


Zentralanstalt für Meteorologie und Geodynamik 

Recent developments in INCA

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INCA geometry and variables

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23-26 Apr 2007

Horizontal

- Lambert projection
- 1x1 km
- 3 domains (AT, SK, CH)

Vertical

- Z-coordinate
- dz = 100-200 m
- 30-40 layers

3-D variables

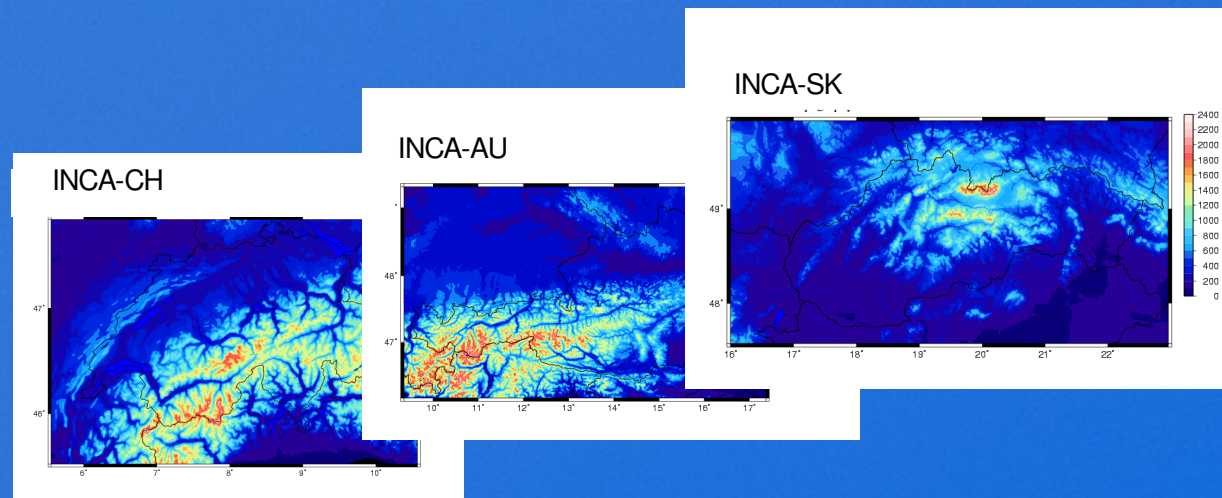
$\nabla \theta, q, u, v, w$

2-D analyses and forecasts

- Precipitation, cloudiness, global radiation
- Precipitation type

3-D analyses and forecasts

- Temperature, humidity, wind



ALADIN input

- Temperature, humidity, wind
- Precipitation, cloudiness
- Global radiation, ground temperature

