The implementation of the nowcasting system INCA for Belgium: current status

M. Reyniers[(1)], L. Delobbe[(1)], A. Kann[(2)], T. Haiden[(2)], C. Wittmann[(2)], A. Deckmyn[(1)]

(1) Royal Meteorological Institute of Belgium (RMI), Brussels, Belgium (2) Central Institute for Meteorology and Geodynamics (ZAMG), Vienna, Austria

1 INCA main features

- Integrated Nowcasting through Comprehensive Analysis (Haiden et al., 2010)
- Developed by national meteorological institute of Austria (ZAMG)
- Nowcasting system for the following meteorological fields:

temperature	humidity	wind
cloudiness	precipitation	precipitation type
icing potential	wind chill	wind gusts
visibility	convective analysis fields	

Several of these fields are analysed in a three-dimensional grid

- High resolution: 1km
- INCA combines observations and NWP: INCA forecast starts with extrapolation of observations, and converges to the NWP forecast for longer lead times (**Fig. 1**)
- INCA is the main nowcasting system of ZAMG, with many internal (weather office) and external (hydrology, media, government) clients

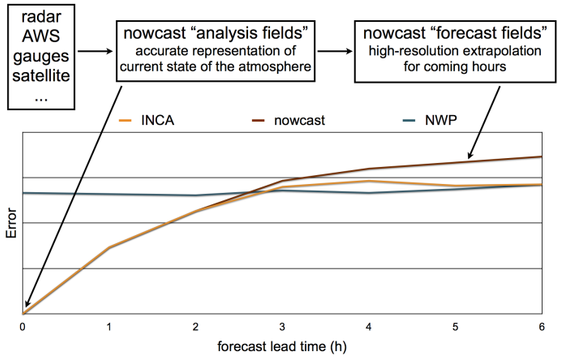

Fig. 1. Schematic representation of the error in three nowcasting strategies: nowcasting by NWP (blue), a "conventional" nowcasting system (red) and INCA (orange). A conventional nowcasting system realises an extrapolation of the current atmospheric conditions in time; INCA combines this nowcast with the NWP forecast for longer lead times.

2 INCA precipitation nowcast

- High resolution in space (1km) and time (15 min), generated every 15 min
- Motion vectors by area tracking method, and filtered by NWP wind field
- INCA precipitation forecast superior to NWP forecast for first ∼2 hours

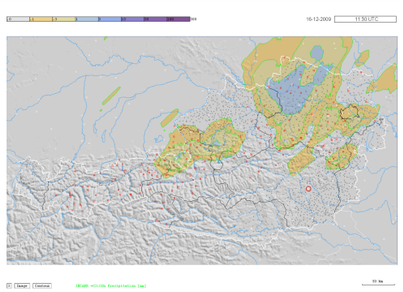

Fig. 2. Precipitation forecast (+2h) in INCA-Austria

3 INCA in Europe

- More and more European countries are implementing (or planning to implement) INCA as their operational nowcasting system, including Slovakia, Slovenia, Croatia, Poland, Switzerland, Czech Republic and Turkey
- INCA-CE: European project to develop a transnational INCA version for Central Europe (from May 2010 till end 2013)

4 INCA in Belgium: INCA-BE

Timeline

- INCA-BE project started on Feb. 1, 2010
- Spring: domain definition and ingestion of NWP data into INCA-BE
- Spring-summer: implementation of fields temperature, humidity, wind
- Autumn: implementation of precipitation
- Beginning 2011: derived fields
- Starting spring 2011: test-phase and verification studies

Domain

- Domain is 600×590 km (**Fig. 3**) centered around Belgium
- Most parts flat, but it contains also hilly terrain
- Contains sea surface (contrary to Austrian domain)

