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MFSTEP- MEDITERRANEAN FORECASTING SYSTEM TOWARDS ENVIRONMENTAL PREDICTION -
Work package 2

Data quality control procedures applied to the M3A buoys

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INTRODUCTION

1.1 Purpose

This document presents the developed procedure DQCL0 for validating physical and biogeochemical parameters daily collected by M3A buoys installed at north of Crete (E1M3A), Southern Adriatic (E2M3A) and Ligurian Sea (W1M3A).

1.2 Scope

The quality control procedure and the Medatlas format for the output data are ready for their application. The program, developed during the MFSP, was modified to fulfil the needs of the new buoy configuration. The procedure consists of an automatic quality control of data. It comprises a series of tests on the data to identify erroneous data, establish and identify corrupted data. It is classified as a data quality control at level 0. Automatic quality control consists of checks on individual or consecutive data points; these checks provide tests for instrument errors, physical limits of the data, rate of change, and stationarity of data. Test of its functioning were performed using simulated data so as data collected in the Gulf of Trieste and at the mooring position. Only meteorological and surface thermohaline data were available during this period, while for the subsurface data a code of 99.999 was introduced for program reasons. The output file is denoted by a suffix NR followed by the date of measurement: NR20040701.TXT. In conformity to what was decided in the MFSTEP-WP2 meetings data every three hours are codified for meteo and in-situ measurements.

As far as the E2M3A is concerned, "high resolution" thermohaline data (every hour) will be also quality controlled and displayed on the web page and the NAS data (Nitrate data) will be not automatic quality controlled on the daily basis. Data coming out from the NAS system will be manually processed and calibrated, from which nitrate values will be calculated at the ISMAR laboratory. Once a week a new complete Medatlas file will be released.

In the following, the data checks of the procedure are identified by these abbreviations:

- C1 - Instrument range
- C2 - Physical range
- C3 - Rate of change
- C4 - Stationary check

Each check is performed in sequence and only if the previous one has been passed. Each of the automatic quality control checks generates a flag when the check fails and the flag is ascribed to the data point failing the check. The data that exceed all the check is considered as a "correct data". No editing of invalid data and replacement of missing data are performed.



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The data quality control program (DQCL0) is activated by an automatic procedure, running on a computer of each centre: HCMR (Athens –Greece), OGS (Trieste - Italy) and CNR (Genova – Italy) that daily:

- collects files data coming from the corresponding M3a Buoy
- prepares input file for the data quality control program
- activates the data quality control program providing the day's date
- transmits the results (MEDATLAS file) to the collection centre: HCMR Athens – Greece.

The DQCL0 program is also applied to the delayed mode files recovered approximately every 2 month.

1.3 cronyms and Abbreviations

MFSTEP	Mediterranean Forecast System Towards Environmental Prediction
M3A	Mediterranean Multisensor Moored Array
HCMR	Hellenic Centre Marine Research
OGS	Istituto Nazionale di Oceanografia e di Geofisica Sperimentale
CNR	National Research Council
DQCL0	Data Quality Control at Level 0

1.4 References

- [1] – MEDATLAS FORMAT – [www.ifremer.fr/sismer/program/medatlas/gb/gb_format.htm]
- [2] – Extended MEDATLAS format for time series
- [3] – B0875-REL-000-0004.0 Data quality control level 0 procedure

2 LIST OF PARAMETERS AND VALIDITY CHECKS

2.1 M3A Parameters

M3A buoy monitors the air sea interface and the deep water column physical, optical and biochemical ecosystem parameters. In figure 2.1 the entire anchoring system of the three buoys is presented.

Status of the 3 systems. Configuration

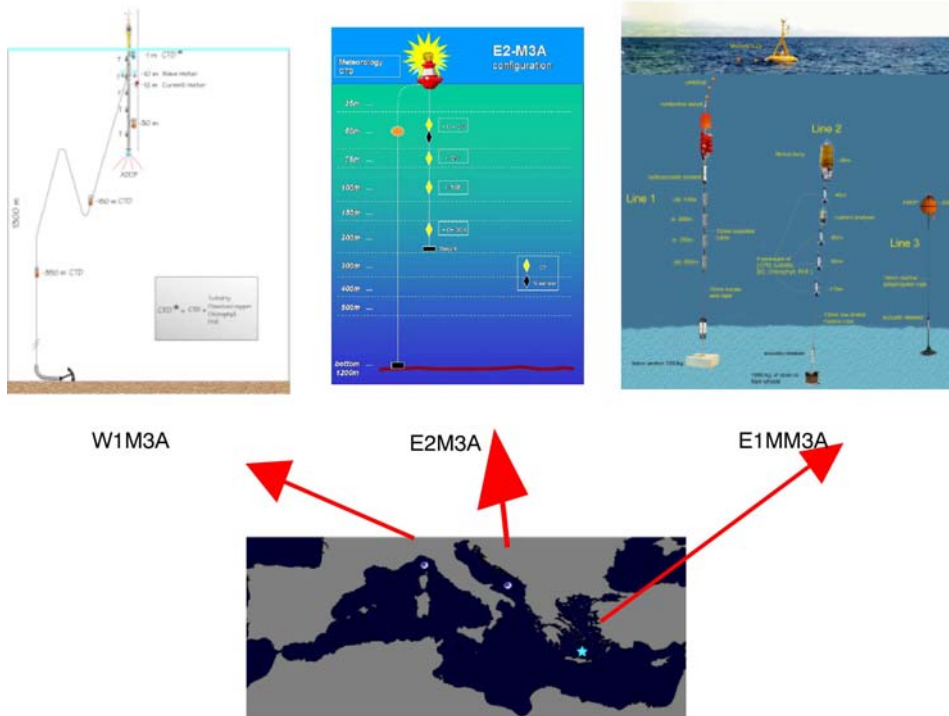


Fig 2.1 – Mooring system of the M3A arrangement

E1M3A:

Mooring 1 and 2 work in “real time”, and transfer the data to the surface buoy at 3- hours intervals. Data from both mooring lines and from on board instrumentation are transferred through Iridium satellite system to Athens (Greece) and after the first check to IFREMER (France).

Mooring 3 (ADCP) data are internally recorded and collected only on system recovery. Therefore mooring 3 data are excluded from DQCL0 procedure.

The following table shows the parameters subjected to the checks with the distinction of the mooring line and the immersion depth of the instruments:



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Parameters / Depth (m)	Mooring 1						Mooring 2			
	0	1	30	50	75	100	150	250	350	500
Air temperature	X									
Wind speed	X									
Wind gust	X									
Wind direction	X									
Air pressure	X									
Relative humidity	X									
Short-Wave Radiation	X									
3- hourly rainfall	X	X	X	X						
Significant wave height	X									
Mean Wave Period	X									
Main Wave Direction	X									
Sea Pressure			X			X	X			X
Conductivity		X	X	X	X	X	X	X	X	X
Temperature		X	X	X	X	X	X	X	X	X
Dissolved Oxygen		X	X	X	X	X				
Turbidity		X	X	X	X	X				
Chlorophyll		X	X	X	X	X				
PAR			X	X	X	X				
Nutrients					X					

Table 2.1 – E1M3A measured parameters for each immersion depth

Such distribution of the sensors is due to:

- the present technological development of the sensors that does not allow the measurement of all parameters, especially chemical and biological, in deep layers;
- the layers between 0 to 500 m are considered the critical depths for the Mediterranean;
- air-sea interaction parameters are needed for a comparison with the atmospheric forcing used to drive the regional circulation models.



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E2M3A:

The mooring work in “real time”, and transfer the data to the surface buoy at 3- hours intervals, while meteo and surface data are measured and stored every hour. All data from the mooring line and from on board instrumentation are transferred through E-TACS system once a day to Trieste (OGS) for the quality control and after the first check to IFREMER (France). Data are also transferred to TECNOMARE in order to check the functioning and position of the buoy.

The following table shows the parameters subjected to the checks and the immersion depth of the instruments:

DEPTH (m)	DRYT	WSPD	WDIR	ATMS	RELH	COND	TEMP	PSAL	SVEL	PRES	TUR6	FLU2	LGHT	NTRA	OSAT
0	*	*	*	*	*										
1						X	X	X	X						
25											§	§		◆	
50						X	X	X		X	§	§X		◆	
75						X	X	X			§	§X		◆	
100						X	X	X			§	§	X	◆	
200						X	X	X		X	§	§		◆	X

* Meteo measurements

x in-situ measurements

§ onboard measurements

◆ NAS-2E measurements

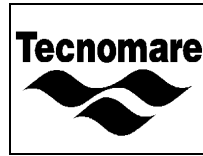
Table 2.2– E2M3A measured parameters for each immersion depth

W1M3A:

All the equipment is installed onboard the buoy and sensors are periodically enquired to collect the measurements. A standard functioning mode creates a data record every hour which is stored locally and also sent to the receive station ashore through a Globalstar satellite connection. Normal functioning conditions allow to transfer the data records every hour to the control station ashore.

Within the control station two main software routines are always running:

- A first programme is the direct interface with the remote system and aims at uploading the data files from the remote system at sea, converting the data into physical measurements by using the calibration coefficients, archiving and creating backup copies of the received files.
- A second programme reads and accumulates the data into a file containing the last 30 days of data at one-hour time interval, applies the quality control procedures to the



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collected data; creates the MEDATLAS data file containing the 8 measurements sets (at three hours interval - 00 03 06 09 12 15 18 21) of the past day during the first hours of the day, copies the MEDATLAS file as soon as it is created on the FTP site thus making HCMR able to upload the file, automatically generates the JPG images of the monthly, weekly and daily data to be included in the web pages.

Every time a new data record is received on the station ashore, a web page is generated containing the last available information. The web page is always named LastData.html and it is stored both locally and on the server running the W1-M3A web site (<http://www.odas.ge.issia.cnr.it>). The already existing page is overwritten.

The creation of the MEDATLAS files occurs daily early in the morning. The hour at which the programme produces the file can be set through the user interface. The default hour is 02:00 UTC. In order to gain more chances to collect all the data records of the past day in case of transmission problems (e.g., due to bad weather conditions) it might be acceptable to delay the production of the file by few hours. The MEDATLAS data file contains 8 measurements taken at 3 hour intervals during the previous solar day (00:00, 03:00, 06:00, 09:00, 12:00, 15:00, 18:00, 21:00 UTC). The files are created locally on the PC and copied into the ftp directory of the CNR-ISSIA server where they can be uploaded by the interested partners.

2.2 Conventional name of parameters

The procedure identifies the parameters, measured by sensors, with a code in accordance with the GF3 codes of MEDATLAS exchange format [1]. The following table resumes these codes:

Parameter	Unit	GF3 codes
Air Temperature	celsius	DRYT
Wind Speed	meter/second	WSPD
Wind Gust	meter/second	GSPD
Wind Direction relative to the true nord	degree	WDIR
Air Pressure	hectopascal	ATMS
Relative Humidity	%	RELH
Short Wave incoming radiation	watts/meter ²	SWIN
3-Hourly Rainfall	millimeter/3hrs	RNRT
Significant Wave height	meter	WVHG



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Parameter	Unit	GF3 codes
Main Wave Direction	degree	WVDR
Mean Wave Period	sec	WVPR
Conductivity	siemens/meter	CND1
Conductivity	microSiemens/centimeter	CNDC
Temperature	Celsius degree	TEMP
Sea Pressure	decibar	PRES
D.Oxygen	milliliter/liter	DOX1
Oxygen Saturation	%	OSAT
Turbidity	%	TUR3
Turbidity	milliF.T.U Formaz Turb Unit=FTU	TUR6
PAR	microeinstein/m2.s	LGH1
PAR	micromole/(m2.s)	LGHT
Fluorecence	milligram/m3	FLU2
Yellow Matter	milligram/liter	PTH1
Chlorophyll	µg/lit = mg/m3	CPH1
Nutrients	µmol/lit = mmol/m3	NTRA

Table 2.2 – Parameters codes for the E1 and E2 M3A buoys

The GF3 codes are used to identify the parameters both in the input files of the procedure and in the output files in MEDATLAS format.

