

Some important weather radar correction algorithms and the development of the new 3D radar composite product at the Hungarian Meteorological Service.

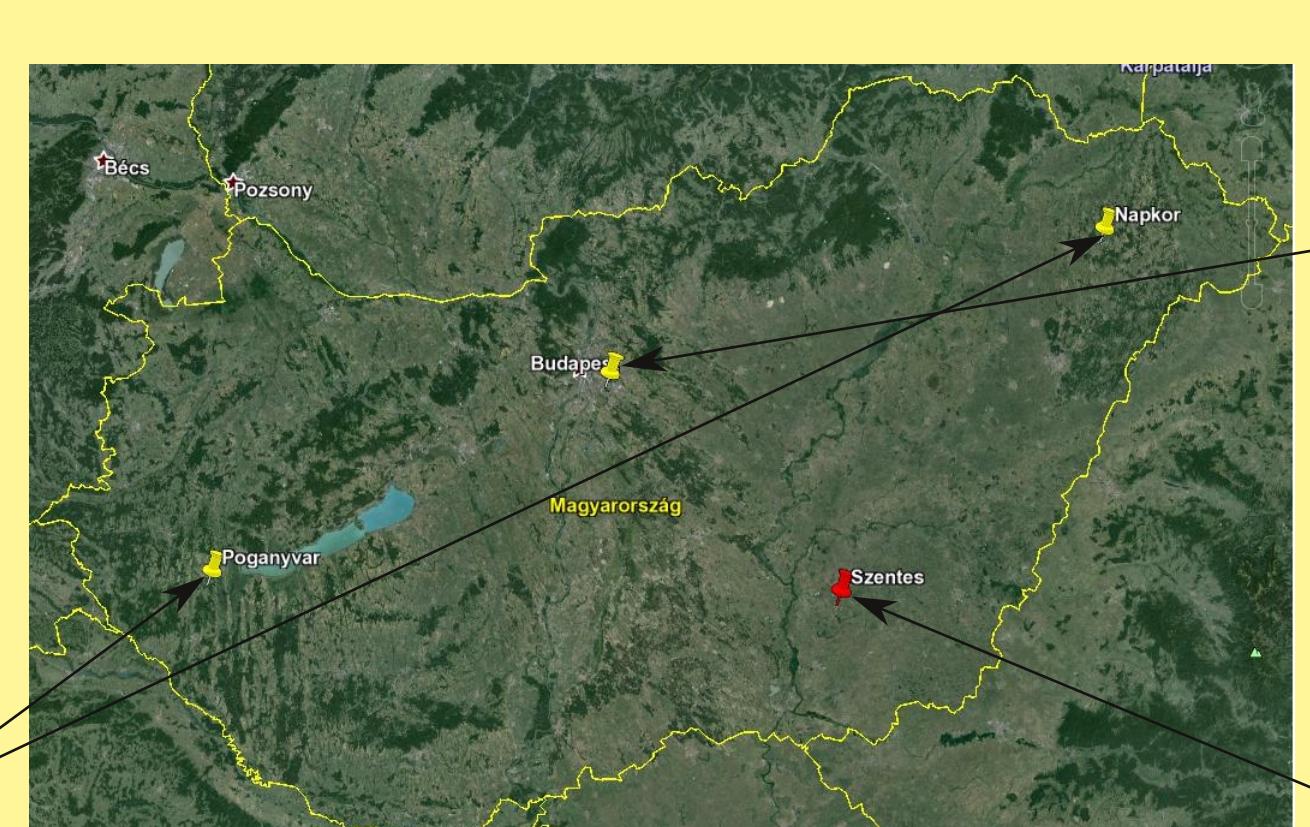


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1. Hungarian radar network

- C-band Doppler radars
- Dual-polarimetric
- Magnetron-based
- Constructed by EEC



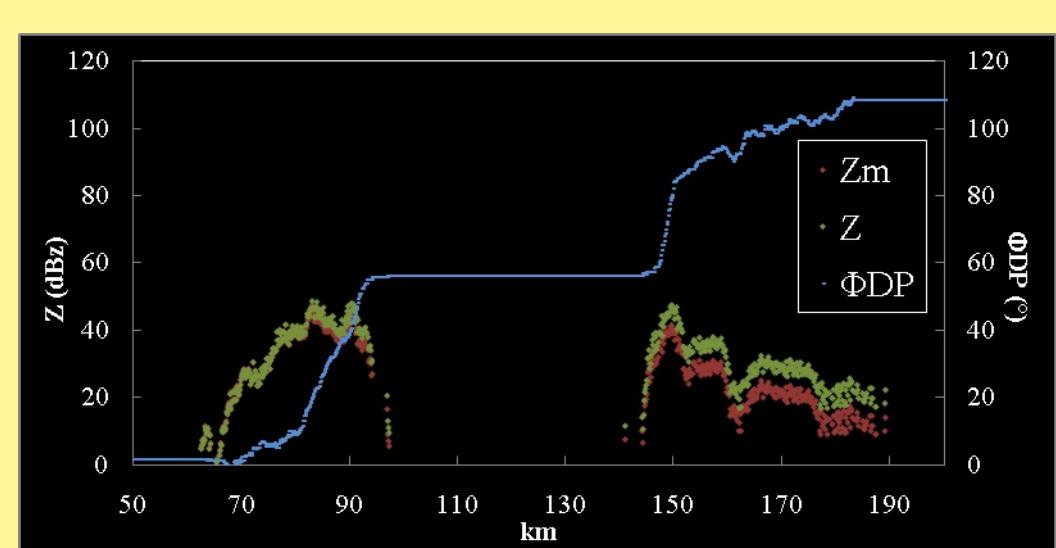
- DWSR-2501C
- EDRP9 signal processor
- Alternate dual
- $ZDR, \Phi_{DP}, \rho_{HV}$

