



Atmospheric Remote Sensing and Climate System Research Group
ARSCIISys

wege entstehen, indem wir sie gehen
paths emerge in that we walk them

Wegener Center
www.wegcenter.at



WegenerNet climate station network region Feldbach/Austria: local climate and weather at 1 km- scale resolution

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**Session MC3/AW13 „Data mapping, spatial interpolation and GIS modelling, Reference climatologies“
@ EMS Annual Meeting & Europ. Conference on Applied Climatology 2010; 13-17 Sep 2010, Zurich**

Outline

- WegenerNet Team & Sponsors
- One-slide Overview & Research Applications
- Station Setup & Measured Parameters
- Processing System & Data Products
- Results: Precipitation and Temperature at 1km-scale Resolution
(including example cases in summer 2008 and 2009)
- Data Availability @ WegenerNet Data Portal



WegenerNet Team & Sponsors

- **WegenerNet Core Team:**
G. Kirchengast
T. Kabas
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C. Bichler

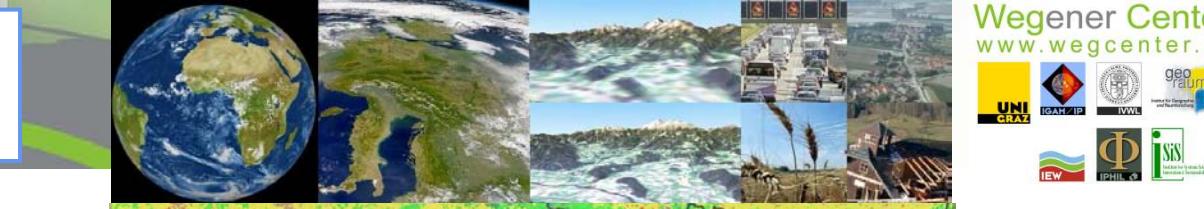


- **Further Contributors:**
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and more - Thanks

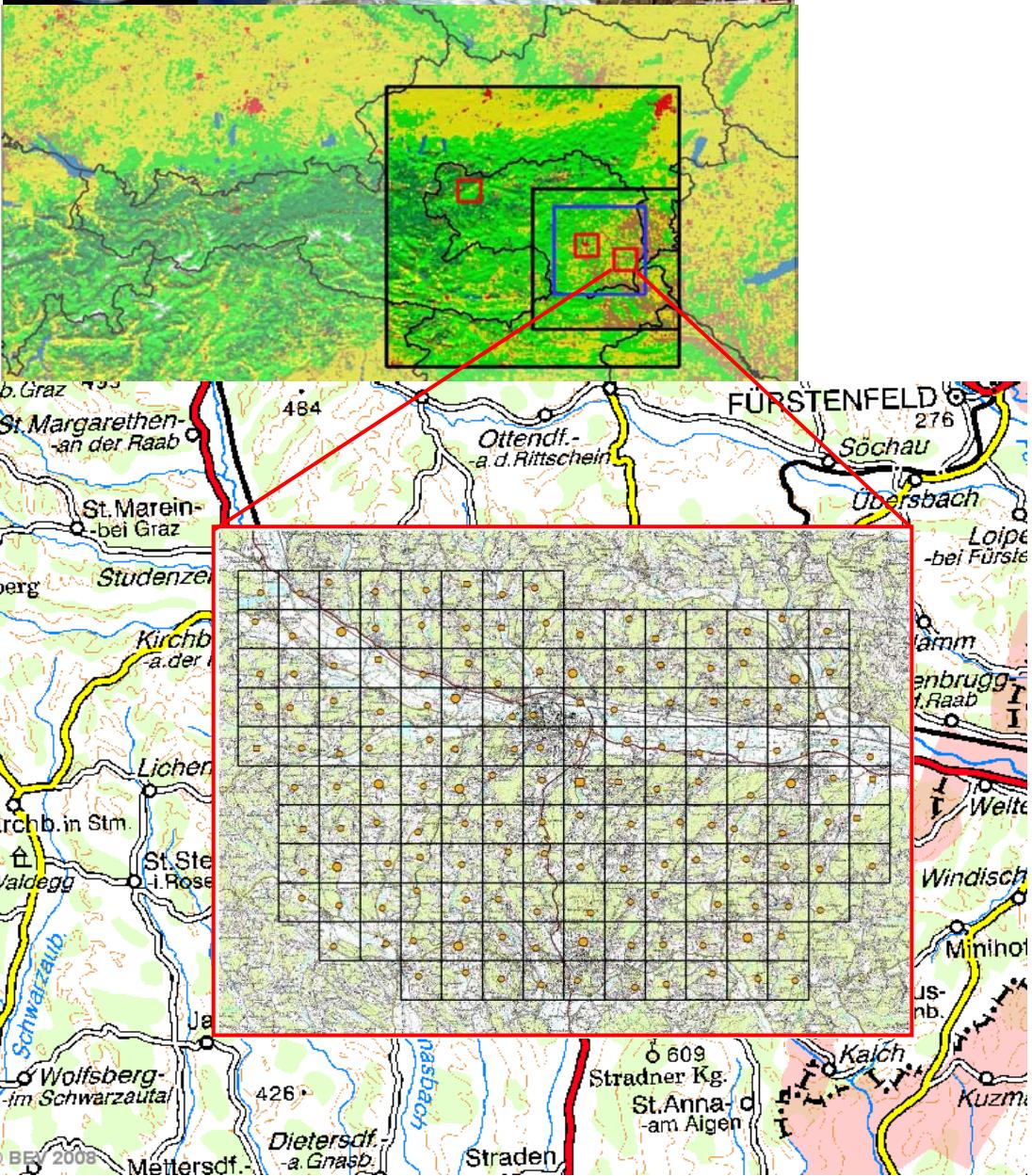
and Thanks to many sponsors

(those with logo here, and all others as well!)

What is the WegenerNet? One-slide Overview



- a pioneering experiment for high-resolution weather & climate observations, supporting monitoring, modeling, and prediction
 - joint funds of federal, provincial, municipal, region partner & university
 - **151 quality stations** in ~20 km x 15 km region (1 station per ~2 km²); several special main stations
 - automatic near-real-time observation of parameters such as **temperature, humidity, precipitation, wind, pressure, radiation**, complemented by **soil measurements (pF-value and temperature)**
 - available in the region: **high-res lightning (Linet), weather radar (Reicherhöhe)**
 - possible extensions: air quality, hydrological parameters, cloud properties, GPS water vapor, etc.)
 - a **new data set for research & practical use by the region itself**



For what is the WegenerNet? Research Applications

Many research projects **investigating climate and environmental change** and their impact, as well as local weather (extremes), **will benefit from WegenerNet data** covering the local scales from 1-10 km.

