

**baltrad**



# **advanced weather radar networking with baltrad+**

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**Baltic Sea Region**  
Programme 2007-2013

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(European Regional Development Fund  
and European Neighbourhood and  
Partnership Instrument)

# what is baltrad?

|                    |   |
|--------------------|---|
| <b>Project(s)</b>  | <ul style="list-style-type: none"><li>+ Partly funded by the EU's Baltic Sea Region Programme</li><li>+ First time that European money is being used for establishing a weather radar network, not as a prototype or proof-of-concept, but as a real-time element of regional infrastructure.</li><li>+ Main-stage project February 2009 - January 2012.</li><li>+ BALTRAD+ January 2012 - December 2013</li></ul>  |
| <b>Partnership</b> | <ul style="list-style-type: none"><li>+ Swedish Meteorological and Hydrological Institute</li><li>+ Finnish Meteorological Institute</li><li>+ Institute of Meteorology and Water Management, Poland</li><li>+ Latvian Environment, Geology and Meteorological Centre</li><li>+ Danish Meteorological Institute</li><li>+ Republican Hydrometeorological Center, Belarus</li><li>+ Lithuanian Hydrometeorological Service</li><li>+ Finnish Radiation and Nuclear Safety Authority</li><li>+ Estonian Meteorological and Hydrological Institute</li><li>+ Department of Civil Engineering, University of Ålborg, Denmark</li><li>+ Århusvand A/S, Denmark</li><li>+ Norwegian Meteorological Institute</li><li>+ German Weather Service</li></ul> |

|                 |   |
|-----------------|---|
| <b>Network</b>  | <ul style="list-style-type: none"><li>+ Real-time exchange of polar weather radar data</li><li>+ ~60 C-band radars in 10 countries, X-band as PoC</li><li>+ Emerging mechanisms for handling radar data in WMO Information System (WIS)</li><li>+ Decentralized concept allows each partner to process all data according to their local needs</li></ul>  |
| <b>Software</b> | <ul style="list-style-type: none"><li>+ Open Source : Lesser Gnu General Public License</li><li>+ Publicly released on 24 January 2012 → <a href="https://git.baltrad.eu">git.baltrad.eu</a></li><li>+ Whole system written in C/C++, Java, Python</li><li>+ A collection of modular sub-systems</li><li>+ Successfully trialed in EUMETNET OPERA to improve the quality of European composites (BALTRAD toolbox)</li></ul> |



## baltrad Frequently Asked Questions and User Guide

Main Page

Related Pages

### Community-based weather radar networking

**Date:**

January 2012

**Version:**

1.0

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on behalf of the BALTRAD partnership

**Legals**

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### Introduction

Welcome to BALTRAD! This page is the first place to come to become acquainted with us. We hope you will like what you see and read.

We have divided up this documentation into a Frequently Asked Questions (FAQ) part, and a User Guide part. The FAQ should probably be consulted first, because it will help you understand what BALTRAD is, and the principles guiding it, whereas the User Guide is more focussed on helping you get started with the system. Another way of putting it is that the FAQ will give you an overview and the User Guide will give you more substance.

The finest level of detail will be available in each software package's documentation, which is available when it is built. If you build a so-called "BALTRAD node", the documentation of the packages you decide to build will be built automatically, and that is where to look for such details.

Enjoy!

TAKE ME TO ...

[Frequently Asked Questions](#)

The screenshot shows a web browser window with the URL `git.baltrad.eu/trac`. The page header includes the BALTRAD logo, a search bar, and navigation links for `logged in as dbm`, `Logout`, `Preferences`, `Help/Guide`, and `About Trac`. A secondary navigation bar contains `Wiki` (selected), `Timeline`, `Roadmap`, `View Tickets`, `New Ticket`, `Search`, and `Admin`. Below the navigation, there are links for `wiki: WikiStart`, `Start Page`, `Index`, and `History`, with a note that the page was `Last modified 3 days ago`.

## Welcome to the BALTRAD software wiki

Looking for the [BALTRAD Cookbook?](#)

## RELEASES

The latest official release is **1.2-beta4**. This is as it says a beta release for the upcoming 1.2 release that is planned for end of june.

This release contains a number of corrections related to authentication between nodes.

To fetch.

```
%> git clone git://git.baltrad.eu/node-installer.git
%> cd node-installer
%> git checkout 1.2-beta4
```

or if you already have a source repository that you have built from you can speed up the process by doing

```
%> cd node-installer
%> git checkout master
%> git pull
%> git checkout 1.2-beta4
```

### Release 1.2-beta4

Release date: 2012-06-21

Changes from 1.2-beta1

BALTRAD-DEX:

- Ticket 120: Enable password encoding for spring-security form login
- Ticket 117: Error when in Home i press Browse files and next press on Details
- Ticket 113: Use spring security package

RAVE:

You are welcome to participate and contribute!

wiki: [cookbook](#)

**BALTRAD Cookbook**

Welcome to this "cookbook", where "recipes" are collected. This is intended to constitute a documentation reference collection of data processing algorithms. Each algorithm recipe is documented in a standardized way, enabling them to be coded as part of the BALTRAD code base or an external system. The important thing is that the community can focus this effort in a harmonized way.