- DWSR-2500C
- IQ2 signal processor
- Simultaneous dual
- $ZDR, \Phi_{DP}, \rho_{HV}, LDR$
- DWSR-5001C
- IQ2 signal processor
- Simultaneous dual
- $ZDR, \Phi_{DP}, \rho_{HV}$

2. The attenuation correction algorithm (rain)

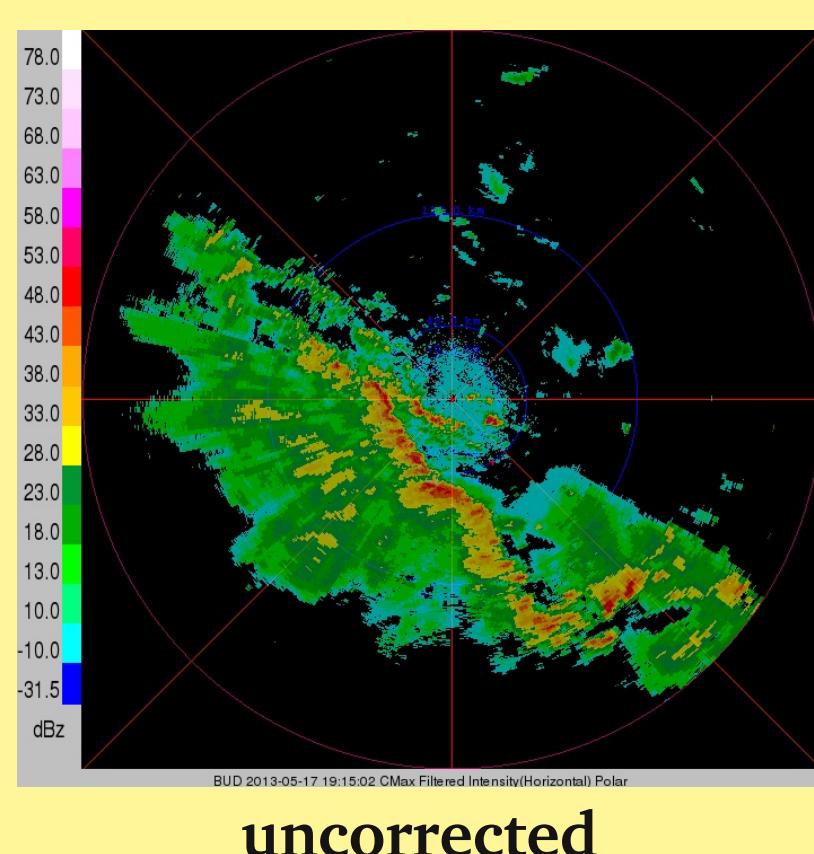
$$\alpha_H = a * \Phi_{DP}, \text{ where } a = 0.08$$

