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# **Rack**

## **radar data processing program**

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# Rack

- Program for radar data processing:
  - Anomaly detection and removal
  - Product generation
  - Compositing
- Implemented in C++
- Command line interface
- HDF5/ODIM support
- Output also in image format(s)



# Anomaly detection and removal

Detectors for:

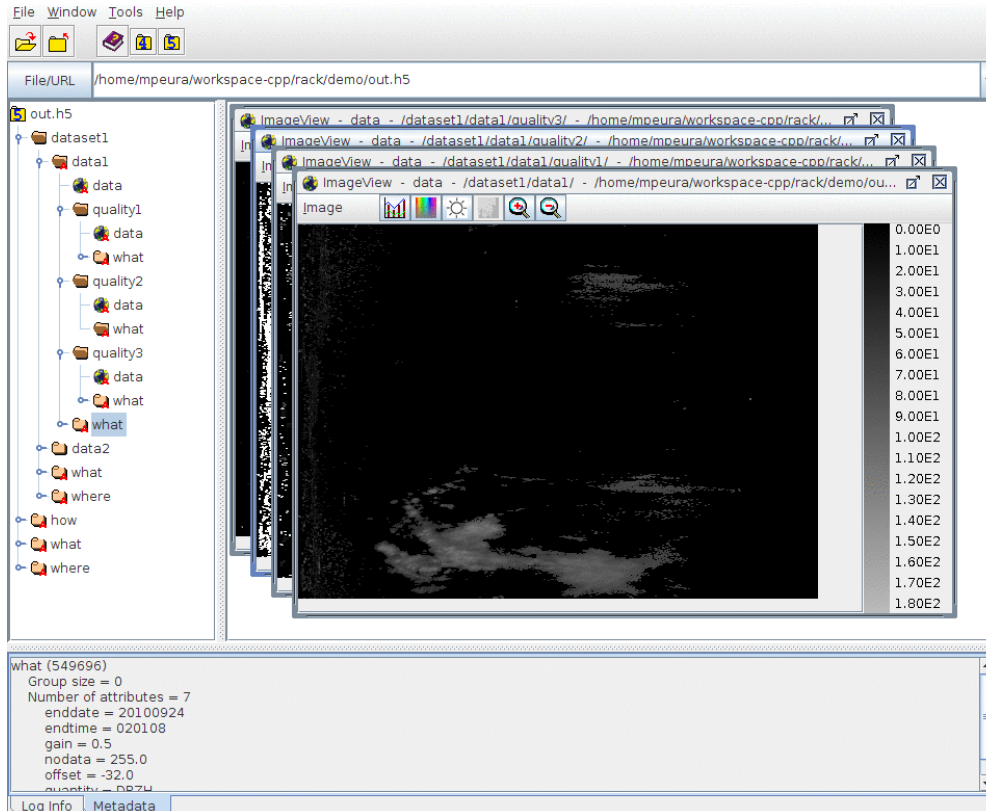
- Ships
- Speckle noise
- Emitters (electromagnetic interference)
- Birds & insects
- Sun

Based on:

- Operational FMI code (2001-)
- Current BALTRAD project work
- Current FMI work



# HDF5 and quality information



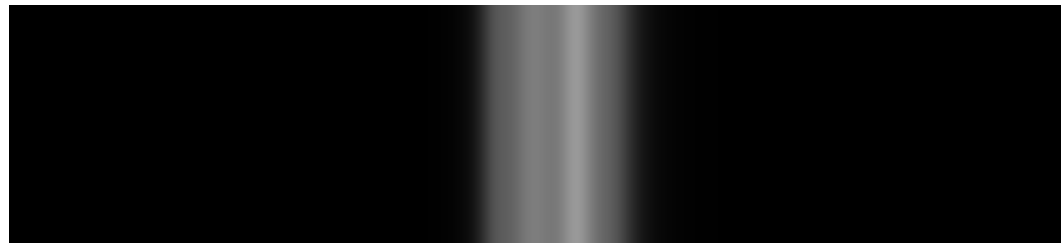
## Command line example:

```
rack
  scan_fikor_20100924T020021Z.h5
  --aSpeckle -32dBZ,6bins
  --aBioMet -15dBZ,800m
  --aShip 25dBZ,5bins,8bins
  -o out.h5
```



