces
Districts
Villages
Cities:
Capitals
Regional
Provincial
Other Cities
Villages
Rivers & Lakes:
Continent
Maior Rivers
Minor Rivers
Road Network:
Continent
Category 1
Category 2
Category 3
Category 4
Railways:
Continent
Maior Lines
Minor Lines
Default
OK
Close
Scale
0
400
800
1200
1600
2000
Elevation (m)
Map = Austria (res. 674 X 1002 m); elevation; GFS forecast not displayed (Display Style = Void)
Prague
Brno
Munich
Vienna
Salzburg
Innsbruck
Chur
Trento
Ljubljana
Zagreb
MetGIS Java GUI:
Selection of geographic settings

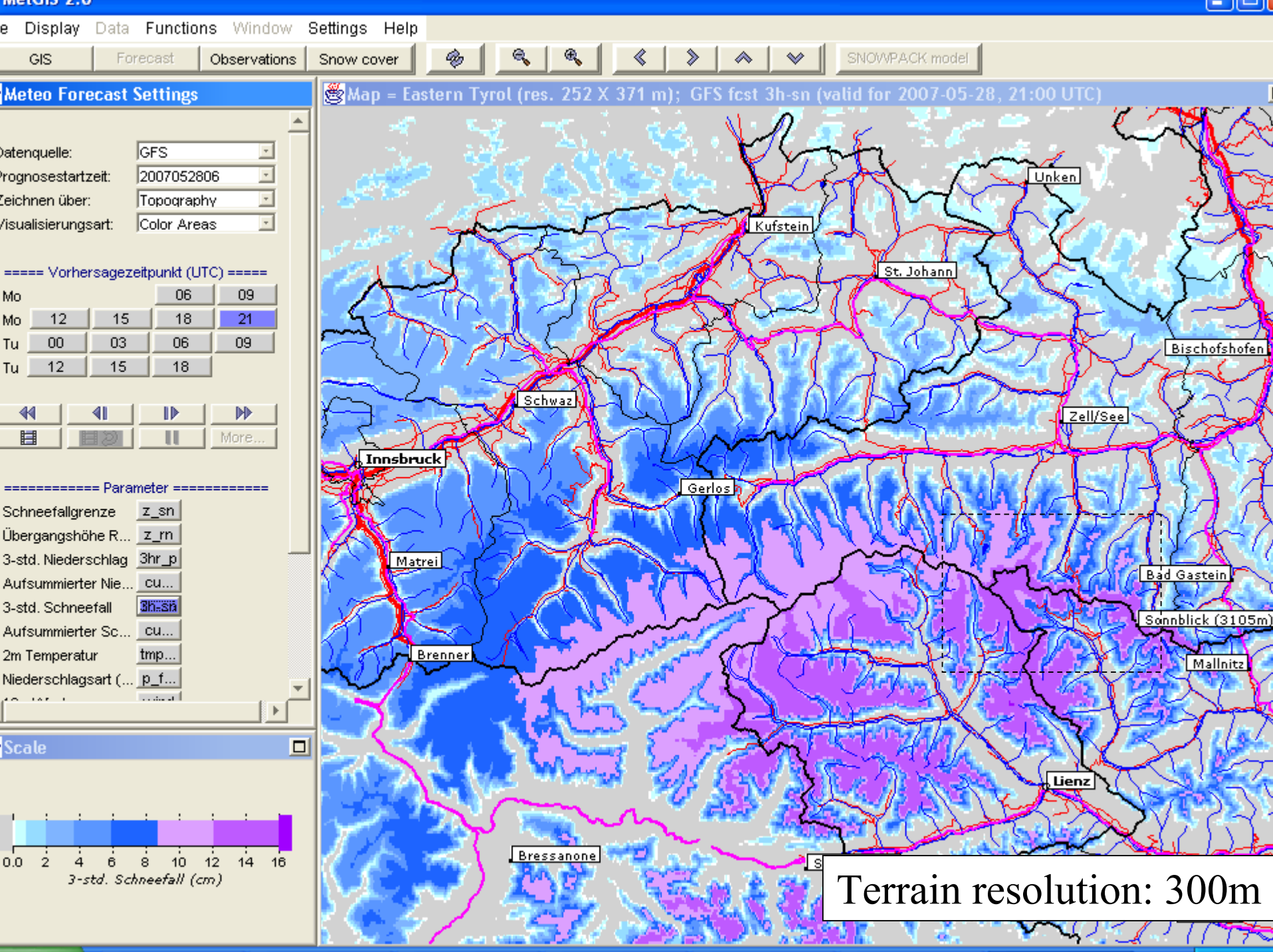

MetGIS 2.0
File Display Data Functions Window Settings Help
GIS Forecast Observations Snow cover SNOWPACK model
Meteo Forecast Settings
Datenquelle: GFS
Prognosestartzeit: 2006120818
Zeichnen über: Topography
Visualisierungsart: Color Areas
===== Vorhersagezeitpunkt (UTC) =====
Fr 18 21
Sa 00 03 06 09
Sa 12 15 18 21
Su 00 03 06
More...
========== Parameter ==========
Schneefallgrenze z_sn
Übergangshöhe R... z_rn