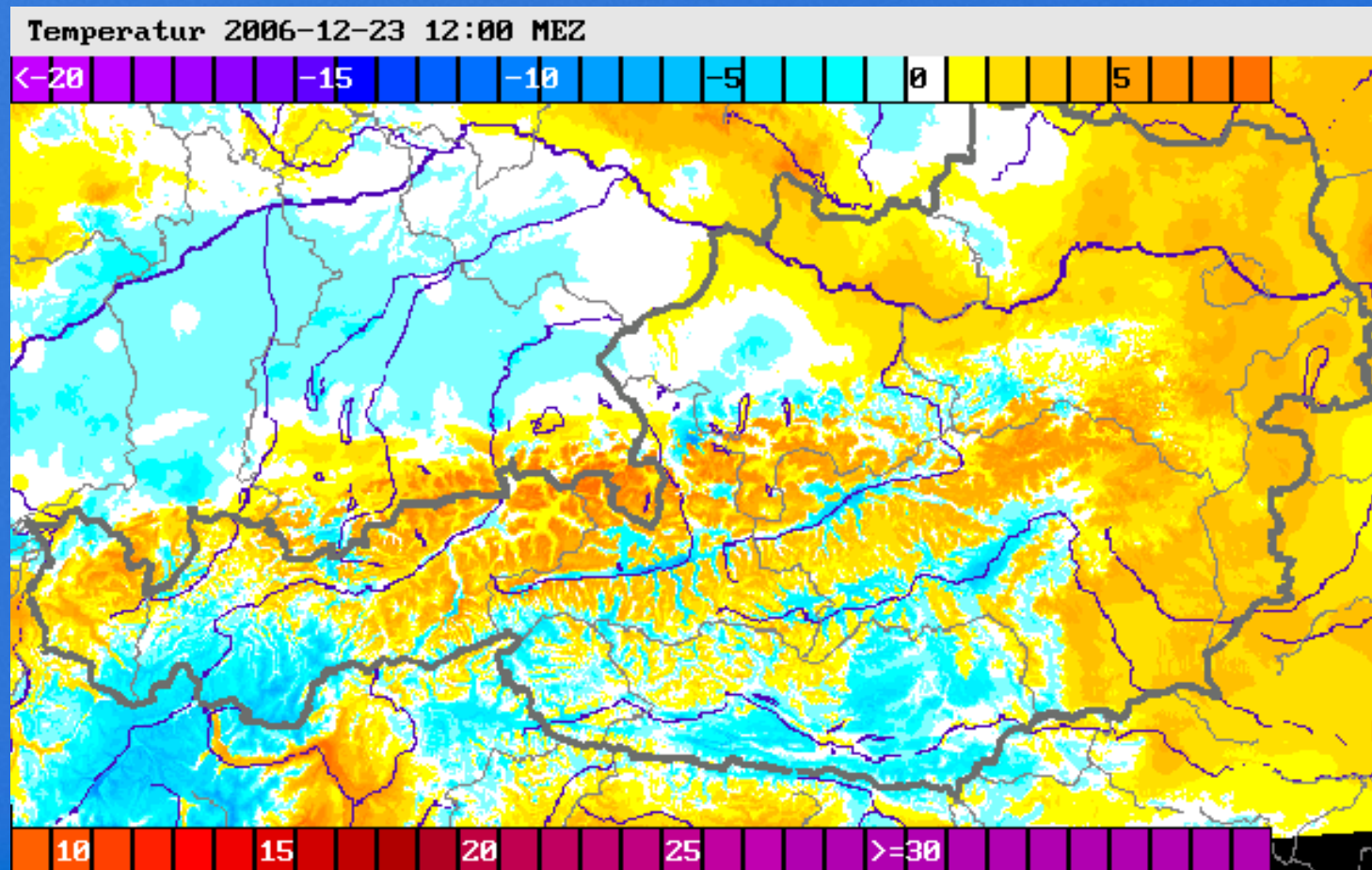
OBS input

- Surface station data
- Radar data
- Satellite data (MSG)

Improved temperature analysis+fcst in stable situations

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Downscaling of ALADIN temperature in stable situations

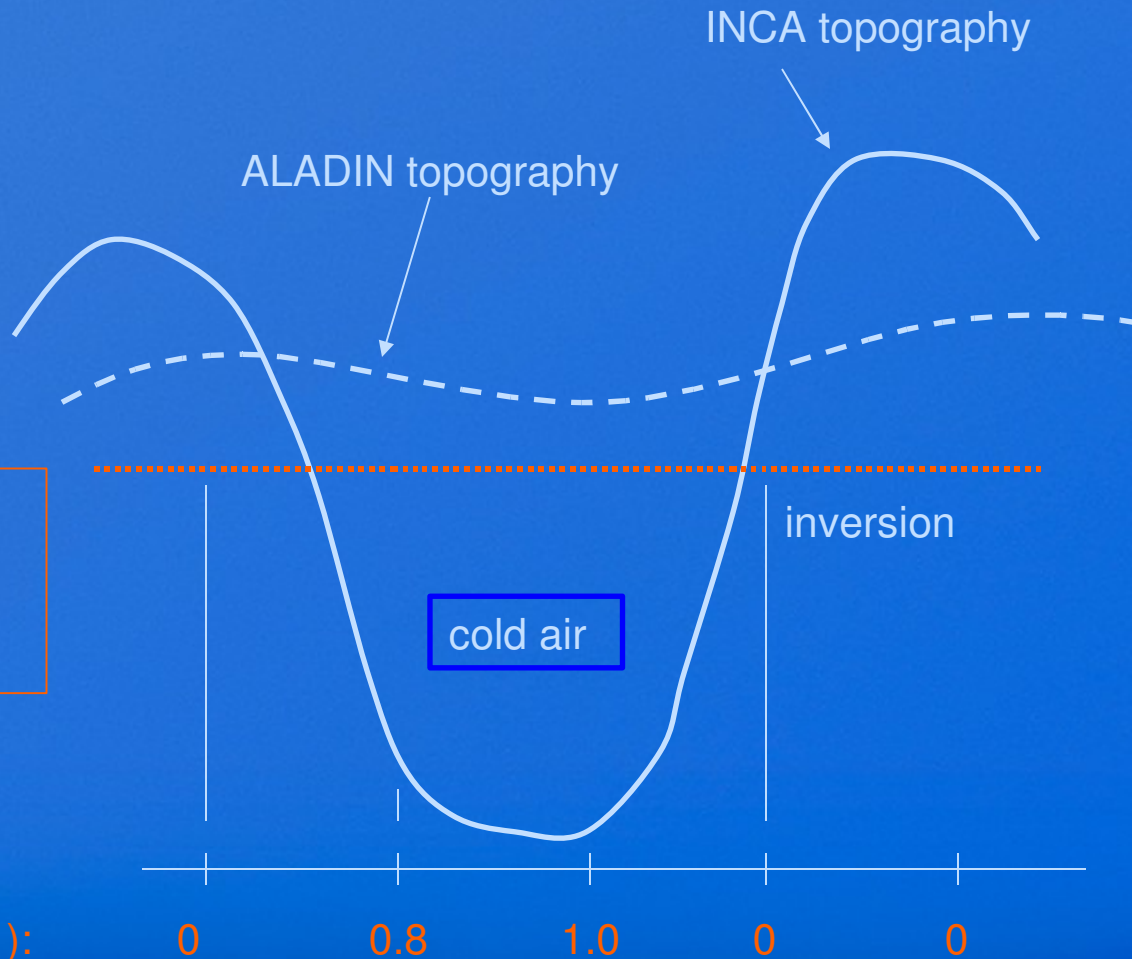
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Temperature inversion not captured by ALADIN -> temperature corrected by surface obs -> inversion in INCA