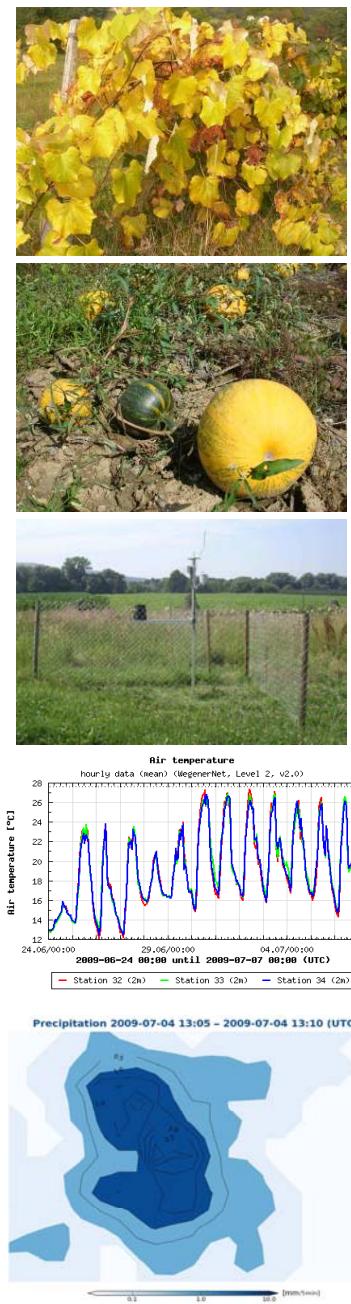
Possible applications include:

Model Testing and Validation at Local-scale Resolution:

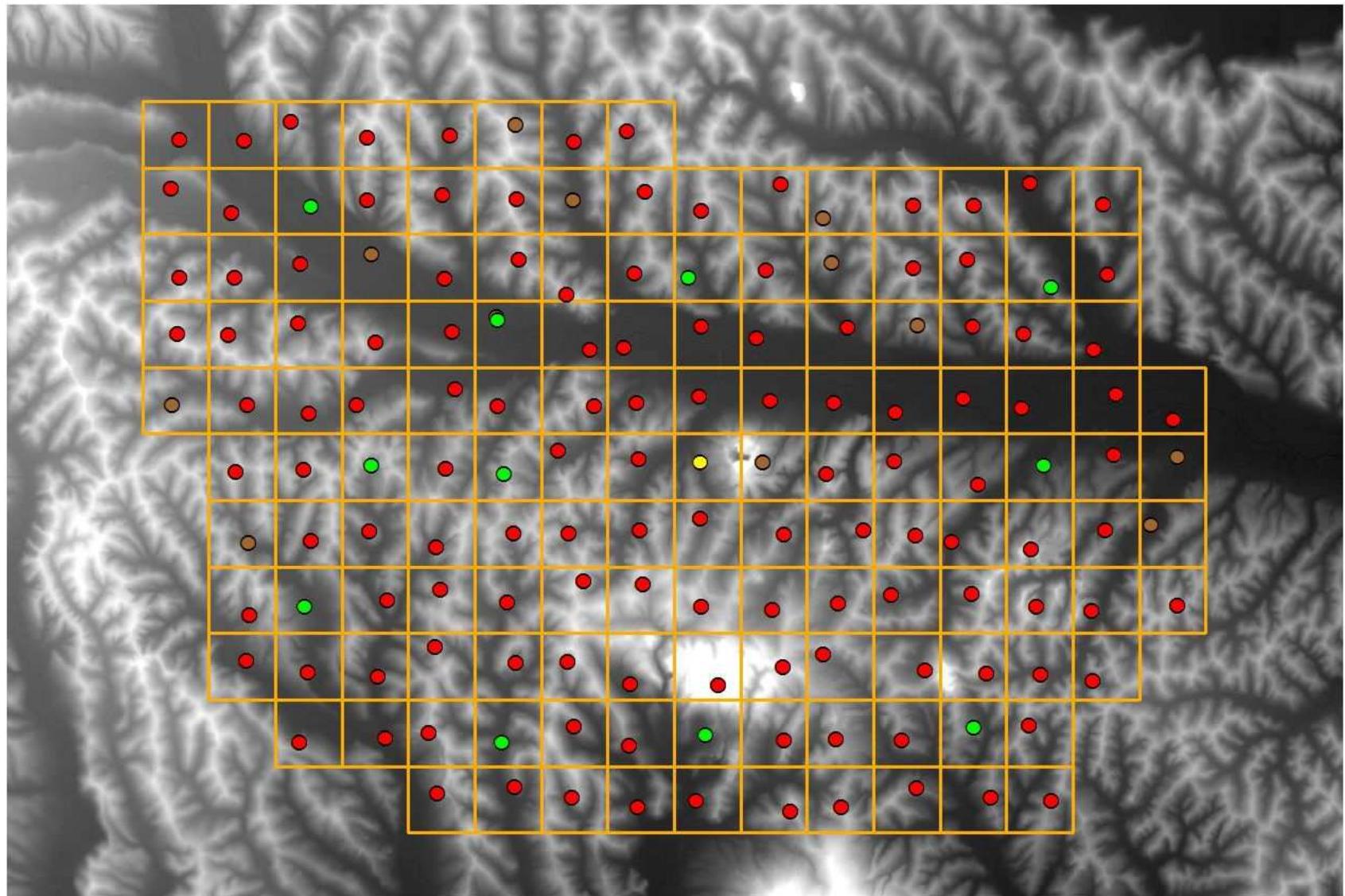
- testing and validation of high-res non-hydrostatic climate models (NHCMS) used for dynamical downscaling to 1-10 km resolution
- testing and validation of statistical climate downscaling techniques, in particular of downscaling of precipitation to 1-10 km resolution
- validation and calibration of high-resolution atmospheric & hydrologic Earth Observation data from satellites
- validation and calibration of weather radar rain rate estimates

Local-scale Weather and Climate Studies:

- study of weather and climate extremes
- monitoring and study of orography-local climate relationships
- basin-scale and local water balance assessments
- study of local meteorological condition-air quality relationships
- and many others



WegenerNet Station Grid



Base station

Special base station

Primary station

Reference station

Station grid (~ 1.4 km x 1.4 km) (Wegener Center, 2010; data basis: GIS Steiermark, BEV Wien, 2005)

Station Types & Measured Parameters

Base station	Special base station	Primary station	Reference station
127 stations temperature, precipitation, rel.humidity	11 stations temperature, precipitation, rel.humidity, soil temperature & pF (yielding soil moisture) 1 station temp & rel.humi	11 stations temperature, precipitation (all T incl. $T < 0$ degC), rel.humidity, wind parameters (incl. wind gusts)	1 station temperature, precipitation (all T), rel.humidity, wind parameters, soil temperature & pF, net radiation, air pressure



Base station (No. 48, 'Maschinenring Raabtal Station')

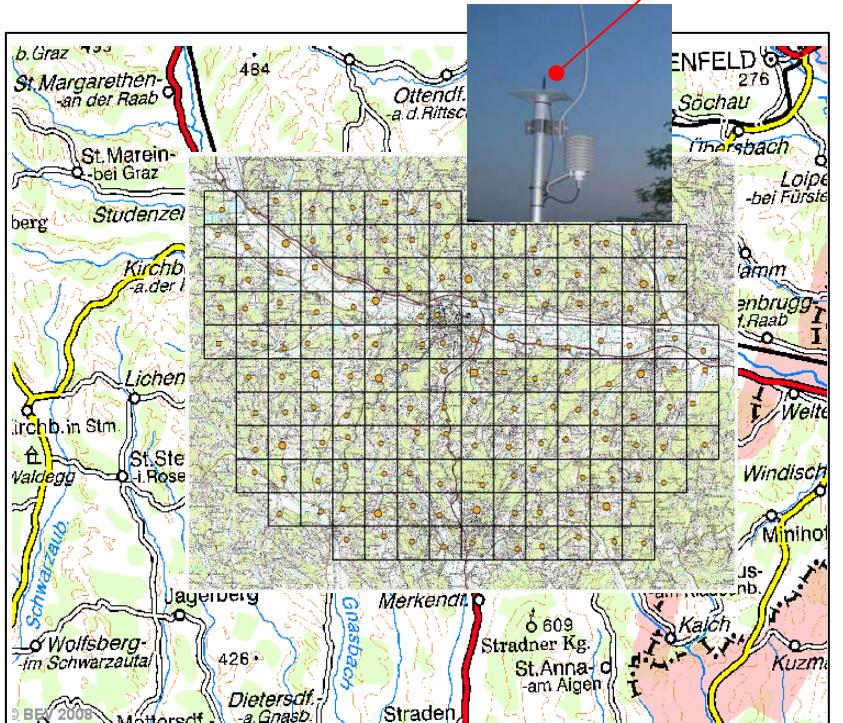
Temp. resolution

temperature: 5min
precipitation: 5min
rel.humidity: 5min
wind params: 5min
soil temp. & pF: 30min
net radiation: 5min
air pressure: 5min

