Quality control of polar weather radar data using the baltrad toolbox

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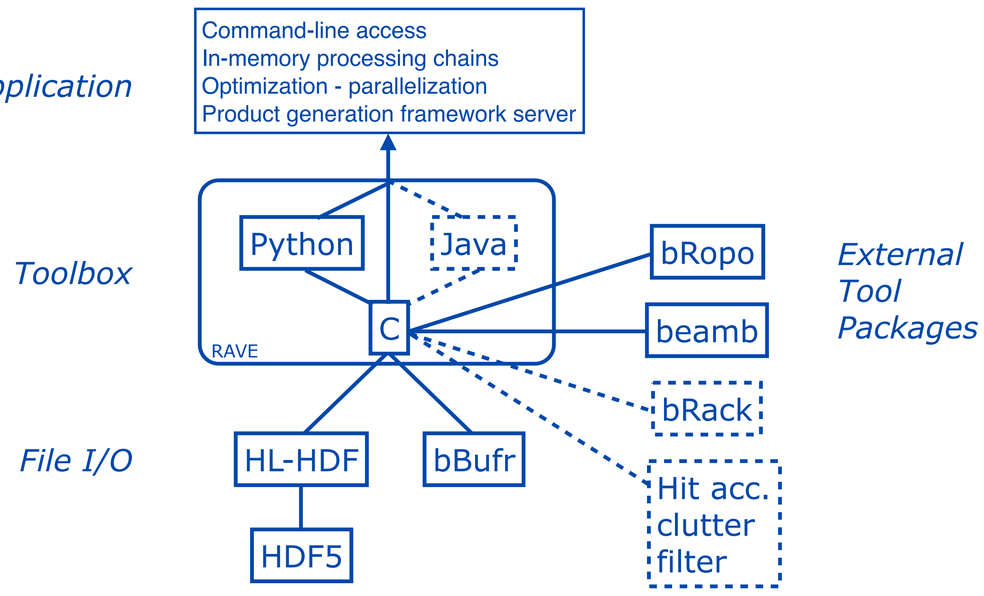
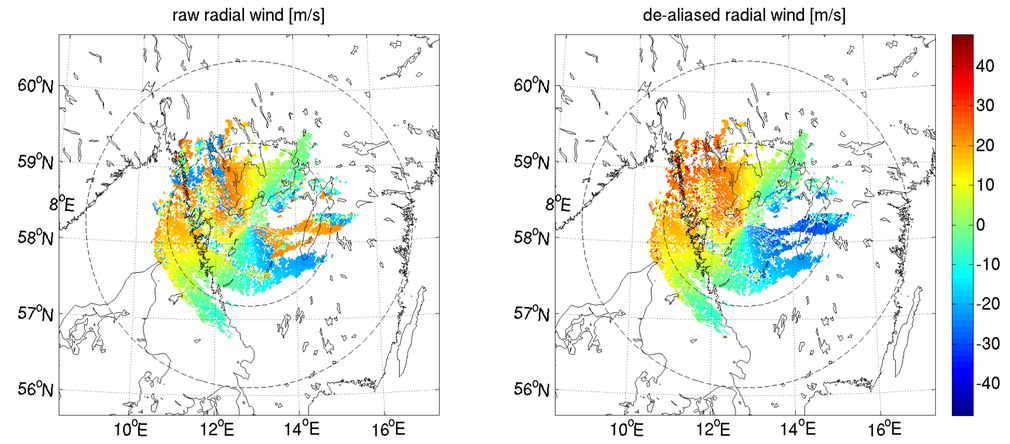
baltrad

