

# cooperation agreement

7 December 2011

## 1 Purpose of the agreement

1.1 The main purpose of the agreement is to ensure mutual exchange of weather radar data for official duty use, and to encourage cooperation within the field of weather radar technology, scientific research, product development and data application.

## 2 Definition of the baltrad weather radar network

2.1 The BALTRAD weather radar network consists of

- weather radars that are owned and/or operated by the partners and the organizations with which they cooperate in their respective countries
- data exchange networking functionality – if specifically established for the exchange of data in BALTRAD
- BALTRAD software developed in BALTRAD projects

## 3 Purpose of baltrad and data's terms of use

3.1 BALTRAD is established for obtaining information about precipitation and other weather parameters, e.g. wind, with comparable quality from different parts of the network covering the partnership's national territories and the surrounding areas covered by BALTRAD radars. BALTRAD forms a powerful system for monitoring, forecasting and warning of weather phenomena for supporting activities that are sensitive to weather and water.

3.2 The partnership intends to do its utmost to ensure that all weather radars, which they own or which are owned by their domestic partners within their respective countries, are connected to the network and contribute the available information.

3.3 Data that are intended for scientific research and for official duty use within the respective partner institutions and within their national territories, will be exchanged without payment between partners. Other use and delivery to third parties and the conditions thereof, should be decided by the BALTRAD steering committee (BSC).

3.3.1 Official Duty: all activities which take place within the partner organization, and external activities of the partner, resulting from legal, governmental, and intergovernmental requirements relating to defence, civil aviation, and the safety of life and property.

3.4 Relation among BALTRAD, ECOMET, and the PSI regarding data's commercial terms of use

3.4.1 Data/products that are intended for commercial use shall be listed in the ECOMET catalogue. Pricing and payment arrangements for these products apply according to the ECOMET principles and standards. This applies to both single-site and composite data/products.

3.4.2 The ownership and intellectual property rights of radar data and products belong to the originating partner. The commercial units of the partners are treated as defined in the European Directive 2003/98/EC on the Re-use of Public Sector Information (PSI).

3.4.3 ECOMET members shall not sell non-ECOMET members' data/products, unless the non-ECOMET member has submitted a Letter of Intent to join ECOMET.

3.4.4 Non-ECOMET members shall not sell ECOMET members' data/products, unless the non-ECOMET member has submitted a Letter of Intent to join ECOMET.

3.4.5 Notwithstanding points 3.4.3 and 3.4.4, non-ECOMET and ECOMET members are free to agree bilaterally on commercial terms for selling each others' (only) data/products. Such bilateral agreements are not regulated by this BALTRAD cooperation agreement.

## **4 Organisation of activities within baltrad**

4.1 The working language of the partnership and its cooperation shall be English.

4.2 Every partner runs, administrates and maintains, at a quality level recommended by the BSC, those parts of the radar network that are located in its own country, with the goal to reach and maintain full geographic coverage. The purpose of the cooperation is that the network will be homogeneous and consistent. Radars and their network should be configured and operated, where technically and/or economically possible, in a way that the common need is satisfied.

4.3 Each partner should secure the availability of a telecommunications line for BALTRAD data exchange within its territory. The bandwidth of this line should be great enough to support all exchange activities to and from that partner without negatively impacting any other partner.

4.4 The common organisation is described with the following scheme:

- BSC, the BALTRAD Steering Committee, entrusted with making top-level decisions regarding projects and operations, and in resolving conflicts for the partnership.
- BG, the BALTRAD Group, which is responsible for managing the operational and development activities of BALTRAD projects, to advice the BSC on technical, operational, development, financial, and policy issues as well as other issues delegated to it, and make proposals for changes (see Appendix 1).

4.4.1 Each partner shall appoint one member to represent it in the BSC. Likewise, each partner shall appoint one or more members to represent it in the BG. In each forum, each partner has equal power. Ideally, all decisions are made unanimously, but this may not always be possible, in which case a pragmatic decision based on consensus is the desirable outcome.

4.4.2 The BSC shall appoint a Chair. Likewise, the BG shall appoint a Partnership Coordinator. These management roles are defined to facilitate and enhance the various activities within the BALTRAD cooperation, the communications between the two groups, and also communications between the BALTRAD partnership and other organizations. No extra decision-making powers are attached to these roles.

4.4.3 The BSC shall at least once per year compile a written report presenting the status of the BALTRAD partnership, its operations, and its developments.