Up to now: 2D-correction interpolated up the slopes (unless there is a mountain station)

NEW: 2D-correction only near valley floor with maximum correction at the valley floor, decreasing linearly with height



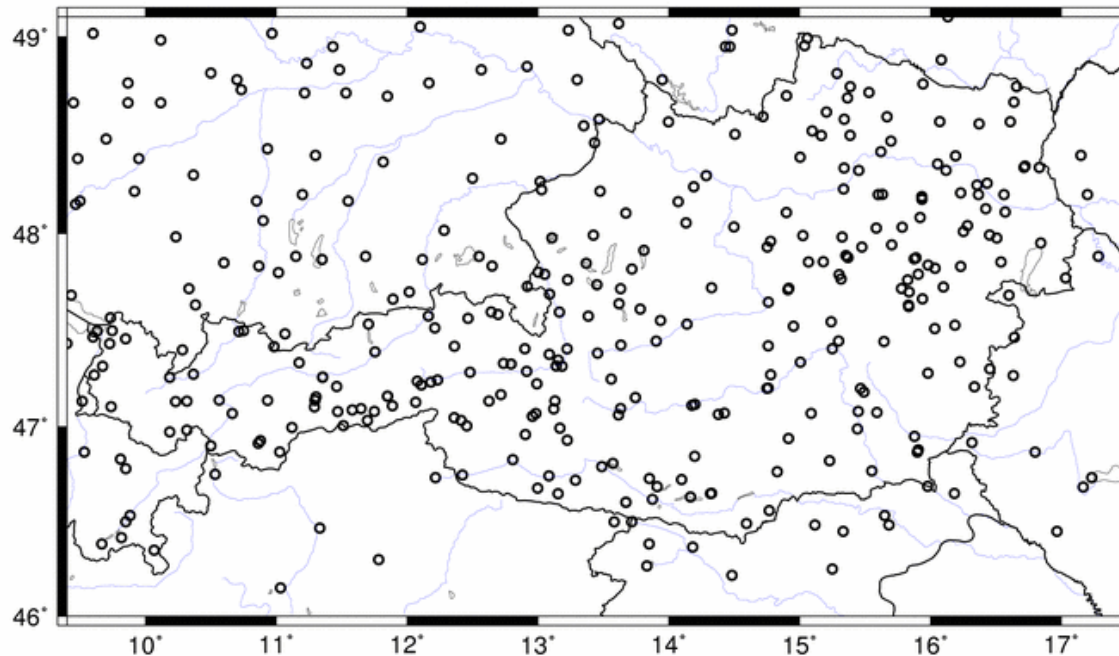
Goal: more variable inversion height corresponding to actual situation

Problem: - Little/no temperature observations between valley floor and mountain top
- ALADIN inversion characteristics not representative for valley

Possible solutions:

- Inversion climatology based on local empirical knowledge
- Analysis of inversion heights based on Innsbruck sounding data
- Other ideas?