The following table shows the meteorological parameters (identified by the GF3 codes) subjected to the checks and the levels at which the corresponding measuring devices are installed:

Description	Unit	GF3 Code
Atmospheric pressure - sea level	hectopascal	ATMS
Dry bulb temperature	celsius degree	DRYT
Relative humidity	%	RELH
Horizontal wind speed	meter/second	WSPD
Wind direction relative to true north	degree	WDIR
Gust wind speed	meter/second	GSPD
Incident radiation	watt/meter ²	RDIN
Long-wave incoming radiation	watt/meter ²	LINC
Precipitation rate	millimeter/hour	PRRT
Platform heading relative to north	degree	HEAD



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Table 2.3– W1M3A measured meteorological parameters

Description	Unit	GF3 Code
Sea temperature	Celsius degree	TEMP
Electrical conductivity	millihoms/meter	CNDC
Sea pressure	decibar	PRES
Dissolved oxygen	milliliter/liter	DOX1
Light transmission	%	TUR6
Chlorophyll-a total	milligram/m ³	CHL2
Average height of the highest 1/3 wave	meter	VAVH
Direction of propagation of the wave relative to true north	degree	VDIR

Table 2.4– W1M3A measured marine parameters

2.3 Validity checks

The scope of the 0 level checks is to point out the bad working of the sensors. Moreover, they may give information about particular situations that go off the standard conditions. The checks considered in the procedure are the following:

1. the values have to lie within the instruments ranges
2. the values have to lie within the prefixed physical ranges
3. the values have to respect a rate of the change in the time.
4. the values can not be constant over a time period relevant to the specific parameter.

In the following, the checks are named with the letter C and the sequential number reported in the list above presented.

The following table lists the checks applied to each parameter:



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Parameter	C1	C2	C3	C4
	Instrument range	Physical range	Rate of change	Stationarity
Air temperature	X	X	X	X
Wind speed	X	X	X	X
Wind gust	X	X	X	X
Wind direction	X		X	X
Air pressure	X	X	X	X
Relative humidity	X	X	X	X
Pressure	X	X	X	X
Conductivity	X	X	X	X
Temperature	X	X	X	X
Dissolved Oxygen	X	X	X	
Turbidity	X	X	X	
Chlorophyll	X	X	X	
Yellow Matter	X	X	X	
PAR	X	X	X	
Nutrients	X	X	X	

Table 2.3 – Applied checks to each parameter

The association between the parameter and the kind of check to be performed is indicated in the “configuration file” that will be described later.

3 DATA QUALITY CONTROL PROCEDURE

In this paragraph a description of the automatic procedure of data quality control is presented. Its flowchart is reported in Figure 3.1

DQCL0 PROCEDURE

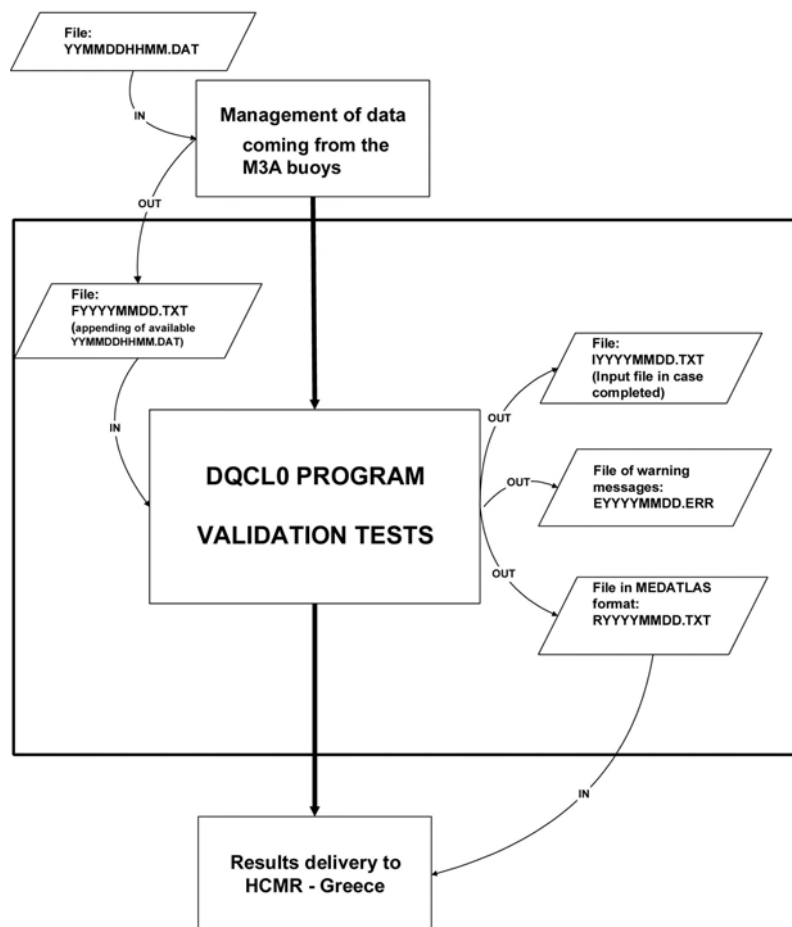


Figure 3.1 - Flowchart of the procedure

3.1 Management of M3A buoy data and delivery to HCMR

In order to handle the amount of data transmitted from the buoy to the fixed station either through the Iridium/Orbcom Satellite system or GSM/TACS network, a simple UNIX program has been created and inserted in a crontab file. This program have been run so that :

- it verifies daily the existence of all synoptic hour files and their completeness
- if this is true, an unique file containing all the data is created



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- this last file together with the one of the previous day is used as input files for the near real time quality control (DQCL0) procedure
- after the DQCL0 procedure is applied and no errors are detected an output file in Medatlas format is created
- subsequently the DQCL0 data files are transmitted to HCMR via an automatic ftp procedure from the two buoys (E2M3A and W1M3A)
- an email message containing the log file is sent to the data transmission responsible scientists

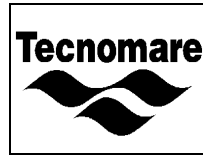
3.2 The DQCL0 Program

In this section a description of input and output data, the performed checks and the adopted criteria are presented. The salinity calculation is based on pressure, temperature and conductivity. For the depths where the pressure parameter is not measured, the salinity calculation is preceded by a pressure interpolation. Since pressure sensors are not installed in all of the levels, an estimated value for each of them have been obtained using the following procedure:

$$\Delta p = p_{\text{measured}} - p_{\text{reference}}$$

The reference pressure in our case corresponds to the one measured at the nominal depth of 100m. The reference pressure may vary from one deployment to another. For instance from January 31st to March 1st this value was 87m, while from March 3rd till May 14th the value was 114m. Due to the influence of marine currents and other factors the whole system moved away from its vertical axis and consequently, each of the sensors found themselves deeper than their nominal depth. Applying this difference in pressure (Δp) to each nominal sensor pressure, we obtained the real position of each sensor.

$$p_{\text{estimated}} = p_{\text{nominal}} + \Delta p$$



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Example:

date: 31/01/2000

reference pressure: 87 dbar

nominal depth: 65 m

Hour	reference pressure $P_{\text{reference}}$	difference Δp
0	89.098	2.098
3	89.422	2.422
6	89.152	2.152
9	89.476	2.476
12	90.232	3.232
15	93.096	6.096
18	99.663	12.663
21	98.636	11.636

Hour	estimated pressure $P_{\text{estimated}}$
0	67.098
3	67.422
6	67.152
9	67.476
12	68.323
15	71.096
18	77.663
21	76.636



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A flow-chart of the program is presented in Fig 3.2

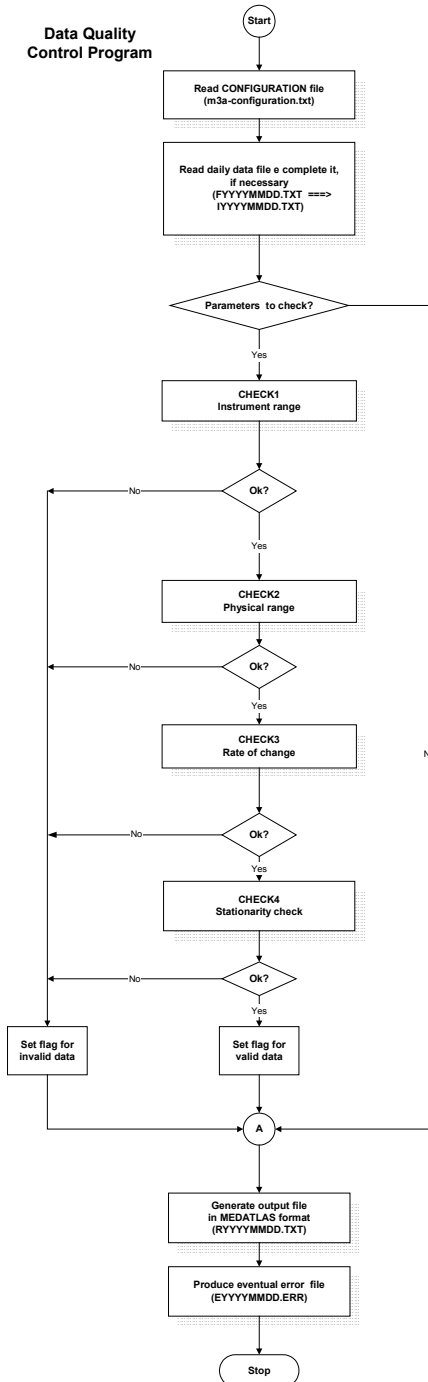


Fig.3.2 Program flow-chart



3.2.1 Input and output data of the procedure

3.2.1.1 Configuration file

The procedure needs many informations to perform the tests. These data are recorded in a file named as the configuration file.

The paragraph describes the tipology of the data and the file format.

The checks of the procedure require all the thresholds used in it:

- Instruments limits
- physical range of the parameters based on the climatology of the site
- allowable rate in time (standard deviation evaluated on a month of data or more)
- allowable interval for constant values

and a prior knowledge of the following data:

- HAT: high astronomical tide (it is required for check C2 on pressure parameter)
- LAT: low astronomical tide (it is required for check C2 on pressure parameter)
- Site water depth

All these data are saved in a configuration file and can be modified, if necessary.

The results of the procedure are related to this initialisation file.

The file name is **m3a-configuration.txt**. It includes all the information relevant to the checks for each parameter using:

- a code for each parameter; as reported in the previous table of GF3 codes (par 2.2 Conventional name of parameters)
- a code for each check:
 - Instrument range C1_INSTR_RANGE
 - Physical range C2_PHYS_RANGE
 - Rate of change C3_RATE_CHANGE
 - Stationarity C4_STATIONARITY

a code to identify the kind of check

- Lower and upper limit BOUNDS
- Threshold THRESHOLD

The file is written in free format; the fields are separated by blank. The file is divided in five sections: the first four are relevant to the checks data and the last one is relevant to general data.