4.4.4 The BALTRAD group is responsible for operating the BALTRAD network and for

proposing, running and reporting joint development projects or joint studies to be agreed. The BALTRAD group may form necessary subgroups for its special activities.

## **5 Operation, development, maintenance, and availability of common baltrad software**

5.1 Common BALTRAD software is not subject to a maintenance contract. If such a need arises, the situation will be discussed by the partnership.

5.2 BALTRAD software that has been developed by a partner should, to the greatest extent possible, be maintained by that partner. If necessary, this software will also be further developed by that partner, subject to agreement within the partnership. Should a partner no longer be able to take responsibility for its contributed software, it shall notify the partnership without delay. Partners are encouraged to develop software jointly.

5.3 A common maintenance plan shall be written and managed by the BG, and it shall be approved by the BSC. This maintenance plan shall include all necessary costs required to fulfil the common need.

5.4 Each partner uses its own funding for its own operations and its contributions to software development and maintenance.

5.5 The intellectual property rights of BALTRAD software remain with its authors.

5.6 BALTRAD software shall be made available to the public free of charge, and it shall be licensed according to the GNU Lesser General Public License available and defined at [gnu.org](http://gnu.org).

5.7 Common infrastructure used to organize and manage BALTRAD software, and represent the partnership and its activities, is subject to agreement in the partnership, and is at the outset listed in Appendix 2.

## **6 Exchange of data and products**

6.1 The data and products that should be available for exchange amongst partners for scientific research and official duty use, and the details of such exchange, are listed in Appendix 2.

## **7 Archiving of data and products**

7.1 The BALTRAD cooperation is not primarily concerned with data archiving, and recognizes that archiving policies differ within the partnership. Nevertheless, each partner may keep an archive of its own and other partners' data as it wishes. The BG may recommend a set of common guidelines for the national archiving to ease the possible use by some partners. Although partners are not bound to these guidelines, they should inform the partnership on their own ways and means of archiving.

## **8 Changes to the agreement and partnership**

8.1 Changes to appendices of this cooperation agreement may be agreed at any given time within the framework of this agreement.

8.2 Changes or amendments to this agreement shall be signed by all partners.

8.3 Countries wishing to join the partnership should send their request in writing to the Chair of the BSC. The BSC will make a recommendation concerning the request without delay after having obtained advice from the BG on the technical and financial implications of the potential new partner.

8.4 Each partner agrees to remain in the partnership unless there are unavoidable reasons for it to withdraw. In the event a partner is unable to stay in the partnership, its withdrawal shall be communicated without delay.

8.5 In case of unauthorised use of exchanged data by a partner, the partner at fault risks exclusion from the partnership if the unauthorised use is not rectified at the latest thirty (30) days after notice referring to this clause. Notice will be given by the Chair of the BSC following the decision to do so taken in the BSC. Such exclusion will be effective immediately.

## 9 Concluding provisions

9.1 Good intent. The partners will act with diligence, according to the public duties to which they have been charged, in meeting the requirements and recommendations in this cooperation agreement, to the extent that is reasonable in terms of costs and other commitments and goals of each partner.

9.2 No warranties. With respect to any data, software, information or materials supplied by one partner to another under this cooperation agreement, no warranty or representation of any kind is made, given or implied as to the sufficiency or fitness for purpose. Therefore, all partners shall in all cases be entirely and solely liable for the use to which it puts such data, software, information and materials.

9.3 Limitations of contractual liability. No partner shall be responsible to any other partner for any loss or similar damage - especially any indirect or consequential loss or similar damage such as, but not limited to, loss of profit, loss of revenue or loss of contracts - provided that damage was not caused by a willful act.

9.4 Damage caused to third parties. Each partner shall be solely liable for any loss, damage or injury to third parties resulting from the performance of the said partner's obligations under this cooperation agreement.

9.5 Force Majeure. No partner shall be considered to be in breach of this cooperation agreement if such breach is caused by circumstances beyond the control of the partner(s) which could not be overcome or remedied, and which could not have been foreseen at the time of entering into the agreement. Each partner will notify the other partners and BALTRAD BSC and BG of any such force majeure without delay.