**Documentation**

- [How to write a cookbook recipe](#)
- [Cookbook roadmap](#)

**Recipes**

- [Precipitation accumulation - ACRR](#)
- [Calibration difference of two radars - CALID](#)
- [Quality characterization due to technical radar parameters - RADVOL-QC: SYS](#)
- [Quality characterization due to distance to radar related effects - RADVOL-QC: BROAD](#)
- [Removal of geometrically-shaped non-meteorological echoes and quality characterization - RADVOL-QC: SPIKE](#)
- [Networked VPR correction](#)



# cookbook roadmap


 Search

logged in as dbm | [Logout](#) | [Preferences](#) | [Help/Guide](#) | [About Trac](#)

- [Wiki](#)
- [Timeline](#)
- [Roadmap](#)
- [View Tickets](#)
- [New Ticket](#)
- [Search](#)
- [Admin](#)

wiki: [cookbook](#) / [roadmap](#)

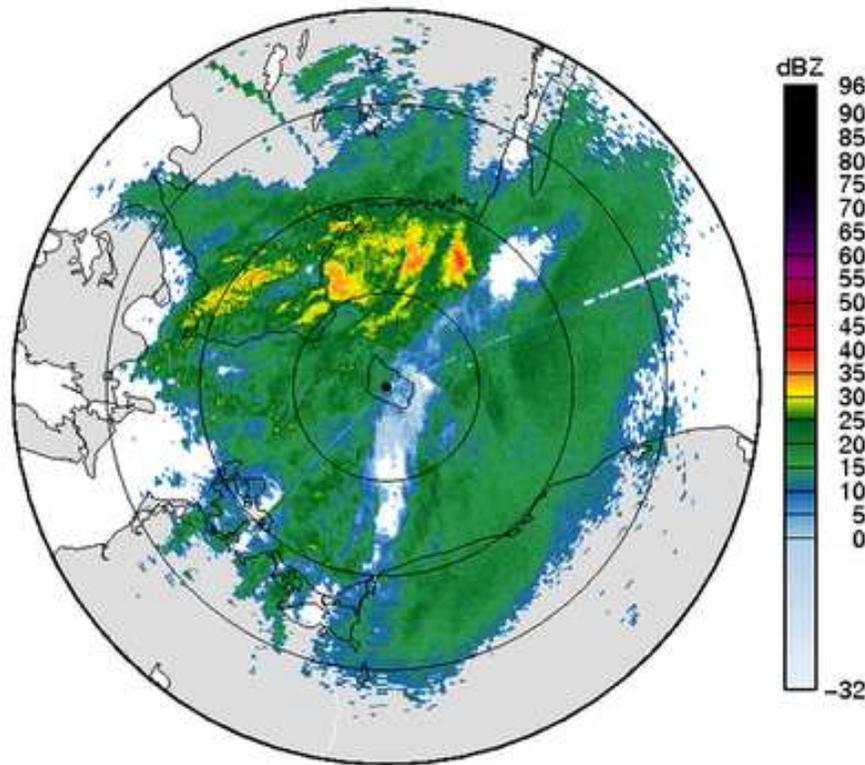
[Up](#) | [Start Page](#) | [Index](#) | [History](#)

*Last modified 3 weeks ago*

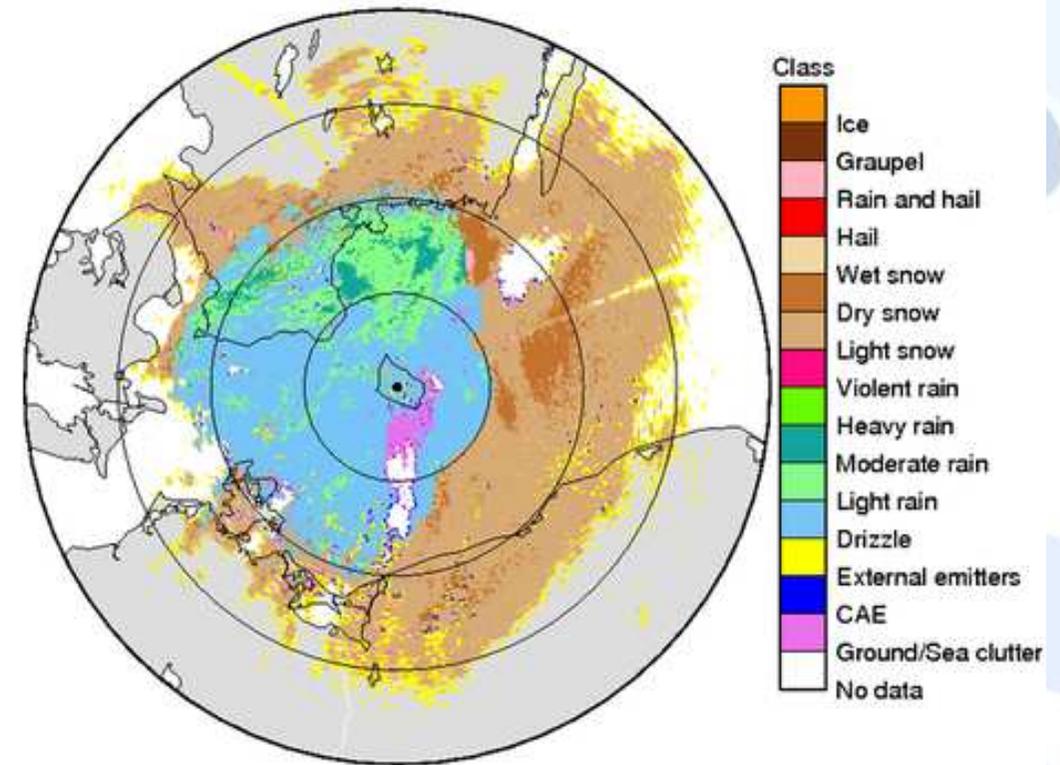
| Topic   | Algorithm developer                                       | Priority in Baltrad+ development | Recipe written (period = 6 months) | Implemented: either working version or fully operational (period) | Software developer                        | Comments   | Links |
|---|---|----------------------------------|------------------------------------|---|---|--|-------|
| <a href="#">Accumulation (mm)</a>   | FMI ( <b>Jarmo 0.5 wm</b> ?, <b>Harri 0.5 wm</b> ?), SMHI | +++                              | 1                                  | 1   | SMHI                                      | Incorporates all the improvements to the ground level dBZ, precipitation intensity and horizontal movement (see the respective algorithms below). <i>Requires clarification of the components included here.</i> |       |
| Satellite-based diagnosis and removal of clutter                                      | SMHI  | +++                              | 1                                  | 2   | SMHI                                      | Requires functionality to read satellite product   |       |
| Polarimetric classification of scatterers   | FMI ( <b>Teemu 1 wm</b> ), DMI                            | +++                              | 1 (FMI 2)                          | 1   | DMI                                       | DMI to make HMC useable. FMI requires R&D before implementation  |       |
