

*Regional Cooperation for
Limited Area Modeling in Central Europe*



First steps towards radar data assimilation at ARSO

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Outline

- ▶ Introduction
- ▶ Quality flags in OPERA compared to local QC (INCA2)
- ▶ First data assimilation trial
- ▶ Discussion & perspective

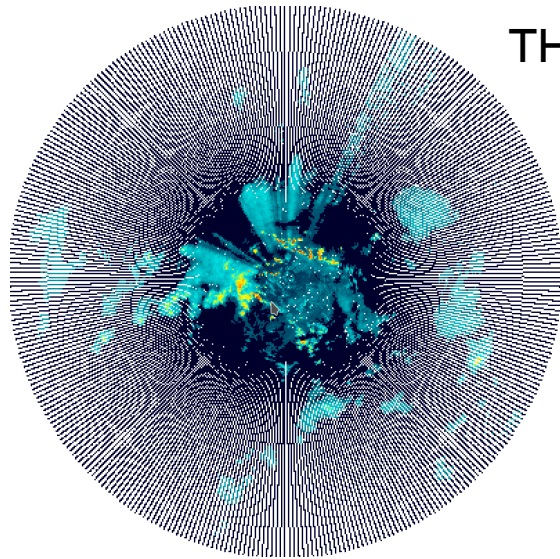
Introduction

- ▶ Radar data crucial for HR nowcasting assimilation
- ▶ Radar assimilation at ARSO was postponed for years
- ▶ Some development on radar QC within SI-INCA2
- ▶ OPERA/OIFS data hub offers excellent availability of European radar data and reaches reasonable standardization

Content of OPERA hdf5 file

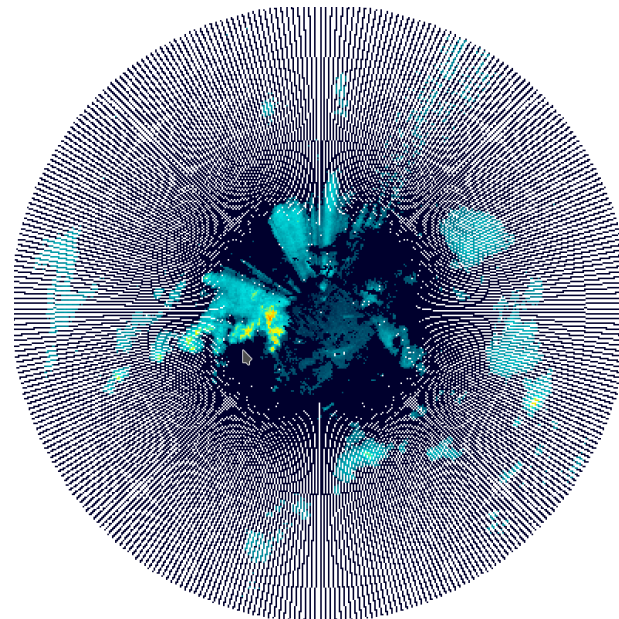
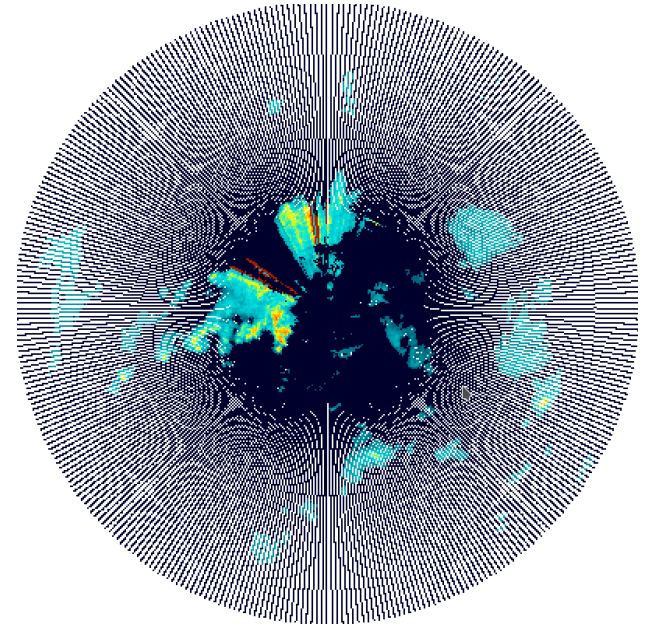
- ▶ Radar moments
 - ▶ Raw reflectivity (TH)
 - ▶ Corrected reflectivity (dBZ)
 - ▶ Radial winds
- ▶ Quality flags
 - ▶ Quality1: BROPO module total Q_i (many filters)
 - ▶ Quality2: Satellite check
 - ▶ Quality3: Beam blockage
 - ▶ Quality4: Total Q_i