# Single-radar products

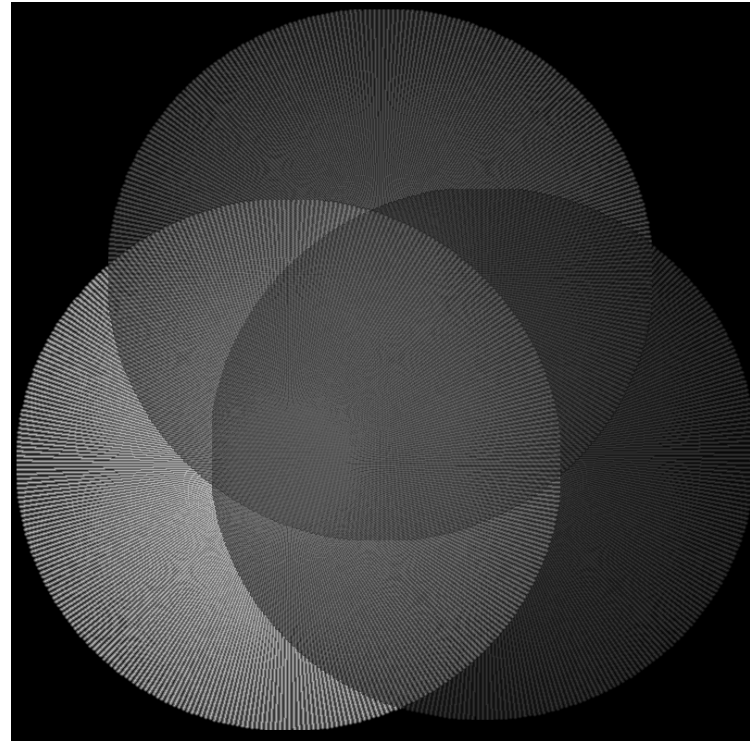
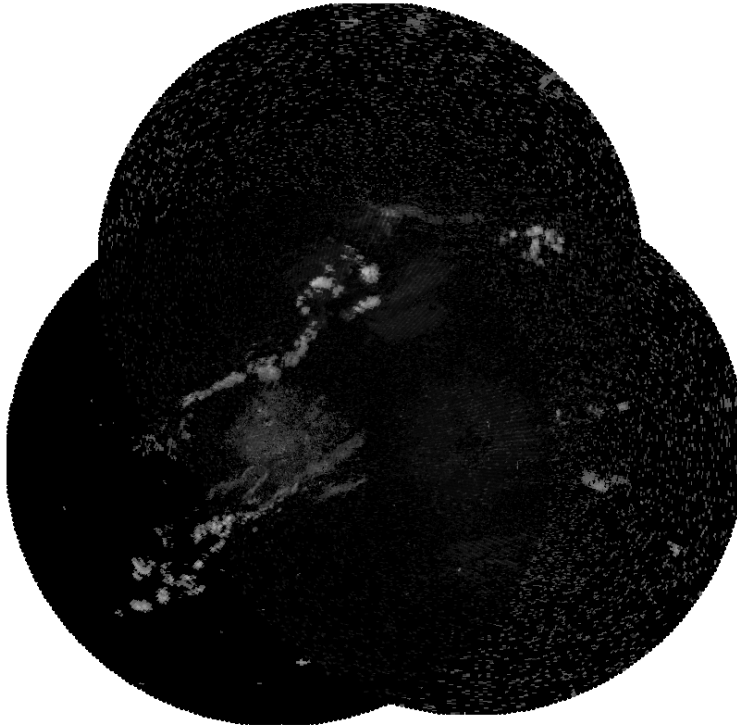
- PseudoCAPPI (and Echo Top, Echo Bottom)
- Computed in polar coordinate system
- Support for quality data





# Composites

- AVG, Weighted-AVG, MAX, MAX-quality
- Support for quality data





# Two versions of Rack

## Rack (FMI Rack)

Command line interface

Internal HDF5 tree structure

Newer anomaly detectors

Libraries: Hdf5, Hdf5cpp, Proj,  
Png, Drain

Continuous development

## Brack (BALTRAD Rack)

BALTRAD interface &  
Command line interface

Image processing based

Older anomaly detectors

Libraries: Hdf5, Proj, Tcl, Tk,  
Python, Numpy, PIL, PycURL, ...  
HLHDF/PyHL, Rave

?