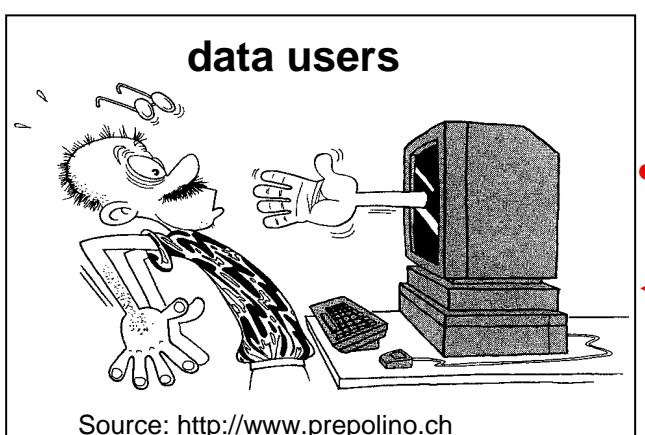
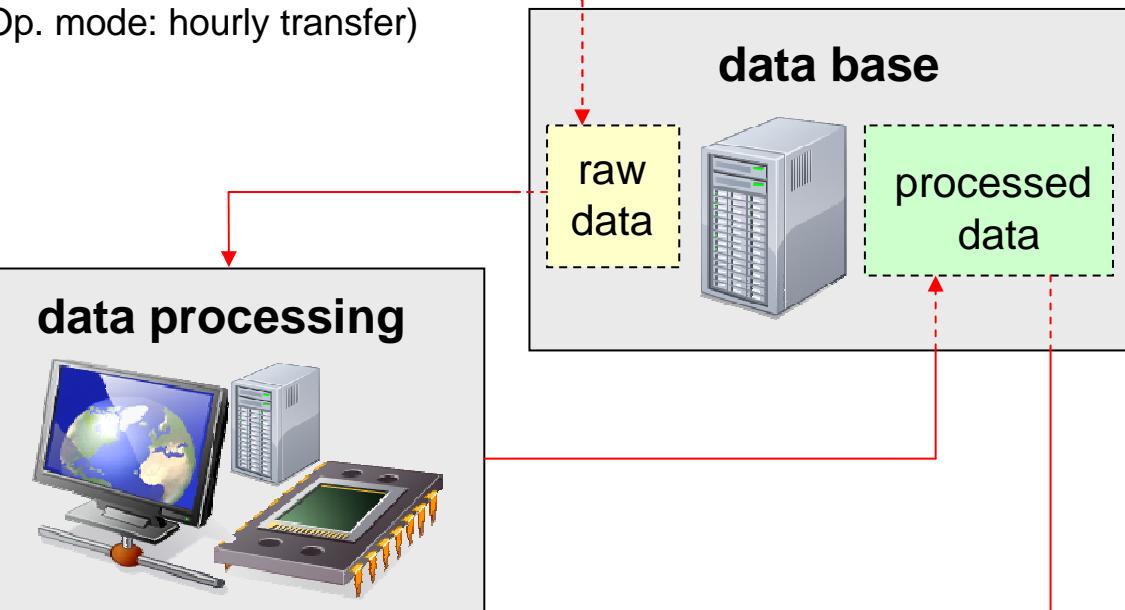


Reference station (No. 77, 'Wegener Center Station')

WegenerNet Processing System (WPS) - overview



GPRS transfer of measured data
(Op. mode: hourly transfer)

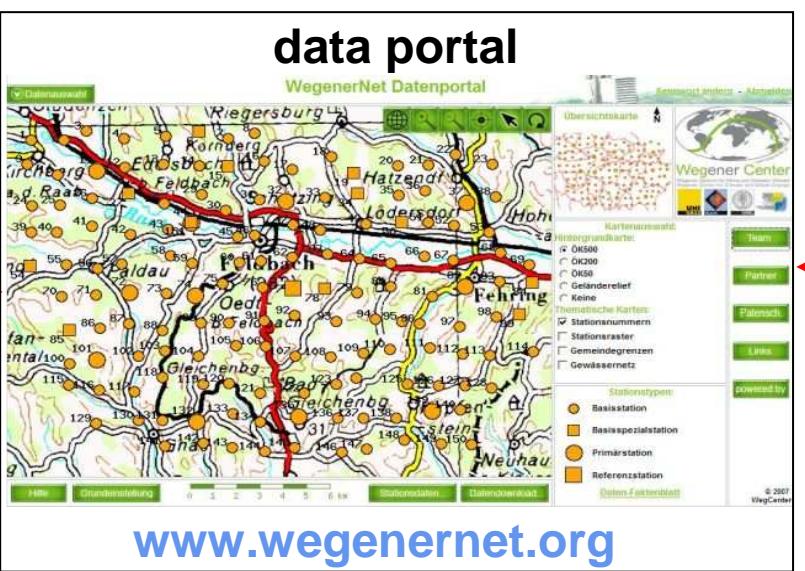


data users

access to data

visualization,
download

Source: <http://www.prepolino.ch>



presentation
of data

WPS – Quality Control System (QCS)

7 layer model

- 0 operation check
- 1 availability check
- 2 sensor check
- 3 climatological check
- 4 time variability check
- 5 intra-station consistency check
- 6 inter-station consistency check
- 7 external reference check

station_id	timezone	meas_id	data_value	quality_flag
47	2007-07-25 06:30:00	10	13.68	0
47	2007-07-25 06:35:00	10	13.8	0
47	2007-07-25 06:40:00	10	13.83	0
47	2007-07-25 06:45:00	10	14.3	0
47	2007-07-25 06:50:00	10	14.67	0
47	2007-07-25 06:55:00	10	15.21	0
47	2007-07-25 07:00:00	10	-61.21	4
47	2007-07-25 07:05:00	10	223.33	4
47	2007-07-25 07:10:00	10	208.94	4
47	2007-07-25 07:15:00	10	212.71	4
47	2007-07-25 07:20:00	10	208.88	4
47	2007-07-25 07:25:00	10	206.57	4
47	2007-07-25 07:30:00	10	22.15	0
47	2007-07-25 07:35:00	10	19.74	0
47	2007-07-25 07:40:00	10	18.15	0
47	2007-07-25 07:45:00	10	18.65	0
47	2007-07-25 07:50:00	10	18.85	0
47	2007-07-25 07:55:00	10	18.95	0
47	2007-07-25 08:00:00	10	19.43	0

