ICES Guidelines
for Moored Current Meter Data

(Compiled October 1999, revised August 2001; April 2009)

Current meters are primarily used for measuring water velocity through time. Moored instruments may use mechanical (rotor and vane), electromagmetic, or acoustic technology to perform the measurements. Current meters may also have attached sensors for temperature, conductivity, pressure, oxygen and turbidity measurements.

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 data should, whenever possible, be stored at the original sampling frequency.

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. 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.

In particular:

- All data values should be expressed in oceanographic terms, which should be clearly stated.
- Depending on the method of measurement, current velocity may be expressed in terms of speed and direction and/or in terms of east and north components.
- A clear statement should be made on whether or not the data have been corrected for magnetic variation - if the correction has been made then the magnetic variation that was assumed should be stored alongside the data. Compass calibration details should be supplied with the data.
- 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.

- Other parameters measured as part of the series, e.g. temperature, pressure, conductivity, should be included with the data.
- Estimate of final uncertainty in the data

A brief description of the data calibration, quality and processing (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 Scientist 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
- Precise time interval between successive data cycles in the series
- Original sampling interval - for cases where the processed observation is derived/extracted from higher resolution data (optional)
- Originator's reference numbers/identifiers for mooring and series
- Latitude and longitude, method of position fix (e.g. DGPS, GPS, etc.)
- Water column depth (specify method e.g. sounding and methodology, chart, etc.)
- Instrument depth (or height, specify which)
- Calibration data (including compass calibration details, equations used to calculate speed and direction)

Example mooring placement and recovery log sheets are provided in Annex A.

Sufficient documentation should accompany each data series so as to ensure that the data are adequately qualified and may therefore be used with confidence by a secondary user. Such documentation should be stored alongside the data, and where applicable, should cover:

Instrument

- Instrument description - manufacturer, model, principle of measurement (each sensor) - refer to publication
- Instrument modifications and their effect on the data
- Accuracy, resolution and response range of individual sensors
- Standard of calibration, e.g. method, quality, dates, calibration coefficients

Mooring

- Brief description of mooring structure
- Performance of mooring including condition on recovery, whether dragged or damaged and any event that might have affected the data (e.g. wave action, knockdown, etc.)

Data sampling/processing - description of original sampling scheme and its relation to the final processed data, for each parameter, including, as appropriate:

- Type of sampling (e.g. instantaneous, averaged, burst recording)
- Sensing interval of meter (regarding raw data whether or not it was vector averaged, burst sampling, etc. with applicable time intervals)
- Duration of individual sample (raw data)
- Number of raw data samples used in processed value
- Nominal interval of processed data (excluding gaps resulting from editing, etc.)
- Methods of averaging, filtering or compression

Report on data quality

Any additional information of use to secondary users which may have affected the data or have a bearing on its subsequent use (e.g. effects of near surface buoyancy, sea state, fouling, etc.)

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 Moored Current Meter data, these should include:

- General check of accompanying information
- Automatic range checking of each parameter

- Checks on timing channel, correct number of scans between start and end times, etc.
- Visual inspection of the time series (e.g. time series plot, current vector scatter plot, progressive vector diagram, etc.)
- Harmonic analysis
- Flag spikes in the data
- Flag suspicious data or correct the data after consultation with the data supplier
- Check for fouling problems
- Check against other data collected on the same mooring, nearby moorings and climatology
- 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.

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, salinity)
- 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. latitude, longitude, water depth, instrument height/depth, project, mooring/instrument identifiers, start and end dates and times of deployment/good data, sampling interval, instrument type, 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

Emery, W.J. and R. E. Thomson. 1998. Data Analysis Methods in Physical Oceanography, Pergamon.

Howarth, M.J. (Ed.), 1989. Current meter data quality. ICES Cooperative Research Reports, No 165.

Annex A
Example Mooring Deployment and Recovery Log Sheets

Deployment

Mooring Deployment Log Sheet					
Mooring Number					
Ship		Cruise No:		Ship Notice:	
Weather Conditions			Sea State		
Intended Duration			Navigation Instr.		
Geographical Area					
Latitude		Longitude		Time of Fix	
Depth	Raw		Corrected		
Main Float	Type		Markings		
Beacon	Type		ID: Serial #		
Light	Type		Colour/Rate		
Mooring Line	Type		Colour		
Release	Type		Serial #		Release Code
	ID		Rx		Tx
Mooring Engineer			Date		

Deployment Log		
Time (Z)	Instrument	Remarks

Recovery

Mooring Recovery Sheet Log				
Mooring Number				
Ship			Cruise Number	
Weather Conditions			Sea State	
Cancel Ship Notice	Yes		No	
Mooring Engineer				
Date				

Recovery Log		
Time(Z)	Instrument	Remarks