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1° Section: Data relevant to check1 - Instrument range

The first line is the following:

C1_INSTR_RANGE TYPE MIN_VALUE MAX_VALUE DEPTH

The next lines include the fields:

FIELD	DESCRIPTION
PARAMETER CODE	GF3 code of parameter
TYPE OF CHECK	BOUNDS
MIN_VALUE	Lower limit of instrument measure
MAX_VALUE	Upper limit of instrument measure
DEPTH	Optional. It indicates the depth of specific sensor. If missing, the range of measure limits is the same for all the sensors that measure the same parameter.

2° Section: Data relevant to check2 - Physical range

The first line is the following:

C2_PHYS_RANGE TYPE MIN_VALUE MAX_VALUE MIN_DEPTH MAX_DEPTH

The next lines include the fields:

FIELD	DESCRIPTION
PARAMETER CODE	GF3 code of parameter
TYPE OF CHECK	BOUNDS
MIN_VALUE	Low limit of physical measure
MAX_VALUE	High limit of physical measure
MIN_DEPTH	Lower depth related to the physical range
MAX_DEPTH	Upper depth related to the physical range

3° Section: Data relevant to check3 - Rate of change

The first line is the following:

C3_RATE_CHANGE TYPE THRESHOLD (STANDARD DEVIATION)

The next lines include the fields:

FIELD	DESCRIPTION
PARAMETER CODE	GF3 code of parameter
TYPE OF CHECK	THRESHOLD
THRESHOLD	Threshold value – Standard deviation calculated on a month of collected data



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4° Section: Data relevant to check1: Stationarity

The first line is the following:

C4_STATIONARITY TYPE PERIOD (Hours)

The next lines include the fields:

FIELD	DESCRIPTION
PARAMETER CODE	GF3 code of parameter
TYPE OF CHECK	THRESHOLD
PERIOD	Allowed period (in hours) of stationarity data

5° Section: Data relevant to general data

The first line is the following:

GENERAL RESOLUTION ACCURACY DEFAULT

The next lines include the fields:

FIELD	DESCRIPTION
PARAMETER CODE	GF3 code of parameter
RESOLUTION	Transmission resolution
ACCURACY	Sensor resolution
DEFAULT	Default value in case of missing parameter value

3.2.1.2 Input files

The input data are the parameter values of one day: a data set constituted by eight values at 3 hours intervals for each parameter. As described in 3.1 Paragraph – Management of M3a buoy data, each Institute (owner of the M3A buoys) automatically receives 8 files at day; each file is named as YYMMDDHH.DAT where:

- YYMM is the date in the format: year-month
- DDHH is the time in the format: day-hour.

The management routine produces a single file appending the received files; the name of file is **FYYYYMMDD.TXT**; it collects sequentially the data relative to each sampling interval: 00:00, 03:00, 06:00, 09:00, 12:00, 15:00, 18:00, 21:00.

The file is written in free format: the fields are separated by comma.

Example of input file in reported in Annex 2 for DQCL0

The file format is the following:



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1° line (header line):

Field	Description
STD	Label to identify the start of data for each interval
WMO	WMO number
OBSERVATION DATE	Date and time in this format: YYYYMMDDHHMM
LATITUDE	Buoy latitude in degree "." and thousand of degree
LONGITUDE	Buoy longitude in degree "." and thousand of degree
LOCALIZATION DATE	Date and time in this format: YYYYMMDDHHMM
NTD	Number of measures from sensors.

Next "NTD" lines:

Field	Description
PARAMETER CODES	GF3 code of parameter + sensor depth (for example TEMP100)
DEPTH	Depth of the sensor in meter (negative value)
VALUE	Value of the parameter expressed in instrument unit.

3.2.1.3 Output file

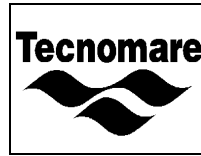
DQCL0 produces three files:

- IYYYYMMDD.TXT; it replaces the input file FYYYYMMDD.TXT
- NRYYYYYMMDD.TXT; the output file in MEDATLAS format for the NRT mode and DMYYYYYMMDD.TXT for the delayed mode mode.
- EYYYYMMDD.ERR; it is produced only if the control checks fail.

Complete Input file: IYYYYMMDD.TXT

It is an intermediate output of the program, because the file is used as input for the quality control tests. The file has the same format of FYYYYMMDD.TXT, but it includes eventual missing parts of the original file corresponding to a sampling interval or eventual missing parameter values.

The missing parts are produced respecting the file format. It is assumed that missing data are replaced by fixed value (99.99) as reported in the "Configuration file".



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MEDATLAS output file: NRYYYMMDD.TXT and/or DMYYYMMDD.TXT

The output file is in extended MEDATLAS format for time series where a flag for each parameter value reflects the check result.

To maintain compatibility with the MEDATLAS flags, the assumed values are the following (reported in heavy type):

Value	Signification	Association with our check
0	NOT CONTROLLED VALUE	
1	CORRECT VALUE	
2	VALUE INCONSISTENT WITH STATISTICS	C2 fails
3	DUBIOUS VALUE	C3 or C4 fails
4	FALSE VALUE	C1 fails
5	VALUE MODIFIED DURING QC	
6 - 8	Not used	
9	NO VALUE	parameter value is missing

The name of the file is **NRYYYMMDD.TXT** and it is automatically transmitted to HCMR for further processing and it is stored in each archiving system.

Format of the output file is reported in Annex 4: Output file of data quality control at level 0.

Error Message File: EYYMMDD.ERR

If checks fail or there are missing data, the program produce a file including some warning messages. Annex 5 reports an example of this file.

3.2.2 Program steps

The main steps of the program are presented in the following paragraphs.

3.2.2.1 Reading of input file and its eventual completion

The automatic procedure of data quality control shall be activated every day and shall produce results in time to provide information for Real Time Data Dissemination. In the same way the program will be applied to the delayed mode files in order to create daily files.

The first operation, performed by DQCL0 program, is to verify the completeness of input file FYYMMDD.TXT.



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As above described, the input file includes the eight daily messages provided by M3a buoy via the transmission (satellite or phone) System. It may present the following problems:

- one (or more) of the eight daily files is missing.
- some parameters inside one of the eight daily files are missing.

In both cases, the file is completed using a presence table (sensor typology vs. installation depth) and assigning default values (99.99) to each missing parameter in agreement with the indications provided by the configuration file.

The complete file is named **IYYYYMMDD.TXT**. However it is produced and archived. The file FYYYYMMDD.TXT is automatically deleted.

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3.2.2.2 Data checks

The checks are applied in sequence and each of them is performed only if the previous one has been passed.

As describe above, the scope of the 0 level checks is to point out the bad working of the sensors and single out macroscopic anomalies.

3.2.2.2.1 Instrument range (C1)

Aim of the check is to verify if the values lie within the range sensors. Each site should provide with the range values that depend on the instrument moored.

Figure 3.3 shows a flow chart of this step.

CHECK1 Instrument range

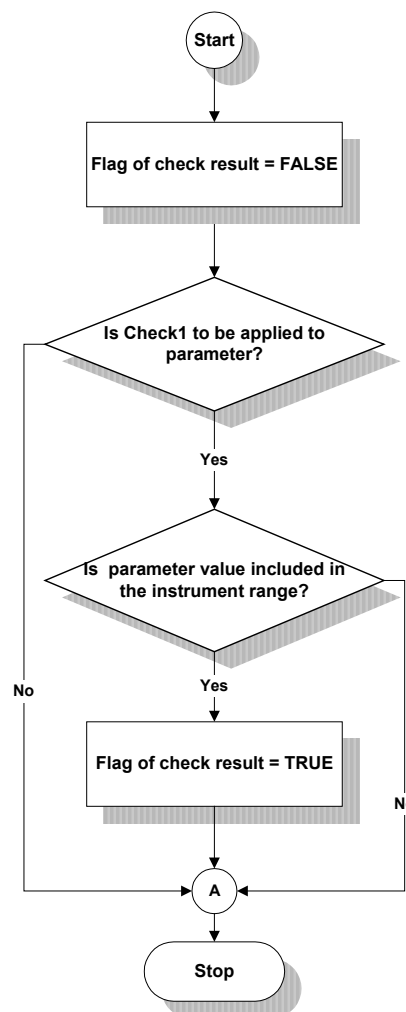


Figure 3.3 Flowchart of the check C1

3.2.2.2.2 Physical range (C2)

Aim of the check is to verify if the values respect the prefixed physical ranges. These last ones need a good knowledge of the site climatology and the environment generally.

CHECK2 - Physical range

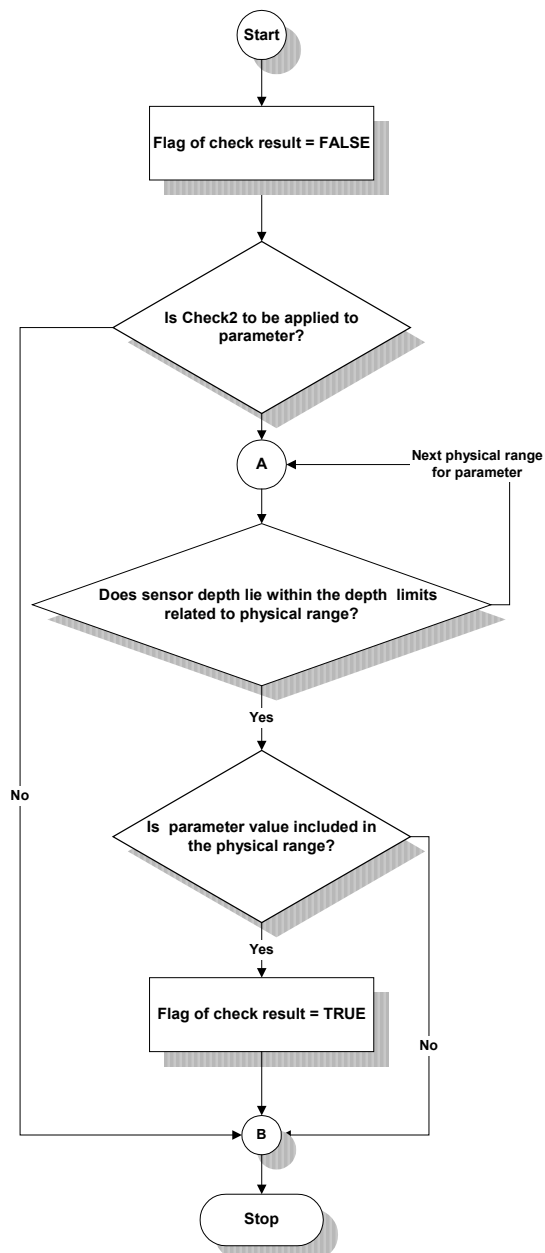


Fig 3.4 flow-chart of the check C2



Data quality control level 0

It is listed below the adopted range for each parameter, the check limits for wind speed values are site specific lower and upper limit:

PARAMETER	Physical range
Air temperature	-20 to 45 C°
Wind speed	0 – 50 m/s
Wind gust	0 – 75 m/s
Wind direction	0 to 360°
Air pressure	900 to 1050 mbar
Relative humidity	5 to 99%
Solar Radiation	0 – 1000 W/m ²
Sea Pressure	0 – 1000 decibar
Temperature	12 – 30 C° (Upper thermocline above 200m) 13 – 18 C° (Lower thermocline below 200m)
Conductivity	4 – 6 S/m 40 – 60 mS/cm
Sound Velocity	1000 – 2000 m/s
Dissolved Oxygen	4 – 6 ml/l (E1M3A)
Oxygen Saturation	4 – 10 ml/l (E2M3A)
Turbidity	30 – 100 % / 30 – 100 FTU
Chlorophyll	0 – 0.5 µg/l
Yellow Matter	0 – 0.5 milligram/l
PAR	0 – 600 µinsteins/s/m ²
Fluorencence	0 - 60 mg/m ³
Nutrients	0 – 4.5 µmol/l
Salinity	38.0 – 39.6 P.S.U.