# Open questions

- Native C++ HDF5 API (by HDF Group) is unsatisfactory
- Evaluating the speed (slowness) of system side calls using command-line interface
- ODIM rules or conventions for quality data need testing and further development



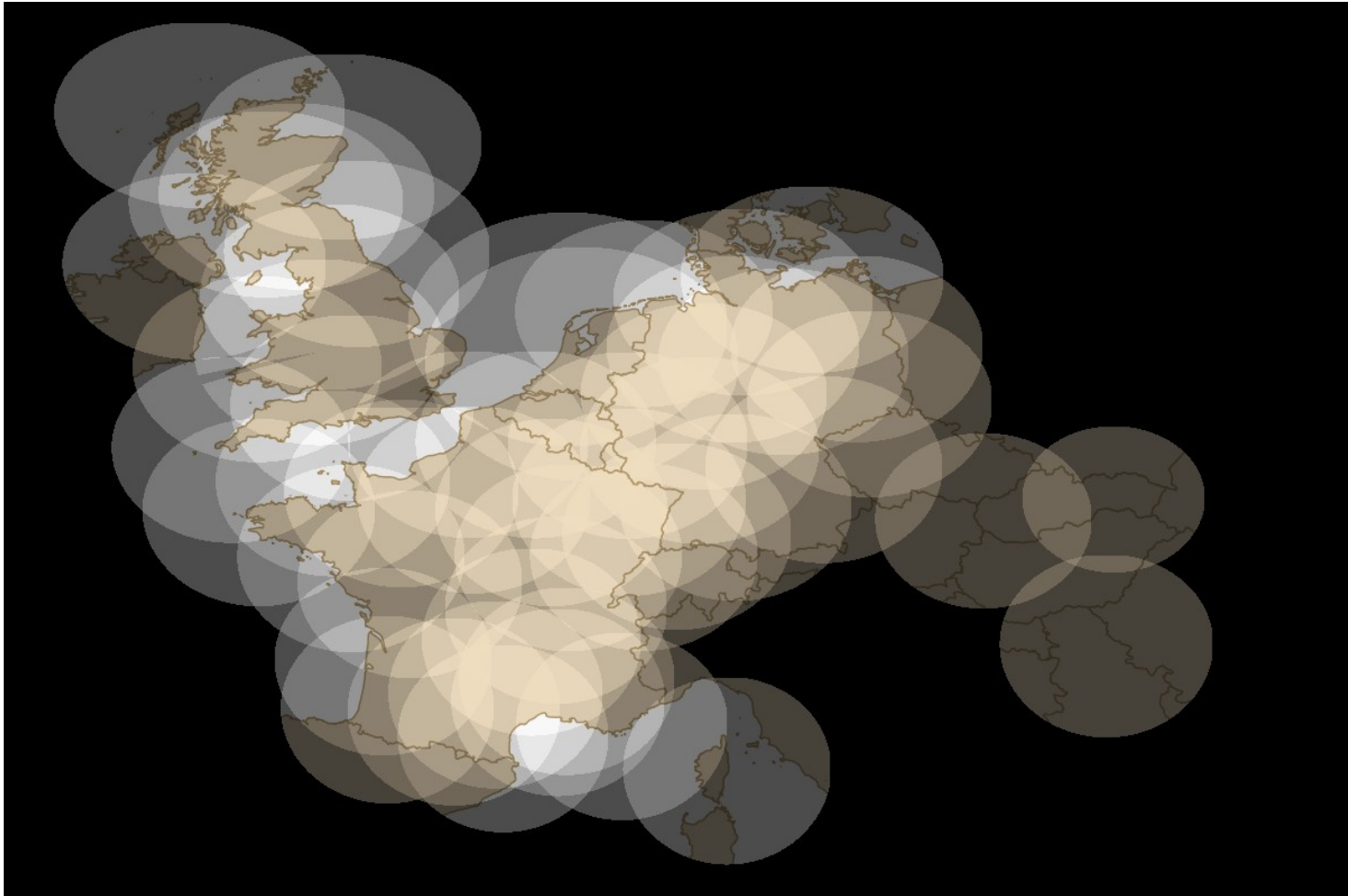


# Time usage

- Data: 52 European radars (HDF5 files)
- Compositing (1200x800pix, lowest sweep)
- Without anomaly detection and removal:  
**2-3 seconds**
- With anomaly detection and removal:  
**20-23 seconds** (~ 0.4 sec / radar)

