

ICES Guidelines for Moored ADCP Data

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ADCPs (acoustic doppler current profiler) were first introduced to the oceanography community in the late 1970s (Rowe and Young, 1979). The instrument measures water velocity over a range of depths using doppler shifts in active acoustic signals. ADCPs may be moored on a traditional oceanographic mooring (these guidelines apply), mounted on a bottom-frame or attached to the bottom of a ship (see shipboard ADCP guidelines). Different data management requirements exist for the three configurations.

1.0 RECEIVING DATA

The Data Centres require the following information to be supplied by the data supplier together with the data. When receiving data, the Data Centres of the ICES community shall strive to meet the following guidelines.

1.1 *Data standard*

Raw and quality controlled ADCP data should, whenever possible, be stored at the original sampling frequency. The ADCP data should be accompanied by an instrument record/deployment sheet which should include such information as described under Collection Details (Section 1.3). All parameters must be clearly specified and described. If parameter codes are to be used, then the source data dictionary must be specified. Parameter units must be clearly stated. Parameter scales must be noted where applicable. If computed values are included, the equations used in the computations should be stated.

All relevant calibrations should be applied to the data including laboratory and field calibrations. Instrument calibration data should be included in the data file. The data should be fully checked for quality and flagged for erroneous values such as spikes, gaps, etc. or profiles. An explicit statement should be made of the checks and edits applied to the data. If any data values have been removed, the times of the removed values should be noted. If the instrument shows differences in measured values when compared to traditional instruments (e.g. Aanderaa Instruments RCM X instruments) it should be sent to the manufacturer for calibration.

Sufficient self-explanatory information and documentation should accompany the data so that they are adequately qualified and can be used with confidence by scientists/engineers other than those responsible for its original collection, processing and quality control.

A brief description of the data calibration, quality and processing must be included and should contain information regarding:

- Laboratory calibrations
- Manufactures calibrations
- In-situ calibrations (e.g. using a calibrated CTD to supply temperature data to calibrate any temperature sensor that may be installed on the ADCP or a current meter moored on the same ADCP mooring to provide water current data for comparison tests.)
- The time zone in use should be clearly stated and each data cycle should include date/time of observation (without loss of precision). It is recommended that UTC is used.
- Estimate of final uncertainty in the data

A brief description of the data processing procedures (manufacturers and in-house) must be included and should contain information regarding:

- Filtering, de-spiking, or smoothing methods
- Editing or quality control methods
- Interpolation techniques
- Adjustments made due to variations in calibration

If a cruise/data report is available describing the data collection and processing, this can be referenced. If possible a copy should be supplied with the data.

1.2 Format Description

Data should be supplied in a fully documented ASCII format. Individual fields, units, etc. should be clearly defined and time zone stated. Time reported in UTC is strongly recommended.

Ideally all of the data from the instrument should be stored in a single file. The contents of the data and ancillary information should adhere to the Formatting Guidelines for Oceanographic Data Exchange (http://ocean.ices.dk/formats/GETADE_Guidelines.aspx)

prepared by the IOC's Group of Experts on the Technical Aspects of Data Exchange (GETADE) and available from RNODC Formats.

1.3 Collection Details

Other pertinent information to be included in the data transfer to the Data Centre includes:

- Name of the country and organisation responsible for the deployment, recovery, collection and processing of the data. The name of the Principal Investigator should be included.
- Project, ship, mooring type, mooring number
- Dates and times of each instrument deployment and recovery
- Dates and times of start and end of usable data for each instrument
- Details of the instrument and sensors (e.g. manufacturer, instrument type, model number, serial number and any modifications carried out, number of transducers)
- Description of operational procedures including sampling interval (time between ensembles), pings per ensemble, bin size, number of bins, percentage good level, automated data rejection (e.g. fish rejection algorithms), etc.
- Frequency (kHz), band type (broad, narrow), heads facing upward or downward.
- Latitude and longitude, method of position fix (e.g. GPS, DGPS)
- Parameters collected (e.g. u and v velocity components, vertical velocity, error velocity, echo intensity, percent good pings)
- Multiplicative and/or additive scale factors where applicable
- Water column depth (specify method e.g. sounding and methodology, chart, etc.)
- Instrument depth (or height, specify which)

See the attached **ADCP Instrument Sheet** as an example of what could be used at sea and what could be sent to the Data Centre.

Any additional information of use to secondary users which may have affected the data or have a bearing on its subsequent use.

2.0 VALUE ADDED SERVICE

When processing and quality controlling data, the Data Centres of the ICES community shall strive to meet the following guidelines.