OPERA vs. local QC - reflectivity



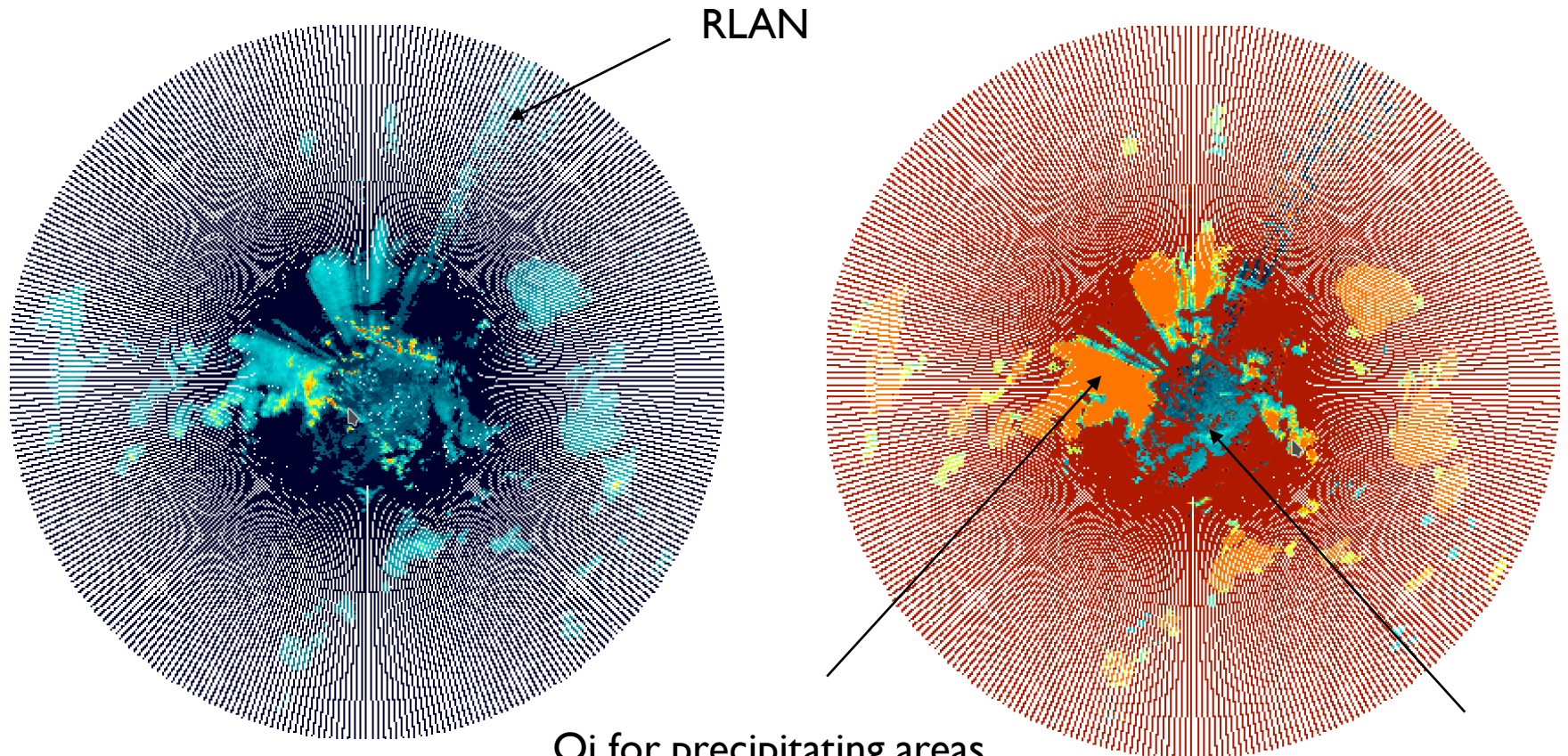
TH

DBZ – OPERA
Different dBZs, already
processed by BROPO



DBZ – local
Only clutter
correction at radar
site

BROPO quality index (quality1)