| Pointing angle applying the Sun   | FMI ( <b>Mikko, Asko</b> ), SMHI                          | +++                              | 1                                  | 1   | SMHI                                      | Requires that partners include relevant metadata   |       |
| Real time power calibration applying the Sun  | FMI ( <b>Mikko, Asko</b> )                                | +++                              | 2?                                 |   | SMHI?                                     | FMI requires R&D before implementation   |       |
| <a href="#">Diagnosis of the height and intensity of the bright band</a>              | FMI ( <b>Jarmo 0.5 wm /VPR output</b> ), SMHI             | +++                              | 2                                  | 3   | FMI ( <b>Harri 1 wm</b> ), SMHI (Günther) | Diagnostics readily available from the existing VPR-correction. Requires that melting-layer heights be available from NWP.   |       |
| <b>Near-range</b> beam blockage correction applying radar data ( <b>without DEM</b> ) | FMI ( <b>Harri 0.5 wm</b> )                               | +++                              | 2                                  | 3   | <b>FMI (Joonas 2 wm)</b>                  | <b>Based on accumulations per azimuth. Requires high-precision ie. 16-bit Z data.</b>  |       |
| Polarimetric path attenuation correction  | FMI ( <b>Pekka R</b> ), DMI                               | +++                              | 1 (FMI 1)                          | 1   | DMI                                       | Make this functionality stand-alone. At FMI the solution is obtained from Vaisala (Reino). Derivation either in DSP or in post-processing. Only the latter solution is applicable for Baltrad+.                  |       |
| Non-polarimetric path   | IMGW<br>FMI ( <b>Timo 0.5</b> )                           | +++                              | 1(FMI                              | 1(FMI 1)  | IMGW (Kate)<br>FMI ( <b>Timo 1</b> )      | <b>FMI contribution depends on product generation framework</b>  |       |