## Appendices

1. BALTRAD Terms of Reference
2. BALTRAD common infrastructure
3. BALTRAD data exchange for scientific research and use for official duties
4. ODIM\_H5 version 2.1 data for BALTRAD

**Appendix 1 to the BALTRAD cooperation agreement**

**baltrad terms of reference (ToR)**

The BALTRAD Group (BG) is responsible for managing the operational activities of the partnership projects, to advise the BALTRAD Steering Committee (BSC) on technical, operational, developmental, financial, and policy issues as well any other issues delegated to it, in particular:

- Foster the development of high-quality algorithms and software to create new radar products or improve existing ones for the quantitative use of weather radar data
- Maintain and develop the technical cooperation in the partnership, including its common infrastructure listed in Appendix 2
- Provide resources needed for the operation of BALTRAD
- Prepare proposals for new studies and development projects to the BSC
- Study and make proposals on formats for sending/exchanging radar and, where required, other data
- Advise the BSC on the technical and financial implications of the application of new members to the partnership
- Define a common set of data for internal infrastructural use, scientific research, and official duties for exchange within the partnership.
- Keep data sets under review and update them as necessary
- Compile reports and other documentation as required by the BSC
- Act as the main channel of communication on the implementation of policy at the operational level
- Agree and initiate operational changes in BALTRAD as recommended in Appendix 3 of this cooperation agreement
- Organize and carry out the annual Baltic Weather Radar Workshop (BWRW) with open participation from the wider weather radar community
- Communicate results generated in the BALTRAD partnership to the wider weather radar community through attendance at other international conferences and workshops, as well as in the scientific and technical literature

**Appendix 2 to the BALTRAD cooperation agreement**

## **baltrad common infrastructure**

The following comprises common infrastructure for BALTRAD. Any of these components may be modified or removed subject to agreement in the partnership, and new components may be added.

1. The top-level Internet domain `baltrad.eu`
2. A publicly-visible website found at `www.baltrad.eu`
3. A GIT software repository, found at `git.baltrad.eu`, for collecting and organizing all common software
4. A Request Tracker system, found at `rt.baltrad.eu`, for managing issues related to the function and performance of the software
5. A Hudson continuous integration server, found at `git.baltrad.eu/hudson`, for automatically testing software releases
6. The programming languages C, C++, Java, and Python, for writing software. Commercial third-party software, including compilers, shall not be used.
7. The Doxygen documentation system, used locally by each partner, for documenting code and the overall system.

**Appendix 3 to the BALTRAD cooperation agreement**

**baltrad data exchange for scientific research  
and use for official duties**

1. BALTRAD nodes and radars shall use Universal Coordinated Time (UTC) and adjust time using NTP client/servers with the objective to achieve an accuracy of within one second.
2. Each partner shall inform the partnership of its scan strategy, and changes to it, without delay.
3. Data from each radar shall be exchanged with an update frequency not exceeding 15 minutes.
4. Data in polar coordinates (azimuth and range) originating from each radar shall be exchanged. In some cases, it may be preferable for a partner to make available data on a scan-by-scan basis; in other cases polar volumes may be preferable.
5. Data exchange encompasses traditional radar moments (reflectivity, radial wind, spectral width) and parameters from polarimetric radars from those radars that measure them.
6. All weather radar data shall be exchanged using the so-called ODIM\_H5 file format. The BALTRAD Group decides on which version of ODIM\_H5 and gives guidelines on how its use should be harmonized in the partnership. Currently, version 2.1 shall be used according to the organization given in Appendix 4 of this cooperation agreement.
7. All data offered shall be available with the highest possible data quality based on the radar's signal processing capabilities. Additional data processing (outside the signal processor) should be avoided prior to exchange. Data shall not be degraded in terms of spatial resolution or information content once they have emerged from the radar hardware and written to digital file.
8. In some cases, non-radar data may be offered for exchange to the partnership by a partner in support of a common BALTRAD application. The nature of these data, and the implications of their exchange in the network, should be studied carefully before they are made available.
9. Data exchange with other partners shall commence no later than one minute after the radar data have been received centrally by the originating partner.
10. BALTRAD data subscription mechanisms and exchange methods shall be used.
11. The partnership shall strive to meet a data availability performance target expressed as 96% per radar and month within 15 minutes of the data's nominal time.
12. In case of absence of data from individual radars, the partnership shall be informed as soon as possible and no later than 2-3 hours after the data outage started. The partnership shall be kept updated about the estimated time for the data to become available again.
13. Each partner shall prepare monthly statistics of the availability percentage of each BALTRAD radar it receives data from. These monthly statistics shall be shared within the partnership.

# ODIM\_H5 version 2.1 files for BALTRAD

August 19, 2011

The purpose of this document is to clarify how ODIM\_H5<sup>1</sup> files are to be formatted for BALTRAD. “Formatted” encompasses compression type, compression levels, file creation properties, which metadata attributes to include, and what information the metadata shall contain. Listings of file structure are also provided for polar scan and polar volume data types.