toolbox

Dashed lines and boxes indicate work in progress



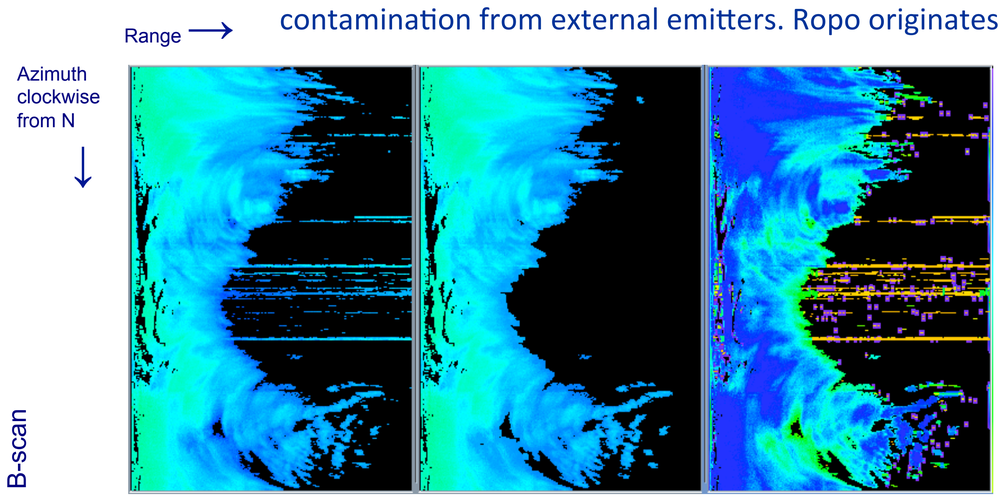
radial winds



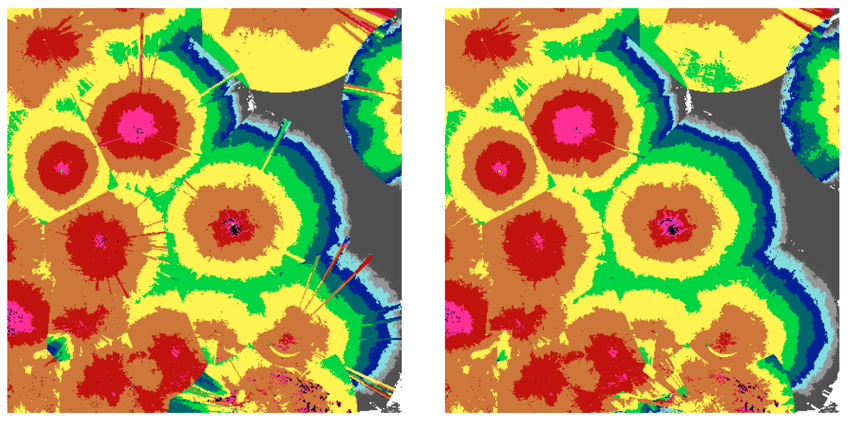
Observed and de-aliased radial wind for the Swedish weather radar in Vara at 19:47 UTC 22 Nov 2011 (0.5º elevation angle). The dashed lines indicate the 120-km and 240-km-range ring, respectively. Tools for processing radial wind data are being integrated into the toolbox now.

anomaly detection and removal

Example using the bRopo package in a case with contamination from external emitters. Ropo originates from FMI.



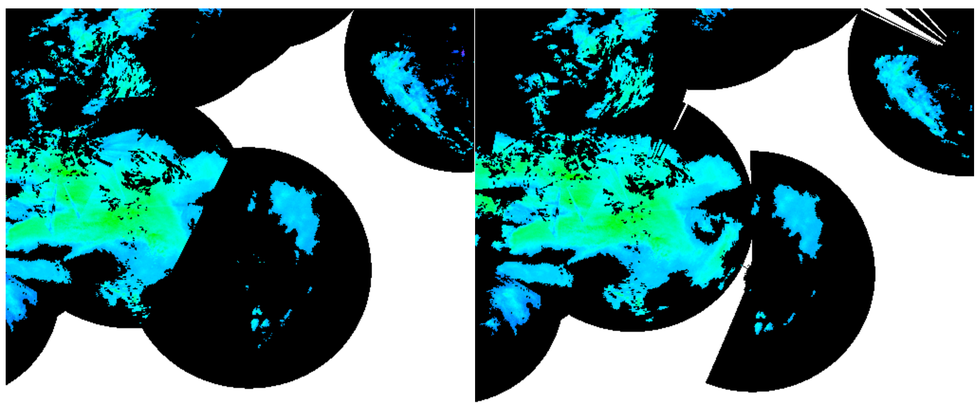
improved data quality



uncorrected corrected

The toolbox was trialed with data from ~115 European radars. Above is a detail of a long accumulation (February 2012). Using gauge data from all of Europe and contingency table statistics revealed noisy statistics and small but measureable improvements to data quality.