## Bornholm

Original



Level 2 Classification

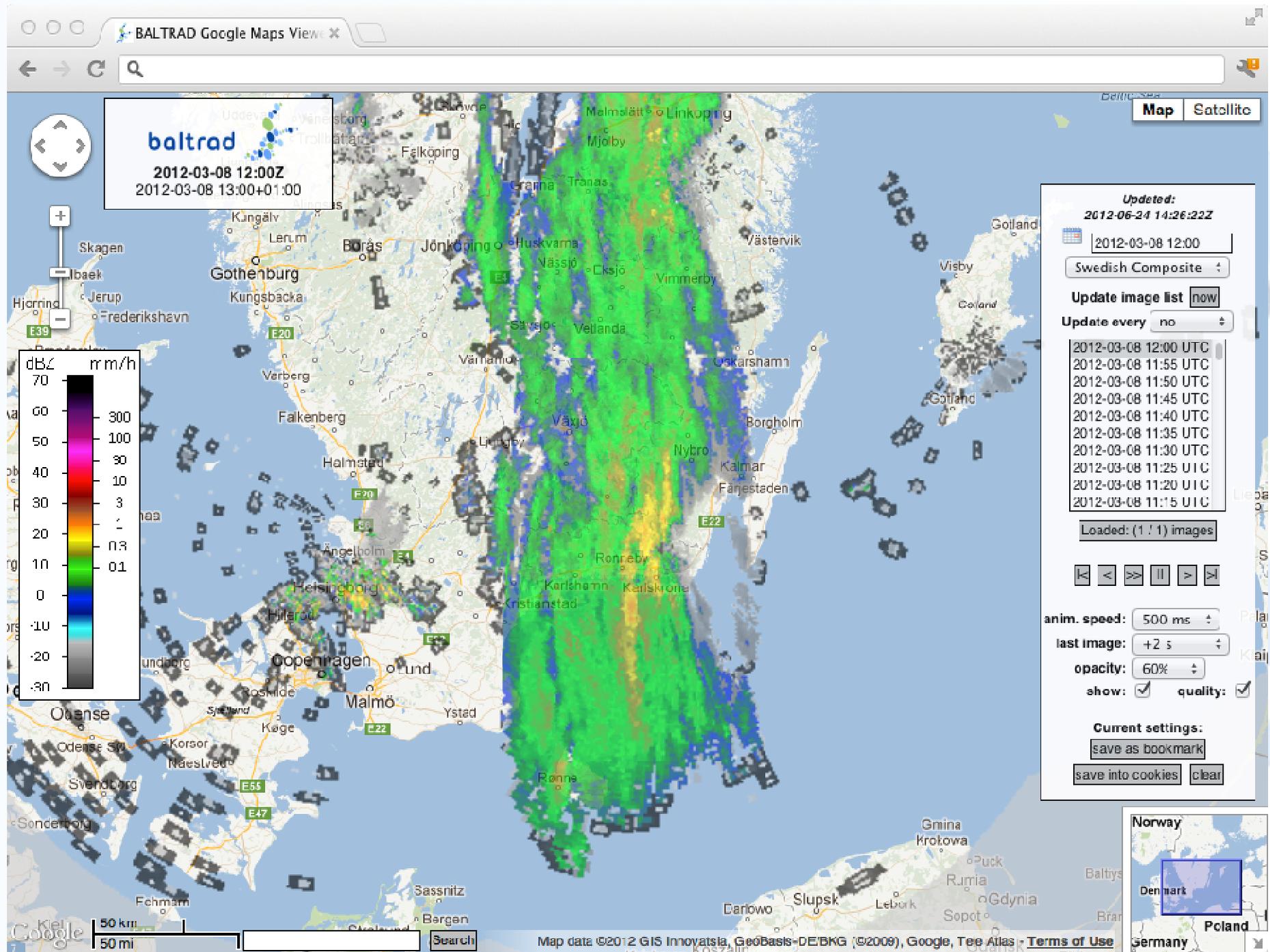


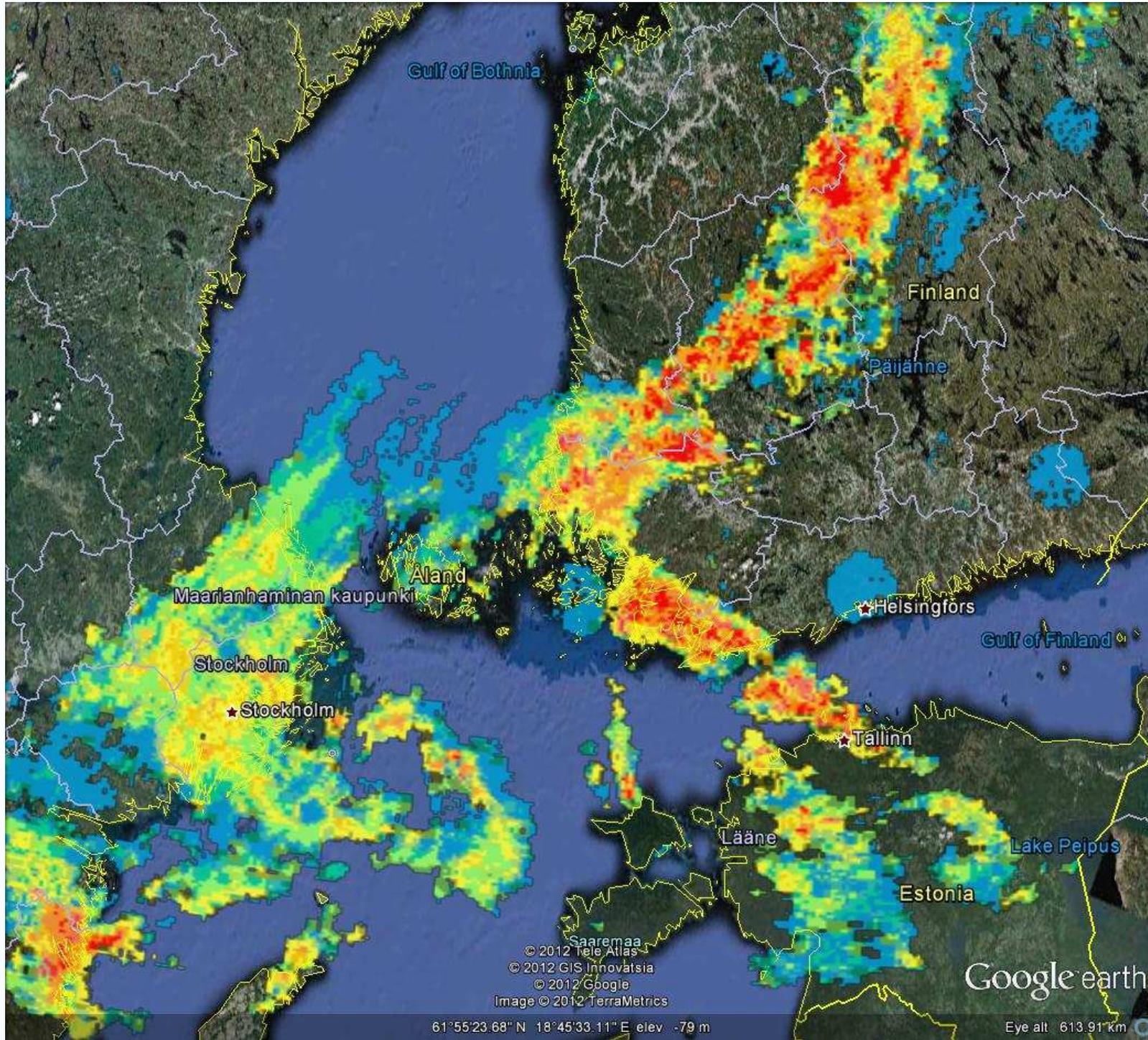
- Gill *et al.*, Microphysics part I
- Software-based