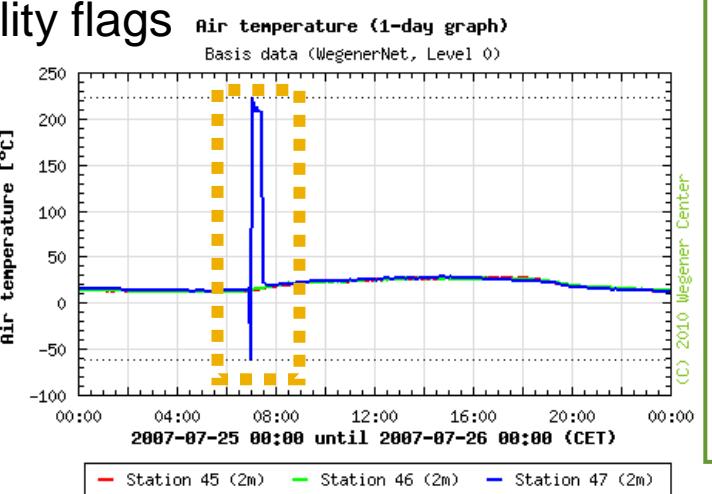
- Automatic quality control of incoming data
- All data (incl. identified errors) marked by quality flags

BUT most important are

- Long time data series
- Experiences in error characteristics
- Know-how in error handling

AND therefore

- further developments are always in progress



WPS – Data Product Generator (DPG)

Data Products

- **Station data products**

timeseries, interpolated and/or flagged data gaps

- **Grid data products**

2 interpolated grids, grid points derived from neighboring sites by squared inverse distance interpolation

- Parameters:

temperature, rel.humidity, precipitation, (...)

- Coordinate systems and geogr. resolution:

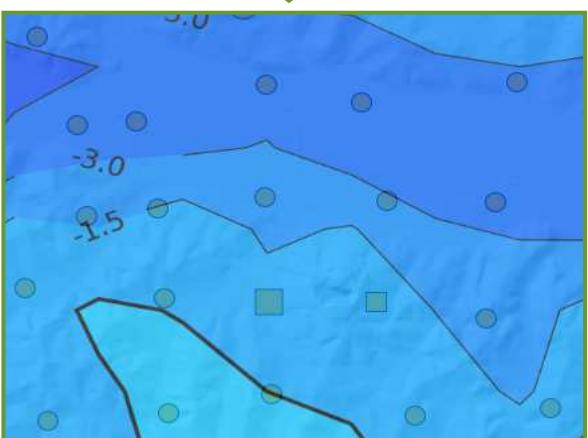
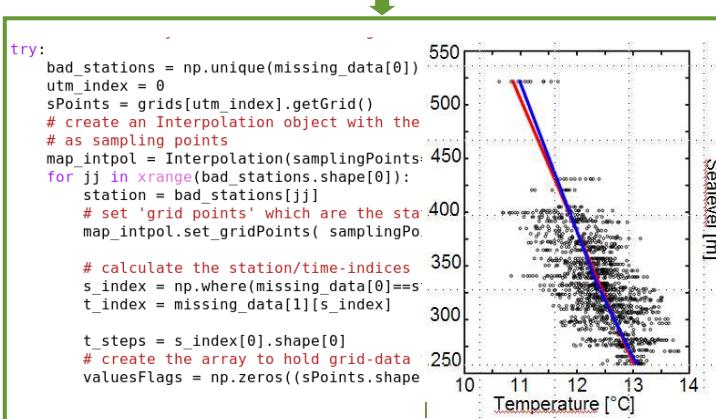
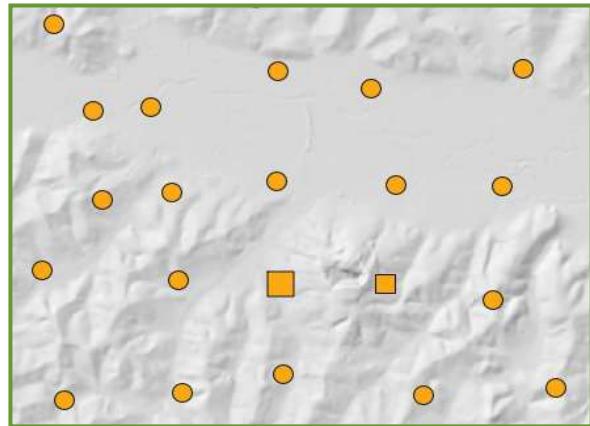
- UTM: 1km x 1km (22km x 15km, WGS84, Zone 33N)
- GEO: 0.01°x 0.01°(~1.1km lat x 0.7km lon)

- Altitude options (based on a 10m x 10m DEM):

- temperature: z300m, zAvgTerr, zTerrain

Data Types

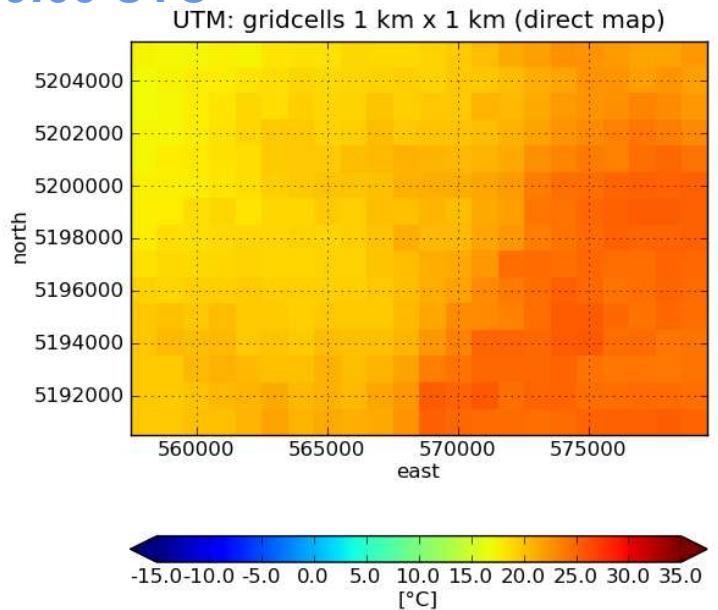
- Basic data (no averaging/summation, raw 5-min resolution)
- (half)hourly/ daily/ monthly/ seasonal/ annual data



