LAWR ODIM_H5 file description

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BALTRAD Document: BALTRAD+ WP4-BALTRAD+LAWR (Data description)

Content

1. Motivation and introduction

The BALTRAD+LAWR converter has been developed in the frame of BALTRAD+ Project as a part of work carried out in Work Package 4: "Pilot investment and real-world use". The overall purpose of the converter is to make the LAWR data available within the BALTRAD radar data exchange and processing framework. Thus, the converter is a vital part of integrating LAWR x-band technology into BALTRAD.

The LAWR weather radar system uses its own output data format with only limited metadata, which is not compatible with BALTRAD. The challenge has therefore been to convert the LAWR data into the supported ODIM_H5 in BALTRAD containing the required metadata.

This report contains the LAWR ODIM_H5 data description, whereas a Quick Guide on how to deploy the BALTRAD+LAWR converter can be found in the BALTRAD Document: *BALTRAD+ WP4-BALTRAD+LAWR (Quick Guide)* entitled: *BALTRAD tailored end-user product: BALTRAD+LAWR Quick Guide.*

2. LAWR ODIM_H5 file description

The LAWR HDF5-file complies with the 'EUMETNET OPERA Weather Radar Information model for implementation with the HDF5 file format' version 2.1, also known as ODIM_H5 (Michelson et al. 2011). The information model and hierarchical file concept will therefore not be described further in this report, as it follows the conventions in the ODIM_H5 format.

The LAWR is a polar metric radar system without Doppler information. Moreover, the system uses an antenna design with a large vertical opening angle. Consequently, the LAWR radar scans continuously in a single elevation (0°) and uses dry weather scans for ground clutter removal (Clutter maps). The LAWR ODIM_H5 data consists of a single dataset containing the non polar metric reflectivity estimates and additional ground clutter information as a quality measure.
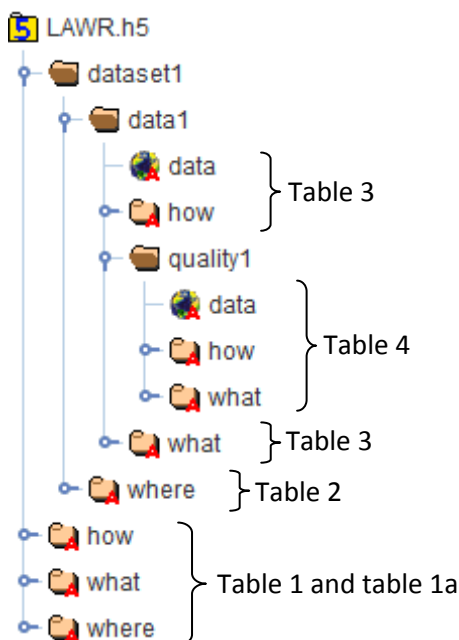

Figure 1: Content of the LAWR ODIM_H5 file with references to relevant tables.

An example from Aarhus LAWR is used to illustrate the content of the LAWR ODIM_H5 file. Figure 1 presents the hierarchical overview of the file content with references to the tables of interest.

Table 1 lists all top-level attributes and values. Additionally, table 1a contains the LAWR source definitions for the what/source attribute. LAWR radars are mostly owned and operated by water utility companies, thus the LAWR radar are not registered in the World Meteorological Organization (WMO) or indexed in the OPERA database. Therefore, additional source definitions of the LAWR radars were required in order to integrate LAWR into BALTRAD (Table 1a). Moreover, these definitions are implemented into the odim_sources.xml file and thereby distributed in current and future releases of the BALTRAD node software. As a result of these achievements, adding LAWR radars and configuring data exchange within the BALTRAD network do not differs from adding and configuring conventional meteorological weather radars.