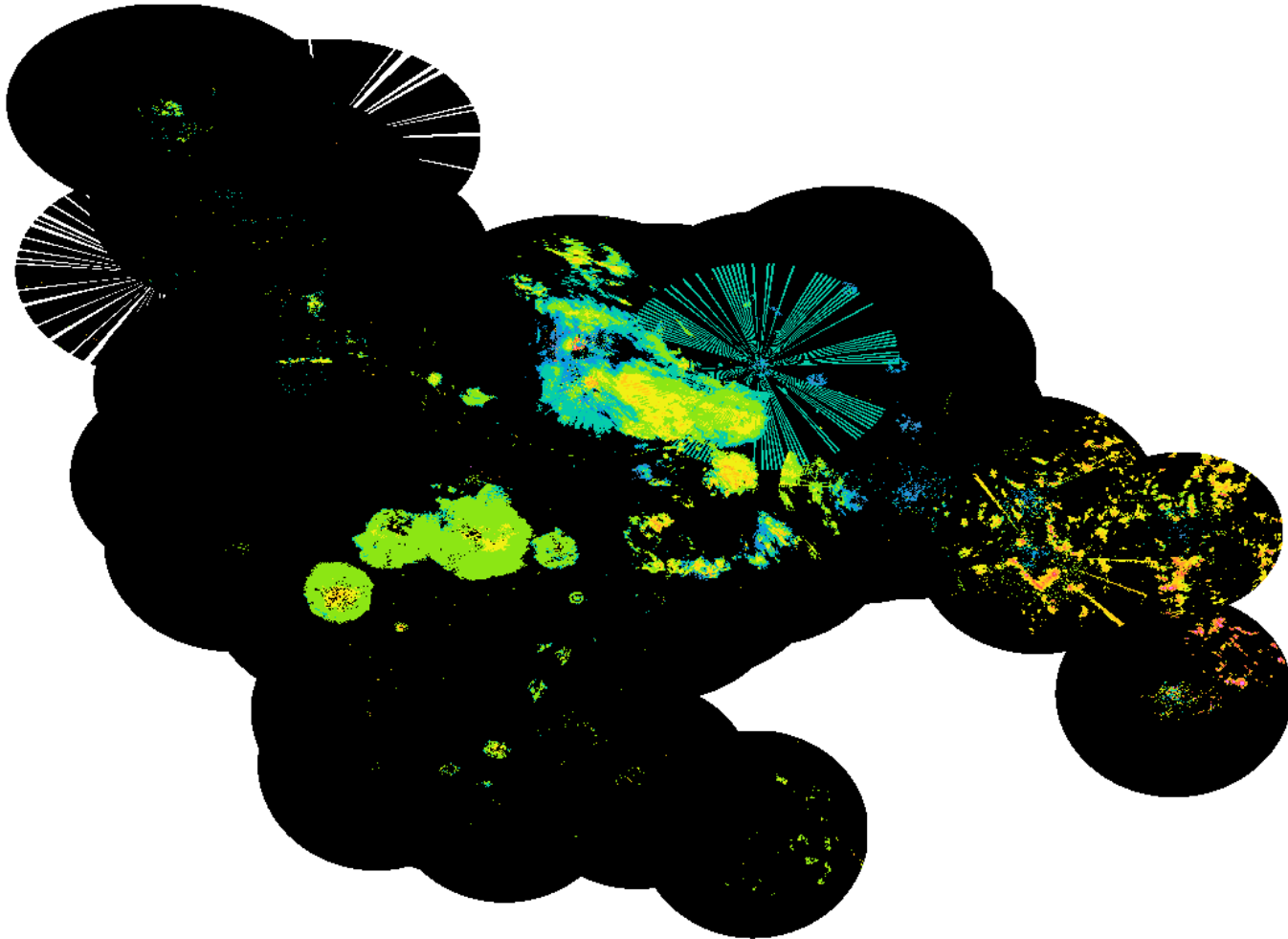


# Example





# Example: without AnDRe





# Example: with AnDRe