TAWES + SYNOP + HYDRO, 1-hourly

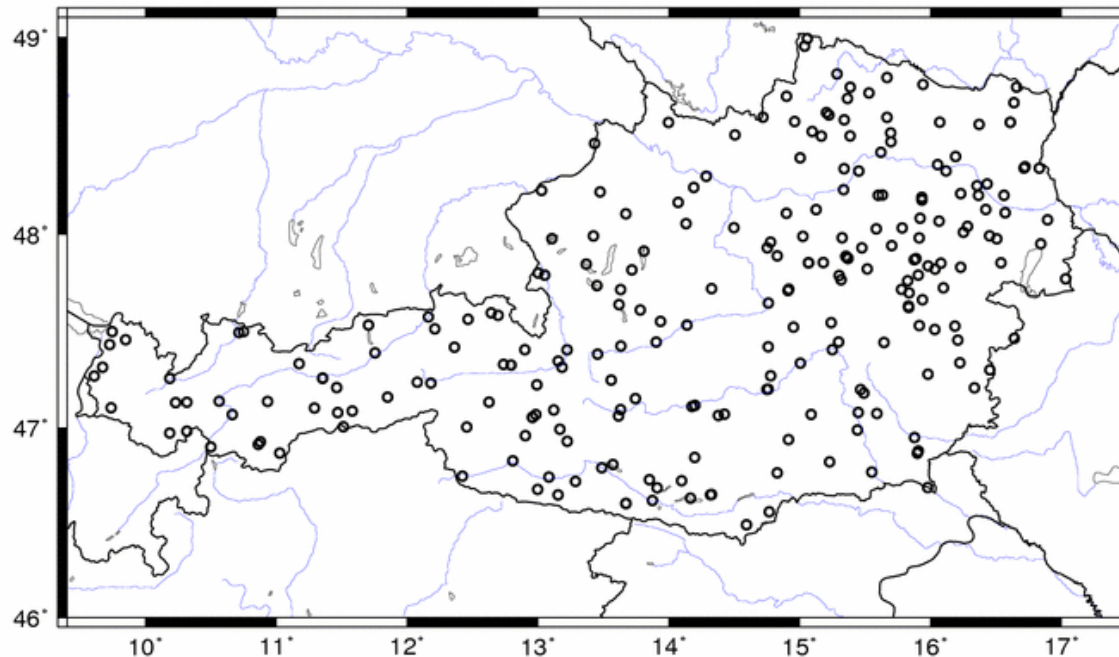


Not so good station coverage for precipitation analysis

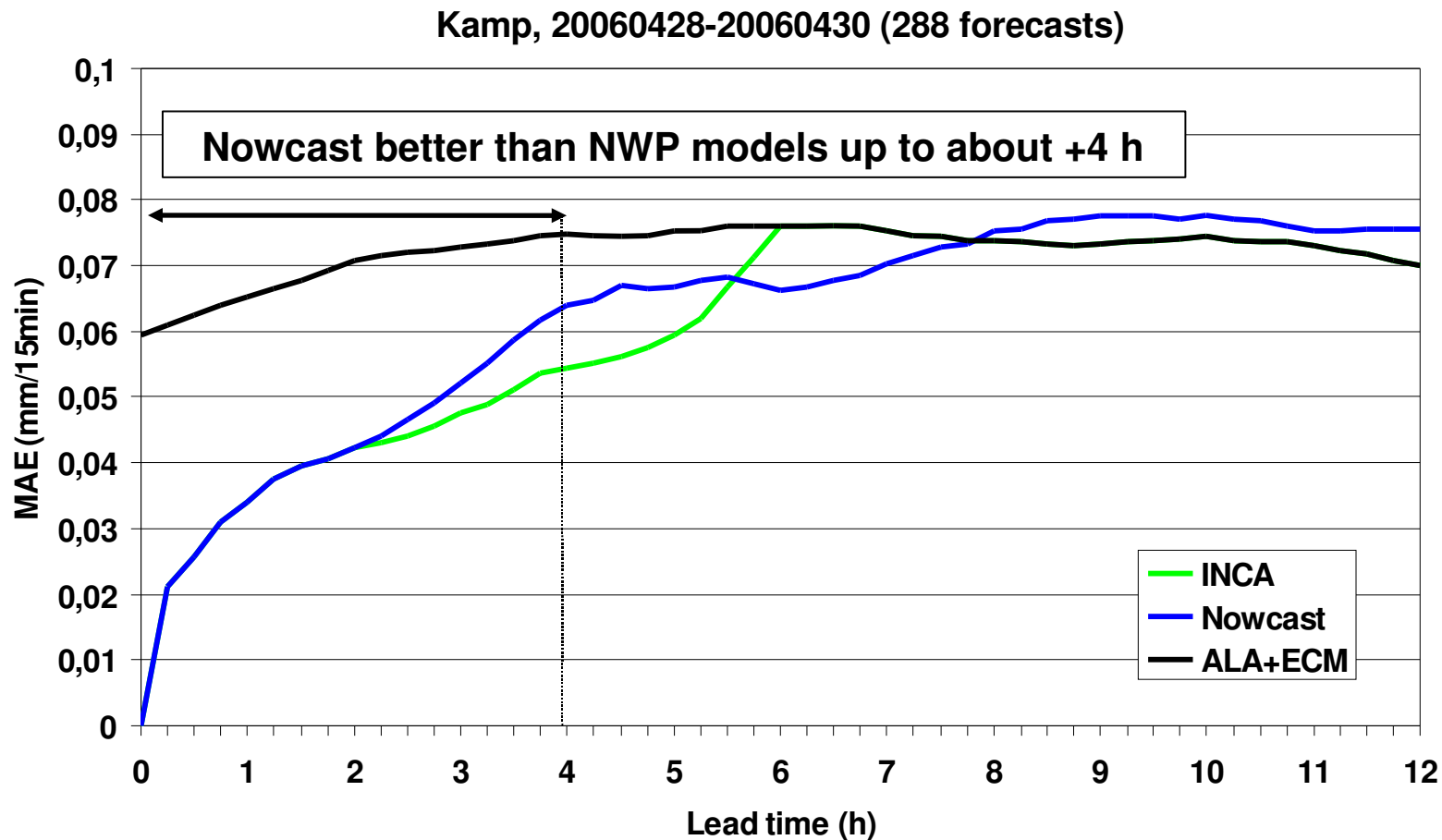
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TAWES + HYDRO NÖ, 15-min