Table 1: Top-level attributes

'root' attribute	Value	Description
/conventions	ODIM_H5/V2_1	Conventions
'what' attribute group	**Value**	**Description**
/data	20121218	Date of data
/time	041500	Time of data
/object	SCAN	Polar Scan
/source	WMO:00000,NOD:dkaar,RAD:DN98,PLC:aarhus,CMT:AROS	Source definition according to table 1a.
/version	H5rad2.1	Information Model Version
'where' attribute group	**Value**	**Description**
/height	20.0	Height above sea level
/lat	56.137361	Latitude position
/lon	10.002226	Longitude position
'how' attribute group	**Value**	**Description**
/beamwH	0.95	Horizontal beam width
/beamwV	20.0	Vertical beam width
/pulsewidth	1.2	Pulse width in μs
/wavelength	3.2	Wavelength in cm
/rpm	24	Antenna rotation speed
/sw_version	11.0.0	LAWR software version
/system	DHI_LAWR_FR1525	LAWR system version
/utm_e	562283.91	Eastern utm coordinate
/utm_n	6221820.22	Northern utm coordinate
/utm_zone	32V	Utm zone definition

Table 1a: what/source definitions

	Node NOD:	Place PLC:	OPERA index RAD:	WMO number WMO:	Comment CMT:
Aalborg LAWR	dkaal	aalborg	DN99	00000	AABO
Aarhus LAWR	dkaar	aarhus	DN98	00000	AROS
Hvidovre LAWR	dkhvi	hvidovre	DN97	00000	HVID
Vejle LAWR	dkvej	vejle	DN96	00000	VERA
Virring LAWR	dkvix	virring	DN95	00000	VIRA
Odense LAWR	dkode	odense	DN94	00000	EKOD
Egedal LAWR	dkege	egedal	DN93	00000	EGDA
Horsholm LAWR	dkhor	horsholm	DN92	00000	HOXX

Table 2 specifies the dataset1 attributes specific for the LAWR system. The polar LAWR data products consists of time integrated polar dataset for the radar scanning. The dataset always contain 360 azimuth gates each with 501 range bins. The bin size of the LAWR data is 120 m.

Table 2: dataset1 attributes

'where' attribute group	Value	Description
/a1gate	1	First azimuth gate
/elangle	0.0	Elevation angel
/nbins	501	Number of range bins
/nrays	360	Number of azimuth gates
/rscale	120.0	Bin size
/rstart	0.0	Start of the first bin (Range)

Table 3 presents the dataset1/data1 attributes. The LAWR reflectivity estimates are located in the dataset1/data1/data object. The radar measurement is map to the 8bit unsigned data class by mean of the gain and offset factor. These factors may vary between LAWR radars, however in this case gain of 0.5 and zero offset is applied. Aarhus LAWR operates in 5 minute scanning mode, hence the radar estimates is based in 5 minute temporal integration. This is also reflected in the start time and end time attributes.

Table 3: dataset1/data1 attributes

'what' attribute group	Value	Description
/gain	0.5	Gain coefficient
/offset	0.0	Offset coefficient
/product	SCAN	Polar Scan
/quantity	DBZH	Physical quantity
/startdate	20121218	Start data of scan
/starttime	041000	Start time of scan
/enddate	20121218	End date of scan
/endtime	041500	End time of scan
'how' attribute group	**Value**	**Discription**
/startzA	Array of 360 data (not shown here)	Azimuthal start angle
/stopzA	Array of 360 data (not shown here)	Azimuthal stop angle
/zr_a	200	Z-R constant
/zr_b	1.6	Z-R constant
'data' attributes	**Value**	**Discription**
/CLASS	IMAGE	Object class
/IMAGE_VERSION	1.2	Image version

Table 4 presents the dataset/data1/quality1 attributes. Dry weather scans (ground clutter information) is included as a quality measure for the LAWR data. Due to the large vertical beam width of the, ground clutter is often significant and may saturate or almost saturate the receiver in some bins. It is therefore crucial to know if there are areas in the radar data, where rainfall is purely detected in order to make the right precautions and/or corrections for real-world applications of the LAWR data. Information of ground clutter in dry weather conditions is directly useful for this, as the dataset identifies ground clutter affected areas and indicates the severity of the problem.

Tabel 4: dataset/data1/quality1 attributes

'what' attribute group	Value	Description
/product	SCAN	Polar Scan
/quantity	DBZH	Physical quantity
'how' attributes	**Value**	**Description**
/task	dkaar.lawr.dryscan	Task description
'data' attributes	**Value**	**Discription**
/CLASS	IMAGE	Object class
/IMAGE_VERSION	1.2	Image version