RLAN

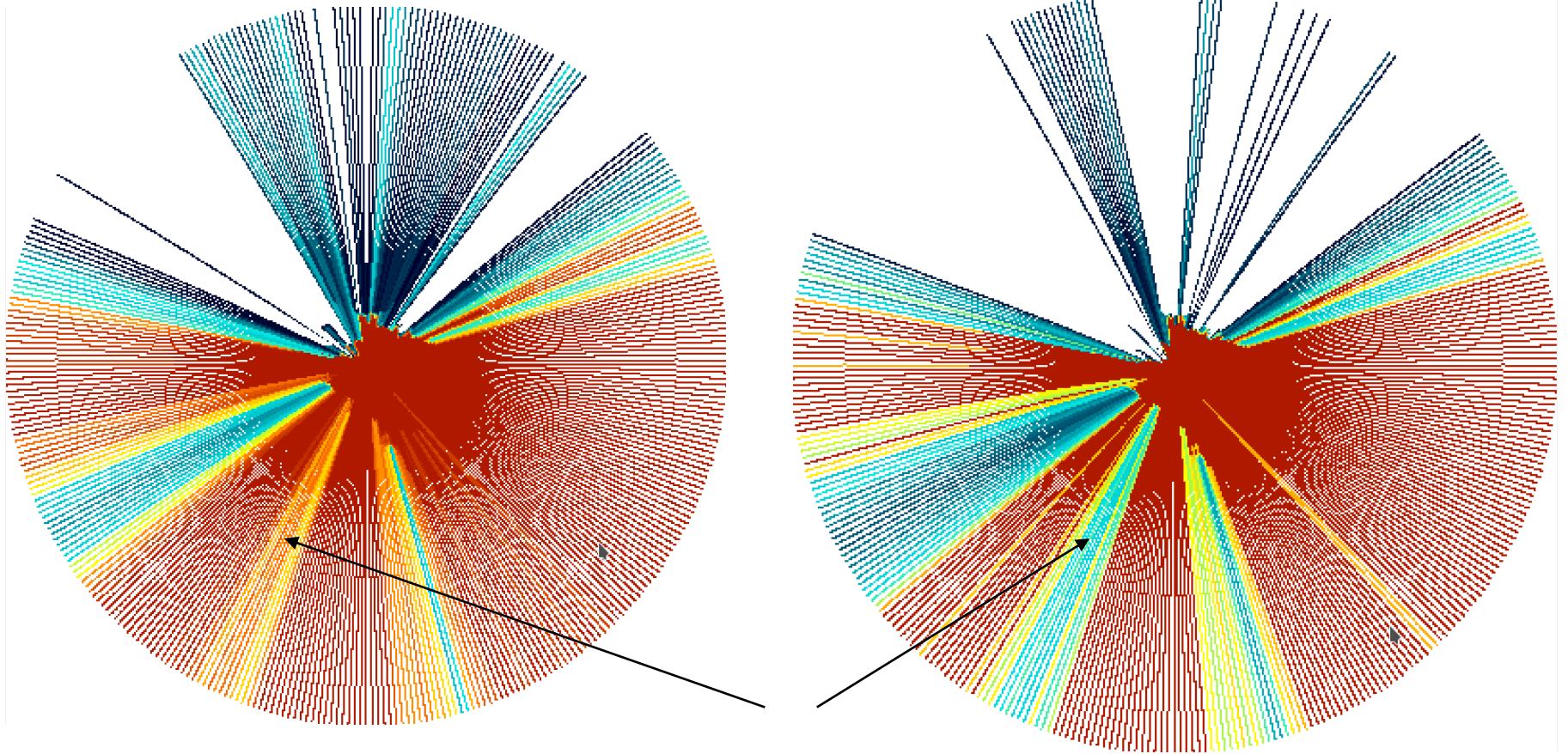
Qi for precipitating areas
depends on dBZ and
limited to ~0.9