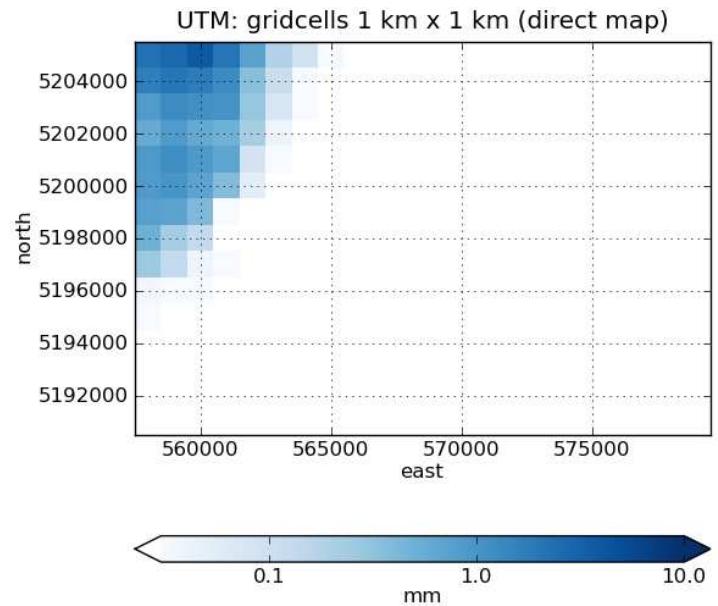
Results – UTM 1 km x 1 km

2010-08-03 11:00:00 UTC

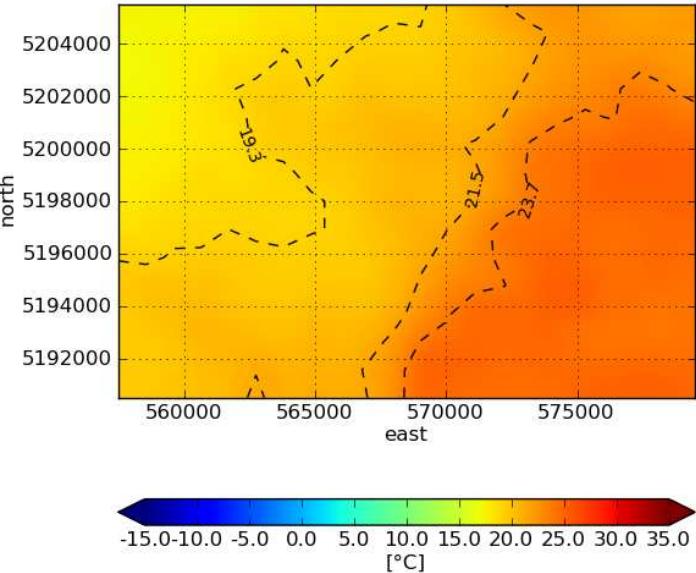
Temperature
(T_zAvg_Terr)



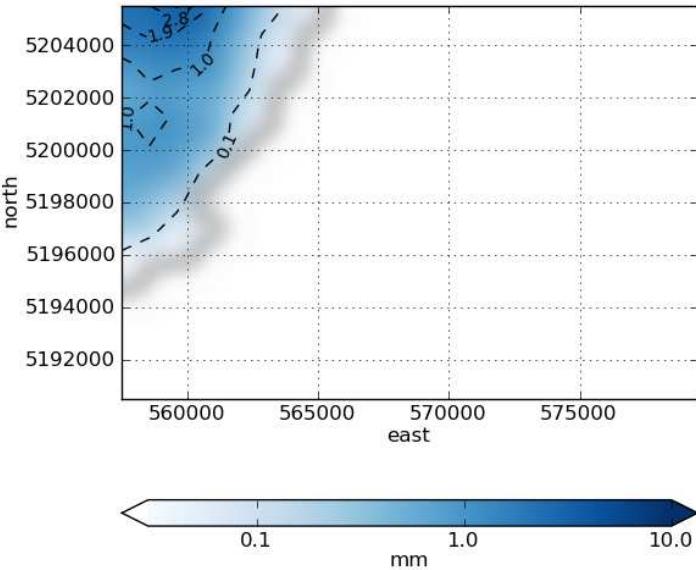
Precipitation
(5 min amount)



UTM: gridcells 1 km x 1 km (contour)



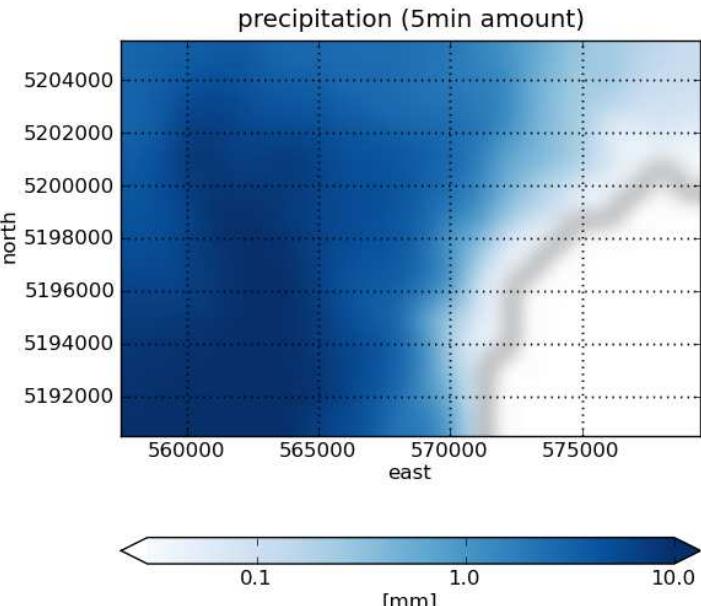
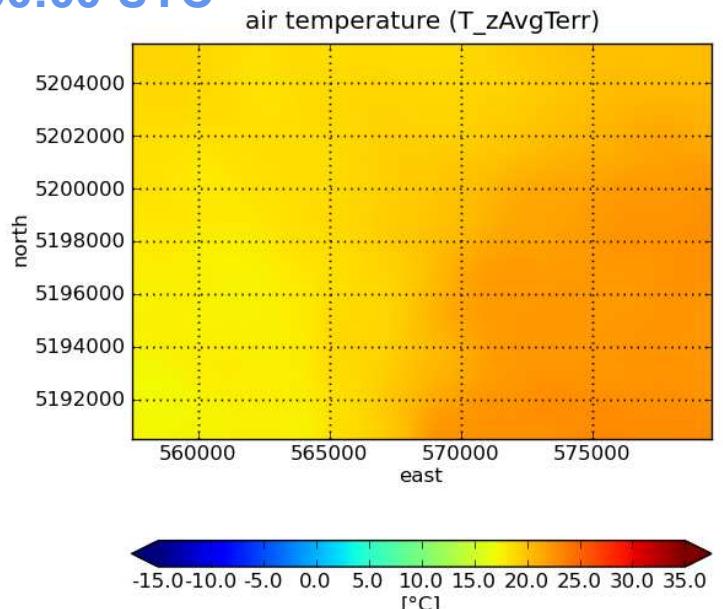
UTM: gridcells 1 km x 1 km (contour)



Example – moving pictures #1

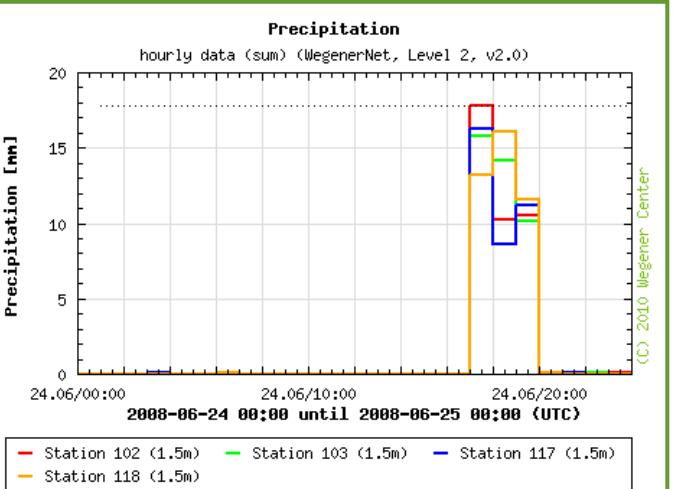
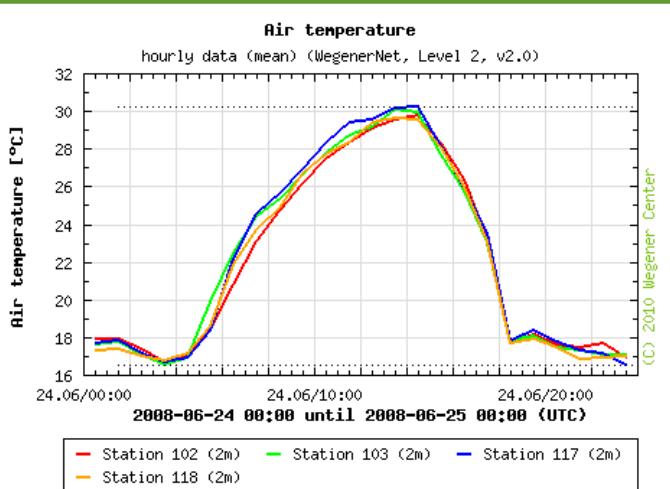
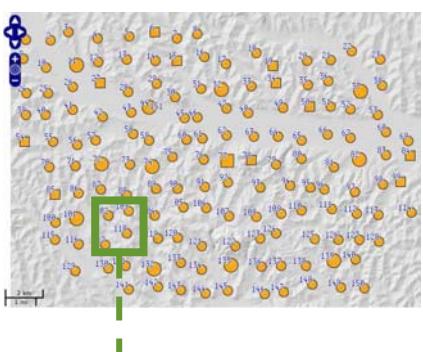
2008-06-24 18:00:00 UTC