$$Z = Z_m + \alpha_H$$

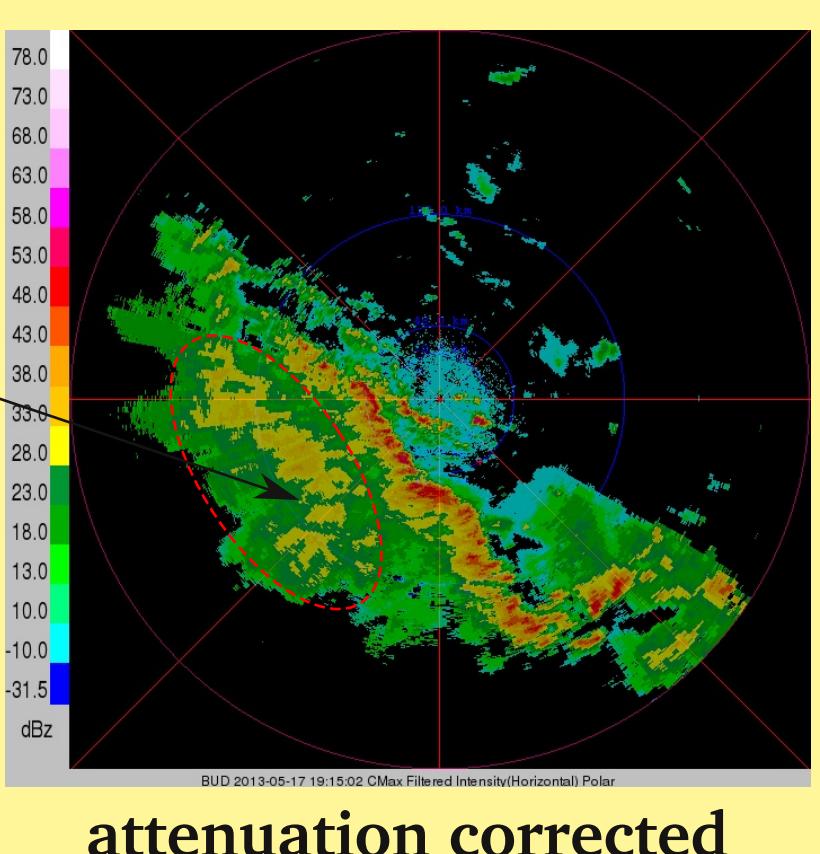


- Preprocessing of differential propagation phase (filtering, unfolding, smoothing)
- Linearly relationship between attenuation (α_H) and differential propagation phase(Φ_{DP})
- Calculation of corrected reflectivity (Z) from measured reflectivity (Z_m) and α_H

Relationship between differential propagation phase, measured and corrected reflectivity along a specific radar ray



- Biggest differences in the southwest direction behind a high reflectivity area (thunderstorm line)
- Correction algorithm is in semi-operative mode

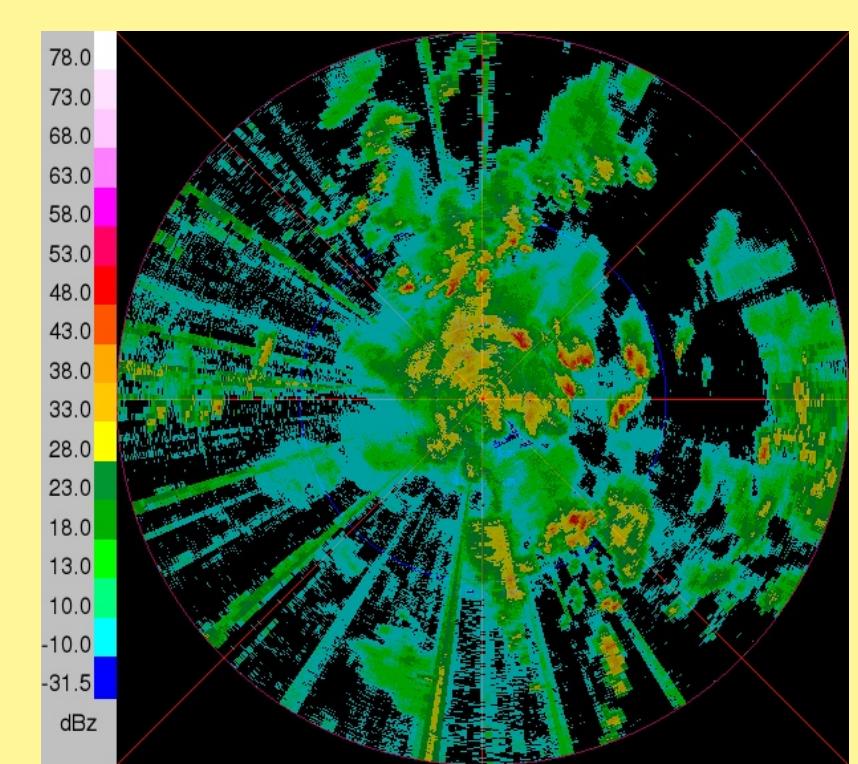
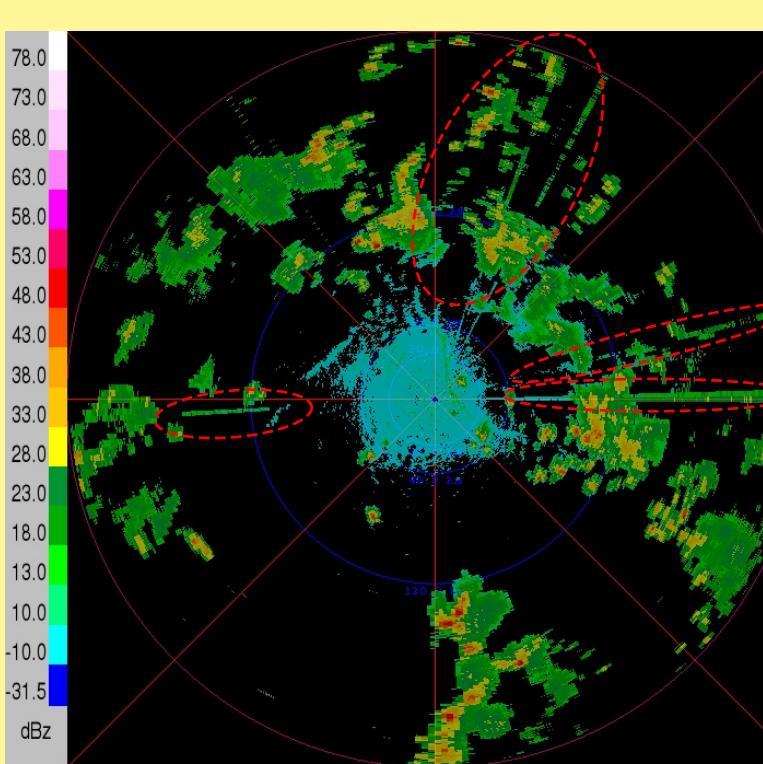


