ICES Guidelines
for Shipboard 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 (see moored ADCP guidelines) or attached to the bottom of a ship (these guidelines apply). Different data management requirements exist for the two 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

Data should be provided as time series of profiles. Each profile should contain information describing the profile date, time, and position. Time reported in UTC is strongly recommended. Each profile should contain numerous records of data, where each record represents a vertical bin in the profile. For each bin, there should be the centre depth of the bin, three orthogonal velocity components, percent good pings, the error velocity, as well as average echo amplitude and average beam correlation (the average of the 4 beams).

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. The data should be fully checked for quality and flagged for erroneous values such as spikes, gaps, or profiles. An explicit statement should be made of the checks and edits applied to the data.

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:

- Reported velocities should be in positive North (v) and positive East direction (u). If not, the co-ordinate system of the horizontal velocity components must be clearly stated.
- The criteria used for flagging or rejecting data (for example threshold values of error velocity and /or percent good pings) must be discussed.
- The method used for correcting profiles for ship speed (that is bottom tracking, navigation or reference level of no motion) must be described.
- Calibrations carried out to correct for transducer misalignment.
- Any problems of contamination of the data due to bubbles in rough weather, high ship speed (propeller noise), change in ship direction or ship speed zero and how these are dealt with.
- An estimate of final accuracy in the data.
- Gyro corrections made utilising heading information from differential GPS systems along with details of the DGPS equipment.
- The method of calculating sound speed should be stated. If a constant value is employed, state what it is and how it might vary along the cruise track. If temperature and a fixed salinity were used to estimate sound speed, state what the latter value is and where temperature data are stored.
- There should be specific mention of bottom tracked velocities. These are valuable in the shallow sections of the cruise for calibration information.
- Comments on Time drift of the ADCP clock
- Number of transducers
- Parameters collected (e.g. u and v velocity components, vertical velocity, error velocity, echo intensity, percent good pings)

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 format (ASCII, NetCDF, …). 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:

- Project, ship, cruise identifier
- Country, organisation

- 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, bottom tracking on/off, pitch and roll on/off, percentage good level, method of position fix (e.g. GPS, DGPS), automated data rejection (e.g. fish rejection algorithms), etc.
- Frequency (kHz), band type (broad, narrow)
- Date and time of the start and end of the profiles for each data file

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 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
- Flag spikes in the data
- Flag suspicious data or correct the data after consultation with the data supplier
- Check corrections/calibrations applied
- Plot navigation data to ensure no land points; compare with cruise report/CSR track chart if available
- Compare the data with available bathymetry (if no bottom ping is used) and flag the "under bottom" data

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. The Data Centre may also consult the Japan Oceanographic Data Centre, as the IOC Responsible National Oceanographic Data Centre for shipboard ADCP data or the University of Hawaii ADCP centre. Other experts in the field or other Data Centres may also be consulted.

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 dataset should accompany that dataset. 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. ship, cruise, project, start and end dates, 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

Joint Archive for Shipboard ADCP at http://ilikai.soest.hawaii.edu/sadcp/

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