Input

- NWP: ALARO-0 4km (=ALADIN adapted for high resolution), 4 runs per day
- Surface stations:
  30 stations inside Belgium available within 10 min
  ∼120 foreign synop stations within INCA-BE domain available after ∼25 min
- Radar: the real-time composite of 3 C-band radars Wideumont (RMI, **Fig. 4**), Zaventem (Belgocontrol) and Avesnois (Météo-France) with a 5 min time sampling; in the future OPERA composite will be considered (Huuskonen et al., 2010)
- Soundings: our institute performs 3 soundings per week
  more frequent soundings are performed in nearby souding stations
- Satellite: only ingestion of MSG Cloud Types product for the moment

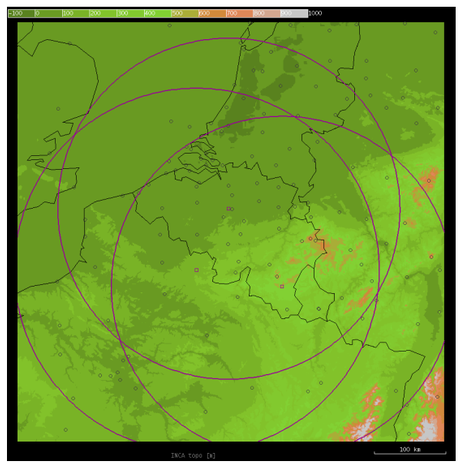

Fig. 3. The INCA-BE topography and the positions of the radars and their ranges (purple squares and circles), and the surface stations (small circles).

Fig. 4. Wideumont radar (RMI)

5 INCA-BE first results

In **Fig. 5**, we give some images of the INCA-BE output produced so far. These images will be produced once INCA-BE runs operationally. In this figure, we show an example of a 2m temperature (left) and 10m wind (right) forecast (+2h). The circles on the maps indicate the position of stations which delivered data for this INCA run.

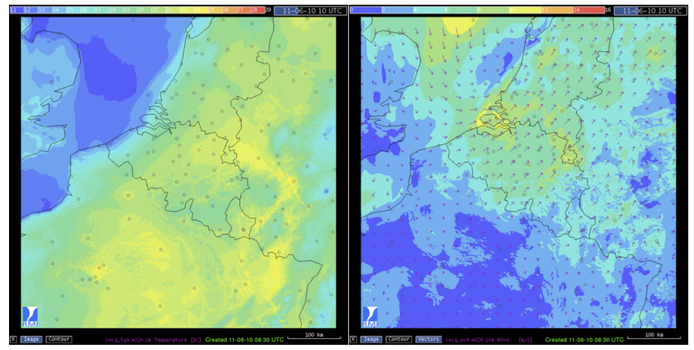

Fig. 5 INCA-BE 2m temperature (left) and 10m wind (right) forecasts (+2h)

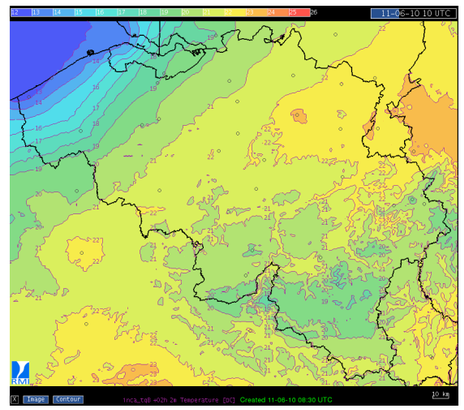

Fig. 6. Zoom on Belgium for the 2m temperature forecast shown in Fig. 5

Fig. 6 shows a zoom on Belgium of the temperature forecast in Fig. 5 (note that the two temperature images do not have the same colour scale). The high detail, the effect of the high resolution topography and the strong land-sea contrast are clear from these figures.

6 Conclusions

In Feb. 2010 we started at the RMI the implementation of INCA for Belgium. Although a thorough verification is not yet carried out, a first qualitative evaluation of the available INCA-BE products (temperature, humidity and wind analyses and forecasts) is very positive. We are currently implementing the precipitation module in INCA-BE. A fully operational version of INCA-BE is expected for 2011.

References

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M. Reyniers, Royal Met. Inst., Ringlaan 3, B-1180 Brussels, Belgium.
maarten.reyniers@meteo.be – http://radar.meteo.be

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