## File size optimization

ZLIB compression shall be used. SZIP compression shall never be used.

ZLIB default compression level 6 shall be used.

Datasets should always be stored in no more than one so-called “chunk”.

File creation properties are the HDF5 mechanisms for optimizing file “overhead”. Since weather radar files are relatively small, these file creation properties can be set to low values and the resulting files will use little overhead which will give even more efficient files. In pseudo-C code, optimized file creation properties can be set like this:

```
userblock = (hsize_t)0;
sizeof_size = (size_t)4;
sizeof_addr = (size_t)4;
sym_ik = (int)1;
sym_lk = (int)1;
istore_k = (long)1;
meta_block_size = (long)0;
```

Then the file creation properties are set using these values with the H5P API when creating and writing the HDF5 file.

## Values of “nodata” and “undetected”

For eight-bit reflectivity data, the “nodata” value 255 shall be used, and the “undetected” value of 0 shall be used.

A separate bitmap showing unradiated areas (“nodata”) shall not be used.

---

<sup>1</sup>OPERA Data Information Model for HDF5. The latest version from 28 April 2011 is found at the OPERA website: [http://knmi.nl/opera/opera3/OPERA\\_2008\\_03\\_WP2.1b\\_ODIM\\_H5\\_v2.1.pdf](http://knmi.nl/opera/opera3/OPERA_2008_03_WP2.1b_ODIM_H5_v2.1.pdf)

## Polar scan

In the following example, it is assumed that the radar has scanned the complete horizon once, and that the parameters contained in the two datasets share a common geometry based on a common radar configuration.

Table 1: Polar scan

| Attribute name   | Comment  |
|------------------|--|
| /                | Root Group   |
| /Conventions     | ODIM_H5/V2_1   |
| /what            | Group  |
| /what/object     |  |
| /what/version    | H5rad 2.1  |
| /what/date       |  |
| /what/time       |  |
| /what/source     | WMO, RAD, PLC, NOD, ORG, and CTY identifiers shall all be used. CMT is optional. |
| /where           | Group  |
| /where/lon       |  |
| /where/lat       |  |
| /where/height    |  |
| /how             | Group  |
| /how/task        |  |
| /how/system      |  |
| /how/software    |  |
| /how/sw_version  |  |
| /how/simulated   |  |
| /how/beamwidth   |  |
| /how/wavelength  |  |
| /how/rpm         |  |
| /how/pulsewidth  |  |
| /how/RXbandwidth |  |
| /how/lowprf      | Same value as highprf if single PRF is used                                      |
| /how/highprf     | Same value as lowprf if single PRF is used                                       |
| /how/TXloss      |  |
| /how/RXloss      |  |
| /how/radomeloss  |  |
| /how/antgain     |  |
| /how/beamwH      | If horizontal and vertical beamwidths are different                              |
| /how/beamwV      | If horizontal and vertical beamwidths are different                              |
| /how/gasattn     |  |
| /how/radconstH   |  |
| /how/radconstV   |  |
| /how/nomTXpower  |  |
| /how/TXpower     |  |
| /how/NI          |  |

*continued on next page*

*continued from previous page*

| Attribute name  | Comment   |
|---|---|
| /how/Vsamples<br>/how/azmethod<br>/how/binmethod<br>/how/elangles<br><br>/how/startazA<br>/how/stopazA<br>/how/startazT<br>/how/stopazT<br>/how/malfunc<br>/how/radar_msg<br>/how/NEZ<br>/how/Dclutter<br>/how/SQI<br>/how/CSR<br>/how/LOG<br>/how/RAC<br>/how/PAC<br>/how/S2N<br>/how/polarization | Used only if an “intelligent” scan is performed                         |
| /dataset1<br>/dataset1/what<br>/dataset1/what/product<br>/dataset1/what/startdate<br>/dataset1/what/starttime<br>/dataset1/what/enddate<br>/dataset1/what/endtime   | Group<br>Group  |
| /dataset1/where<br>/dataset1/where/elangle<br>/dataset1/where/algate<br>/dataset1/where/nbins<br>/dataset1/where/rstart<br>/dataset1/where/rscale<br>/dataset1/where/nrays  | Group   |
| /dataset1/data1<br>/dataset1/data1/what<br>/dataset1/data1/what/quantity<br>/dataset1/data1/what/gain<br>/dataset1/data1/what/offset<br>/dataset1/data1/what/nodata<br>/dataset1/data1/what/undetected  | Group<br>Group  |
| /dataset1/data1/data<br>/dataset1/data1/data/CLASS<br>/dataset1/data1/data/IMAGE_VERSION  | Dataset<br>Only relevant for 8-bit data<br>Only relevant for 8-bit data |
| /dataset1/data2   | Group   |