Weak, non-
meteorological echo

OPERA vs. Local QC – beam blockage

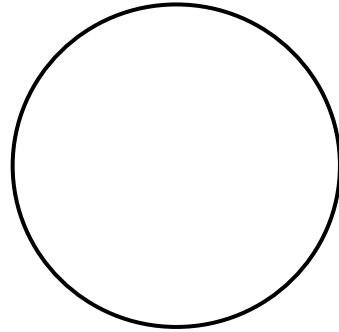
OPERA - quality3

INCA
more conservative

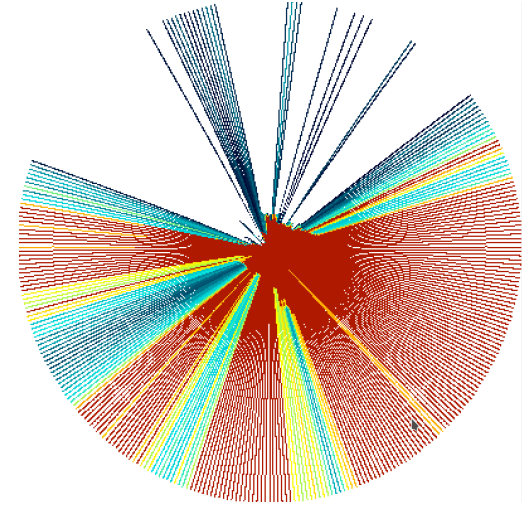


Other INCA-2 Qis

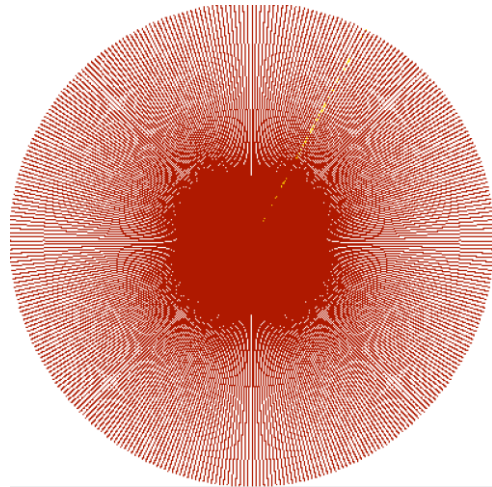
SAF Qi



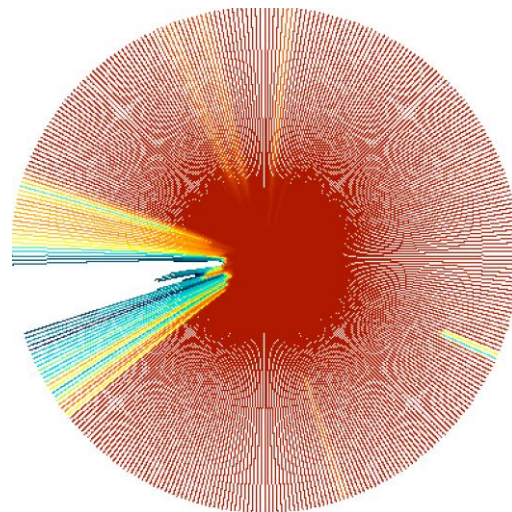
Beam block



WLAN test



Attenuation



Laplace

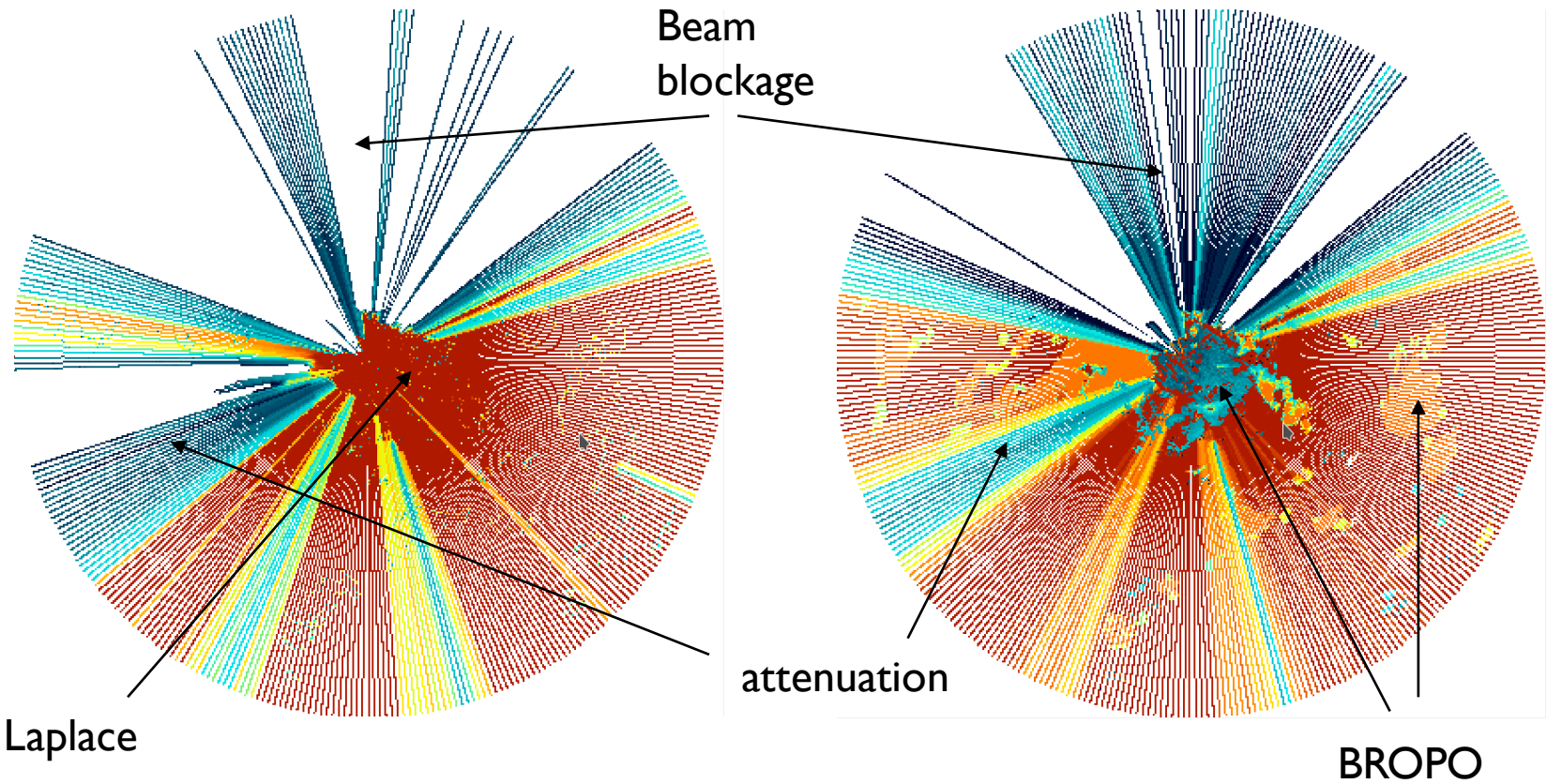
...letti meg a kép. Lehet, hogy nincs elegendő memória a megnyitáshoz, de az sem kizárt, hogy
...a kép. Indítsa újra a számítógépet, és nyissa meg újból a fájlt. Ha továbbra is a piros x ikon jelenik
meg, törölje a képet, és szűrje be ismét.