The check limits for wind gust values correspond to 1.5 * wind speed, while the check limits for the pressure data due to the head of water are based on the maximum tidal range and the assumed meter depth with some allowance (LAT above meter level) ≤ head of water ≤ (HAT above meter level + 1.0 m).



3.2.2.2.3 Rate of Change(C3)

Aim of the check is to verify the rate of the change in the time. It is based on the difference between the current value with the previous and the next ones. Failure of a rate of change test is ascribed to the current data point of the set.

The adopted algorithm is the following:

$$|V_i - V_{i-1}| + |V_i - V_{i+1}| \leq 2 * (2 * \sigma_V)$$

where

V_i is the current value of the parameter,

V_{i-1} is the previous one,

V_{i+1} is the next one,

σ_V is the standard deviation of the examined parameter.

If the previous parameter or the next one is missing, the relative part of formula is omitted and the comparison term is $2 * \sigma_V$.

The test relevant to the rate of change is applied in the same manner to the following parameters and however to all the parameters listed in the "Configuration file" and summarised in table of paragraph 2.3 – Validity checks. The standard deviation (σ_V) will be calculated on the base of the first month of significant data collected by M3a buoys. A flow-chart of the program step is presented in the following figure:

Data quality control level 0

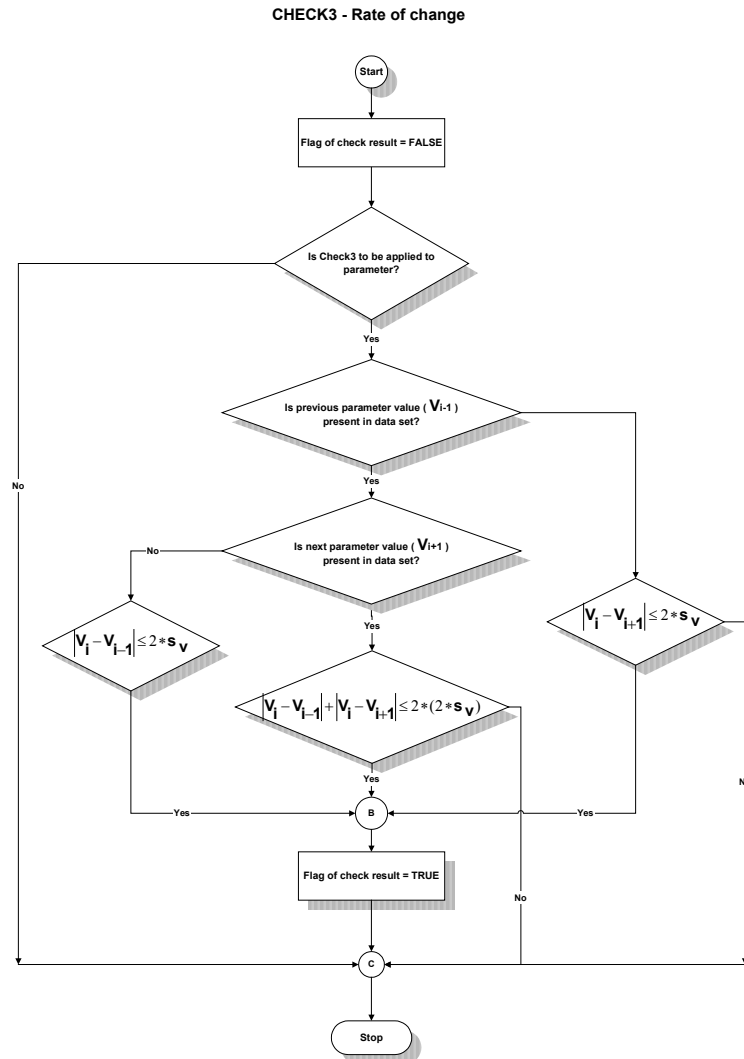


Fig 3.5 – Flow chart of the check C4

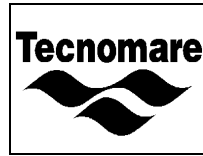
3.2.2.2.4 Stationarity check (C4)

The occurrence of constant values of data depends on the variable being measured, the sampling interval used and the resolution of the sensors.

Air temperature, air pressure, and relative humidity

Air temperature, air pressure and relative humidity may be constant for a short period of time.

A flag for each parameter should be set against each data point that is equal in value to the previous one. (3 hours)



Data quality control level 0

Wind speed and direction, gust speed and direction

Wind and gust speeds and directions are unlikely to remain constant.

A flag for each parameter should be set against each data point that is equal in value to the previous one. (3 hours)

Pressure

Pressure data should respond to the tidal rise, so it is not allowed stationary data with a sampling interval of 3 hours.

A flag for each parameter should be set against each data point that is equal in value to the previous one. (3 hours)

Temperature

Constant temperature values are relatively common and up to one day of consecutive values is allowed.

The check is performed on two consecutive data sets. A flag for each parameter should be set against each data point that is equal in value to the 8 previous ones. (24 hours)

3.2.2.2.5 Result of the checks

The result of the checks consists of a flag assigned to each parameter.

The parameter value is considered right if all the applied tests have been passed.

The adopted flag are the following in agreement with the MEDASTLAS format rules:

1	Correct value	all checks passed
4	False value	check C1 fails
2	Value inconsistent with statistics	check C2 fails
3	Dubious Value	check C3 or C4 fails

3.2.2.3 Salinity computation

Salinity is calculated to increase the knowledge of the parameters relevant to the marine environment. The algorithm for computation of salinity is extracted from UNESCO technical papers in marine science 44 – UNESCO 1983. Salinity is function of pressure, temperature and conductivity. Where the pressure parameter is not available, a linear interpolation with the contiguous values is performed.



Data quality control level 0

3.2.2.4 Output result in Medatlas format

The extended Medatlas format for time series has been adopted to save the results of the data quality control procedure. This common format is necessary to merge them in an integrated data set. This format insures non only the recording of collected data and their quality flags, but also the recording of general information such as project name, data source, laboratory name and its address, archiving centre and much more.

The file in Medatlas format includes (using the Medatlas terminology):

- a) a cruise header based on the international ROSCOP information
- b) a station header including the Medatlas reference, the time and location
- c) list of the parameters reported in the time-series.
- d) additional information for time-series as date, time, location, duration (days) of the series and sampling rate (sec)
- e) estimated pressure
- f) data records as many as collected data daily (at three hours intervals)

The sequence b), c), d) e) and f) is repeated for each multi-sensor.

In this case:

- the cruise, as system to collect data, is represented by M3A buoy;
- the station is each multisensor installed at the fixed depth as reported in table 2.1
- the parameters codes are those included in the table 2.2

The file is produce everyday.

The main fields of an “cruise summary” example are reported:

Region	ADRIATIC SEA
Source laboratory country code	48
Laboratory address	OGS, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale
Project	MFSTEP
Regional Archiving	FI
Availability	P (Public)

As above described the file name is nRYYYYMMDD.TXT. It is recorded in the archiving system of OGS and is sent automatically to HCMR. An example of file is reported in the Annex 4.



4 Tests of the procedure

System tests have been performed using simulated data. A program, to generate the input file FYYYYMMDD.TXT has been developed. It has been an important tool for the testing phase. The simulated data are been chosen in such a way to prove the correct working of the checks. Moreover, the capability of the procedure has been tested in presence of missing data. The input and output files presented in Annex 2, 3 and 4 are relevant to the E1-M3a buoy data of 31 January 2000.

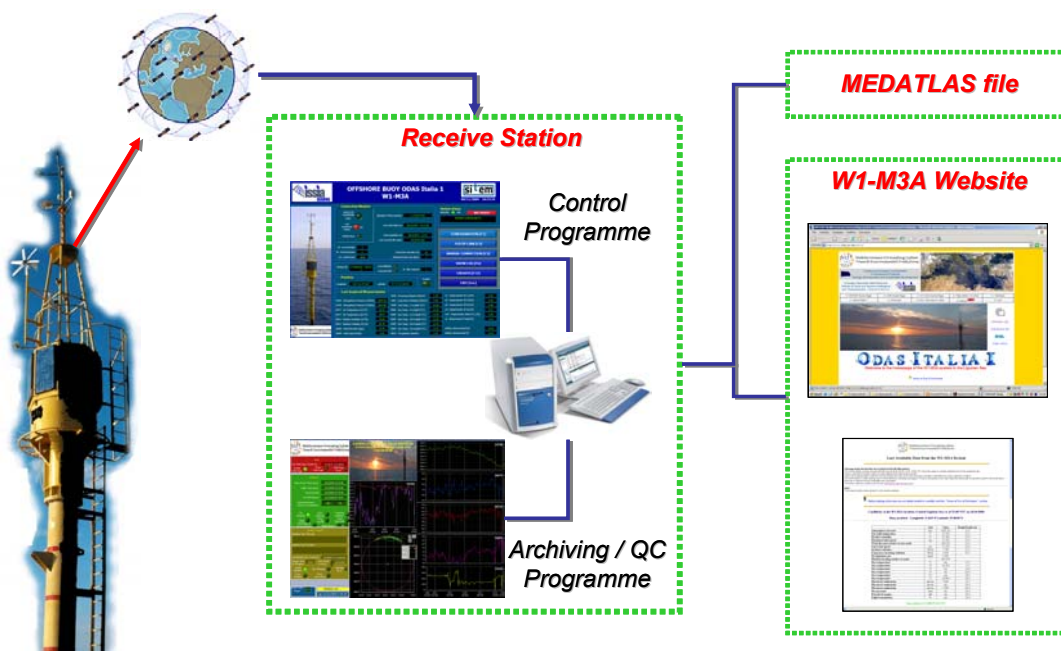
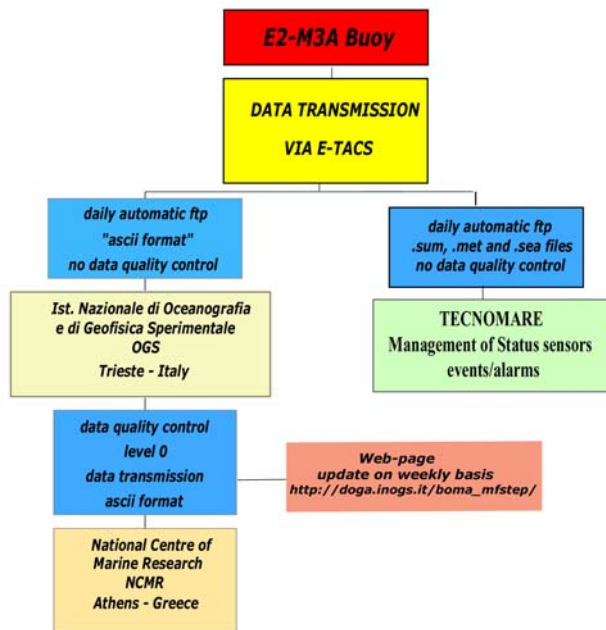
Data quality control level 0