# google maps – quality layer(s)

baltrad

Data Quality in BALTRAD+  
Szturc et al. DQ





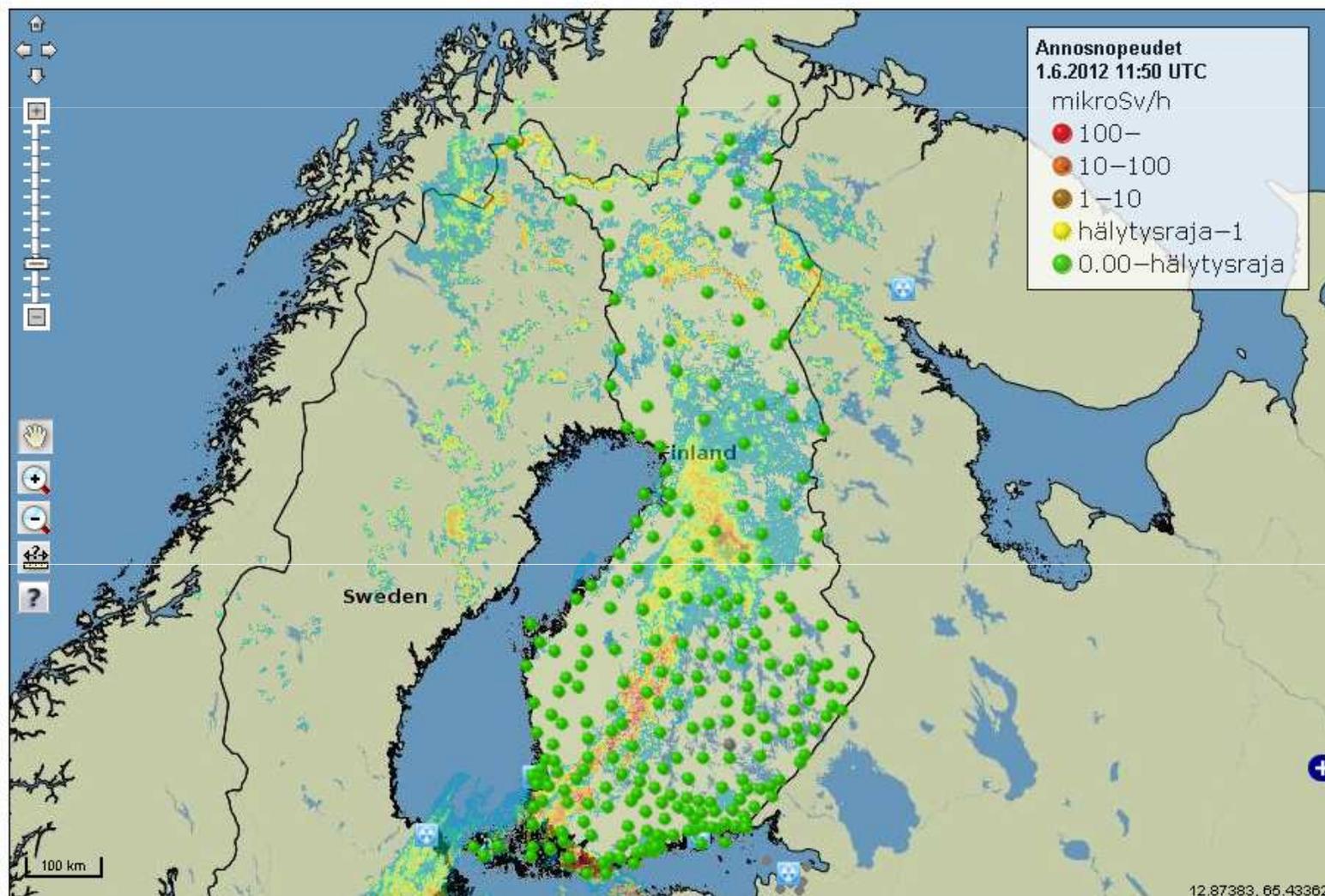
# radiation monitoring

baltrad

USVA<sub>net</sub>  
Ulkoisen Säteilyn Valvontaverkko

Säteilytilanne Kuvaajat Säätiedot Raportointi Linkit Yhteystiedot

Kirjaudu ulos Kirjautuneet



Tulokset Sää Trajektorit Kartta

BALTRAD-säätutka

Aikaleima: 2012-06-01T11:15Z

Käytä annosnopeustulosten aikaleimaa

>7  
5-7  
2-5  
1-2  
0.5-1  
0.2-0.5  
0.1-0.2  
0-0.1

Päivitä tiedot

Paluu alkutilaan

Tarkenna kohteeseen

tai kirjoita aseman tunnus/nimi:

Hae

Radar-based precipitation rates with dose rates from surface network

## Ketale

### Map Controls

event-3 silamdisp-2 **dataset-1** map

#### Datasets

Dataset 1:

Dispersion are

#### Dimensions And

Boundaries (Grid

Data)

Time:

2012-05-27 11:00:00 UTC

Start animation

Height:

Min  
0.0

Max  
0.0435264

#### Style (Grid Data)

#### Extra Layers

Ketale Content

Baltrad

Show Baltrad

Layer

Timestamp:

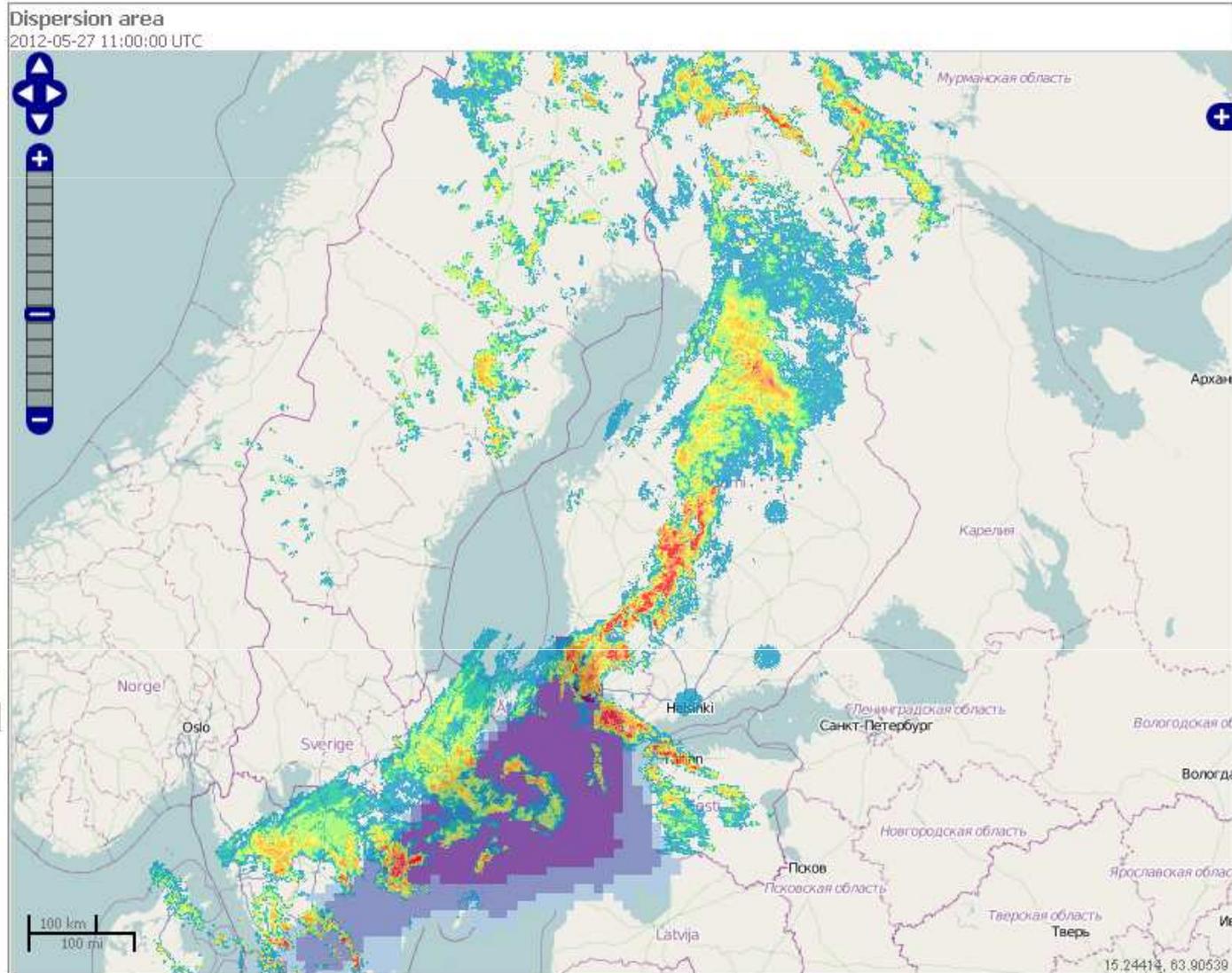
2012-06-01T11:00:00 UTC

Start radar animation

#### External Layers

### Reporting And Export

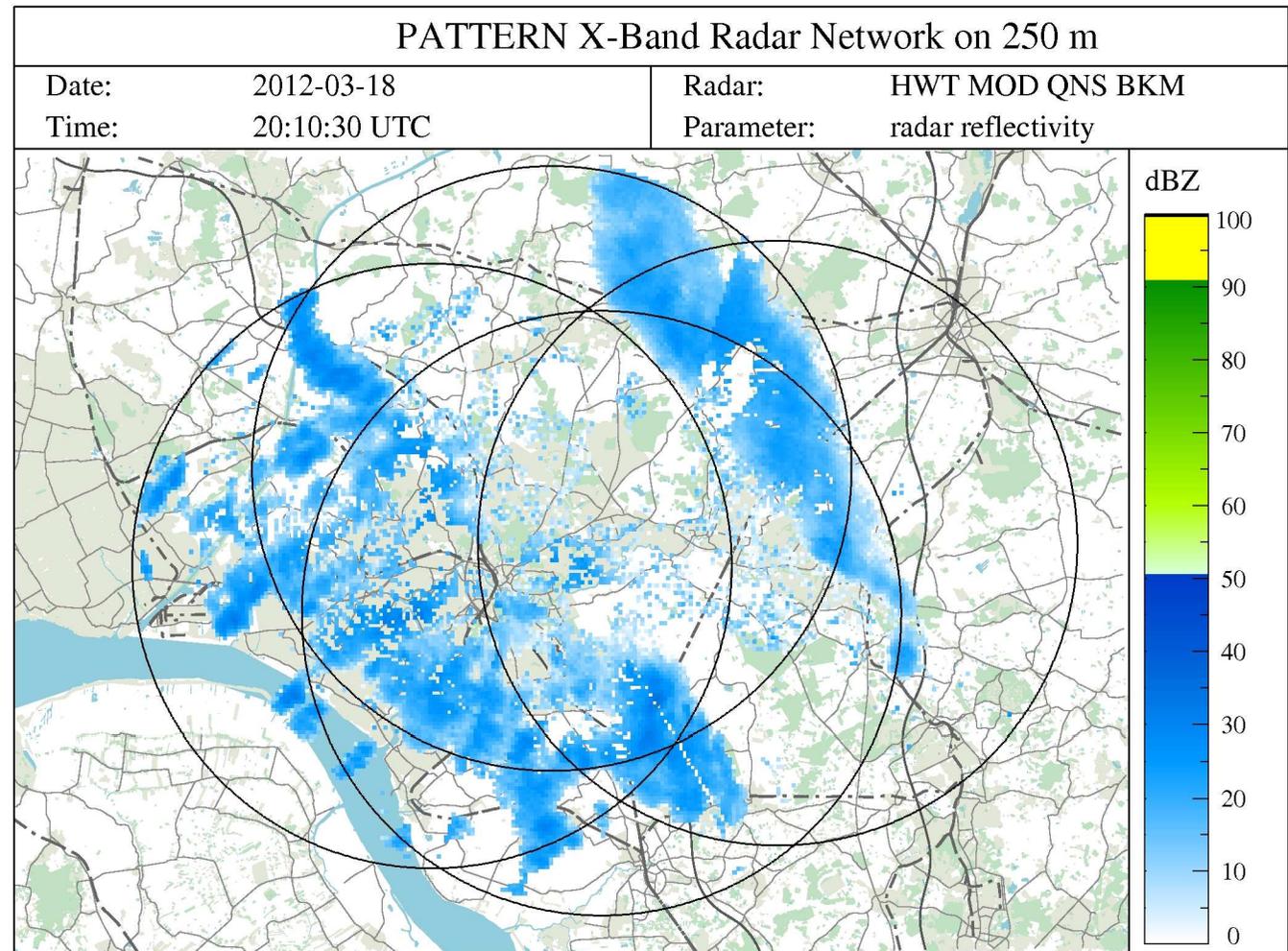
Add To Report



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OGC Web Map Services solution showing radar-based precipitation rates and particle-concentration distributions from dispersion model.

# transfer to X-band in support of urban applications



C-band polarimetric  
