

Name: SOP for vessel:maria_s_merian:adcp_75khz_2096 (7472)

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Status: This is a **public version**. Certain sensitive information, such as server names, addresses, and exact paths and storage locations that is not meant for others than AWI associates was removed in that document.

Changelog:

1. 2022-08-25

- initial publication

2. 2023-01-11

- author ORCID addition
- added changelog

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2. Purpose & Scope

Description: This SOP describes device configuration, parameter characteristics, transmission and processing of its output, ingest procedure, storage, data access possibilities, and publishing. Intended user groups are device owners, technicians, and data managers.

Comment: This item is managed and processed by the Deutsche Allianz Meeresforschung (German Marine Research Alliance), please see www.allianz-meeresforschung.de for further information.

3. Item Description

Short Name: ADCP_75kHz_2096

Long Name: Acoustic Doppler Current Profiler Ocean Surveyor 75 kHz

URN: vessel:maria_s_merian:adcp_75khz_2096

ID: 7472

UUID: cdb197e2-1080-4154-8a91-c16a3fc69048

Description: Acoustic Doppler Current Profiler (ADCP) at 75 kHz with a maximum range of 700 m and a maximum ping rate of 0.7 Hz. Fixed ADCP installation in the keel. The 75 kHz ADCP can only be used if the Atlas Doppler Log on the bridge is switched off. The Satlog can be used as an alternative for the Doppler Log in this case.

Serial No.: Transducer: 2096, Deck Unit: 10486

Manufacturer: Teledyne RD Instruments

PID/Handle: <https://hdl.handle.net/10013/sensor.fa1278ea-b854-4bae-8cae-46876025cb20>

4. Parameter Description

Short Name: current_east

Long Name: current east

full URN: vessel:maria_s_merian:adcp_75khz_2096:current_east
ID: 97166

UUID: 1ec00b7a-61ce-4a28-8043-1a996247f086

Type: current speed

Unit: m/s

Comment:

Measurement Properties: none

Short Name: current_north

Long Name: current north

full URN: vessel:maria_s_merian:adcp_75khz_2096:current_north
ID: 97167

UUID: 1bd101a4-8387-498e-8fff-8c2513d041e0

Type: current speed

Unit: m/s

Comment:

Measurement Properties: none

Short Name: current_up

Long Name: current up

full URN: vessel:maria_s_merian:adcp_75khz_2096:current_up
ID: 97168

UUID: 350d32ec-f4cf-493a-918f-94f8b20e75fe

Type: current speed

Unit: m/s

Comment:

Measurement Properties: none

Short Name: depth

Long Name: depth

full URN: vessel:maria_s_merian:adcp_75khz_2096:depth
ID: 97169

UUID: 21d8a0e0-5bf7-4461-8f16-f4a626a1498f

Type: depth

Unit: m

90 **Comment:**

Measurement Properties: none

Short Name: echo_intensity

Long Name: relative echo intensity

95 **full URN:** vessel:maria_s_merian:adcp_75khz_2096:echo_intensity

ID: 97170

UUID: db612dcb-721c-44db-862e-b45d8d524f1a

Type: intensity

Unit:

100 **Comment:**

Measurement Properties: none

Short Name: correlation

Long Name: correlation

105 **full URN:** vessel:maria_s_merian:adcp_75khz_2096:correlation

ID: 97171

UUID: 09182e6f-fb89-47ad-9d26-d6234f59c182

Type: intensity

Unit:

110 **Comment:**

Measurement Properties: none

Short Name: percent_good

Long Name: percent good

115 **full URN:** vessel:maria_s_merian:adcp_75khz_2096:percent_good

ID: 97172

UUID: 3931064d-607a-4b9a-bebc-6007bfa28404

Type: ratio

Unit: %

120 **Comment:**

Measurement Properties: none

Short Name: sound_speed

Long Name: sound speed

125 **full URN:** vessel:maria_s_merian:adcp_75khz_2096:sound_speed

ID: 97173

UUID: b171907f-72d9-4757-bae6-135fb9df635c

Type: sound velocity

Unit: m/s

130 **Comment:**

Measurement Properties: none

Short Name: temperature

Long Name: temperature

135 **full URN:** vessel:maria_s_merian:adcp_75khz_2096:temperature

ID: 97174

UUID: 808536d5-8f52-4380-be17-3784bb4644d2

Type: temperature

Unit: °C

140 **Comment:**

Measurement Properties: none

5. Processing

145 The instrument measures upper-ocean water velocity profiles along the ship track using the principle of Doppler shift from scatterers in the water column (typically zooplankton or suspended particles in the water column). To obtain true ocean velocities, high-quality navigational (GPS and heading) and attitude (pitch and roll) data are required to eliminate the ship's movement from the velocity profiles. Raw data is stored in binary files using the acquisition software VmDas (Teledyne Marine 2022). Data conversion, single-ping editing and further post-
150 processing is performed using the Python DAM ADCP Toolbox (Kopte 2022).