3-std. Niederschlag 3hr_p
Aufsummierter Nie... cu...
3-std. Schneefall 3h-sn
Aufsummierter Sc... cu...
2m Temperatur tmp...
Niederschlagsart (... p_f...
Scale
-30 -22 -15 -7 -2 3 8 13 18 23 28 33 38
2m Temperatur (C)
Map = zoomed (res. 189 X 278 m); GFS fcst tmp2m (valid for 2006-12-10, 06:00 UTC)
Pertisau
Brixlegg
Rattenberg
Muehltal
Maurach
Wiesing
Muenster
Auffach
Alpbach
Inneralpbach
Hart im Zillertal
Gnadenwald
Fritzens
Pill
Uderns
Reith bei Seefeld
Thaur
Hall in Tirol
Wattens
Weerberg
Kaltenbach
Zirl
Innsbruck
Kolsassberg
Tulfes
Aschau im Zillertal
Kematen in Tirol
Bad Volderwildbad
Aldrans
Natters
Axams
Zell am Ziller
Gerlos
Sellrain
Mutters
Hainzenberg
Schoenberg im Stubaital
Schwendau
Mieders
Mayrhofen
Lanersbach
Unterkirchen
Haeusling
Medraz
Matrei
Navis
Hintertux
Milders
Steinach am Brenner
Ginzling
Kroessbach
Trins
Schmirn
Stafflach
Gschnitz
Ranalt
Gries am Brenner
Obernberg am Brenner
Brenner
MetGIS Java GUI:
Selection of meteorological settings