X-band LAWR  
near Århus, Denmark

Preliminary result  
Courtesy: Katharina Lengfeld, Hamburg University  
See Networking part II, Thursday

# continental scale

Application of the  
BALTRAD toolbox  
for EUMETNET OPERA.

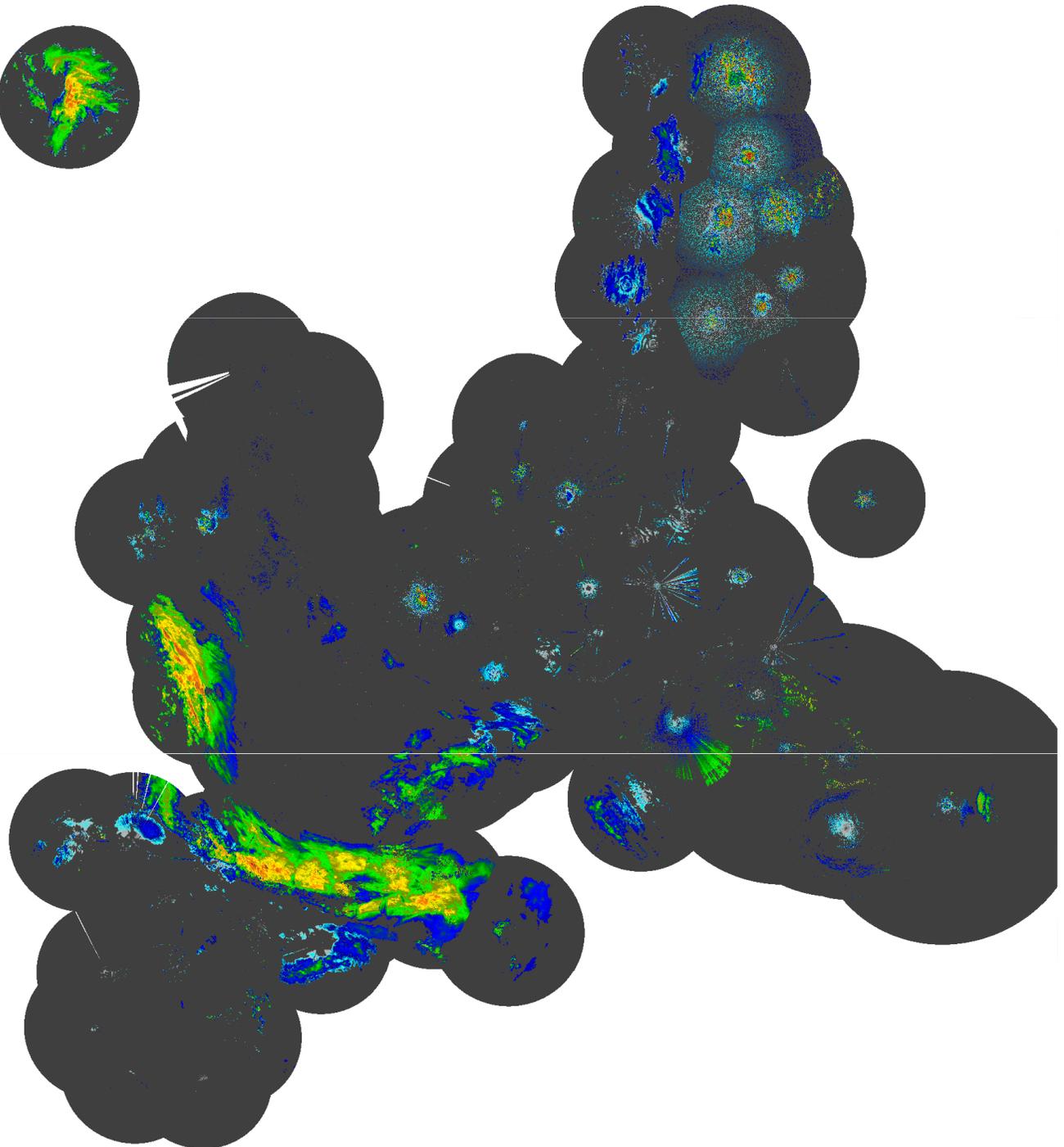
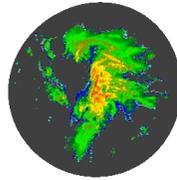
Composites consist of  
uncorrected and corrected  
reflectivities, each with  
four quality indicator  
datasets.