5.1. Acquisition

The mobile ADCP unit is installed in the starboard sounding shaft and connected to the deck unit in the Sounder Room. The sensor PC is also located in the Sounder Room. The software VmDas is installed on the sensor PC and is used for data acquisition. In VmDas, the desired configuration (consisting of a data option file [* .ini] and a
155 settings file [* .txt]) is uploaded, specifying the communication with ADCP unit and auxiliary data streams, setting storage directory, file naming convention etc.

Auxiliary Files:

Name: "Maria S. Merian" research vessel manual

Type: Manual

160 **Description:** General overview on the research vessel Maria S. Merian with detailed information on onboard scientific devices

URL: <https://www.ldf.uni-hamburg.de/en/merian/technisches/dokumente-tech-merian/handbuch-merian-eng.pdf>

Last Modification: Jan. 2021

165 **Name:** *Ocean Surveyor / Ocean Observer Technical Manual*

Type: User Guide

Description: Software User's Guide describing usage of VmDas and detailed configuration options of the ADCP

URL: [http://www.teledynemarine.com/Documents/Brand%20Support/RD%20INSTRUMENTS/Technical%
170 20Resources/Manuals%20and%20Guides/Ocean%20Surveyor_Observer/Ocean%20Surveyor%20Technical%
20Manual_Apr22.pdf](http://www.teledynemarine.com/Documents/Brand%20Support/RD%20INSTRUMENTS/Technical%20Resources/Manuals%20and%20Guides/Ocean%20Surveyor_Observer/Ocean%20Surveyor%20Technical%20Manual_Apr22.pdf)

Last Modification: 2022

175 5.2. Extraction

Raw data files are continuously written to HD, using the file naming convention (something of the form 'msmXXX_OS3800Y_00000Z', XXX: expedition, Y: dataset number, Z: file number) and maximum file size (typically 10 MB) set in the configuration for the deployment. Each time data collection is started, VmDas will increment Y in the file naming convention by 1, each time the maximum file size is reached, a new file with Z incremented by 1 in the

180 file naming convention is started.
Different file extensions storing different data, yet following the same naming convention are generated: *.ENR: Raw ADCP data in beam coordinates, *.ENS: ADCP data in beam coordinates screened for RSSI and correlation by VmDas, includes also navigation data merged into the ensembles from the *.NMS file, *.ENX: ADCP single-ping in Earth coordinates plus navigation data after a number of screening and pre-processing steps have been performed

185 internally by VmDas, *.N1R/*.N2R/*.N3R: Raw NMEA files from different navigation sources, *.NMS: Binary format navigation data after being screened and pre-averaged, *.LTA: ADCP plus navigation data that has been averaged using the long time period specified in the settings, *.STA: ADCP plus navigation data that has been averaged using the short time period specified in the settings.

All raw data files are automatically copied to the ship's mass data management system (MDM) by configured

190 robocopy scripts.

Auxiliary Files: none

5.3. Conversion

Processing of binary ADCP data is carried out using the Python DAM ADCP Toolbox, which offers an integrated

195 step-by-step procedure for the conversion of binary ADCP data into a quality-controlled data product of upper-ocean velocity profiles

Software: [Kopte \(2022\)](#)

Network Share Name: merian/MSMXXX/ ← *public version, input cropped*

Filename Convention: msmXXX_OS3800Y_00000Z.ENX

200 In most cases (i.e. when acquisition worked flawlessly), the entry point for data processing using DAM ADCP Toolbox are the .ENX files, which contain pre-screened single-ping ADCP data in Earth-coordinates and navigation data in binary format. Deployment (ship/expedition/transducer depth/lever arms/..) and relevant processing information (processing directories/datasets/processing mode/processing parameters) are entered and modified/updated in os_settings.py - a function, which stores all relevant information in a json-dictionary and creates a list of files to

205 be processed.

Using os_read_enx.py, the binary data is then converted file-wise and arranged in data structures, containing both measured parameters and meta data. The data is checked for completeness, clock drift of the sensor PC and quality of the navigation data. In an intermediate step, converted single-ping data are stored file-wise as netCDF following the file convention expanded by *_dat_[wt,bt].nc (either wt: watertrack calibration or bt: bottomtrack processing)

210 in the processing directory.

Next, using os_edit_bottom.py, bottom signals are identified file-wise by manual screening of the backscatter signal in the *_dat_[wt,bt].nc files. If required, a mask is edited, marking all bins below the identified bottom depth and stored file-wise as netCDF following the file convention expanded by *_bot.nc.