Temperature
(T_zAvg_Terr)

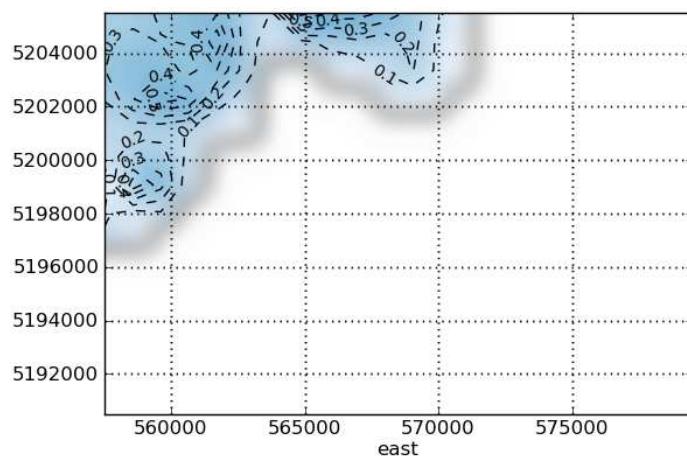


Precipitation
(5min amount)

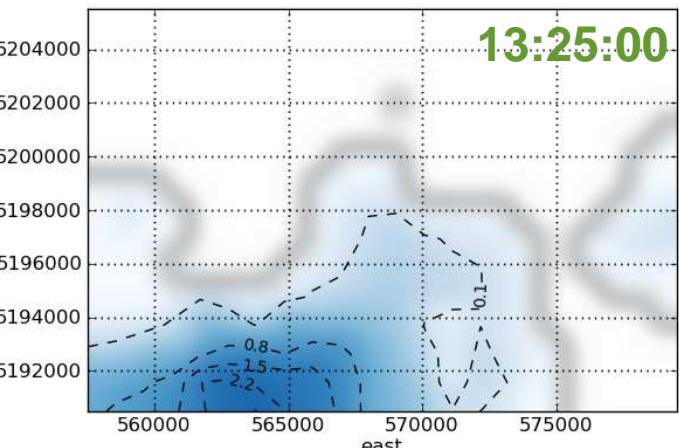
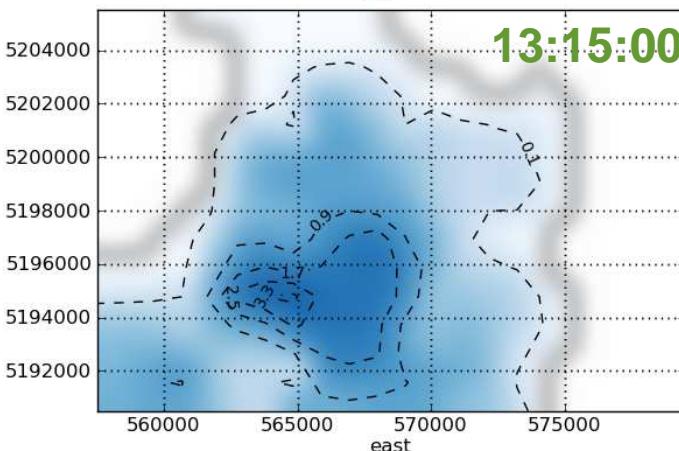
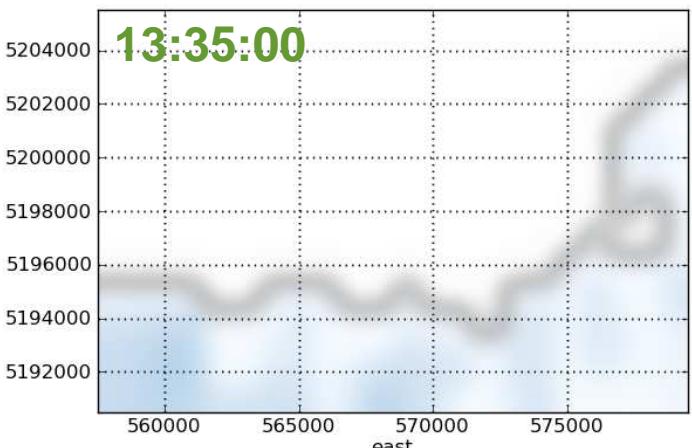
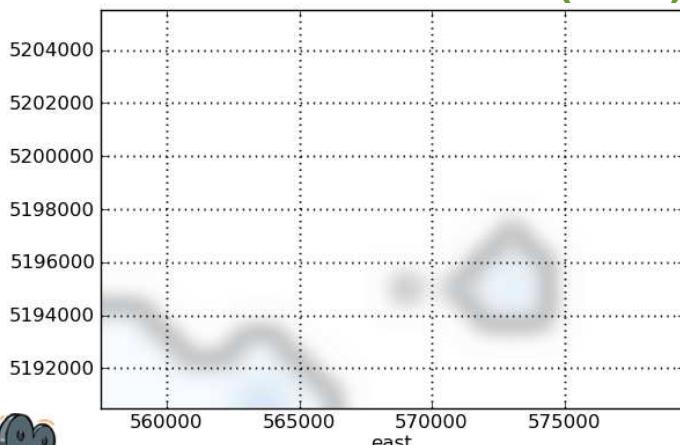
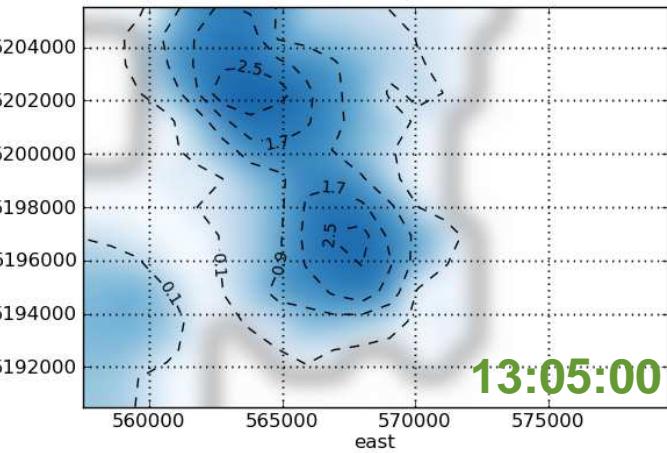
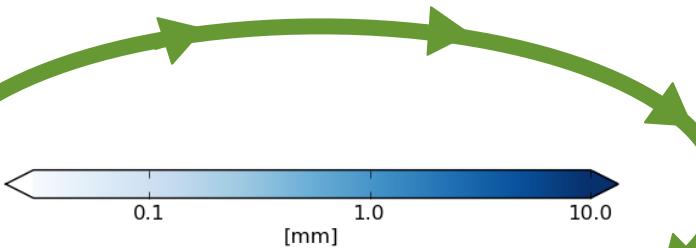
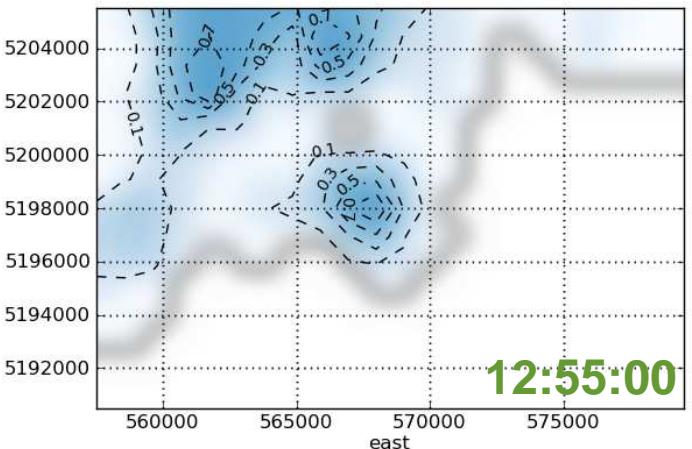
2008-06-24 00:00:00 – 2008-06-25 00:00:00 UTC