ANNEX1: M3A BUOYS – MFSTEP TRANSMISSION AND DATA FLOW PROCEDURES

E2 - M3A Adriatic Buoy

MFSTEP

Transmission and Data flow procedures



W1-M3A data management scheme



**ANNEX2: INPUT FILE FOR DQCL0
INPUT FILE FOR DQCL0 (FYYYYMMDD.TXT)**

```

STD,17652,51023 ,200001310035, 35.6667, 24.9953,200001310035,01,49
DRYTO , 0, 10.600
WSPDO , 0, 8.658
GSPDO , 0, 16.583
WDIR0 , 0, 45.679
ATMS0 , 0, 1024.967
RELHO , 0, 66.633
CND11 , -1, 4.791
CND115 , -15, -99.999
CND140 , -40, 4.787
CND165 , -65, 4.789
CND187 , -87, 4.793
CND1150, -150, 4.804
CND1250, -250, 4.753
CND1350, -350, 4.733
CND1500, -500, 4.700
TEMP1 , -1, 15.745
TEMP15 , -15, -99.999
TEMP40 , -40, 15.754
TEMP65 , -65, 15.775
TEMP87 , -87, 15.753
TEMP150, -150, 15.795
TEMP250, -250, 15.157
TEMP350, -350, 14.907
TEMP500, -500, 14.547
PRES15 , -15, -99.999
PRES87 , -87, 89.098
PRES150, -150, 152.114
PRES500, -500, 502.128
DOX11 , -1, 5.243
DOX115 , -15, -99.999
DOX140 , -40, 5.349
DOX165 , -65, -99.999
DOX187 , -87, -99.999
TUR31 , -1, -99.999
TUR315 , -15, -99.999
TUR340 , -40, 92.110
TUR365 , -65, 90.870
TUR387 , -87, 86.780
CPH11 , -1, -99.999
CPH115 , -15, -99.999
CPH140 , -40, .282
CPH165 , -65, .122
CPH187 , -87, .261
LGH115 , -15, -99.999
LGH140 , -40, .002
LGH165 , -65, .004
LGH187 , -87, .373
PHT11 , -1, -99.999
NTRA65 , -65, .592
STD,17652,51023 ,200001310330, 35.6661, 24.9956,200001310330,01,49
DRYTO , 0, 11.692
WSPDO , 0, 9.280
GSPDO , 0, 11.940
WDIR0 , 0, 28.880
ATMS0 , 0, 1023.877
RELHO , 0, 70.733
CND11 , -1, 4.791
CND115 , -15, -99.999
CND140 , -40, 4.786
CND165 , -65, 4.791
CND187 , -87, 4.804
CND1150, -150, 4.803
CND1250, -250, 4.753
CND1350, -350, 4.733

```



Data quality control level 0

```

CND1500, -500, 4.701
TEMP1 , -1, 15.793
TEMP15 , -15, -99.999
TEMP40 , -40, 15.771
TEMP65 , -65, 15.788
TEMP87 , -87, 15.856
TEMP150, -150, 15.818
TEMP250, -250, 15.142
TEMP350, -350, 14.897
TEMP500, -500, 14.554
PRES15 , -15, -99.999
PRES87 , -87, 89.422
PRES150, -150, 151.580
PRES500, -500, 501.852
DOX11 , -1, 5.243
DOX115 , -15, -99.999
DOX140 , -40, 5.342
DOX165 , -65, -99.999
DOX187 , -87, -99.999
TUR31 , -1, -99.999
TUR315 , -15, -99.999
TUR340 , -40, 92.230
TUR365 , -65, 90.800
TUR387 , -87, 86.880
CPH11 , -1, -99.999
CPH115 , -15, -99.999
CPH140 , -40, .285
CPH165 , -65, .098
CPH187 , -87, .261
LGH115 , -15, -99.999
LGH140 , -40, .002
LGH165 , -65, .004
LGH187 , -87, .404
PHT11 , -1, -99.999
NTRA65 , -65, .594
STD,17652,51023 ,200001310626, 35.6667, 24.9953,200001310626,01,49
DRYTO , 0, 12.313
WSPD0 , 0, 6.489
GSPD0 , 0, 8.684
WDIRO , 0, 51.981
ATMS0 , 0, 1025.656
RELH0 , 0, 68.833
CND11 , -1, 4.791
CND115 , -15, -99.999
CND140 , -40, 4.790
CND165 , -65, 4.789
CND187 , -87, 4.792
CND1150, -150, 4.799
CND1250, -250, 4.762
CND1350, -350, 4.733
CND1500, -500, 4.704
TEMP1 , -1, 15.745
TEMP15 , -15, -99.999
TEMP40 , -40, 15.802
TEMP65 , -65, 15.781
TEMP87 , -87, 15.781
TEMP150, -150, 15.772
TEMP250, -250, 15.243
TEMP350, -350, 14.901
TEMP500, -500, 14.579
PRES15 , -15, -99.999
PRES87 , -87, 89.152
PRES150, -150, 151.737
PRES500, -500, 501.935
DOX11 , -1, 5.243
DOX115 , -15, -99.999
DOX140 , -40, 5.330
DOX165 , -65, -99.999
DOX187 , -87, -99.999
TUR31 , -1, -99.999
TUR315 , -15, -99.999

```



Data quality control level 0

```

TUR340 , -40, 92.510
TUR365 , -65, 90.570
TUR387 , -87, 86.370
CPH11 , -1, -99.999
CPH115 , -15, -99.999
CPH140 , -40, .288
CPH165 , -65, .140
CPH187 , -87, .314
LGH115 , -15, -99.999
LGH140 , -40, .002
LGH165 , -65, .004
LGH187 , -87, .404
PHT11 , -1, -99.999
NTRA65 , -65, .569
STD,17652,51023 ,200001310933, 35.6669, 24.9950,200001310933,01,49
DRYTO , 0, 12.534
WSPDO , 0, 4.870
GSPDO , 0, 6.633
WDIR0 , 0, 134.370
ATMS0 , 0, 1027.138
RELH0 , 0, 63.600
CND11 , -1, 4.798
CND115 , -15, -99.999
CND140 , -40, 4.788
CND165 , -65, 4.794
CND187 , -87, 4.793
CND1150 , -150, 4.797
CND1250 , -250, 4.760
CND1350 , -350, 4.734
CND1500 , -500, 4.703
TEMP1 , -1, 15.793
TEMP15 , -15, -99.999
TEMP40 , -40, 15.788
TEMP65 , -65, 15.827
TEMP87 , -87, 15.798
TEMP150 , -150, 15.743
TEMP250 , -250, 15.217
TEMP350 , -350, 14.916
TEMP500 , -500, 14.565
PRES15 , -15, -99.999
PRES87 , -87, 89.476
PRES150 , -150, 152.604
PRES500 , -500, 502.407
DOX11 , -1, 5.243
DOX115 , -15, -99.999
DOX140 , -40, 5.332
DOX165 , -65, -99.999
DOX187 , -87, -99.999
TUR31 , -1, -99.999
TUR315 , -15, -99.999
TUR340 , -40, 92.480
TUR365 , -65, 90.750
TUR387 , -87, 86.350
CPH11 , -1, -99.999
CPH115 , -15, -99.999
CPH140 , -40, .296
CPH165 , -65, .129
CPH187 , -87, .310
LGH115 , -15, -99.999
LGH140 , -40, .002
LGH165 , -65, .003
LGH187 , -87, .412
PHT11 , -1, -99.999
NTRA65 , -65, .579
STD,17652,51023 ,200001311231, 35.6656, 24.9947,200001311231,01,49
DRYTO , 0, 12.417
WSPDO , 0, 5.684
GSPDO , 0, 7.739
WDIR0 , 0, 128.557
ATMS0 , 0, 1026.959
RELH0 , 0, 60.267

```



Data quality control level 0

```

CND11 , -1, 4.798
CND115 , -15, -99.999
CND140 , -40, 4.789
CND165 , -65, 4.791
CND187 , -87, 4.800
CND1150, -150, 4.800
CND1250, -250, 4.759
CND1350, -350, 4.735
CND1500, -500, 4.701
TEMP1 , -1, 15.842
TEMP15 , -15, -99.999
TEMP40 , -40, 15.785
TEMP65 , -65, 15.799
TEMP87 , -87, 15.833
TEMP150, -150, 15.749
TEMP250, -250, 15.200
TEMP350, -350, 14.915
TEMP500, -500, 14.551
PRES15 , -15, -99.999
PRES87 , -87, 90.232
PRES150, -150, 155.417
PRES500, -500, 503.848
DOX11 , -1, 5.311
DOX115 , -15, -99.999
DOX140 , -40, 5.333
DOX165 , -65, -99.999
DOX187 , -87, -99.999
TUR31 , -1, -99.999
TUR315 , -15, -99.999
TUR340 , -40, 92.310
TUR365 , -65, 90.540
TUR387 , -87, 86.250
CPH11 , -1, -99.999
CPH115 , -15, -99.999
CPH140 , -40, .285
CPH165 , -65, .146
CPH187 , -87, .342
LGH115 , -15, -99.999
LGH140 , -40, .002
LGH165 , -65, .003
LGH187 , -87, .453
PHT11 , -1, -99.999
NTRA65 , -65, .695
STD,17652,51023 ,200001311534, 35.6658, 24.9922,200001311534,01,49
DRYTO , 0, 12.484
WSPD0 , 0, 2.226
GSPD0 , 0, 4.776
WDIR0 , 0, 120.177
ATMS0 , 0, 1027.965
RELH0 , 0, 53.433
CND11 , -1, 4.798
CND115 , -15, -99.999
CND140 , -40, 4.787
CND165 , -65, 4.795
CND187 , -87, 4.805
CND1150, -150, 4.786
CND1250, -250, 4.759
CND1350, -350, 4.732
CND1500, -500, 4.702
TEMP1 , -1, 15.842
TEMP15 , -15, -99.999
TEMP40 , -40, 15.774
TEMP65 , -65, 15.797
TEMP87 , -87, 15.838
TEMP150, -150, 15.632
TEMP250, -250, 15.195
TEMP350, -350, 14.883
TEMP500, -500, 14.560
PRES15 , -15, -99.999
PRES87 , -87, 93.096
PRES150, -150, 157.460

```

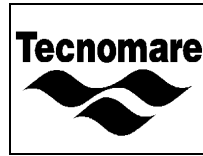


Data quality control level 0

```

PRES500, -500, 504.864
DOX11 , -1, 5.344
DOX115 , -15, -99.999
DOX140 , -40, 5.344
DOX165 , -65, -99.999
DOX187 , -87, -99.999
TUR31 , -1, -99.999
TUR315 , -15, -99.999
TUR340 , -40, 91.900
TUR365 , -65, 90.570
TUR387 , -87, 86.450
CPH11 , -1, -99.999
CPH115 , -15, -99.999
CPH140 , -40, .338
CPH165 , -65, .151
CPH187 , -87, .350
LGH115 , -15, -99.999
LGH140 , -40, .002
LGH165, -65, .003
LGH187 , -87, .461
PHT11 , -1, -99.999
NTRA65 , -65, .853
STD,17652,51023 ,200001311832, 35.6661, 24.9944,200001311832,01,49
DRYTO , 0, 12.293
WSPDO , 0, 2.394
GSPDO , 0, 4.342
WDIR0 , 0, 105.101
ATMS0 , 0, 1029.015
RELH0 , 0, 56.000
CND11 , -1, 4.798
CND115 , -15, -99.999
CND140 , -40, 4.792
CND165 , -65, 4.798
CND187 , -87, 4.808
CND1150, -150, 4.790
CND1250, -250, 4.759
CND1350, -350, 4.738
CND1500, -500, 4.705
TEMP1 , -1, 15.793
TEMP15 , -15, -99.999
TEMP40 , -40, 15.792
TEMP65 , -65, 15.810
TEMP87 , -87, 15.815
TEMP150, -150, 15.670
TEMP250, -250, 15.196
TEMP350, -350, 14.941
TEMP500, -500, 14.585
PRES15 , -15, -99.999
PRES87 , -87, 99.663
PRES150, -150, 155.196
PRES500, -500, 503.734
DOX11 , -1, 5.243
DOX115 , -15, -99.999
DOX140 , -40, 5.318
DOX165 , -65, -99.999
DOX187 , -87, -99.999
TUR31 , -1, -99.999
TUR315 , -15, -99.999
TUR340 , -40, 92.160
TUR365 , -65, 90.800
TUR387 , -87, 86.050
CPH11 , -1, -99.999
CPH115 , -15, -99.999
CPH140 , -40, .346
CPH165 , -65, .127
CPH187 , -87, .354
LGH115 , -15, -99.999
LGH140 , -40, .002
LGH165, -65, .004
LGH187 , -87, .441
PHT11 , -1, -99.999

```



Data quality control level 0

```

NTRA65 , -65, .803
STD,17652,51023 ,200001312126, 40.4503, 22.8725,200001312126,01,49
DRYTO , 0, 11.970
WSPDO , 0, 4.099
GSPDO , 0, 6.513
WDIRO , 0, 50.310
ATMS0 , 0, 1028.770
RELHO , 0, 65.267
CND11 , -1, 4.798
CND115 , -15, -99.999
CND140 , -40, 4.791
CND165 , -65, 4.794
CND187 , -87, 4.800
CND1150, -150, 4.801
CND1250, -250, 4.758
CND1350, -350, 4.734
CND1500, -500, 4.705
TEMP1 , -1, 15.793
TEMP15 , -15, -99.999
TEMP40 , -40, 15.800
TEMP65 , -65, 15.792
TEMP87 , -87, 15.803
TEMP150, -150, 15.769
TEMP250, -250, 15.201
TEMP350, -350, 14.901
TEMP500, -500, 14.582
PRES15 , -15, -99.999
PRES87 , -87, 98.636
PRES150, -150, 152.445
PRES500, -500, 502.324
DOX11 , -1, 5.209
DOX115 , -15, -99.999
DOX140 , -40, 5.321
DOX165 , -65, -99.999
DOX187 , -87, -99.999
TUR31 , -1, -99.999
TUR315 , -15, -99.999
TUR340 , -40, 92.180
TUR365 , -65, 90.470
TUR387 , -87, 85.370
CPH11 , -1, -99.999
CPH115 , -15, -99.999
CPH140 , -40, .377
CPH165 , -65, .135
CPH187 , -87, .358
LGH115 , -15, -99.999
LGH140 , -40, .002
LGH165, -65, .004
LGH187 , -87, .453
PHT11 , -1, -99.999
NTRA65 , -65, .738

```



Data quality control level 0

ANNEX3: CONFIGURATION FILE
CONFIGURATION FILE (m3a-configuration.txt)

C1_INSTR_RANGE	TYPE	MIN_VALUE	MAX_VALUE	DEPTH	
DRYT	BOUNDS	-20	45		
WSPD	BOUNDS	0	60		
GSPD	BOUNDS	0	60		
WDIR	BOUNDS	0	360		
ATMS	BOUNDS	900	1100		
RELH	BOUNDS	5	100		
CND1	BOUNDS	0	7.5	1	
CND1	BOUNDS	0	7		
TEMP	BOUNDS	-5	35		
PRES	BOUNDS	0	680		
DOX1	BOUNDS	0	15		
TUR3	BOUNDS	0	100		
CPH1	BOUNDS	0	75		
LGH1	BOUNDS	0	600		
PHT1	BOUNDS	0	10		
NTRA	BOUNDS	0	5		
C2_PHYS_RANGE	TYPE	MIN_VALUE	MAX_VALUE	MIN_DEPTH	MAX_DEPTH
DRYT	BOUNDS	-20	45	0	0
WSPD	BOUNDS	0	50	0	0
GSPD	BOUNDS	0	75	0	0
WDIR	BOUNDS	0	360	0	0
ATMS	BOUNDS	900	1050	0	0
RELH	BOUNDS	5	99	0	0
CND1	BOUNDS	4	6	0	4500
TEMP	BOUNDS	12	30	0	200
TEMP	BOUNDS	13	18	201	4500
PRES	BOUNDS	0	5	0	4500
DOX1	BOUNDS	4	6	0	4500
TUR3	BOUNDS	30	100	0	4500
CPH1	BOUNDS	0	2.5	0	4500
LGH1	BOUNDS	0	600	0	4500
PHT1	BOUNDS	0	0.5	0	4500
NTRA	BOUNDS	0	4.5	0	4500
PSAL	BOUNDS	38	39.6	0	4500
C3_RATE_CHANGE	TYPE	MIN_VALUE	MAX_VALUE		
DRYT	THRESHOLD	3			
WSPD	THRESHOLD	2			
GSPD	THRESHOLD	2			
WDIR	THRESHOLD	10			
ATMS	THRESHOLD	10			
RELH	THRESHOLD	5			
CND1	THRESHOLD	0.5			
TEMP	THRESHOLD	3			
PRES	THRESHOLD	4			
DOX1	THRESHOLD	0.1			
TUR3	THRESHOLD	1			
CPH1	THRESHOLD	5			
LGH1	THRESHOLD	30			
PHT1	THRESHOLD	0.1			
NTRA	THRESHOLD	0.01			
C4_STATIONARITY	TYPE	MIN_VALUE	MAX_VALUE		
DRYT	THRESHOLD	6			
WSPD	THRESHOLD	3			
GSPD	THRESHOLD	3			
WDIR	THRESHOLD	3			
ATMS	THRESHOLD	12			
RELH	THRESHOLD	12			
CND1	THRESHOLD	24			
TEMP	THRESHOLD	24			
PRES	THRESHOLD	3			
GENERAL	RESOLUTION	ACCURACY	MISSING_VALUE		
DRYT	0.1	0.05	-99.999		
WSPD	0.1	0.02	-99.999		
GSPD	0.1	0.02	-99.999		
WDIR	0.1	0.01	-99.999		
ATMS	0.1	0.01	-99.999		



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RELH	0.1	0.01	-99.999
CND1	0.1	0.01	-99.999
TEMP	0.1	0.01	-99.999
PRES	0.1	0.01	-99.999
DOX1	0.1	0.01	-99.999
TUR3	0.1	0.01	-99.999
CPH1	0.1	0.01	-99.999
LGH1	0.1	0.01	-99.999
PHT1	0.1	0.01	-99.999
NTRA	0.1	0.01	-99.999



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ANNEX4: OUTPUT FILE OF DATA QUALITY CONTROL AT LEVEL 0 IN MEDATLAS FORMAT

EXAMPLE OF AN OUTPUT FILE OF DATA QUALITY CONTROL AT LEVEL 0 IN MEDATLAS FORMAT FOR THE E1M3A (NRYYYMMDD.TXT AND DMYYYMMDD.TXT)

```

*IO48200000131 M3A                                XXXX UNKNOWN
31/01/2000 31/01/2000 AEGEAN SEA
48 OGS, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale
Vanessa Cardin                                     Project= MFSP
Regional Archiving= FI                             Availability=P
Data Type=M01 n= 1 QC=Y
Data Type=H72 n= 9 QC=Y
COMMENT
*IO482000001310B020 Data Type=M01
*DATE=31012000 TIME=0000 LAT=N40 27.02 LON=E022 52.35 DEPTH= 1500 QC=0000
*NB PARAMETERS=09 RECORD LINES=00008
*YEAR YEAR                                         (yyyy)                ) def.= 9999
*DATE DATE                                         (mmdd)                ) def.= 9999
*TIME TIME WITHIN DAY                             (hhmmss)              ) def.= 999999
*DRYT DRYT BULB TEMPERATURE                      (Celsius degree)     ) def.=99.999
*WSPD WIND SPEED                                  (m/s)                 ) def.=99.999
*GSPD GUST WIND SPEED                             (m/s)                 ) def.=99.999
*WDIR WIND DIRECTION REL. TRUE NORTH(degree)     ) def.=999.999
*ATMS ATMOSPHERIC PRESSURE - SEA LEV(millibars)  ) def.=9999.999
*RELH RELATIVE HUMIDITY                          (%)                   ) def.=99.999
*GLOBAL PROFILE QUALITY FLAG=* GLOBAL PARAMETERS QC FLAGS=000111111
*DC HISTORY=
*
*DM HISTORY=
*
*COMMENT
*ADDITIONAL INFORMATION - TIME SERIES
*EDATE=31012000 ETIME=0000 ELAT=N40 27.02 ELON=E022 52.35 EDEPTH= 1500 QC=0000
*SENSOR DEPTH= 0 (metre)                          DISTANCE TO BOTTOM= 1500 (metre) QC=00
*DURATION= 1 (day)                                 QC=00
*SAMPLING RATE=10800 (second)                     MAGNETIC DECLINATION=
*
*SURFACE SAMPLES=
*
*YEAR DATE TIME DRYT WSPD GSPD WDIR ATMS RELH
2000 0131 000000 10.600 8.658 16.583 45.679 1024.967 66.633 000113311
2000 0131 030000 11.692 9.280 11.940 28.880 1023.877 70.733 000113311
2000 0131 060000 12.313 6.489 8.684 51.981 1025.656 68.833 000133311
2000 0131 090000 12.534 4.870 6.633 134.370 1027.138 63.600 000111311
2000 0131 120000 12.417 5.684 7.739 128.557 1026.959 60.267 000133113
2000 0131 150000 12.484 2.226 4.776 120.177 1027.965 53.433 000111311
2000 0131 180000 12.293 2.394 4.342 105.101 1029.015 56.000 000111313
2000 0131 210000 11.970 4.099 6.513 50.310 1028.770 65.267 000113313
9999 9999 999999 99.999 99.999 99.999 999.999 9999.999 99.999 999999999
*IO482000001310B020 Data Type=H72
*DATE=31012000 TIME=0000 LAT=N40 27.02 LON=E022 52.35 DEPTH= 1500 QC=0000
*NB PARAMETERS=10 RECORD LINES=00008
*YEAR YEAR                                         (yyyy)                ) def.= 9999
*DATE DATE                                         (mmdd)                ) def.= 9999
*TIME TIME WITHIN DAY                             (hhmmss)              ) def.= 999999
*CND1 ELECTRICAL CONDUCTIVITY                    (S/m)                 ) def.=99.999
*TEMP SEA TEMPERATURE                            (Celsius degree)     ) def.=99.999
*DOX1 DISSOLVED OXYGEN                           (ml/l)                ) def.=99.999
*TUR3 LIGHT TRANSMISSION                         (%)                   ) def.=999.999
*CPH1 CHLOROPHYLL-A TOTAL                       (milligram/m3)       ) def.=9.999
*PHT1 PHAEOPIGMENTS VERTICAL FLUX               (milligram/l)        ) def.=99.999
*PSAL PRACTICAL SALINITY                         (P.S.U.)              ) def.=99.999
*GLOBAL PROFILE QUALITY FLAG=* GLOBAL PARAMETERS QC FLAGS=000111111
*DC HISTORY=
*
*DM HISTORY=
*
*COMMENT
*ADDITIONAL INFORMATION - TIME SERIES
*EDATE=31012000 ETIME=0000 ELAT=N40 27.02 ELON=E022 52.35 EDEPTH= 1500 QC=0000
*SENSOR DEPTH= 1 (metre)                          DISTANCE TO BOTTOM= 1499 (metre) QC=00
*
*ESTIMATED PRESSURE (db) :
*
0000 3.098 1200 4.232

```



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```

*
*          0300    3.422        1500    7.096
*          0600    3.152        1800    13.663
*          0900    3.476        2100    12.636
*
*
* DURATION=      1 (day)                                QC=00
* SAMPLING RATE=10800 (second)          MAGNETIC DECLINATION=
*
* SURFACE SAMPLES=
*
* YEAR DATE TIME  CND1  TEMP  DOX1  TUR3  CPH1  PHT1  PSAL
2000 0131 000000  4.791 15.745  5.243 999.999 9.999 99.999 38.857 0001119991
2000 0131 030000  4.791 15.793  5.243 999.999 9.999 99.999 38.810 0001119991
2000 0131 060000  4.791 15.745  5.243 999.999 9.999 99.999 38.857 0001119991
2000 0131 090000  4.798 15.793  5.243 999.999 9.999 99.999 38.873 0001119991
2000 0131 120000  4.798 15.842  5.311 999.999 9.999 99.999 38.825 0001119991
2000 0131 150000  4.798 15.842  5.344 999.999 9.999 99.999 38.825 0001119991
2000 0131 180000  4.798 15.793  5.243 999.999 9.999 99.999 38.873 0001119991
2000 0131 210000  4.798 15.793  5.209 999.999 9.999 99.999 38.873 0001119991
9999 9999 999999 99.999 99.999 99.999 999.999 9.999 99.999 99.999 9999999999
* IO482000001310B020 Data Type=H72
* DATE=31012000 TIME=0000 LAT=N40 27.02 LON=E022 52.35 DEPTH= 1500 QC=0000
* NB PARAMETERS=11 RECORD LINES=00008
* YEAR YEAR (YYYY) ) def.= 9999
* DATE DATE (mmdd) ) def.= 9999
* TIME TIME WITHIN DAY (hhmmss) ) def.= 999999
* CND1 ELECTRICAL CONDUCTIVITY (S/m) ) def.=99.999
* TEMP SEA TEMPERATURE (Celsius degree) ) def.=99.999
* PRES SEA PRESSURE sea surface=0 (decibar=10000 pascals) ) def.=999.999
* DOX1 DISSOLVED OXYGEN (ml/l) ) def.=99.999
* TUR3 LIGHT TRANSMISSION (%) ) def.=999.999
* CPH1 CHLOROPHYLL-A TOTAL (milligram/m3) ) def.=9.999
* LGH1 LIGHT IRRADIANCE IMMERGED PAR (micromeinsteins/ (m2.s)) ) def.=9999.999
* PSAL PRACTICAL SALINITY (P.S.U.) ) def.=99.999
* GLOBAL PROFILE QUALITY FLAG=* GLOBAL PARAMETERS QC FLAGS=000111111111
* DC HISTORY=
*
* DM HISTORY=
*
* COMMENT
* ADDITIONAL INFORMATION - TIME SERIES
* EDATE=31012000 ETIME=0000 ELAT=N40 27.02 ELON=E022 52.35 EDEPTH= 1500 QC=0000
* SENSOR DEPTH= 15 (metre) DISTANCE TO BOTTOM= 1485 (metre) QC=00
*
* ESTIMATED PRESSURE (db) :
*          0000    17.098        1200    18.232
*          0300    17.422        1500    21.096
*          0600    17.152        1800    27.663
*          0900    17.476        2100    26.636
*
*
* DURATION=      1 (day)                                QC=00
* SAMPLING RATE=10800 (second)          MAGNETIC DECLINATION=
*
* SURFACE SAMPLES=
*
* YEAR DATE TIME  CND1  TEMP  PRES  DOX1  TUR3  CPH1  LGH1  PSAL
2000 0131 000000 99.999 99.999 999.999 99.999 999.999 9.999 9999.999 99.999 000999999999
2000 0131 030000 99.999 99.999 999.999 99.999 999.999 9.999 9999.999 99.999 000999999999
2000 0131 060000 99.999 99.999 999.999 99.999 999.999 9.999 9999.999 99.999 000999999999
2000 0131 090000 99.999 99.999 999.999 99.999 999.999 9.999 9999.999 99.999 000999999999
2000 0131 120000 99.999 99.999 999.999 99.999 999.999 9.999 9999.999 99.999 000999999999
2000 0131 150000 99.999 99.999 999.999 99.999 999.999 9.999 9999.999 99.999 000999999999
2000 0131 180000 99.999 99.999 999.999 99.999 999.999 9.999 9999.999 99.999 000999999999
2000 0131 210000 99.999 99.999 999.999 99.999 999.999 9.999 9999.999 99.999 000999999999
9999 9999 999999 99.999 99.999 999.999 99.999 999.999 9.999 9999.999 99.999 999999999999
* IO482000001310B020 Data Type=H72
* DATE=31012000 TIME=0000 LAT=N40 27.02 LON=E022 52.35 DEPTH= 1500 QC=0000
* NB PARAMETERS=10 RECORD LINES=00008
* YEAR YEAR (YYYY) ) def.= 9999
* DATE DATE (mmdd) ) def.= 9999
* TIME TIME WITHIN DAY (hhmmss) ) def.= 999999
* CND1 ELECTRICAL CONDUCTIVITY (S/m) ) def.=99.999
* TEMP SEA TEMPERATURE (Celsius degree) ) def.=99.999
* DOX1 DISSOLVED OXYGEN (ml/l) ) def.=99.999
* TUR3 LIGHT TRANSMISSION (%) ) def.=999.999
* CPH1 CHLOROPHYLL-A TOTAL (milligram/m3) ) def.=9.999
* LGH1 LIGHT IRRADIANCE IMMERGED PAR (micromeinsteins/ (m2.s)) ) def.=9999.999
* PSAL PRACTICAL SALINITY (P.S.U.) ) def.=99.999
* GLOBAL PROFILE QUALITY FLAG=* GLOBAL PARAMETERS QC FLAGS=000111111111

```



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*DC HISTORY=
*
*DM HISTORY=
*
*COMMENT
*ADDITIONAL INFORMATION - TIME SERIES
*EDATE=31012000 ETIME=0000 ELAT=N40 27.02 ELON=E022 52.35 EDEPTH= 1500 QC=0000
*SENSOR DEPTH= 40 (metre)          DISTANCE TO BOTTOM= 1460 (metre) QC=00
*
*ESTIMATED PRESSURE (db) :
*
*           0000  42.098      1200  43.232
*           0300  42.422      1500  46.096
*           0600  42.152      1800  52.663
*           0900  42.476      2100  51.636
*
*DURATION= 1 (day)                      QC=00
*SAMPLING RATE=10800 (second)          MAGNETIC DECLINATION=
*
*SURFACE SAMPLES=
*
*YEAR DATE TIME  CND1  TEMP  DOX1  TUR3  CPH1  LGH1  PSAL
2000 0131 000000  4.787 15.754  5.349  92.110  0.282  0.002  38.827 0001111111
2000 0131 030000  4.786 15.771  5.342  92.230  0.285  0.002  38.801 0001111111
2000 0131 060000  4.790 15.802  5.330  92.510  0.288  0.002  38.807 0001111111
2000 0131 090000  4.788 15.788  5.332  92.480  0.296  0.002  38.803 0001111111
2000 0131 120000  4.789 15.785  5.333  92.310  0.285  0.002  38.814 0001111111
2000 0131 150000  4.787 15.774  5.344  91.900  0.338  0.002  38.807 0001111111
2000 0131 180000  4.792 15.792  5.318  92.160  0.346  0.002  38.834 0003111111
2000 0131 210000  4.791 15.800  5.321  92.180  0.377  0.002  38.817 0003111111
9999 9999 999999 99.999 99.999 99.999 999.999 9.999 9999.999 99.999 9999999999
*IO482000001310B020 Data Type=H72
*DATE=31012000 TIME=0000 LAT=N40 27.02 LON=E022 52.35 DEPTH= 1500 QC=0000
*NB PARAMETERS=11 RECORD LINES=00008
*YEAR YEAR (yyyy) def.= 9999
*DATE DATE (mmdd) def.= 9999
*TIME TIME WITHIN DAY (hhmmss) def.= 999999
*CND1 ELECTRICAL CONDUCTIVITY (S/m) def.=99.999
*TEMP SEA TEMPERATURE (Celsius degree) def.=99.999
*DOX1 DISSOLVED OXYGEN (ml/l) def.=99.999
*TUR3 LIGHT TRANSMISSION (%) def.=999.999
*CPH1 CHLOROPHYLL-A TOTAL (milligram/m3) def.=9.999
*LGH1 LIGHT IRRADIANCE IMMERSGED PAR (micromeinsteins/ (m2.s) def.=9999.999
*NTRA NITRATE (NO3-N) CONTENT (millimole/m3) def.=99.999
*PSAL PRACTICAL SALINITY (P.S.U.) def.=99.999
*GLOBAL PROFILE QUALITY FLAG=* GLOBAL PARAMETERS QC FLAGS=0001111111
*DC HISTORY=
*
*DM HISTORY=
*
*COMMENT
*ADDITIONAL INFORMATION - TIME SERIES
*EDATE=31012000 ETIME=0000 ELAT=N40 27.02 ELON=E022 52.35 EDEPTH= 1500 QC=0000
*SENSOR DEPTH= 65 (metre)          DISTANCE TO BOTTOM= 1435 (metre) QC=00
*
*ESTIMATED PRESSURE (db) :
*
*           0000  67.098      1200  68.232
*           0300  67.422      1500  71.096
*           0600  67.152      1800  77.663
*           0900  67.476      2100  76.636
*
*DURATION= 1 (day)                      QC=00
*SAMPLING RATE=10800 (second)          MAGNETIC DECLINATION=
*
*SURFACE SAMPLES=
*
*YEAR DATE TIME  CND1  TEMP  DOX1  TUR3  CPH1  LGH1  NTRA  PSAL
2000 0131 000000  4.789 15.775 99.999  90.870  0.122  0.004  0.592  38.796 0001191111
2000 0131 030000  4.791 15.788 99.999  90.800  0.098  0.004  0.594  38.801 0001191113
2000 0131 060000  4.789 15.781 99.999  90.570  0.140  0.004  0.569  38.790 0001191113
2000 0131 090000  4.794 15.827 99.999  90.750  0.129  0.003  0.579  38.790 0001191113
2000 0131 120000  4.791 15.799 99.999  90.540  0.146  0.003  0.695  38.790 0001191113
2000 0131 150000  4.795 15.797 99.999  90.570  0.151  0.003  0.853  38.828 0001191113
2000 0131 180000  4.798 15.810 99.999  90.800  0.127  0.004  0.803  38.840 0003191113
2000 0131 210000  4.794 15.792 99.999  90.470  0.135  0.004  0.738  38.822 0003191113
9999 9999 999999 99.999 99.999 99.999 999.999 9.999 9999.999 99.999 9999999999
*IO482000001310B020 Data Type=H72

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```

*DATE=31012000 TIME=0000 LAT=N40 27.02 LON=E022 52.35 DEPTH= 1500 QC=0000
*NB PARAMETERS=11 RECORD LINES=00008
*YEAR YEAR (yyyy) ) def.= 9999
*DATE DATE (mmdd) ) def.= 9999
*TIME TIME WITHIN DAY (hhmmss) ) def.= 999999
*CND1 ELECTRICAL CONDUCTIVITY (S/m) ) def.=99.999
*TEMP SEA TEMPERATURE (Celsius degree) ) def.=99.999
*PRES SEA PRESSURE sea surface=0 (decibar=10000 pascals) ) def.=999.999
*DOX1 DISSOLVED OXYGEN (ml/l) ) def.=99.999
*TUR3 LIGHT TRANSMISSION (%) ) def.=999.999
*CPH1 CHLOROPHYLL-A TOTAL (milligram/m3) ) def.=9.999
*LGH1 LIGHT IRRADIANCE IMMERGED PAR (micromeinsteins/ (m2.s) ) def.=9999.999
*PSAL PRACTICAL SALINITY (P.S.U.) ) def.=99.999
*GLOBAL PROFILE QUALITY FLAG=* GLOBAL PARAMETERS QC FLAGS=000111111111
*DC HISTORY=
*
*DM HISTORY=
*
*COMMENT
*ADDITIONAL INFORMATION - TIME SERIES
*EDATE=31012000 ETIME=0000 ELAT=N40 27.02 ELON=E022 52.35 EDEPTH= 1500 QC=0000
*SENSOR DEPTH= 87 (metre) DISTANCE TO BOTTOM= 1413 (metre) QC=00
*
*ESTIMATED PRESSURE (db) :
*
* 0000 89.098 1200 90.232
* 0300 89.422 1500 93.096
* 0600 89.152 1800 99.663
* 0900 89.476 2100 98.636
*
*DURATION= 1 (day) QC=00
*SAMPLING RATE=10800 (second) MAGNETIC DECLINATION=
*
*SURFACE SAMPLES=
*
*YEAR DATE TIME CND1 TEMP PRES DOX1 TUR3 CPH1 LGH1 PSAL
2000 0131 000000 4.793 15.753 89.098 99.999 86.780 0.261 0.373 38.829 000111911111
2000 0131 030000 4.804 15.856 89.422 99.999 86.880 0.261 0.404 38.827 000111911111
2000 0131 060000 4.792 15.781 89.152 99.999 86.370 0.314 0.404 38.792 000111911111
2000 0131 090000 4.793 15.798 89.476 99.999 86.350 0.310 0.412 38.784 000111911111
2000 0131 120000 4.800 15.833 90.232 99.999 86.250 0.342 0.453 38.813 000111911111
2000 0131 150000 4.805 15.838 93.096 99.999 86.450 0.350 0.461 38.853 000112911111
2000 0131 180000 4.808 15.815 99.663 99.999 86.050 0.354 0.441 38.900 000112911111
2000 0131 210000 4.800 15.803 98.636 99.999 85.370 0.358 0.453 38.839 000312911111
9999 9999 999999 99.999 99.999 999.999 99.999 999.999 9.999 9999.999 99.999 999999999999
*IO482000001310B020 Data Type=H72
*DATE=31012000 TIME=0000 LAT=N40 27.02 LON=E022 52.35 DEPTH= 1500 QC=0000
*NB PARAMETERS=07 RECORD LINES=00008
*YEAR YEAR (yyyy) ) def.= 9999
*DATE DATE (mmdd) ) def.= 9999
*TIME TIME WITHIN DAY (hhmmss) ) def.= 999999
*CND1 ELECTRICAL CONDUCTIVITY (S/m) ) def.=99.999
*TEMP SEA TEMPERATURE (Celsius degree) ) def.=99.999
*PRES SEA PRESSURE sea surface=0 (decibar=10000 pascals) ) def.=999.999
*PSAL PRACTICAL SALINITY (P.S.U.) ) def.=99.999
*GLOBAL PROFILE QUALITY FLAG=* GLOBAL PARAMETERS QC FLAGS=00011111
*DC HISTORY=
*
*DM HISTORY=
*
*COMMENT
*ADDITIONAL INFORMATION - TIME SERIES
*EDATE=31012000 ETIME=0000 ELAT=N40 27.02 ELON=E022 52.35 EDEPTH= 1500 QC=0000
*SENSOR DEPTH= 150 (metre) DISTANCE TO BOTTOM= 1350 (metre) QC=00
*
*ESTIMATED PRESSURE (db) :
*
* 0000 152.098 1200 153.232
* 0300 152.422 1500 156.096
* 0600 152.152 1800 162.663
* 0900 152.476 2100 161.636
*
*DURATION= 1 (day) QC=00
*SAMPLING RATE=10800 (second) MAGNETIC DECLINATION=
*
*SURFACE SAMPLES=
*
*YEAR DATE TIME CND1 TEMP PRES PSAL
2000 0131 000000 4.804 15.795 152.114 38.860 00011111