Verification of areal precipitation forecast

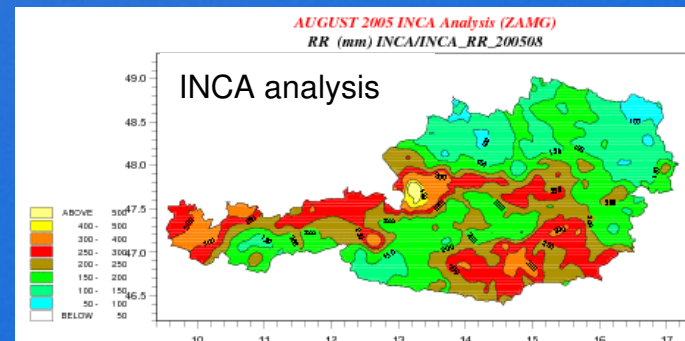
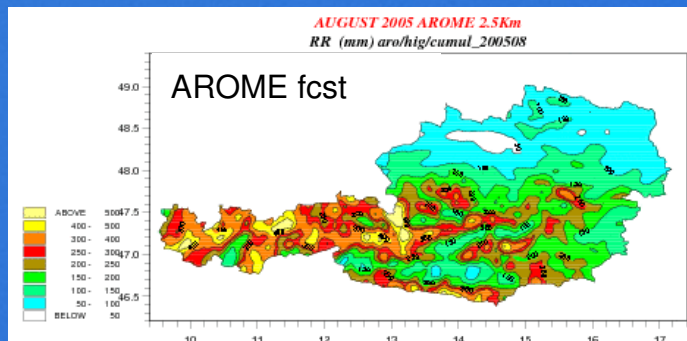
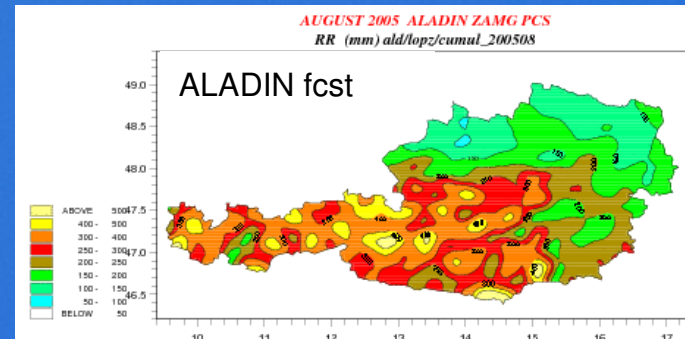
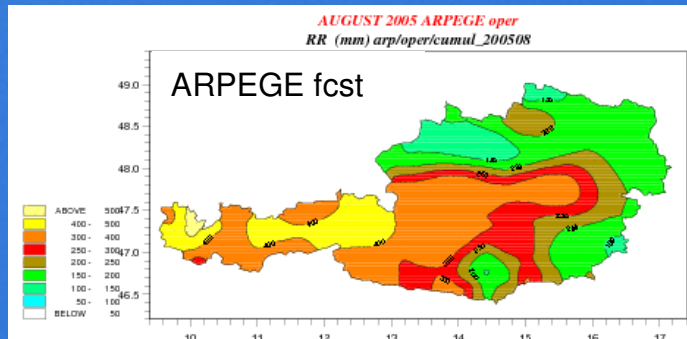