Example – moving pictures #2

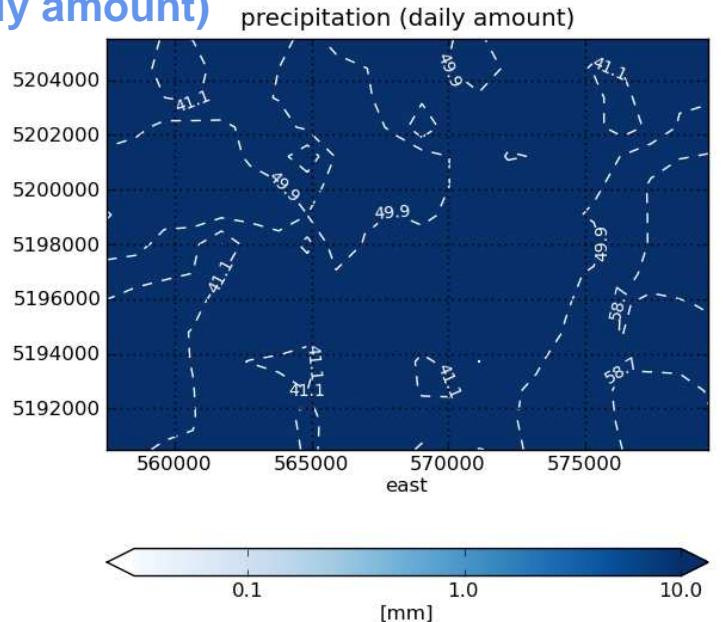


Precipitation (5min amount)
→ every 2nd timestep

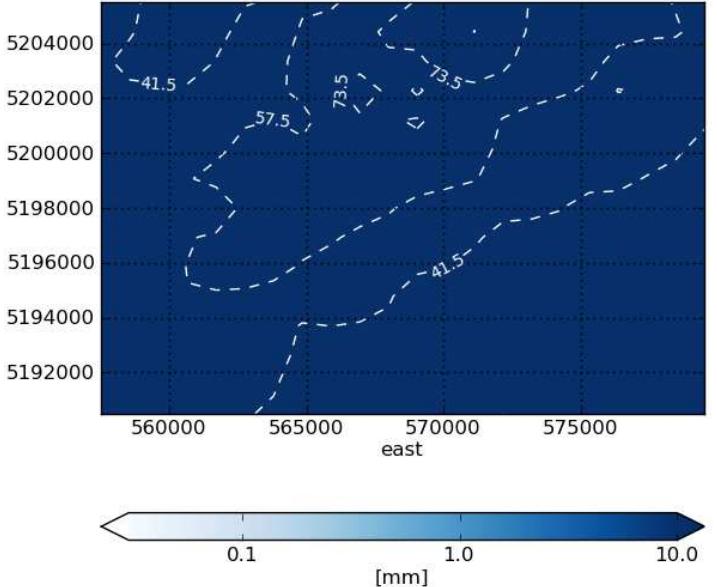


Example – extreme precipitation event

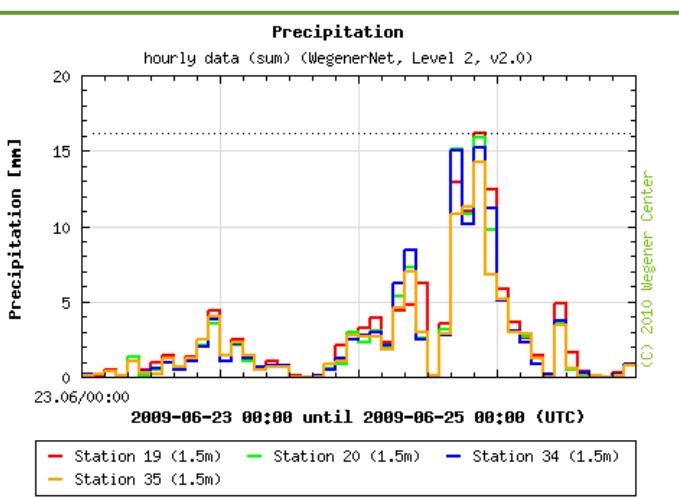
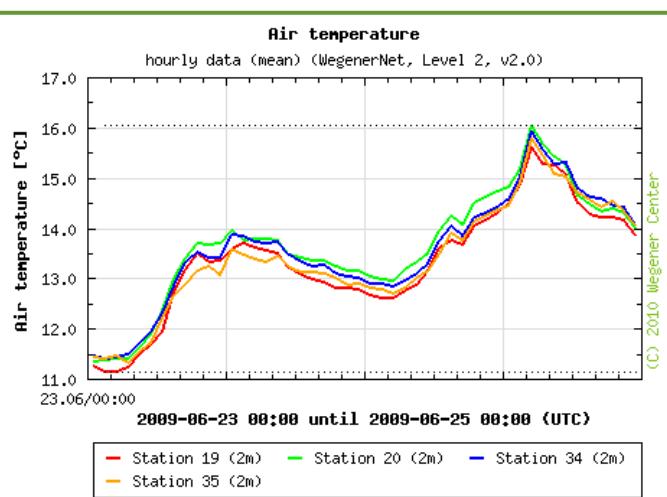
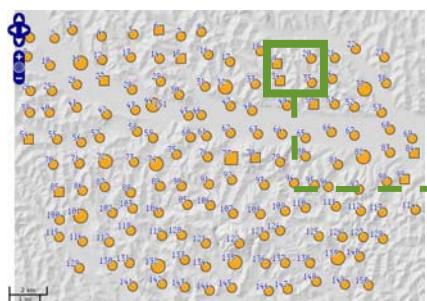
2009-06-23 (daily amount)



2009-06-24 precipitation (daily amount)



2009-06-23 00:00:00 – 2009-06-25 00:00:00 UTC



Example – extreme precipitation event

Floods



Source: Landesfeuerwehrverband Stmk.,
orf.at, 2009

Landslides



Source: F. Fink, T. Meier, kleinezeitung.at, 2009

29.06.2009 19:42

Feldbach: 60 Hangrutschungen innerhalb eines Tages

In Feldbach beruhigt sich auch am Montagabend die Lage nicht. 72 Menschen mussten evakuiert werden, insgesamt 120 Häuser und Gebäude werden von den Katastrophenschützern als generell bis akut gefährdet eingestuft.



Noch keine Entspannung im Raum Feldbach. Foto: Johann Schleich

Zum Thema

- ▶ Hangrutschungen und Sperren

OAMTC

- ▶ Aktuelle Verkehrsinfos

Straßen sperren

Von halbseitigen Straßen sperren sind bis auf weiteres folgende Straßen betroffen:
B66 von Riegersburg nach Ilz.
L216 von Paldau nach St. Stefan im Rosental.
L241 von Breitenfeld nach Riegersburg.



Einsatzkräfte sichern die betroffenen Gebiete in Feldbach Foto: Barbara Schön

Fotoserie

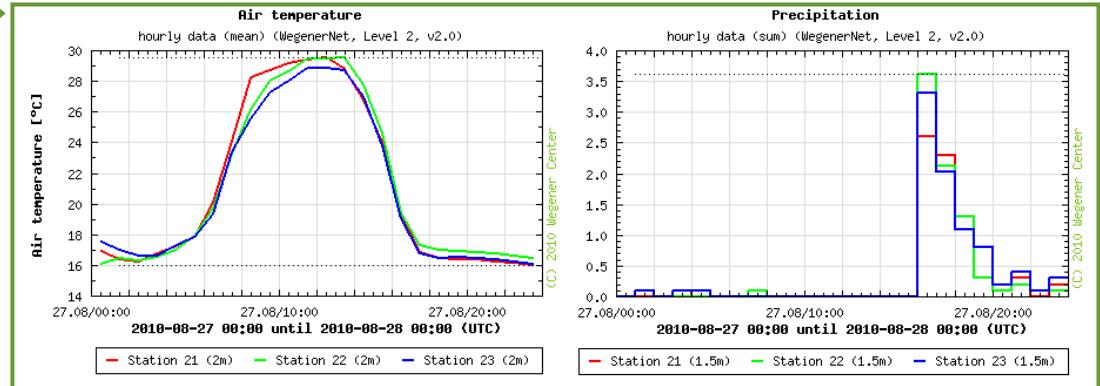
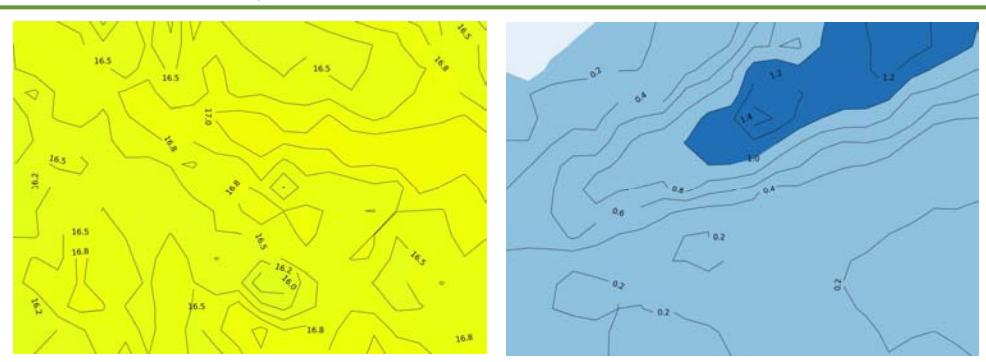
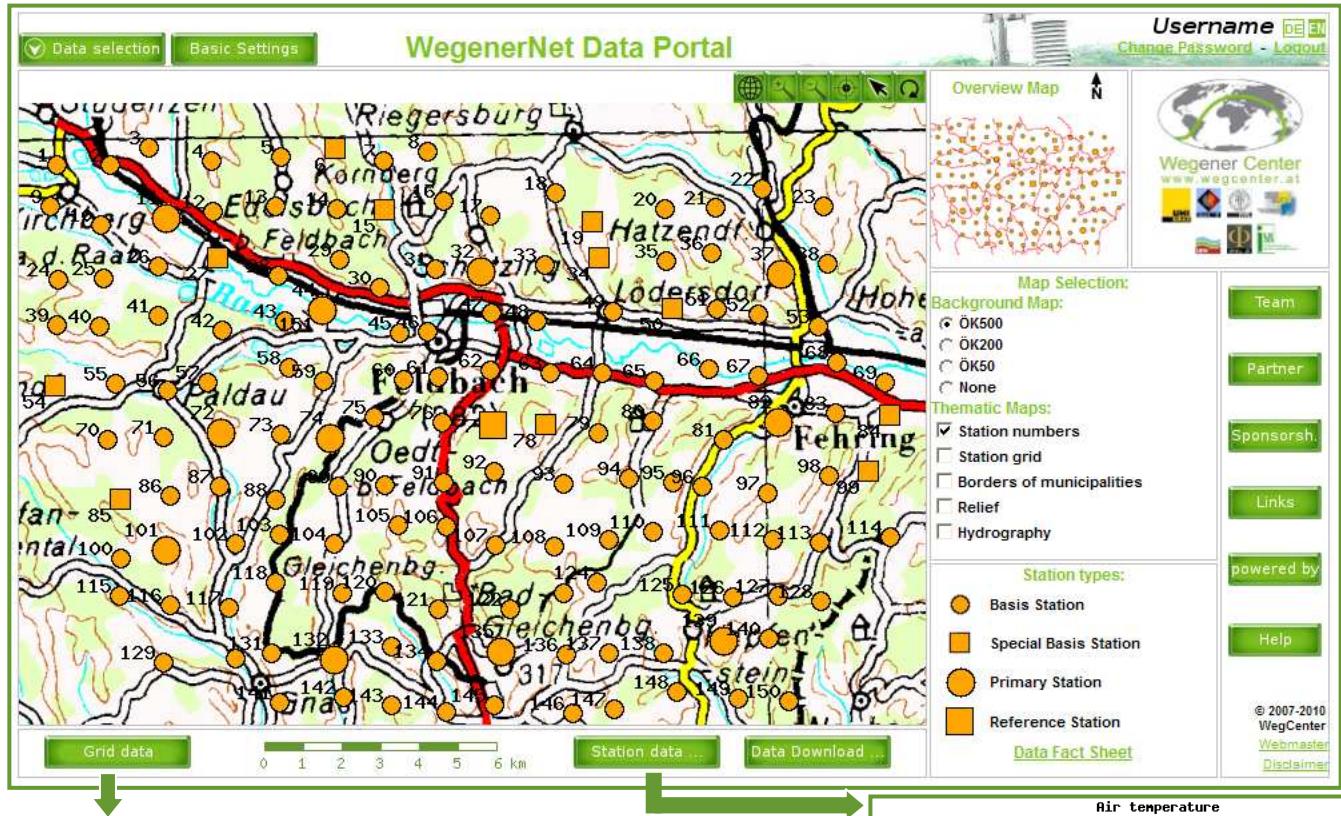


▶ Bilder von den Erdrutschen in Feldbach

Source: kleinezeitung.at, 2009

Data Availability & Access

WegenerNet data portal - www.wegenernet.org



Infos & Contact

Further information:

www.wegenernet.org

WegenerNet data portal

www.wegcenter.at/wegenernet

WegenerNet homepage

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Thanks for your attention!