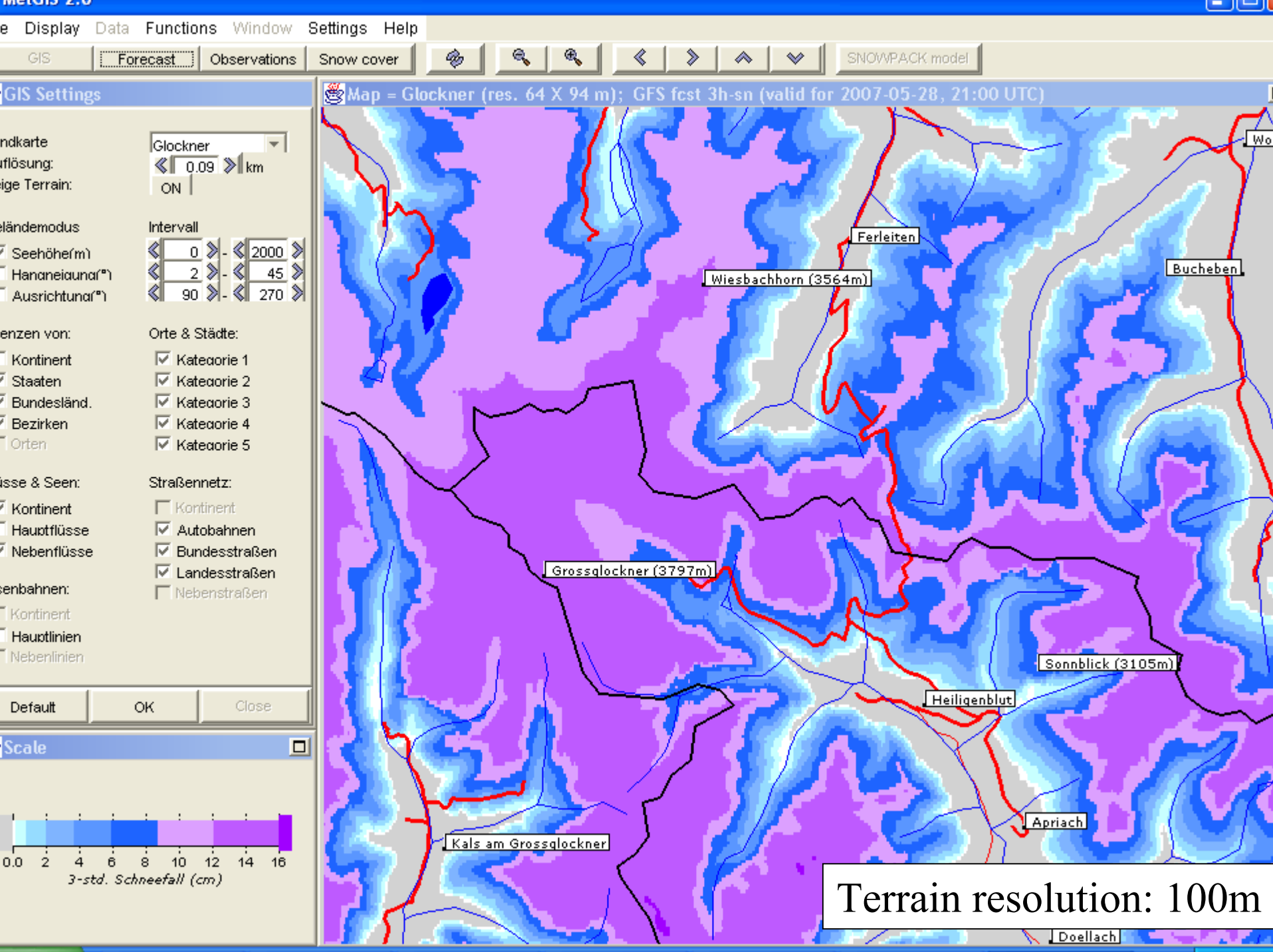
# MetGIS Java GUI:
Zoom example: Fresh snow forecast




Terrain resolution: 6000m


ile Display Data Functions Window Settings Help
GIS
Forecast
Observations
Snow cover
SNOWPACK model
GIS Settings
Landkarte
Auflösung:
Zeige Terrain:
Austria
2.0
km
ON
Geländemodus
Intervall
Seehöhe(m)
Hangneigung(°)
Ausrichtung(°)
0
2000
2
45
90
270
Grenzen von:
Kontinent
Staaten
Bundesländ.
Bezirken
Orten
Orte & Städte:
Kategorie 1
Kategorie 2
Kategorie 3
Kategorie 4
Kategorie 5
Flüsse & Seen:
Kontinent
Hauptflüsse
Nebenflüsse
Straßennetz:
Kontinent
Autobahnen
Bundesstraßen
Landesstraßen
Nebenstraßen
Eisenbahnen:
Kontinent
Hauptlinien
Nebenlinien
Default
OK
Close
Scale
0.0 2 4 6 8 10 12 14 16
3-std. Schneefall (cm)
Map = Austria (res. 1360 X 2024 m); GFS fcst 3h-sn (valid for 2007-05-28, 21:00 UTC)
Praha
Plzen
Nuernberg
Jihlava
Regensburg
Budejovice
Ulm
Linz
St. Poelten
Wien
Muenchen
Salzburg
Bregenz
Innsbruck
Szombathely
Graz
Chur
Lienz
Klagenfurt
Bolzano
Ljubljana
Terrain resolution: 2000m