NWP verification and model intercomparison

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E. Bazile
(2006)

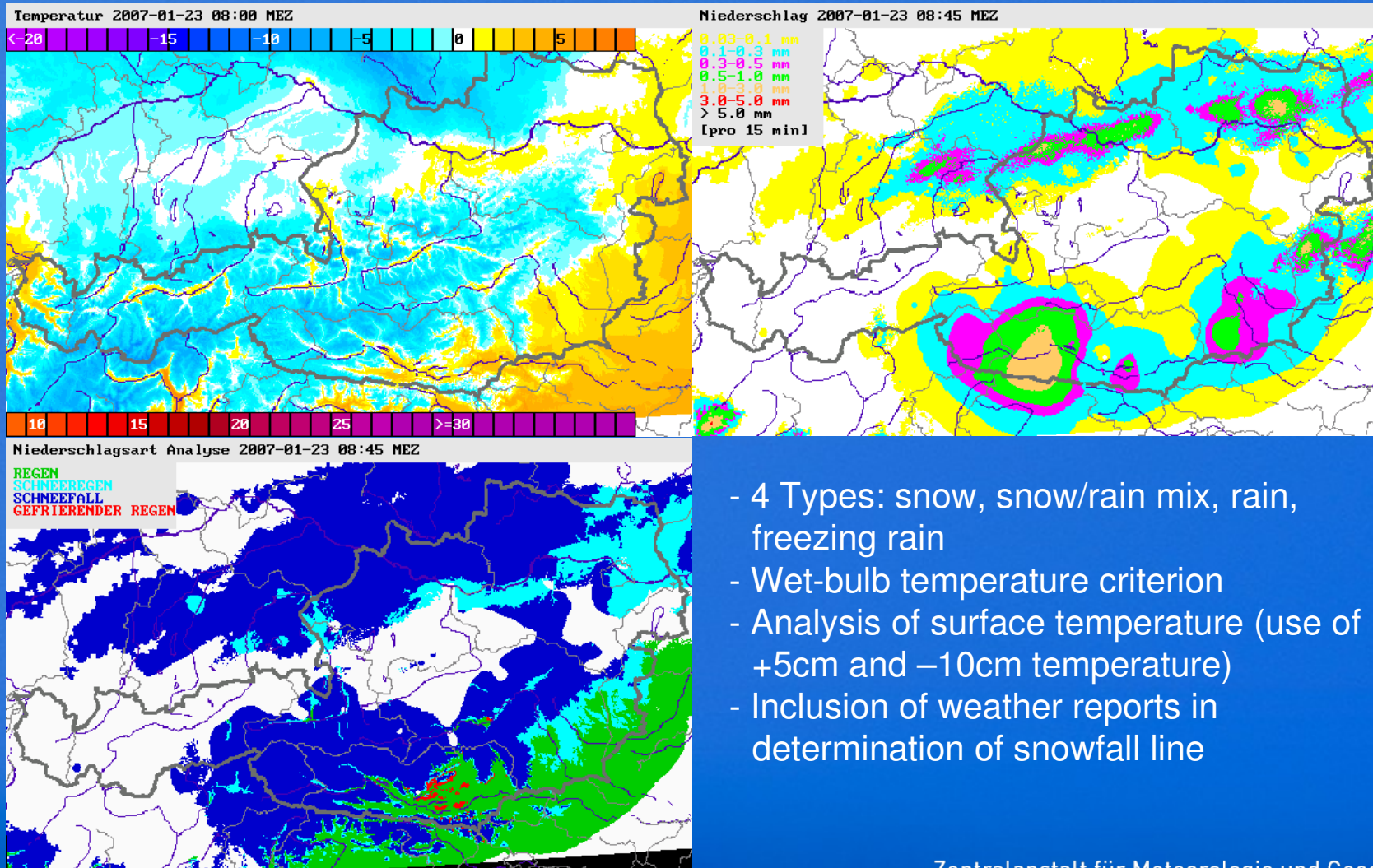


Planned for 2007: precipitation re-analysis with improved surface station dataset and improved radar correction (2003-2007)

INCA/ALADIN precipitation type analysis & fcst

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- 4 Types: snow, snow/rain mix, rain, freezing rain
- Wet-bulb temperature criterion
- Analysis of surface temperature (use of +5cm and -10cm temperature)
- Inclusion of weather reports in determination of snowfall line

Icing potential (COST 727)

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Empirical approach: Icing potential is product of 3 factors