2.1 *Quality Control*

A range of checks are carried out on the data to ensure that they have been correctly imported into the Data Centre's format without any loss of information. For self-contained ADCP data, these should include:

- General check of accompanying information
- Automatic range checking of each parameter
- Visual inspection of the time series (e.g. time series plot, current vector scatter plot, progressive vector diagram, etc.)
- Flag spikes in the data
- Flag suspicious data or correct the data after consultation with the data supplier
- Check against other data collected on nearby moorings
- Check corrections/calibrations applied
- Check latitude/longitude not on land

2.2 *Problem Resolution*

The quality control procedures followed by the Data Centres will typically identify problems with the data and/or metadata. The Data Centre will resolve these problems through consultation with the originating Principal Investigator (PI) or data supplier. Other experts in the field or other Data Centres may also be consulted. Problems solved shall be reported to the originating Principal Investigator (PI) or data supplier.

2.3 *History Documentation*

All quality control procedures applied to a dataset are fully documented by the Data Centre. As well, all quality control applied to a data set should accompany that data set. All problems and resulting resolutions will also be documented with the aim to help all parties involved; the Collectors, Data Centre, and Users. A history record will be produced detailing any data changes (including dates of the changes) that the Data Centre may make.

3.0 PROVIDING DATA AND INFORMATION PRODUCTS

When addressing a request for information and/or data from the User Community, the Data Centres of the ICES community shall strive to provide well-defined data and products. To meet this objective, the Data Centres will follow these guidelines.

3.1 *Data Description*

The Data Centre shall aim to provide well-defined data or products to its clients. If digital data are provided, the Data Centre will provide sufficient self-explanatory information and documentation to accompany the data so that they are adequately qualified and can be used with confidence by scientists/engineers other than those responsible for their original collection, processing and quality control. This is described in more detail below:

- A data format description fully detailing the format in which the data will be supplied
- Any ancillary parameters (e.g. temperature)
- Parameter and unit definitions and scales of reference
- Definition of flagging scheme, if flags are used
- Relevant information included in the data file (e.g. geographical position – latitude, longitude and water depth, self-contained ADCP deployment identifiers, start and end times of data, sampling interval, project name, etc.)
- Data history document (as described in 3.2 below)

3.2 Data History

A data history document will be supplied with the data to include the following:

- A description of data collection and processing procedures as supplied by the data collector (as specified in Section 1.1 and 1.3)
- Quality control procedures used to check the data (as specified in Section 2.1)
- Any problems encountered with the data and their resolution
- Any changes made to the data and the date of the change

Any additional information of use to secondary users which may have affected the data or have a bearing on its subsequent use should also be included.

3.3 Referral Service

ICES member research and operational data centres produce a variety of data analysis products and referral services. By dividing ocean areas into regions of responsibility, and by developing mutually agreed guidelines on the format, data quality and content of the products, better coverage is obtained. By having the scientific experts work in ocean areas with which they are familiar, the necessary local knowledge finds its way into the products. Data and information products are disseminated as widely as possible and via a number of media including mail, electronic mail and bulletin boards.

If the Data Centre is unable to fulfil the client's needs, it will endeavour to provide the client with the name of an organisation and/or person who may be able to assist. In particular, assistance from the network of Data Centres within the ICES Community will be sought.

REFERENCES

Rowe, F. and J. Young. 1979. An ocean current profiler using doppler sonar, Oceans '79 Proceedings.

INSTRUMENT SHEET (ADCP)

Record No		Acoustic Frequency: kHz Broadband / Narrowband Upward / Downward
Instrument Type	ADCP	
Instrument Serial No.		

Deployment Position and type (e.g. GPS, DGPS)			
Area/Project			
Sounding (metres)		Inst. Heads height above sea floor (m)	

Instrument ON:		Instrument OFF:	
Date:		Date:	
UTC Time:		UTC Time:	
IN Water:		OUT Water:	
Date:		Date:	
UTC Time:		UTC Time:	

<i>Instrument Configuration</i>			
Pings per ensemble		<i>Parameters Recorded</i>	
Bin Length		Velocity	Y / N
Number of Bins		Co-ordinate system: Earth/ Beam/ Instrument/ Ship	E / B / I / S
Blank after Transmit		Correlation	Y / N
Profile Mode		Intensity	Y / N
Time between ping groups		Percentage Good Pings	Y / N
Time per Ensemble		Record Status? (reason ADCP rejects data)	Y / N
Deployment Length		Recorded Enabled	Y / N

Battery Capacity Fitted		MB Memory Available	
Samples Expected		Samples Received	
Pre. Mooring Checks		Post Recovery Check	

Test and Configuration Files:

Readings and Remarks: