ICES Guidelines
for Surface Underway Data

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Underway near-surface measurements are typically made using the cooling water intake of a vessel. This guideline refers to electronically measured parameters typically including temperature and salinity. Additional parameter measurements such as fluorescence and nutrients may also be added. Autosampling devises may also be included in the underway system, thus providing the automatic water sampling for lab analysis and calibration of the electronic equipment.

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 averages and should be merged with navigation data. The typical time interval of the averages should be between 3 minutes (delayed mode transmission) and 30 minutes (real time transmission).except when in frontal regions when the averaging interval should be one minute. Alternately, the entire dataset may be provided in one-minute intervals, rather than mixing the 30 and one-minute intervals.

The format of the data set should be a single, standard ASCII file with one average value per record. A record should consist of date and time, navigation data, observed parameters and number of raw observations in the average. It is recommended that each cruise constitute a single file. but for operational oceanography it is recommended to have one file per day of cruise. The navigation data should be in ASCII and in the form of latitude and longitude in degrees and decimal minutes, or decimal degrees. The navigation format should be explicitly stated. Date and time must include month, day, year, hour, and minute. It is recommended that UTC is used.

If the navigation has not been merged, they should be submitted as a separate file, which could be linked to the along track data using date and time. The navigation position should be applicable to the middle of the averaging interval.

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 (excluding simple averages) are included, the equations used in the computations should be stated.

The list of parameters may include temperature, salinity, fluorescence, dissolved oxygen, transmittance, nutrients and partial CO_2.

All relevant calibrations should be applied to the data including laboratory and field calibrations. If no calibration have been applied, this should be clearly stated. 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.

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

- Laboratory calibrations for all parameters (e.g. for temperature and salinity see SCOR Working Group 51 recommendations. Although applicable to lowered CTD measurements, there is relevant information in this report. As well, see Karl (1996) and UNESCO (1991).)
- Computation equations used to determine the parameters
- In-situ calibrations (e.g. comparisons with lowered near-surface CTD data, or water samples)
- Report on corrections made to data
- Estimate of final uncertainty in the data

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

- Filtering, de-spiking or smoothing methods
- Editing or quality control methods
- Time lag correction scheme
- 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:

- Project, ship, cruise identifier
- Country, organisation

- Date and time of the start and end of the sampling
- details of the instrument and sensors (e.g. manufacturer, model number, serial number and any modifications carried out, and sampling rate)
- Description of operational procedures including sampling rate, sensor resolutions, methods of position fixing (e.g. GPS, DGPS)
- Flow volume per unit time, flow rate, size of water line
- Depth and position of water intake
- Discussion of possible temperature increase due to the flow through the ships intake lines. An estimate of this increase and whether or not the data (both temperature and salinity) have been corrected for this increase. In addition, how this affects the final uncertainty in the data.
- The location of the sensors should be clearly stated (eg. if temperature sensor is next to the conductivity sensor or mounted separately on the hull). The time lag for a parcel of water moving between the sensors should be stated.

Any additional information of use to secondary users which may have affected the data or have a bearing on its subsequent use should be provided. In particular, if water samples were also collected the following related information should be included:

- The water sample data should be included with the alongtrack data
- Was it an automatic or manual water sampling system, and how were the samples collected, what was the sample volume
- Details of any automatic system used (e.g. manufacturer, model number, serial number)
- What was the water sampling time interval
- What analyses were conducted on the water samples, how much time elapsed between collection and the analysis

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 correctly and without any loss of information. For alongtrack data, these should include:

- General check of accompanying information (e.g. Alongtrack runs within cruise dates, correct cruise identifier)
- Plot navigation file to ensure no land points; compare with cruise report/CSR track chart if available
- Checks on ship speed
- Automatic range checking of each parameter

- Visual inspection of time series for all parameters supplied - this may include, for example, oxygen, transmittance or fluorescence, in addition to temperature and salinity
- Flag spikes in data
- Flag suspicious data or correct after consultation with the data supplier
- Check any available comparison with water bottle samples, and corrections/calibrations applied
- Compare with climatology

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
- 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

Karl, David, Luis Tupas, Fernando Santiago-Mandujanu, Craig Nosse, Dale Hebel, Eric Firing and Roger Lukas. 1996. Hawaii Ocean Time-Series Data Report 7:1995, SOEST 96-09, University of Hawaii.

UNESCO. 1988. The acquisition, calibration and analysis of CTD data. A report of SCOR WG 51. Tech. Pap. Mar Sci., 54: 59pp.

UNESCO, 1991. Processing of Oceanographic Station Data, JPOTS Editorial Panel.

UNESCO. 2001. IODE Steering Group for Underway Sea Surface Salinity Data Pilot Project, First Session, Brest France, 15-16 November 2001.

SOOP (Ship Of Opportunity Programme) thermosalinograph guide:
http://www.jcommops.org/soopip/soopog.html

GOSUD real time QC procedures, version 1.0, 2003, available at:
http://www.coriolis.eu.org/content/download/8202/55503/file/MyOcean_RTQC_BGC_v1.0.pdf