NET.P03

Polarimetric radar observations in Belgium

A contribution to the 8th European Conference on Radar in Meteorology and Hydrology
1-5 September 2014, Garmisch-Partenkirchen, Germany

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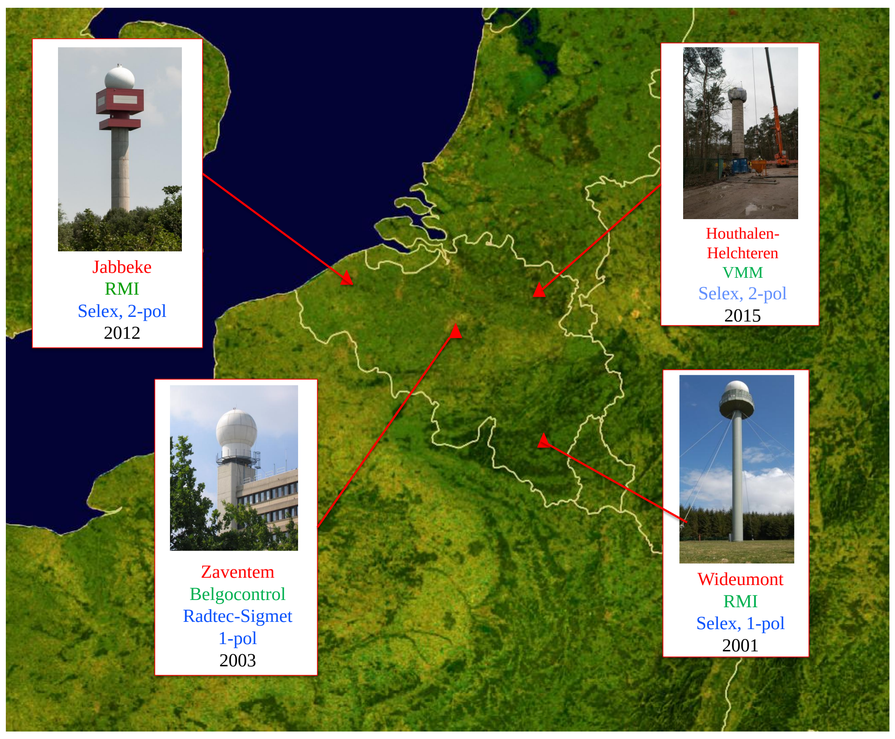
Operational weather radars in Belgium

The Belgian operational radar network includes 3 C-band Doppler radars. RMI operates two radars in Wideumont and Jabbeke. The latter is dual-pol.

A third radar is located in Zaventem and is operated by Belgocontrol (air traffic safety). A new dual-pol radar is being installed by the Flemish Environmental Agency (VMM).



Clutter removal using polarimetric data

Raw reflectivity data are strongly contaminated by sea clutter over the North Sea. Off-shore wind farms and intense marine traffic generate clutter even in non-anaprop conditions.

The sea clutter detection and removal module available in Selex Rainbow 5 software is used operationally (Bringi et al. 2007). It is based on a fuzzy logic algorithm. The algorithm is effective for removing land clutter as well.

Data types used in the fuzzy logic algorithm

Non-polarimetric:

- Reflectivity Z (-)
- Texture of Z (-)
- Vert. gradient of Z (-)
- Radial velocity Vr (-)

Polarimetric :

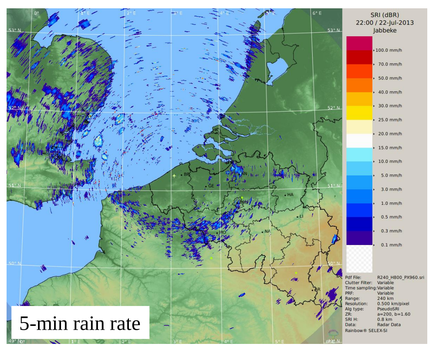
- Texture of differential reflectivity ZDR (++)
- Texture of specific differential phase PhiDP (+++)
- Correlation coef. RhoHV (+)

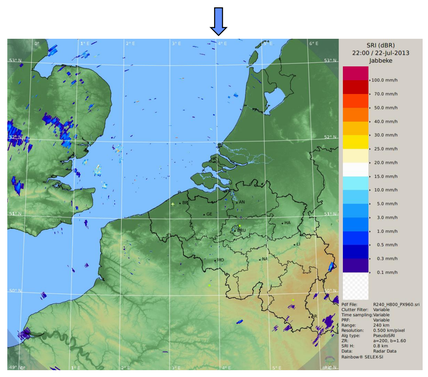
(x) indicates for each data type the discrimination capacity tested in strong ANAPROP conditions. Discrimination is mainly performed by polarimetric data.