Comparison of final Q_i

INCA – total Q_i
Product of all Q_i s

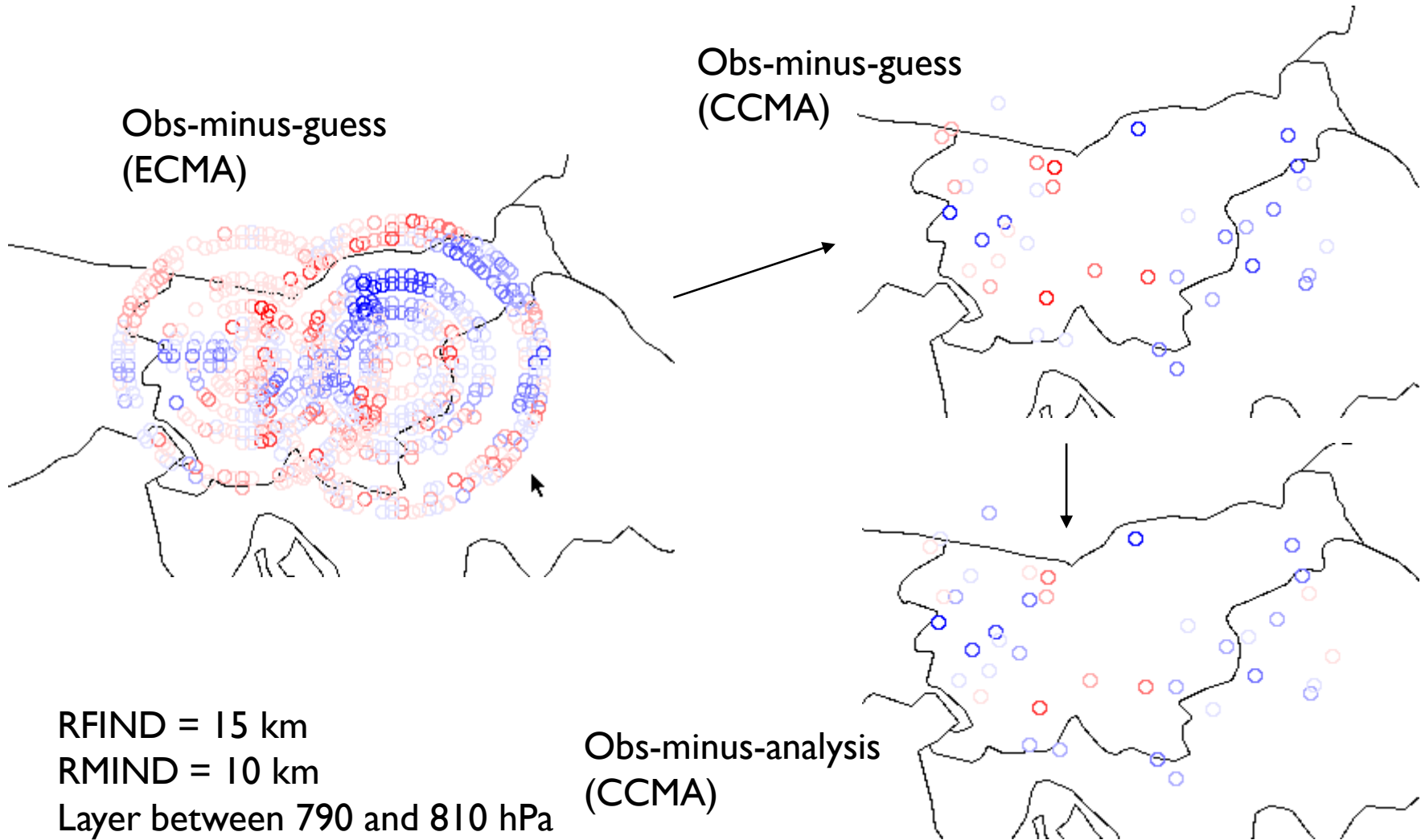
OPERA – quality4
Minimum of all Q_i s



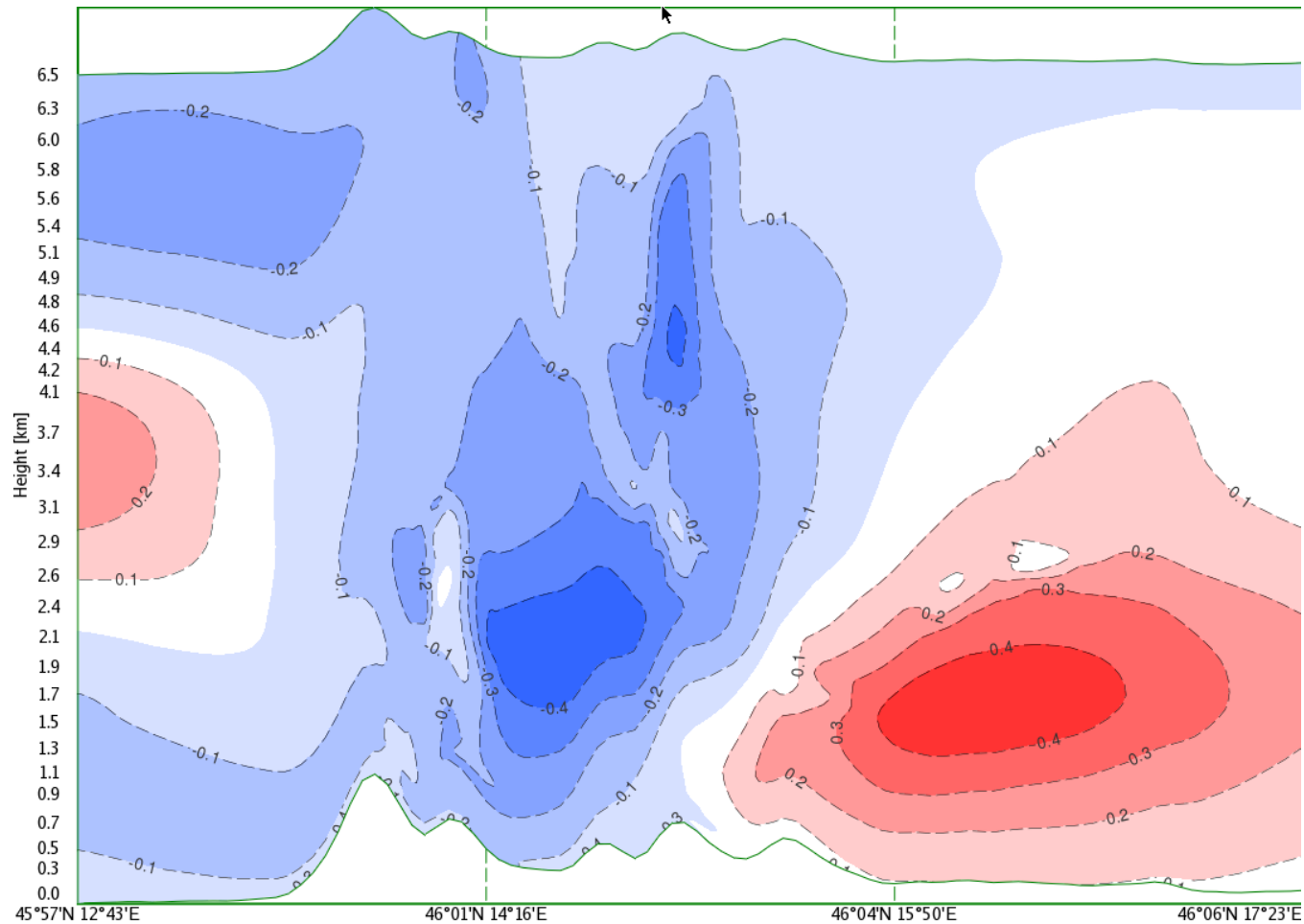
First data assimilation trial

- ▶ Opera data downloaded in real-time (for SI) and regularly for other countries
- ▶ Preopera.py to pre-thinn radar data (bin size currently 5 km)
- ▶ Hdf5 decoder (from Harmonie) compiled into Bator, values above 12 dBZ used as „rainy“
- ▶ Resolved segmentation fault in minimization (gfl_suobs_mod.F90): disabled deactivation of rain and snow GFL fields, graupel not used/available