*continued on next page*

*continued from previous page*

| Attribute name  | Comment   |
|---|---|
| /dataset1/data2/what<br>/dataset1/data2/what/quantity<br>/dataset1/data2/what/gain<br>/dataset1/data2/what/offset<br>/dataset1/data2/what/nodata<br>/dataset1/data2/what/undetected | Group   |
| /dataset1/data2/data<br>/dataset1/data2/data/CLASS<br>/dataset1/data2/data/IMAGE_VERSION  | Dataset<br>Only relevant for 8-bit data<br>Only relevant for 8-bit data |

## Polar volume

The following example represents a polar volume consisting of two scans, each of which contains two parameters. The radar set-up is different for each scan. Even if the radar set-up is the same for each scan, the how attributes shall be organized as they are in this example.

Table 2: Polar volume

| Attribute name  | Comment   |
|---|---|
| /   | Root Group  |
| /Conventions  | ODIM_H5/V2_1  |
| /what<br>/what/object<br>/what/version<br>/what/date<br>/what/time<br>/what/source  | Group<br><br>H5rad 2.1<br><br>WMO, RAD, PLC, NOD, ORG, and CTY identifiers shall all be used. CMT is optional.  |
| /where<br>/where/lon<br>/where/lat<br>/where/height   | Group   |
| /how<br>/how/system<br>/how/software<br>/how/sw_version<br>/how/beamwidth<br>/how/wavelength<br>/how/radomeloss<br>/how/antgain<br>/how/beamwH<br><br>/how/beamwV | Group<br><br><br><br><br><br><br><br><br><br>If horizontal and vertical beamwidths are different<br>If horizontal and vertical beamwidths are different |

*continued on next page*



*continued from previous page*

| Attribute name   | Comment   |
|--|---|
| /dataset1/how/LOG<br>/dataset1/how/RAC<br>/dataset1/how/PAC<br>/dataset1/how/S2N<br>/dataset1/how/polarization   |   |
| /dataset1/data1<br>/dataset1/data1/what<br>/dataset1/data1/what/quantity<br>/dataset1/data1/what/gain<br>/dataset1/data1/what/offset<br>/dataset1/data1/what/nodata<br>/dataset1/data1/what/undetected | Group<br>Group  |
| /dataset1/data1/data<br>/dataset1/data1/data/CLASS<br>/dataset1/data1/data/IMAGE_VERSION   | Dataset<br>Only relevant for 8-bit data<br>Only relevant for 8-bit data |
| /dataset1/data2<br>/dataset1/data2/what<br>/dataset1/data2/what/quantity<br>/dataset1/data2/what/gain<br>/dataset1/data2/what/offset<br>/dataset1/data2/what/nodata<br>/dataset1/data2/what/undetected | Group<br>Group  |
| /dataset1/data2/data<br>/dataset1/data2/data/CLASS<br>/dataset1/data2/data/IMAGE_VERSION   | Dataset<br>Only relevant for 8-bit data<br>Only relevant for 8-bit data |
| /dataset2<br>/dataset2/what<br>/dataset2/what/product<br>/dataset2/what/product<br>/dataset2/what/startdate<br>/dataset2/what/starttime<br>/dataset2/what/enddate<br>/dataset2/what/endtime            | Group<br>Group  |
| /dataset2/where<br>/dataset2/where/elangle<br>/dataset2/where/algate<br>/dataset2/where/nbins<br>/dataset2/where/rstart<br>/dataset2/where/rscale<br>/dataset2/where/nrays                             | Group   |
| /dataset2/how<br>/dataset2/how/task<br>/dataset2/how/simulated<br>/dataset2/how/rpm<br>/dataset2/how/pulwidth  | Group   |

*continued on next page*



*continued from previous page*

| Attribute name   | Comment   |
|--|---|
| /dataset2/data2/what/nodata<br>/dataset2/data2/what/undetected                           |   |
| /dataset2/data2/data<br>/dataset2/data2/data/CLASS<br>/dataset2/data2/data/IMAGE_VERSION | Dataset<br>Only relevant for 8-bit data<br>Only relevant for 8-bit data |