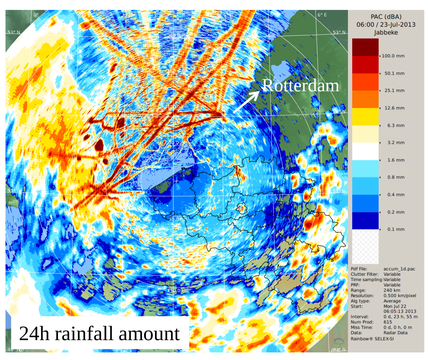
Texture = stand. deviation along range

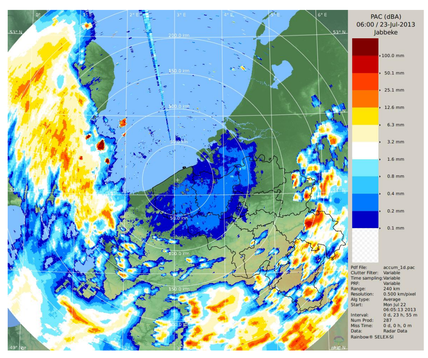
Case with strong ANAPROP conditions

With clutter removal









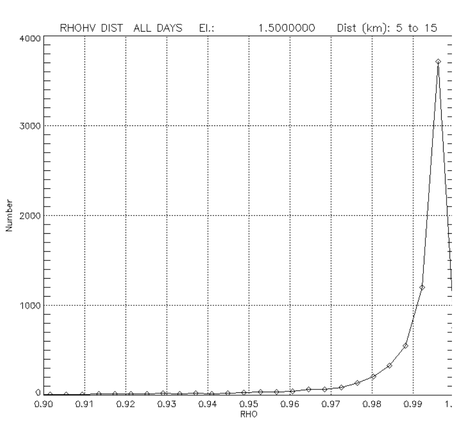
Acknowledgements

This work is supported by the Belgian Federal Science Policy Office - Project MO/34/022. Comments and suggestions from Loris Foresti and Maarten Reyniers were greatly appreciated.

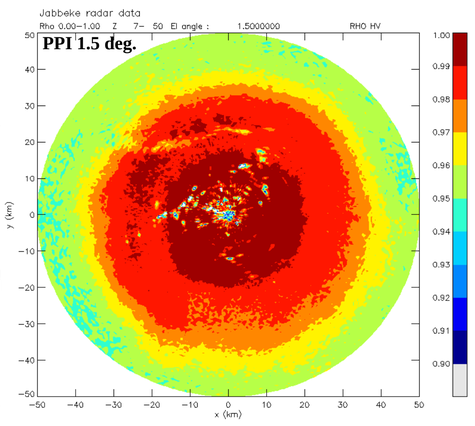
Quality assessment of Jabbeke polarimetric data

Six stratiform widespread precipitation episodes have been used to evaluate data quality.

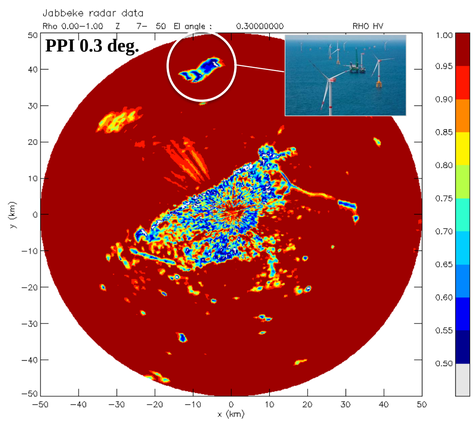
The quality tests are based on the OPERA (2012) report which describes current practices of several European meteorological services.



The **RHOHV distribution** under the BB peaks above 0.99 as expected in rain.