If watertrack calibration is chosen in os_settings.py (i.e. files end with *_dat_wt.nc), processing continues with

215 os_watertrack.py. Ship velocities are determined from GPS fixes for each single ping profile via central differences. A geometric compensation for the different positions of ADCP unit and GPS antenna relative to the midship position is applied. Depth-ranges marked as contaminated by the bottom are marked invalid by loading the corresponding *_bot.nc file and applying the mask to the data. Potential interferences originating from the parallel operation of other hydroacoustic instruments are removed before averaging single-pings to form 60 sec ensemble averages. Fol-

220 lowing the water-track calibration of misalignment-angle and scale factor, which is applied to the ensemble averages, the derived ship velocities are subtracted from the velocity profiles to obtain ocean velocities.
If bottomtrack processing is chosen in `os_settings.py` (i.e. files end with `*_dat_bt.nc`, bottom-track must have been enabled during data acquisition), processing continues with `os_bottomtrack.py` (instead of `os_watertrack.py`). Following the marking of bottom-contaminated bins, bottom-track velocities are subtracted from the velocity profile for each single ping to obtain ocean velocities, followed by forming of 60 sec ensemble averages.
225 Final data is saved as netCDF files named `msmXXX_vmADCP_38kHz_01.nc`, containing time, longitude, latitude and depth information as well as arrays with zonal and meridional velocity components, echo intensity, `pings_per_ensemble`, and quality flags.
`os_aux_netcdf2ascii.py` converts the netCDF file into a tab-limited text file named `msmXXX_vmADCP_38kHz_01.txt`
230 tailored for publication in PANGAEA.

Auxiliary Files:

Name: “Shipboard ADCP Measurements”

Type: Manual

Description: Guidelines and general information on the acquisition and processing of shipboard ADCP data

235 **URL:** <https://repository.oceanbestpractices.org/handle/11329/385>

Last Modification: 2010

6. Ingest

240 Ingest is part of the O2A process chain (Koppe et al. 2015, Gerchow et al. 2017) and is the starting point to collect, store, and redistribute data and metadata.

Protocol: MDM

Project path: *public version, input removed*

Campaign Data: yes

245 **Filename Convention:** per campaign

Expected Data Interval: per campaign

Ingest Data Interval: per campaign

Mapping: -

Save Directory: -

250 **json/xml:** -

Script: several in parts manual steps

Script calls:

- `ssh ltosrv2.awi.de`
- `sudo mount /dev/sdXX /mnt/hddext[0,1,2,3,4]`
- 255 • `sudo chmod -R a+r /mnt/hddext[0,1,2,3,4]`
- `sudo su - ingest`
- `cd /opt/rdif_2.0/MDM_Extractor/scripts`
- `./extractor.sh /mnt/hddext[0,1,2,3,4] /mnt/hddext[0,1,2,3,4] ...`
- `./completeness.sh platform campaign`

260 **Repository:** https://gitlab.awi.de/data-logistics-support/MDM_Extractor

7. Storage

7.1. Raw Data

Location *public version, input cropped*

265 **Backup Policy:** AWI snapshot and backup policy.

7.2. Near Real-Time Data

Info: no NRT for this workflow

Service: [link to near real-time data service](#)

270

7.3. Publications and further Reading

Publication: Mohrholz et al. [2022a](#), Mohrholz et al. [2022b](#), Gross et al. [2022](#), Krastel et al. [2022](#), Hölz et al. [2022](#)

Further Reading: This device and workflow is part of DAM, please check <https://www.allianz-meeresforschung.de/> for further information.

275 References

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Gross, Felix, Robert Kopte, and Ralph R. Schneider (Feb. 2022). "ADCP current measurements (38 kHz) during RV MARIA S. MERIAN cruise MSM101". en. In: DOI: 10.1594/PANGAEA.940856. URL: <https://doi.pangaea.de/10.1594/PANGAEA.940856> (visited on 07/15/2022).

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295 Kopte, Robert (June 2022). *DAM ADCP Toolbox (Version 2.2, Python)*.

Krastel, Sebastian, Robert Kopte, Kai-Frederik Lenz, and Rachel Barrett (July 2022). "ADCP current measurements (38 kHz) during RV MARIA S. MERIAN cruise MSM102". en. In: URL: <https://doi.pangaea.de/10.1594/PANGAEA.945800> (visited on 07/15/2022).

300 Mohrholz, Volker, Robert Kopte, and Toralf Heene (July 2022a). "ADCP current measurements (75 kHz transit dataset) during RV MARIA S. MERIAN cruise MSM105". en. In: URL: <https://doi.pangaea.de/10.1594/PANGAEA.946310> (visited on 07/15/2022).

- 305 Mohrholz, Volker, Robert Kopte, and Toralf Heene (July 2022b). "ADCP current measurements (75 kHz working area dataset) during RV MARIA S. MERIAN cruise MSM105". en. In: URL: <https://doi.pangaea.de/10.1594/PANGAEA.946298> (visited on 07/15/2022).
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