MetGIS 2.0
e Display Data Functions Window Settings Help
GIS
Forecast
Observations
Snow cover
SNOWPACK model
Meteo Forecast Settings
Datenquelle:
GFS
Prognosestartzeit:
2007052806
Zeichnen über:
Topography
Visualisierungsart:
Color Areas
===== Vorhersagezeitpunkt (UTC) =====
Mo 06 09
Mo 12 15 18 21
Tu 00 03 06 09
Tu 12 15 18
More...
========== Parameter ==========
Schneefallgrenze z_sn
Übergangshöhe R... z_rn
3-std. Niederschlag 3hr_p
Aufsummierter Nie... cu...
3-std. Schneefall 3h-sn
Aufsummierter Sc... cu...
2m Temperatur tmp...
Niederschlagsart (... p_f...
Scale
0.0 2 4 6 8 10 12 14 16
3-std. Schneefall (cm)
Map = Eastern Tyrol (res. 252 X 371 m); GFS fcst 3h-sn (valid for 2007-05-28, 21:00 UTC)
Unken
Kufstein
St. Johann
Bischofshofen
Schwaz
Zell/See
Innsbruck
Gerlos
Matrei
Bad Gastein
Sonnblick (3105m)
Brenner
Mallnitz
Lienz
Bressanone
Terrain resolution: 300m


MetGIS 2.0
Display Data Functions Window Settings Help
GIS Forecast Observations Snow cover SNOWPACK model
GIS Settings
Glockner
0.09 km
ON
Intervall
0 2000
2 45
90 270
Orte & Städte:
Kategorie 1
Kategorie 2
Kategorie 3
Kategorie 4
Kategorie 5
Straßennetz:
Autobahnen
Bundesstraßen
Landesstraßen
Default OK Close
Scale
0.0 2 4 6 8 10 12 14 16
3-std. Schneefall (cm)
Map = Glockner (res. 64 X 94 m); GFS fcst 3h-sn (valid for 2007-05-28, 21:00 UTC)
Ferleiten
Wiesbachhorn (3564m)
Bucheben
Grossglockner (3797m)
Sonnblick (3105m)
Heiligenblut
Apriach
Kals am Grossglockner
Doellach
Terrain resolution: 100m

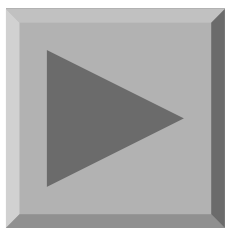
# MetGIS Web Interface

**http://univie.ac.at/amk/metgis**

- **Easy-to-use interface** designed for applied users (traffic operation centers, avalanche control centers)
- **Operational 36-hour forecasts** (password-protected)
- **Forecast examples** for various regions (freely accessible)
- **Forecast parameters**: temperature, precipitation amount and type, fresh snow depth, snow limit, wind
- **Languages**: English, German, Spanish

# Demo

Demo MetGIS Web Interface



# MetGIS Operational Application

- 4 model runs a day at University of Vienna to produce the downscaled graphical road weather forecasts for various regions
- Operation started 2007, first in a test mode involving Austrian highway authorities (constant improvements and adjustments)
- Preliminary user comment: „valuable help“
- Main problem: many traffic operation managers hesitate to use new technology
- Detailed verification study is planned, using last winters MetGIS forecast and observation data

# MetGIS Outlook

- Upgrades in **forecast quality**:

- Snow limit (use of valley geometry)
- Precipitation amounts (use of climatological information)
- Temperature (energy balance models)

- Inclusion of **observation data** (e.g. from road weather stations) to improve the forecast quality and to detect forecast errors

- Inclusion of MetGIS graphics in foreign road weather information systems (JPGs in web pages, as layer in GIS)

- Point and **line forecasts** (highway sections)

Thank you
for your attention!
Visit:
http://univie.ac.at/amk/metgis

University of Vienna - Department of Meteorology and Geophysics - Division for General Meteorol - Microsoft Internet Explorer
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück Suchen Favoriten
Adresse http://www.univie.ac.at/AMK/metgis/casestudies/GL_2007052806/index.htm
Wechseln zu Links
Google Los geht's! Lesezeichen 47 blockiert Rechtschreibprüfung Senden an Einstellungen

# MetGIS

**Ausgangslage 16.06.2007, 08:00:** 08 11 14 17 20 23 | 02 05 08 11 14 17 20 MESZ LOOP

## Glocknergebiet

**Temperatur (2m)**
Zahlen Fläche
**Niederschlag (3stdg.)**
Zahlen Fläche
**Niederschlagsart**
Fläche
**Neuschnee (3stdg.)**
Zahlen Fläche
**Schneefallgrenze**
Zahlen Fläche
**Wind**
Zahlen Fläche