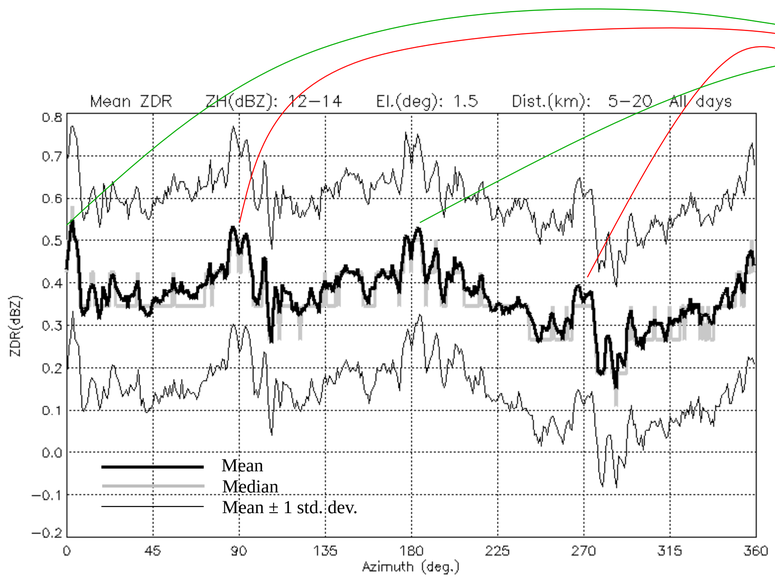
The mean value of RHOHV at short range is larger than 0.99 in all directions except in clutter contaminated areas.



At lowest elevation, ground and sea clutter are clearly visible in the mean RHOHV field. Offshore wind farm at 40 km shows RHOHV around 0.5.

The **azimuthal dependence of ZDR** has been analyzed as well. Figure below shows the results at elevation 1.5 deg for ranges between 5 and 20 km, ZH between 12 and 14 dBZ and RhoHV larger than 0.99.

Azimuthal variations up to 0.2-0.3 dBZ are identified. Four peaks can be attributed to metallic cables along the radome. Such impact has been already noticed by several authors (e.g. Gourley et al. 2006). Lower ZDR values tend to be measured in 230-340 deg. probably due to obstacles in the vicinity of the radar.



Power supply obstruction lights (2)

Lightning protection (2)

Rain rate estimation based on Z and KDP

Operational rain rate products at RMI make use of the traditional Z-R relationship. Some first tests have been performed to estimate rain rate using KDP as additional variable.

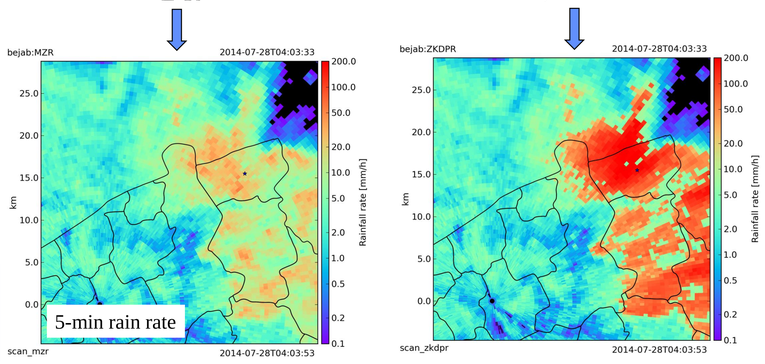
The following relation is used (Bringi et al., 2001) :

$R=33.5\ K_{DP}^{0.83}$ if $Z > 38$ dBZ and $K_{DP} > 0.15$ deg/km

$R = R(Z) \Leftrightarrow Z = 200\ R^{1.6}$ else

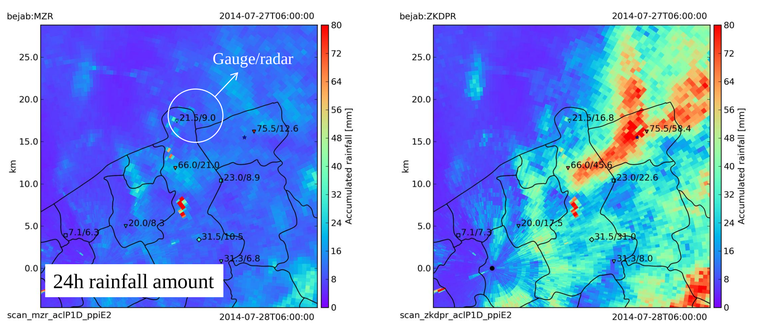
Z-R

Z, KDP - R



The results for an organized convective episode close to the radar are shown. Rainfall rates (upper panel) obtained with the Z,KDP-R relation are substantially larger. The resulting 24h rainfall amount (lower panel) shows better agreement with raingauge measurements.

Evaluation on a long-term dataset is of course required before any operational implementation.



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