```



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2000 0131 030000 4.803 15.818 151.580 38.829 0001111
2000 0131 060000 4.799 15.772 151.737 38.838 0001111
2000 0131 090000 4.797 15.743 152.604 38.848 0001111
2000 0131 120000 4.800 15.749 155.417 38.868 0001121
2000 0131 150000 4.786 15.632 157.460 38.855 0001121
2000 0131 180000 4.790 15.670 155.196 38.855 0001121
2000 0131 210000 4.801 15.769 152.445 38.858 0001111
9999 9999 999999 99.999 99.999 999.999 99.999 9999999
*IO482000001310B020 Data Type=H72
*DATE=31012000 TIME=0000 LAT=N40 27.02 LON=E022 52.35 DEPTH= 1500 QC=0000
*NB PARAMETERS=06 RECORD LINES=00008
*YEAR YEAR (yyyy) def.= 9999
*DATE DATE (mmdd) def.= 9999
*TIME TIME WITHIN DAY (hhmmss) def.= 999999
*CND1 ELECTRICAL CONDUCTIVITY (S/m) def.=99.999
*TEMP SEA TEMPERATURE (Celsius degree) def.=99.999
*PSAL PRACTICAL SALINITY (P.S.U.) def.=99.999
*GLOBAL PROFILE QUALITY FLAG=* GLOBAL PARAMETERS QC FLAGS=000111
*DC HISTORY=
*
*DM HISTORY=
*
*COMMENT
*ADDITIONAL INFORMATION - TIME SERIES
*EDATE=31012000 ETIME=0000 ELAT=N40 27.02 ELON=E022 52.35 EDEPTH= 1500 QC=0000
*SENSOR DEPTH= 250 (metre) DISTANCE TO BOTTOM= 1250 (metre) QC=00
*
*ESTIMATED PRESSURE (db) :
* 0000 252.098 1200 253.232
* 0300 252.422 1500 256.096
* 0600 252.152 1800 262.663
* 0900 252.476 2100 261.636
*
*DURATION= 1 (day) QC=00
*SAMPLING RATE=10800 (second) MAGNETIC DECLINATION=
*
*SURFACE SAMPLES=
*
*YEAR DATE TIME CND1 TEMP PSAL
2000 0131 000000 4.753 15.157 38.982 000111
2000 0131 030000 4.753 15.142 38.997 000111
2000 0131 060000 4.762 15.243 38.979 000111
2000 0131 090000 4.760 15.217 38.986 000111
2000 0131 120000 4.759 15.200 38.993 000111
2000 0131 150000 4.759 15.195 38.997 000111
2000 0131 180000 4.759 15.196 38.997 000311
2000 0131 210000 4.758 15.201 38.984 000311
9999 9999 999999 99.999 99.999 99.999 9999999
*IO482000001310B020 Data Type=H72
*DATE=31012000 TIME=0000 LAT=N40 27.02 LON=E022 52.35 DEPTH= 1500 QC=0000
*NB PARAMETERS=06 RECORD LINES=00008
*YEAR YEAR (yyyy) def.= 9999
*DATE DATE (mmdd) def.= 9999
*TIME TIME WITHIN DAY (hhmmss) def.= 999999
*CND1 ELECTRICAL CONDUCTIVITY (S/m) def.=99.999
*TEMP SEA TEMPERATURE (Celsius degree) def.=99.999
*PSAL PRACTICAL SALINITY (P.S.U.) def.=99.999
*GLOBAL PROFILE QUALITY FLAG=* GLOBAL PARAMETERS QC FLAGS=000111
*DC HISTORY=
*
*DM HISTORY=
*
*COMMENT
*ADDITIONAL INFORMATION - TIME SERIES
*EDATE=31012000 ETIME=0000 ELAT=N40 27.02 ELON=E022 52.35 EDEPTH= 1500 QC=0000
*SENSOR DEPTH= 350 (metre) DISTANCE TO BOTTOM= 1150 (metre) QC=00
*
*ESTIMATED PRESSURE (db) :
* 0000 352.098 1200 353.232
* 0300 352.422 1500 356.096
* 0600 352.152 1800 362.663
* 0900 352.476 2100 361.636
*
*DURATION= 1 (day) QC=00
*SAMPLING RATE=10800 (second) MAGNETIC DECLINATION=
*
*SURFACE SAMPLES=

```



MFSTEP
Workpackage 2

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Data quality control level 0

```

*
*YEAR DATE TIME CND1 TEMP PSAL
2000 0131 000000 4.733 14.907 39.002 000111
2000 0131 030000 4.733 14.897 39.013 000111
2000 0131 060000 4.733 14.901 39.009 000111
2000 0131 090000 4.734 14.916 39.003 000111
2000 0131 120000 4.735 14.915 39.012 000111
2000 0131 150000 4.732 14.883 39.015 000111
2000 0131 180000 4.738 14.941 39.014 000311
2000 0131 210000 4.734 14.901 39.018 000311
9999 9999 999999 99.999 99.999 99.999 999999
*IO482000001310B020 Data Type=H72
*DATE=31012000 TIME=0000 LAT=N40 27.02 LON=E022 52.35 DEPTH= 1500 QC=0000
*NB PARAMETERS=07 RECORD LINES=00008
*YEAR YEAR ) def.= 9999
*DATE DATE (yyyy ) def.= 9999
(mmdd ) def.= 9999
*TIME TIME WITHIN DAY (hhmmss ) def.= 999999
*SND1 ELECTRICAL CONDUCTIVITY (S/m ) def.=99.999
*TEMP SEA TEMPERATURE (Celsius degree ) def.=99.999
*PRES SEA PRESSURE sea surface=0 (decibar=10000 pascals ) def.=999.999
*PSAL PRACTICAL SALINITY (P.S.U. ) def.=99.999
*GLOBAL PROFILE QUALITY FLAG=* GLOBAL PARAMETERS QC FLAGS=0001111
*DC HISTORY=
*
*DM HISTORY=
*
*COMMENT
*
*ADDITIONAL INFORMATION - TIME SERIES
*EDATE=31012000 ETIME=0000 ELAT=N40 27.02 ELON=E022 52.35 EDEPTH= 1500 QC=0000
*SENSOR DEPTH= 500 (metre) DISTANCE TO BOTTOM= 1000 (metre) QC=00
*
*ESTIMATED PRESSURE (db) :
* 0000 502.098 1200 503.232
* 0300 502.422 1500 506.096
* 0600 502.152 1800 512.663
* 0900 502.476 2100 511.636
*
*DURATION= 1 (day) QC=00
*SAMPLING RATE=10800 (second) MAGNETIC DECLINATION=
*
*SURFACE SAMPLES=
*
*YEAR DATE TIME CND1 TEMP PRES PSAL
2000 0131 000000 4.700 14.547 502.128 38.991 0001111
2000 0131 030000 4.701 14.554 501.852 38.993 0001111
2000 0131 060000 4.704 14.579 501.935 38.996 0001111
2000 0131 090000 4.703 14.565 502.407 39.000 0001111
2000 0131 120000 4.701 14.551 503.848 38.995 0001111
2000 0131 150000 4.702 14.560 504.864 38.995 0001111
2000 0131 180000 4.705 14.585 503.734 38.998 0003111
2000 0131 210000 4.705 14.582 502.324 39.002 0003111
9999 9999 999999 99.999 99.999 999.999 99.999 9999999

```



**ANNEX5: ERROR FILE
ERROR FILE (EYYYYMMDD.ERR)**

```
*****  
*                               *  
*                WARNING                *  
*                               *  
*****  
DATE = 20000307  
*  
CHECKS NOT EXCEEDED:  
C1: INSTRUMENT RANGE - FLAG = 4  
C2: PHYSICAL RANGE - FLAG = 2  
C3, C4: RATE OF CHANGE, STATIONARITY - FLAG = 3  
*  
*  
MISSING DATA - FLAG = 9
```