3. The WifiFilter correction algorithm

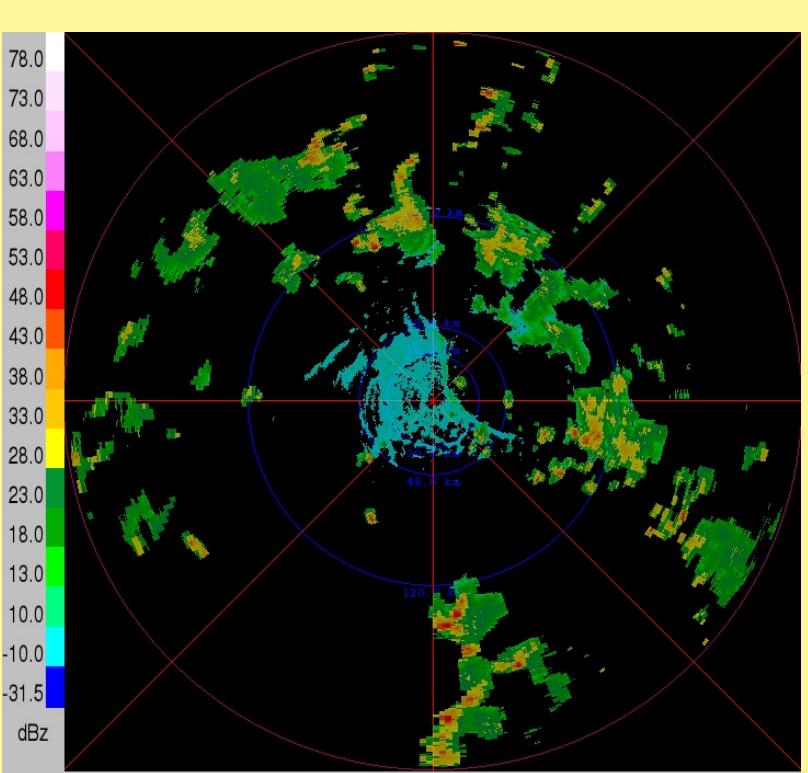
- Data quality of C-band radars affected by RLANs
- Interferences in the lower elevations of radar products

WifiFilter

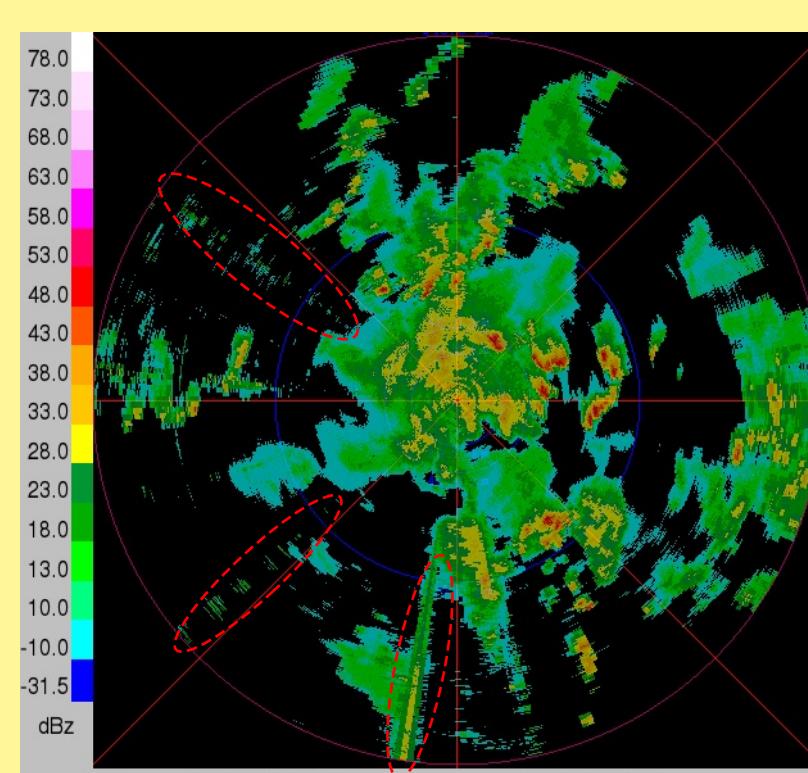
- Filter out interferences
- Remove real echoes as less as possible