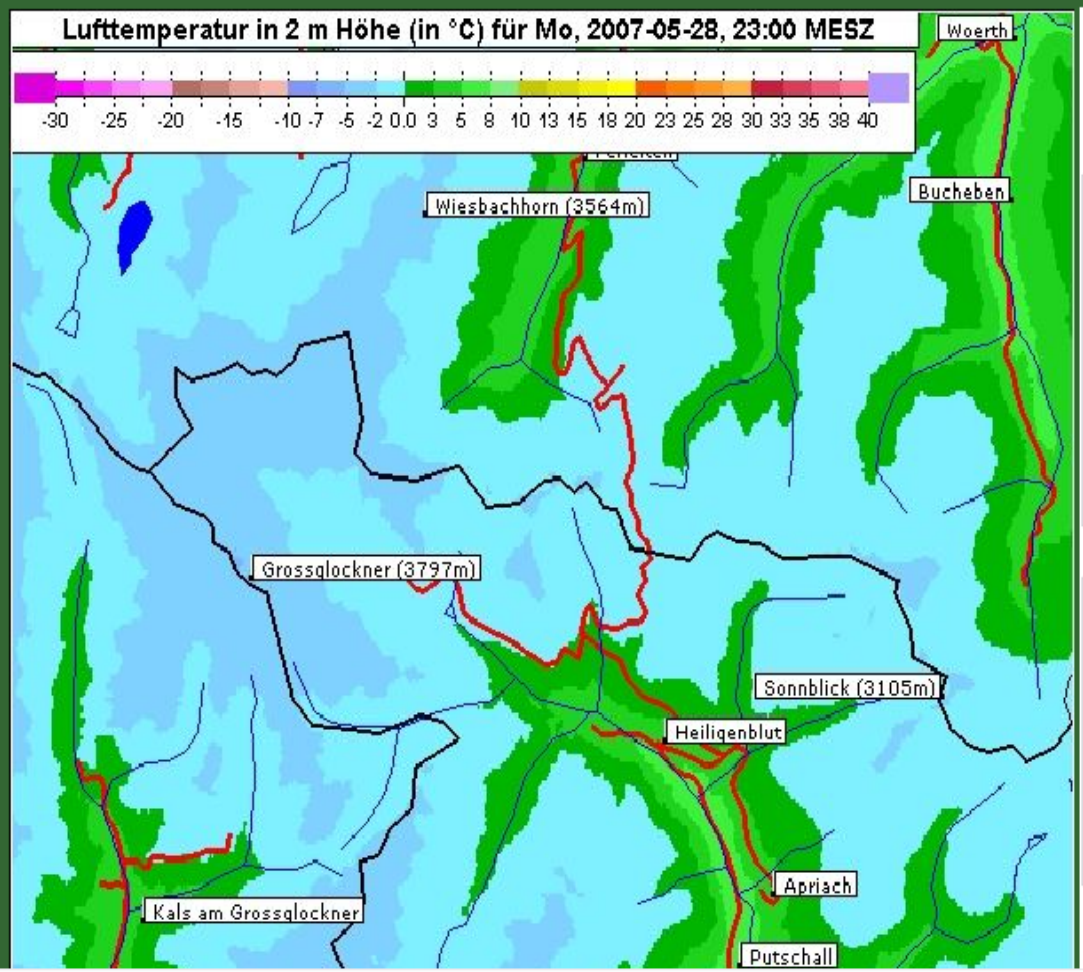



Bild
<< erstes
< voriges
> nächstes
>> letztes

Animation
Start
Stop

Zeit/Bild [ms]
1000

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0 Internet

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Datei Bearbeiten Ansicht Favoriten Extras ?