Quality improvements are  
apparent and measurable.

Output in ODIM\_H5

Henja & Michelson, DQ

uncorrected



# continental scale

Application of the  
BALTRAD toolbox  
for EUMETNET OPERA.

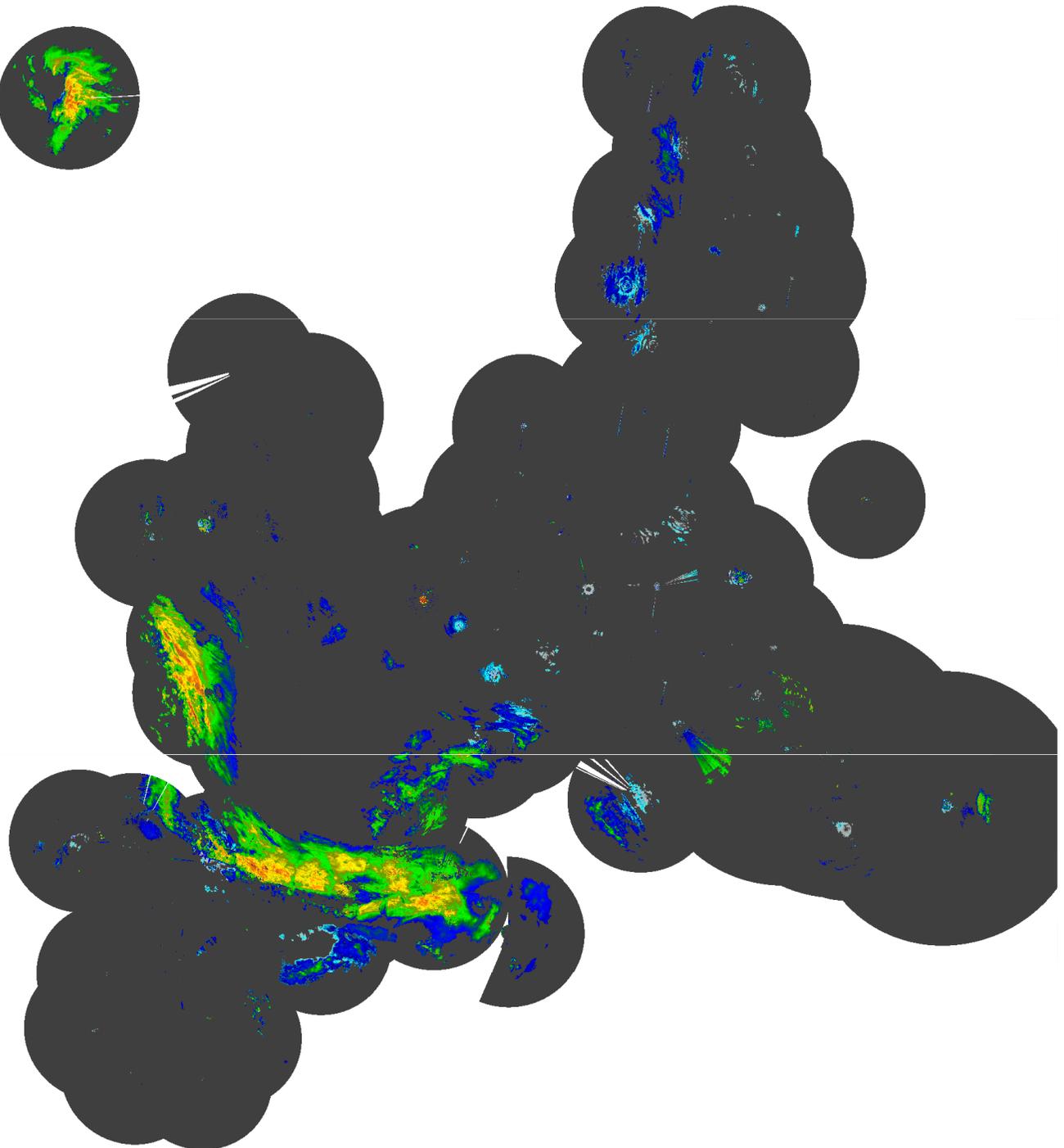
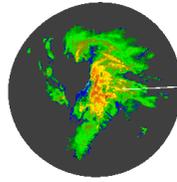
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uncorrected and corrected  
reflectivities, each with  
four quality indicator  
datasets.

Quality improvements are  
apparent and measurable.

Output in ODIM\_H5

Henja & Michelson, DQ

corrected



# take-home messages

BALTRAD+ offers Open Source technology for advanced radar networking and data processing.

The community is welcome to contribute to the cookbook and software developments.

BALTRAD User Forum offers users of the system and the data the chance to meet and train, give feedback.

# resources

|                            |   |
|----------------------------|---|
| Project website            | <a href="http://baltrad.eu/">http://baltrad.eu/</a>   |
| FAQ & User guide           | <a href="http://git.baltrad.eu/">http://git.baltrad.eu/</a>                                       |
| Software                   | <a href="http://git.baltrad.eu/trac">http://git.baltrad.eu/trac</a>                               |
| Toolbox API<br>Cheat sheet | <a href="http://git.baltrad.eu/manual/cheatsheet/">http://git.baltrad.eu/manual/cheatsheet/</a>   |
| Cookbook                   | <a href="http://git.baltrad.eu/trac/wiki/cookbook/">http://git.baltrad.eu/trac/wiki/cookbook/</a> |
| BALTRAD Facebook community |   |

Look for BALTRAD User Forum!