Napkor
Budapest
Uncorrected CMAX pictures



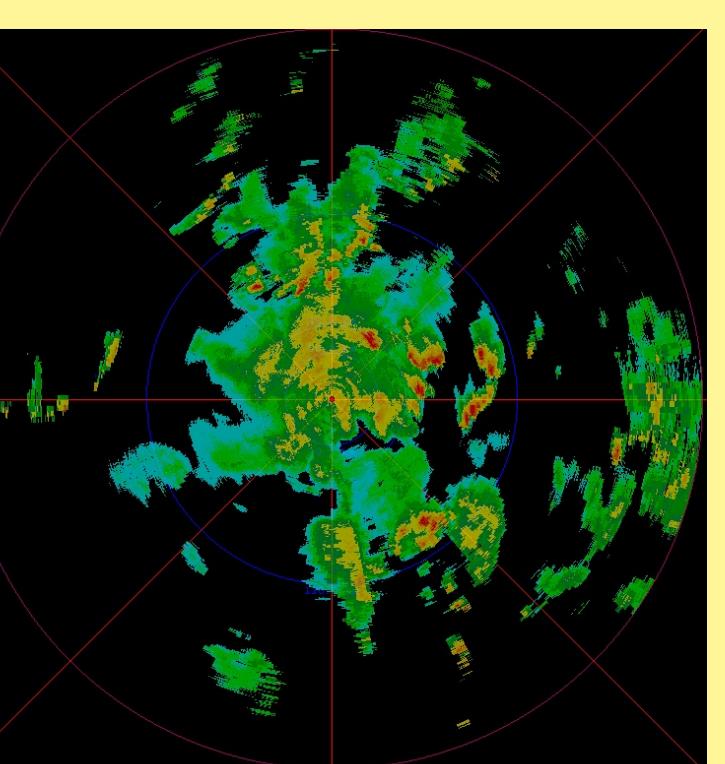
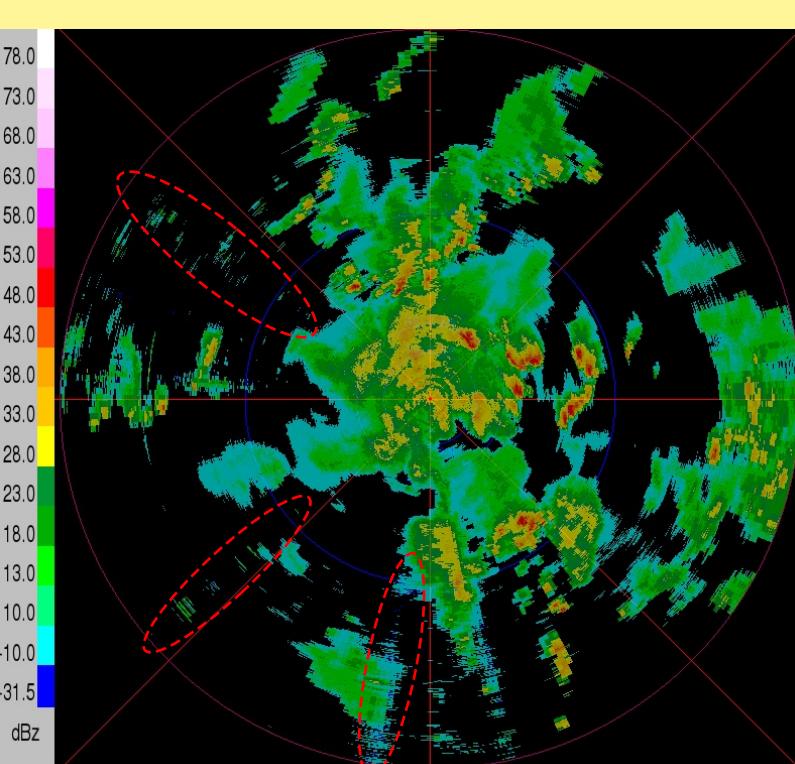
Napkor
(good correction)



Budapest
(still some RLANs)

WifiFilterB

- Algorithm relies on the shape of the echoes
- Can filter out interferences which are only a few rays wide



Budapest
WifiFilter A,R,B
(almost good correction)

Budapest
WifiFilter A,S,R,B
(in operative use)