Zurück Suchen Favoriten

Adresse http://www.univie.ac.at/AMK/metgis/casestudies/GL_2007052806/index.htm Wechseln zu Links

Google Los geht's! Lesezeichen 47 blockiert Rechtschreibprüfung Senden an Einstellungen

# MetGIS

**Ausgangslage 16.06.2007, 08:00:** 08 11 14 17 20 23 | 02 05 08 11 14 17 20 **MESZ LOOP**

## Glocknergebiet

**Temperatur (2m)**
Zahlen Fläche
**Niederschlag (3stdg.)**
Zahlen Fläche
**Niederschlagsart**
Fläche
**Neuschnee (3stdg.)**
Zahlen Fläche
**Schneefallgrenze**
Zahlen Fläche
**Wind**
Zahlen Fläche

**Impressum**

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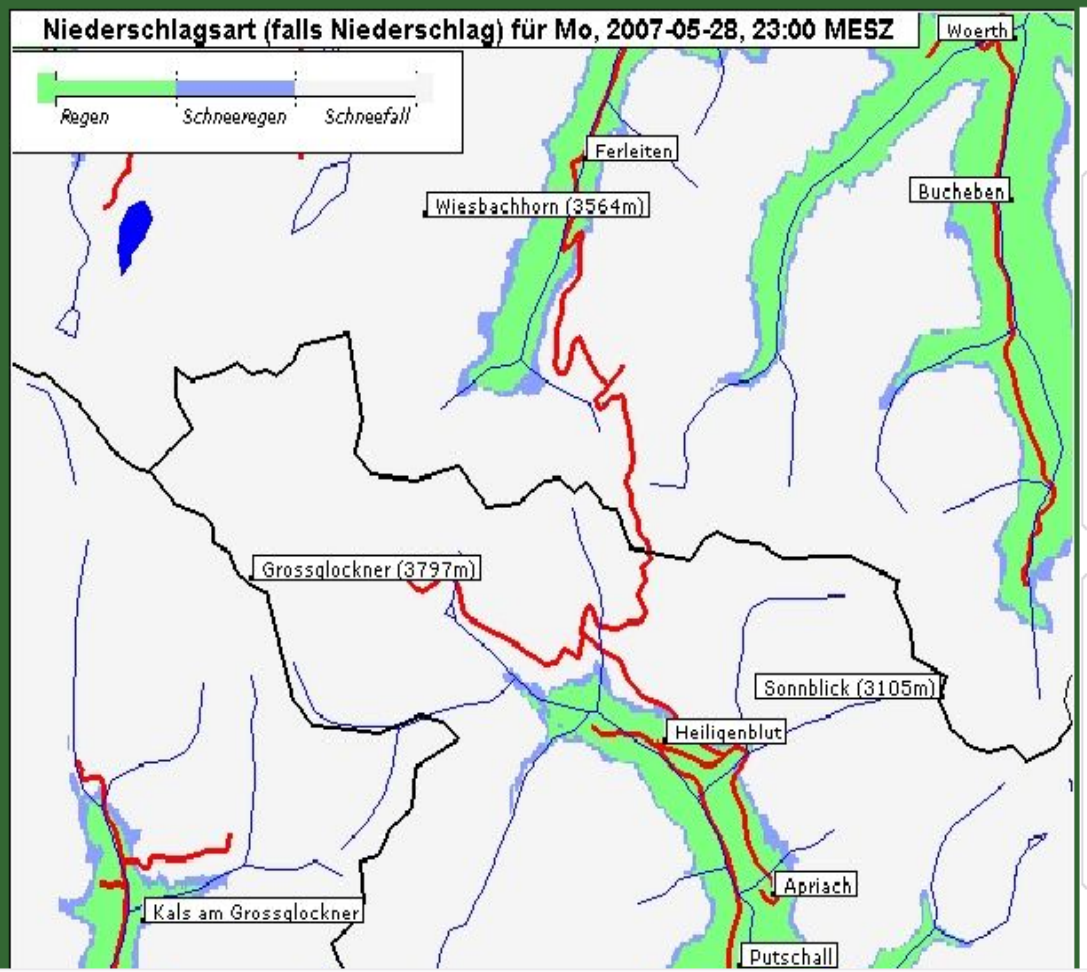


0 Internet

University of Vienna - Department of Meteorology and Geophysics - Division for General Meteorol - Microsoft Internet Explorer
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück Suchen Favoriten
Adresse http://www.univie.ac.at/AMK/metgis/casestudies/GL_2007052806/index.htm
Wechseln zu Links
Google Los geht's! Lesezeichen 47 blockiert Rechtschreibprüfung Senden an Einstellungen