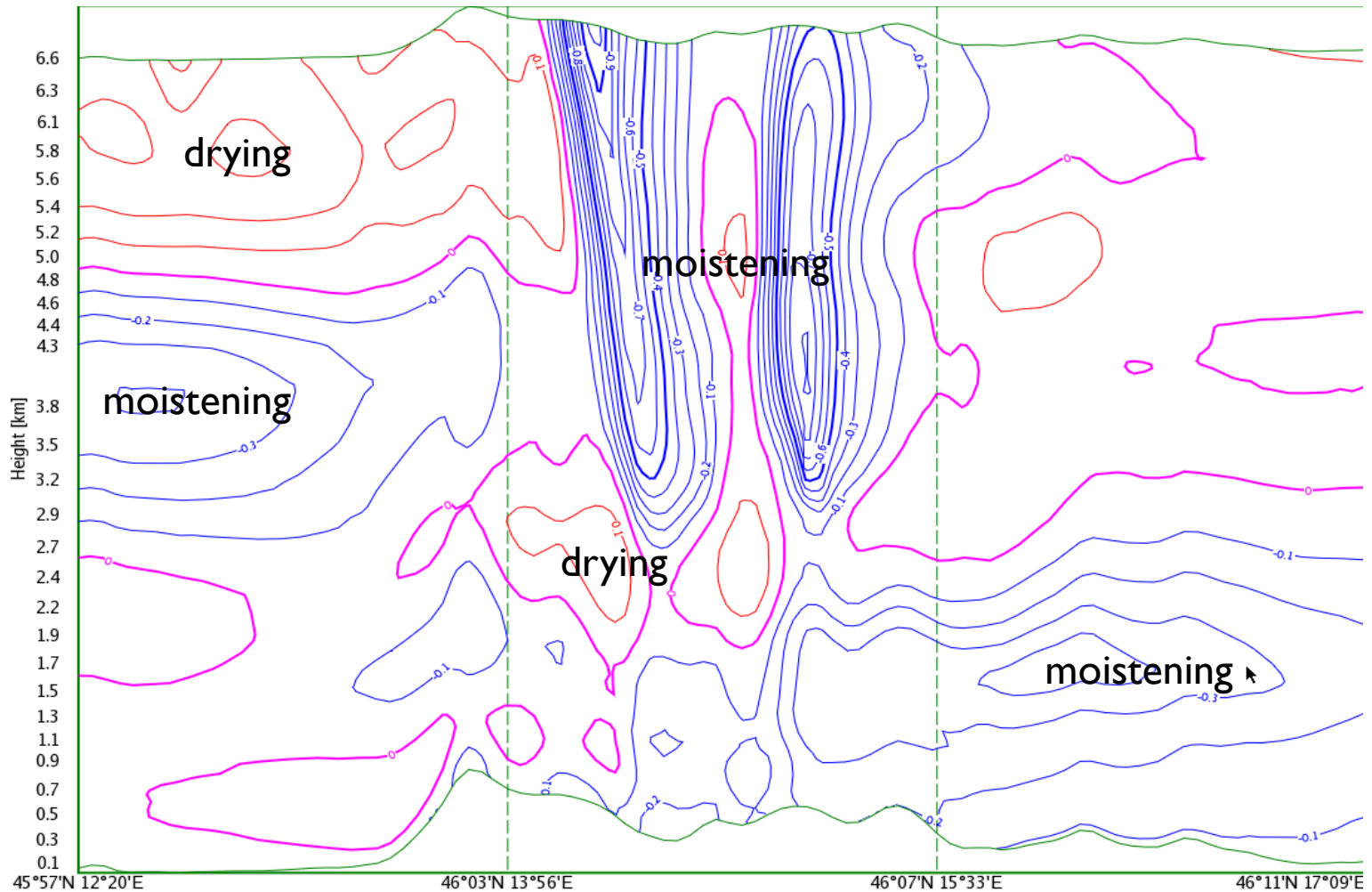
First data assimilation trial – refl



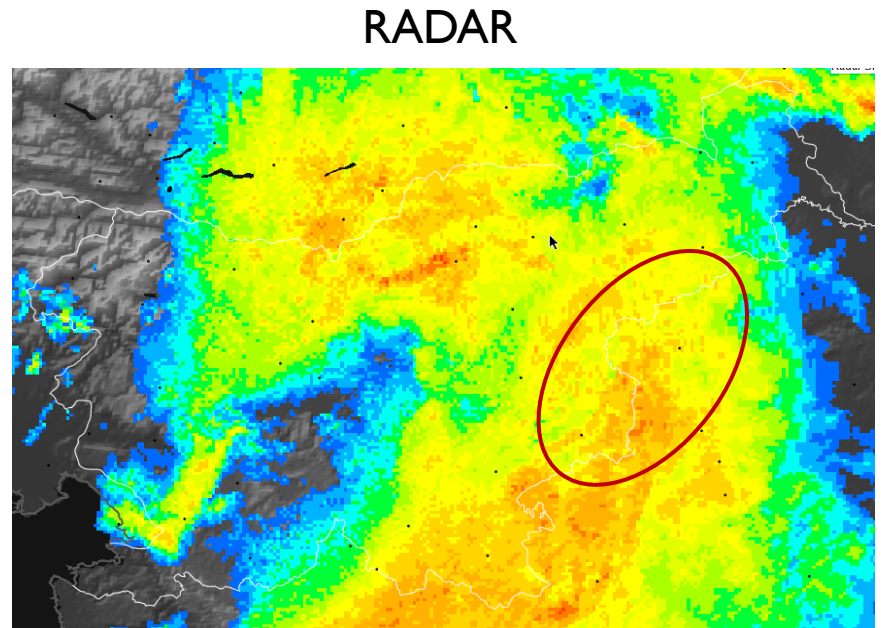
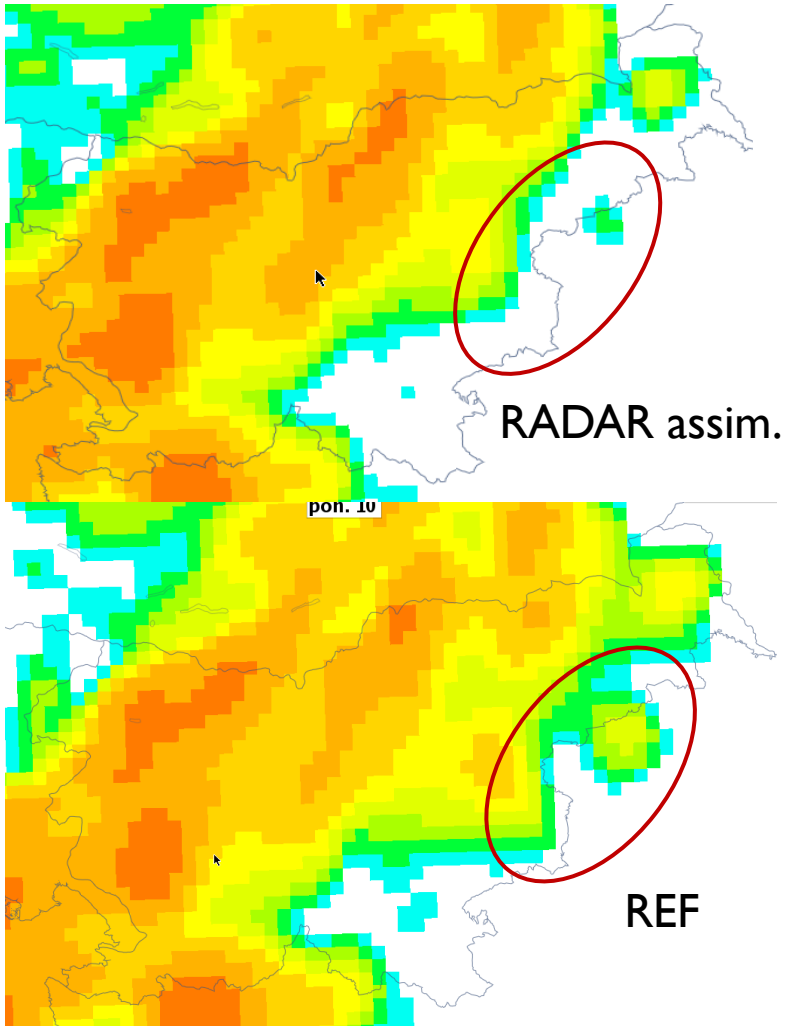
First trial – humidity increment (g/kg)



First trial – induced temperature increment



Impact on very short range forecast



Discussion & Outlook

- ▶ Opera quality check quite sophisticated
 - ▶ applies more filters than local QC for INCA (except for Laplace filter)
 - ▶ For SI radars, the OPERA BROPO module increases dBZ
- ▶ An extension of local QC tool is planned
 - ▶ to apply various filters on any hdf5 file (local or OPERA)
 - ▶ flexibility to use additional filters if needed
 - ▶ ideal place to implement correction of DOW wind (de-aliasing) – so far not touched
- ▶ Issues for assimilation which technically works
 - ▶ Is it possible to use Qis as obs. error std. ?
 - ▶ How to determine optimal thinning?
 - ▶ Rainy background-error covariances?