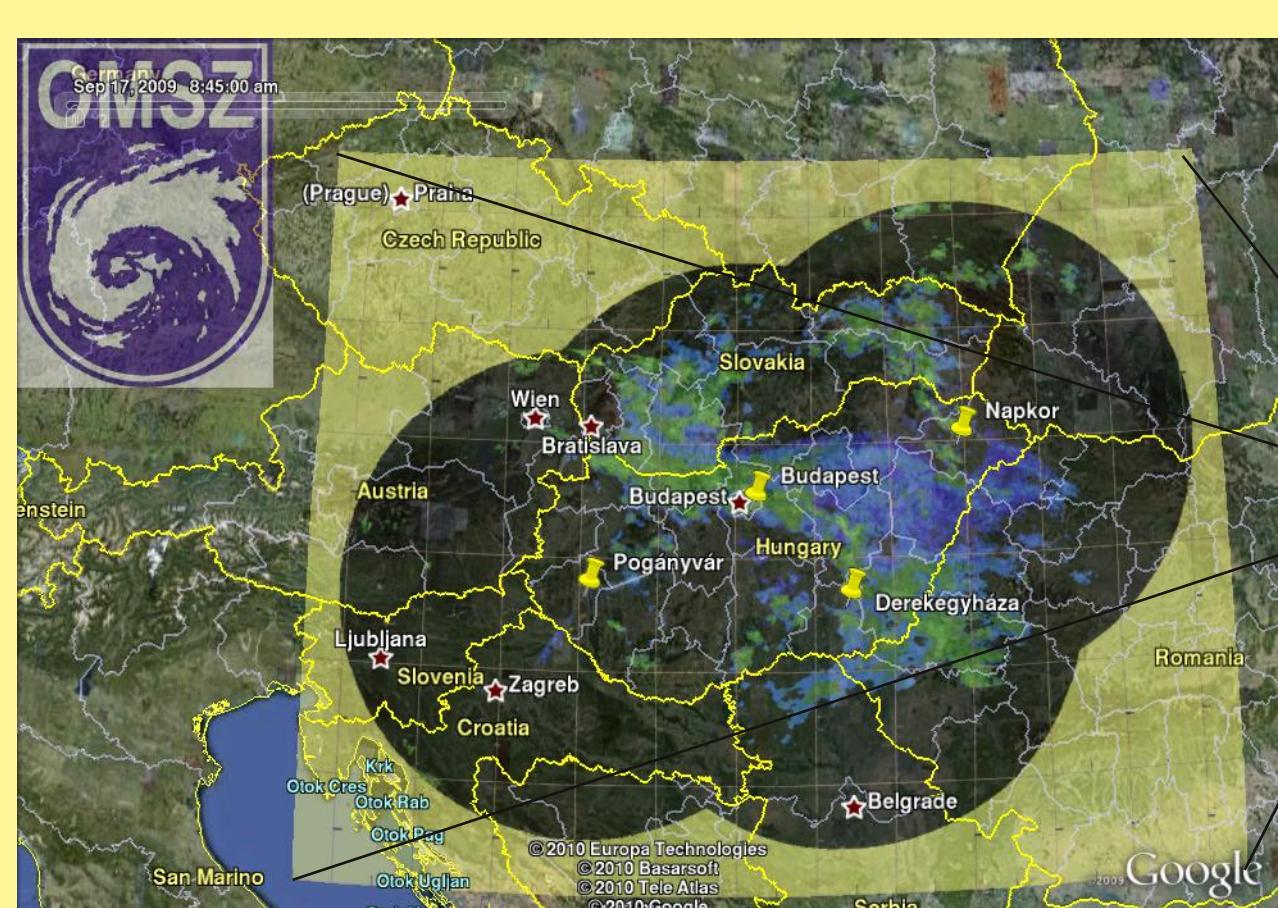
WifiFilterR

- Used together with WifiFilterA
- If a flagged ray is found, the algorithm makes a linear azimuthal interpolation from the previous and next rays's reflectivity values

WifiFilterS

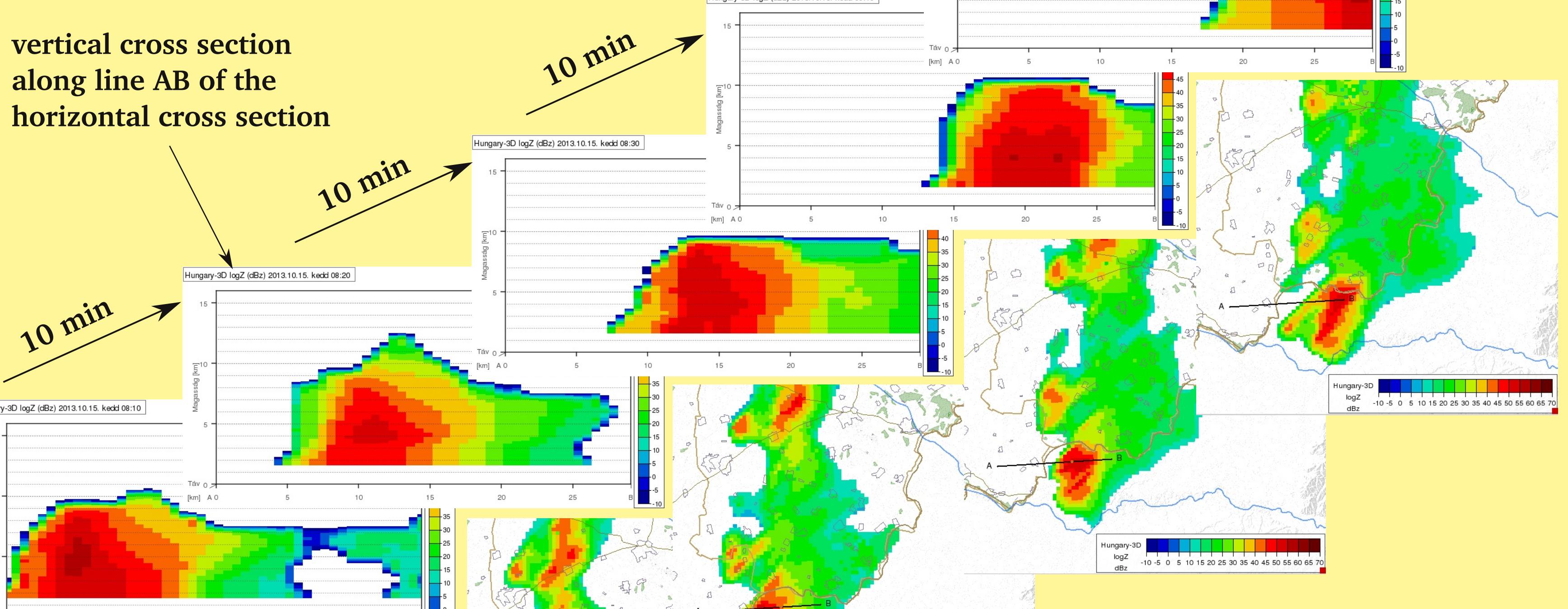
- In operative use since the Budapest radar upgrade (2013)
- Relies on specific values of Volume parameters (SNR, SQI)