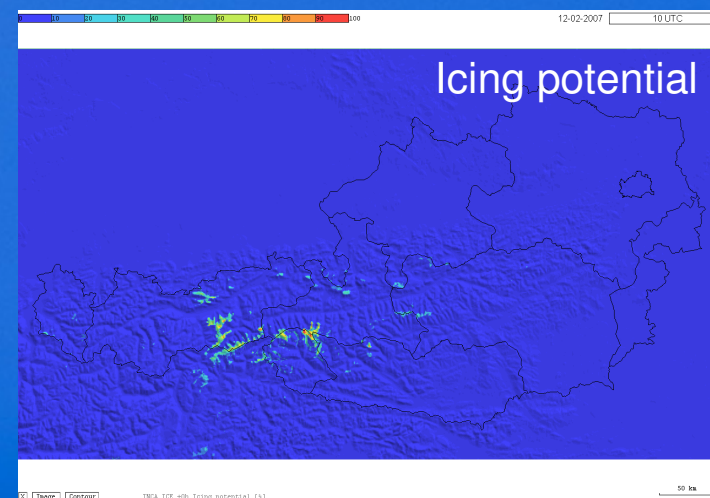
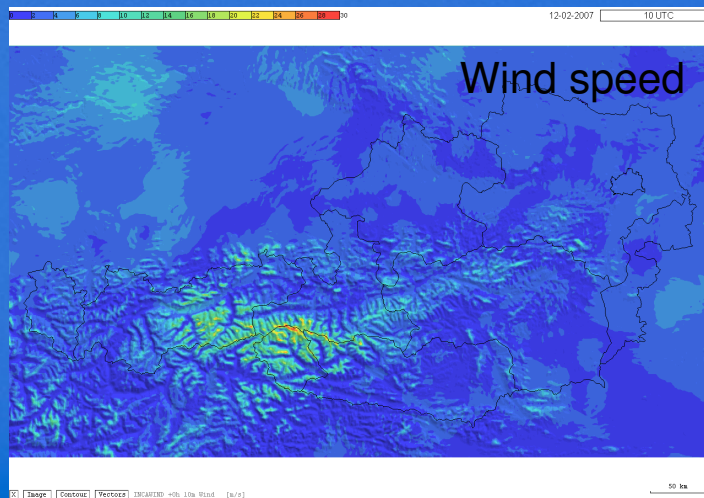
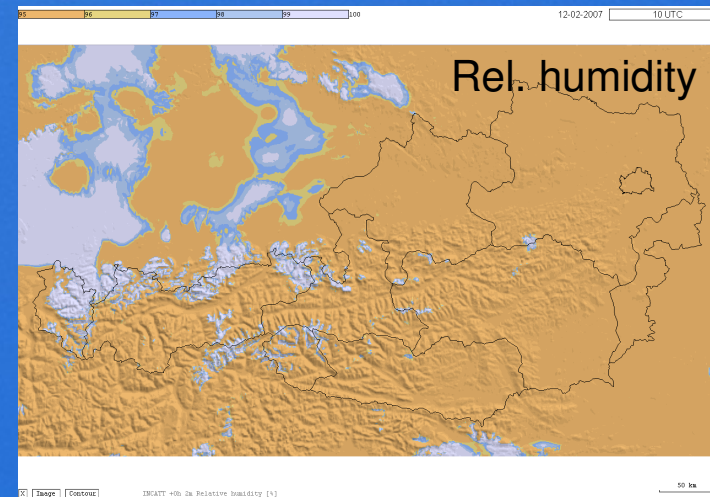
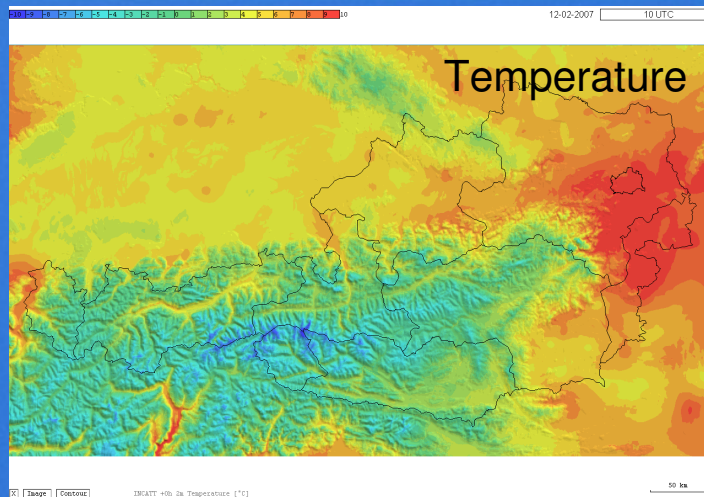
- temperature function
- relative humidity function (to be replaced by clw content)
- wind speed function