# MetGIS

**Ausgangslage 16.06.2007, 08:00:** 08 11 14 17 20 23 | 02 05 08 11 14 17 20 **MESZ LOOP**

## Glocknergebiet

**Temperatur (2m)**
Zahlen Fläche
**Niederschlag (3stdg.)**
Zahlen Fläche
**Niederschlagsart**
Fläche
**Neuschnee (3stdg.)**
Zahlen Fläche
**Schneefallgrenze**
Zahlen Fläche
**Wind**
Zahlen Fläche

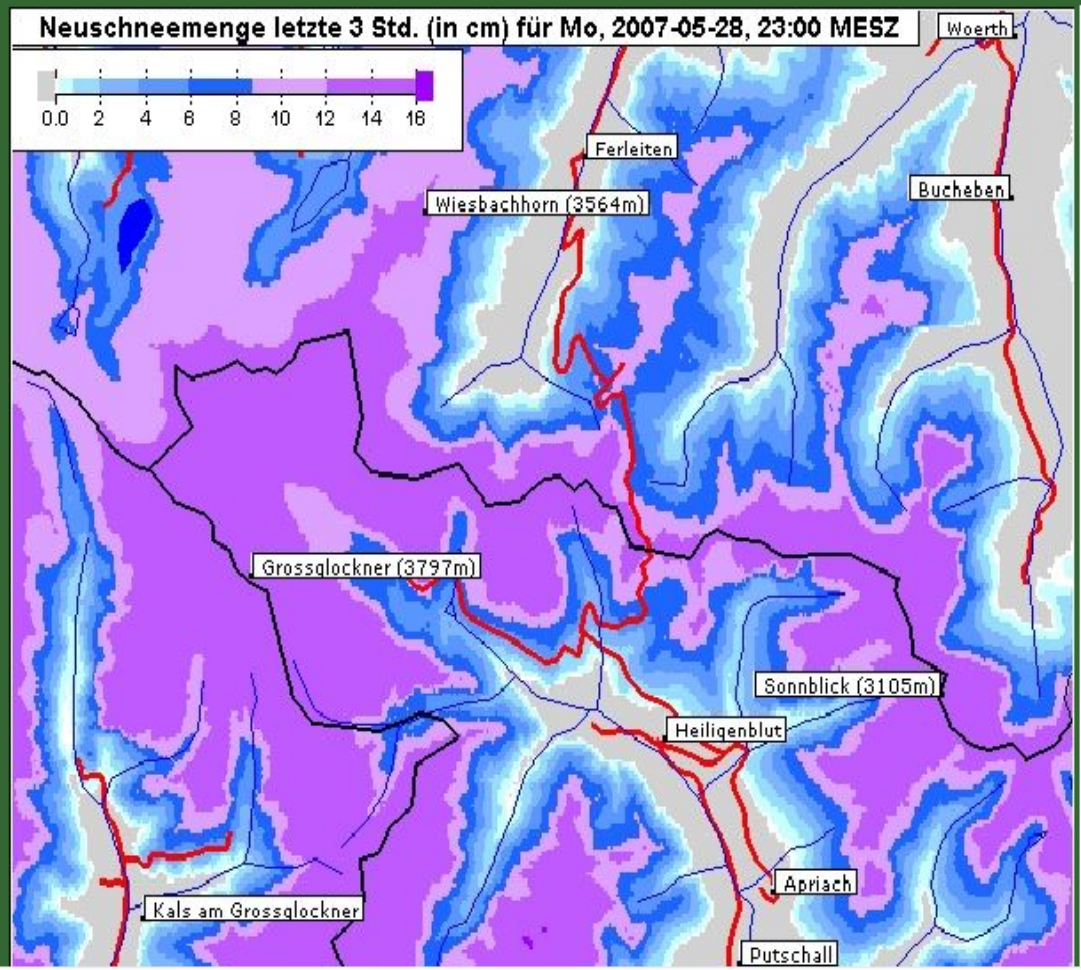


Bild
<< erstes
< voriges
> nächstes
>> letztes

Animation
Start
Stop

Zeit/Bild [ms]
1000

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