4. The 3D composite radar product

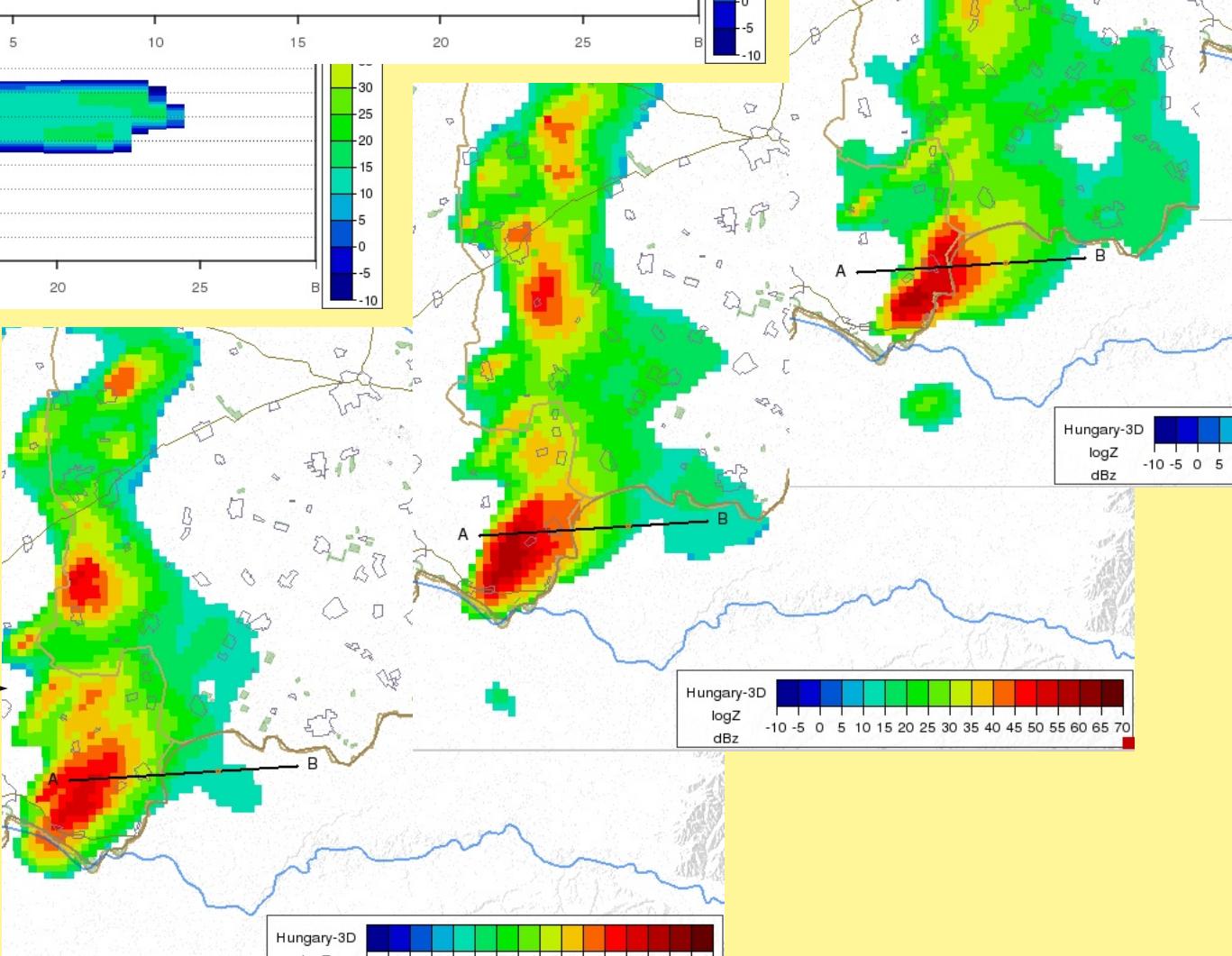


base of 3D grid (813x961)
~ 1 km resolution

vertical cross section
along line AB of the
horizontal cross section

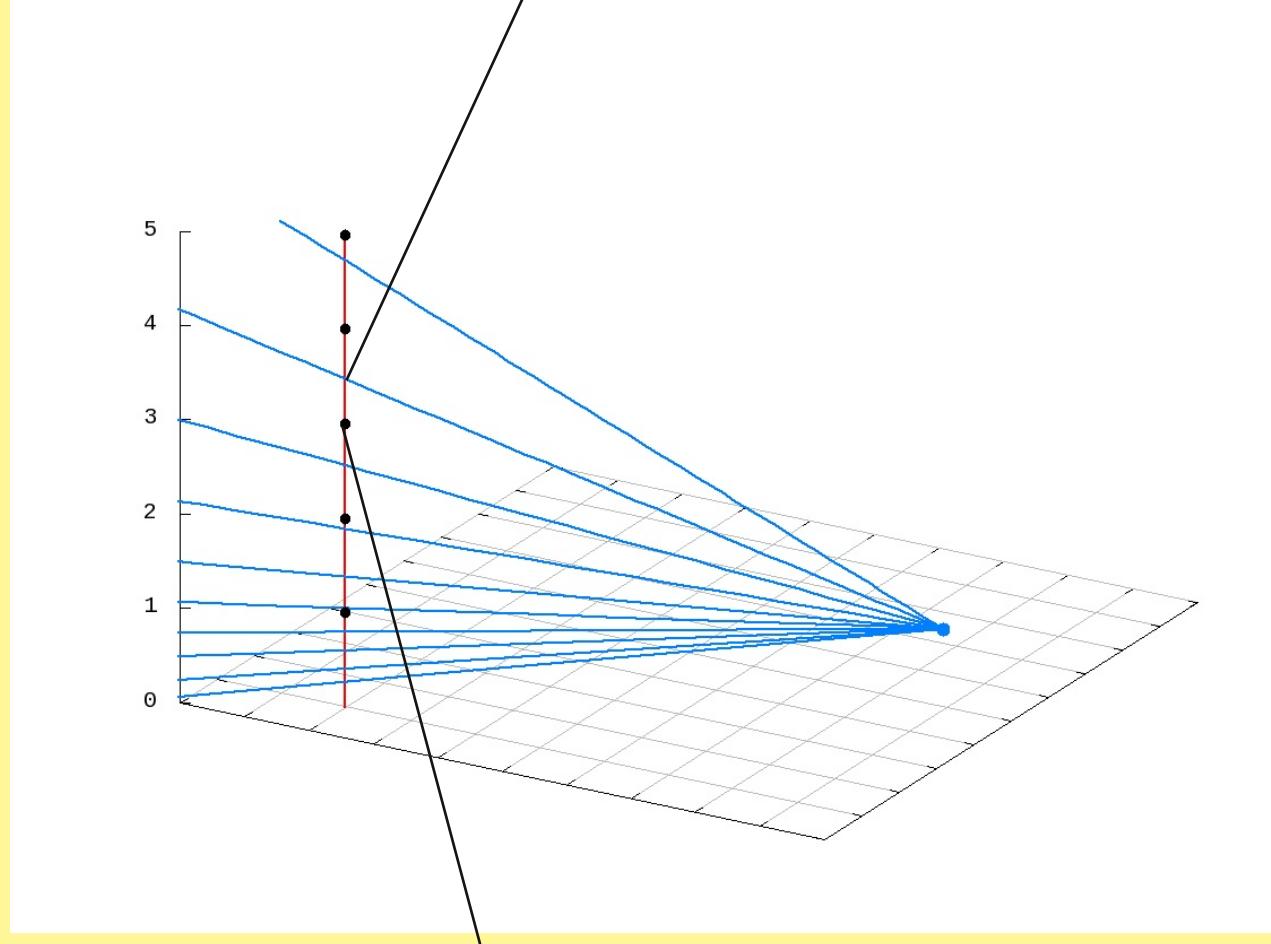


horizontal cross section
of 3D composite radar
product at 5000 m
(composite CAPPI)



Step 1

- radar polar Volume \rightarrow pseudo-3D grid
- vertical layers = number of radar sweeps (10)



Step 2

- pseudo-3D grid \rightarrow cartesian 3D grid
- vertical layers = 16 (every 1 km)

- individual 3D \rightarrow composite 3D
- selection of maximum reflectivity

HAWK-3

- tool for visualization of all meteorological data that are used at HMS
- representation of 3D meteorological fields