$$IP = 100 \cdot f_1(T) f_2(u) f_3(h)$$

INCA/ALADIN icing potential, experimental

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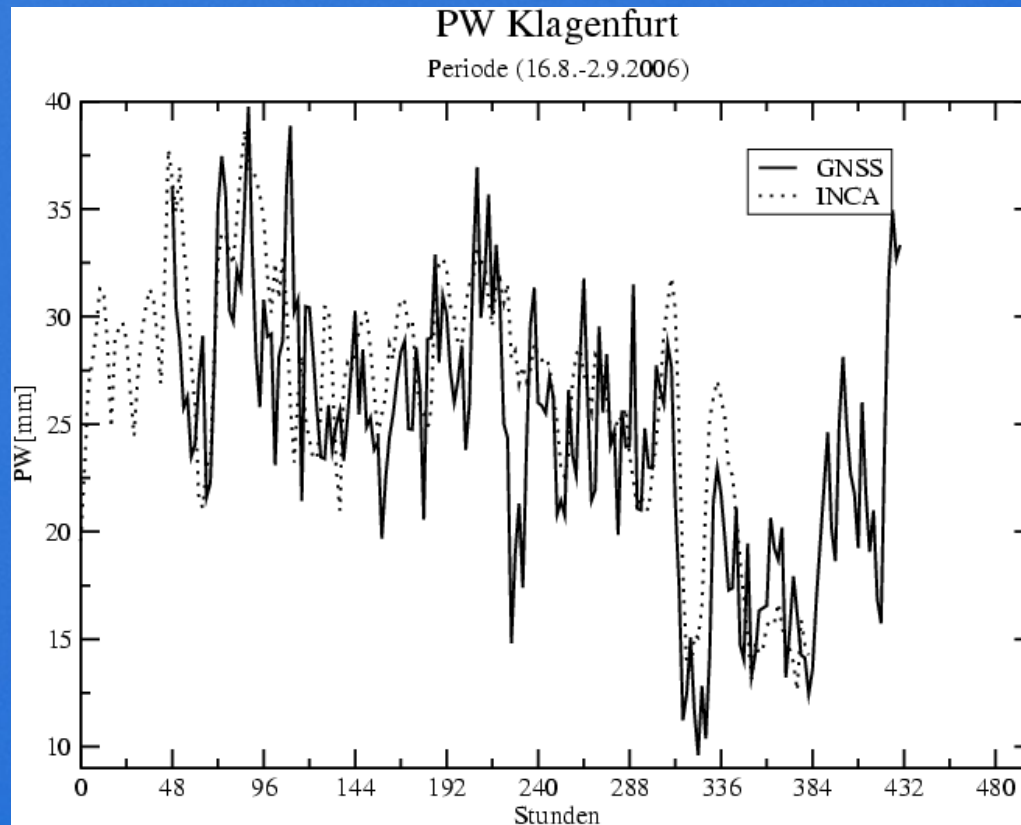
Further steps at ZAMG:

- Analyse cloud water content in INCA → better IP estimation
- Improve IP formula based on point observations:
 - Gütsch, Switzerland
 - Deadwater Fell, Scotland
 - Luosto, Finland
- Routinely predict IP for Gütsch using INCA-CH

Precipitable water INCA/ALADIN vs GPS

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Research project with Univ. of Technology, Vienna

- Precipitation analysis: improve topographic correction of radar data
- Wind analysis: take into account topographic anisotropy in correction interpolation
- Wind nowcasting: take into account pressure tendency
- Low-level 3-D analysis of cloudiness: combine humidity analysis with satellite information

Existing

- SHMU: Parts of INCA ported (INCA-SK) and operationally tested
- DWD: INCA-AT for parts of Bavaria, operationally tested (NINJO)
- MeteoSwiss: INCA-CH (using aLMo), operationally tested

In preparation

- INTERREG/CADSES-Project (Cr, Cz, D, Hu, Pl, Ro, Si, Sk, At)
 - Development of a common nowcasting framework using existing systems (INCA, MEANDER) as starting point
 - Proposal to be submitted in 2nd half of 2007

[INCA system documentation \(last updated March 2007\)](#)

http://www.zamg.ac.at/fix/INCA_system.doc

[INCA precipitation nowcasting](#)

Steinheimer, M., and T. Haiden, 2007: Improved nowcasting of precipitation based on convective analysis fields. *Adv. Geosci.*, **10**, (in press).