beam blockage



Example composites without (left) and with (right) the beamb package in a case where a radar is severely blocked by topography. Beamb originates from SMHI. Partial blockage is corrected up to a user-defined degree of blockage.

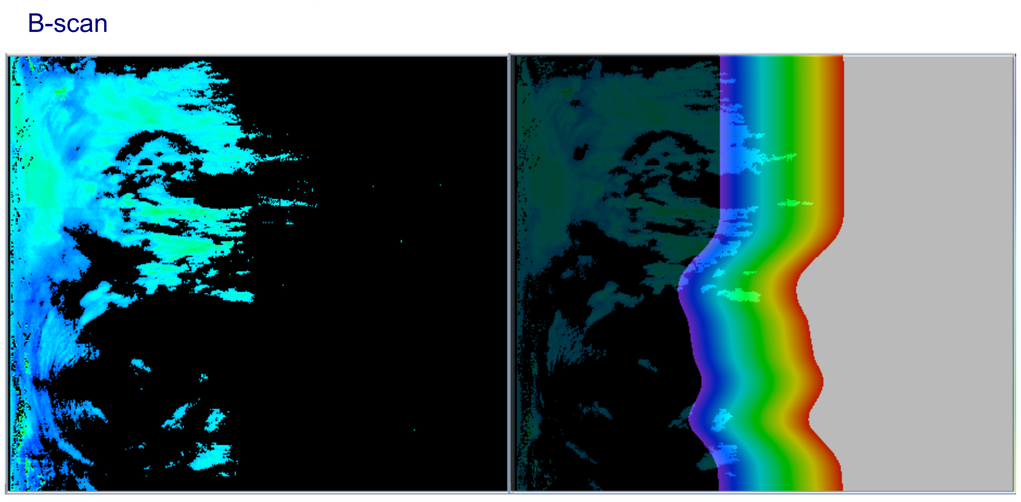
high performance

- ✓ Fast code base written in C, with small memory footprint
- ✓ Parallelization using *asynchronous multiprocessing* through the Python interface
- ✓ Specialized serialization objects unnecessary: HDF5 files are sufficient
- ✓ Table below shows some benchmarking results using a modest rack server that cost around 2500 € in 2009, with 1 quad-core CPU and 12 Gb RAM.

task	time (sec) cpu cores 1	4
Read and sort 695 scans, write 49 polar volumes	10	1
Anomaly identification and removal only	121	31
Full QC chain, generate all beam-blockage analyses from scratch	1094	436
Full QC chain, look up all beam-blockage analyses	146	42
Generate European composite as single tile	451	
Generate tiled (parallelized) European composite		43

Work with data from all of Europe has been partly funded by EUMETNET OPERA.

probability of overshooting



- ✓ "detection range" tool, code from FMI & SMHI
- ✓ elaborated analysis from echo tops (FMI, ERAD 2010)
- ✓ purely descriptive, data remain unmodified

open source software

Project website	http://baltrad.eu/
FAQ & User guide	http://git.baltrad.eu/
Software	http://git.baltrad.eu/trac

select references

Haase G. and Landelius, Dealiasing of Doppler Radial Velocities Using a Torus Mapping. *J. Atmos. Oceanic Technol.* **21**, 1566-1573

Michelson D. and Henja A., 2012: OPERA Work Package 3.6: Odyssey additions, Task 3. tuning and evaluation of "andre" tool. OPERA Working document WD_2012_02c.

Peura, M., 2002: Computer vision methods for anomaly removal. *Proc. ERAD 2002*. Copernicus GmbH. p. 312-317.

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