

Data Quality Control Procedures

*Volunteer Observing Ship
Mediterranean Forecasting System
Pilot Project
(VOS MFSP)*

A stylized logo for 'VOS MFSP' in a blue, outlined, serif font. The letters are interconnected and have a 3D effect with a slight shadow.

Document:

Data Quality Control Procedures

Classification and Approval

Classification: Public after review

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Content

| | |
|--|----|
| 1. Introduction | 4 |
| 2. On board quality control of real-time data | 4 |
| 3. Laboratory quality control of the near-real-time data | 5 |
| 3.1 Near-real-time data | 5 |
| 3.2 Delayed mode data | 6 |
| 4. Transmission strategy | 7 |
| 5. Format of decimated data | 7 |
| 6. Format of the WP1 Web | |
| 7. Format of full resolution data | 8 |
| 8. Ship lines and time schedule | 9 |
| | |
| Appendix 1. Mediterranean data centres codes | 11 |
| Appendix 2. IOC Mediterranean country codes | 12 |
| Appendix 3. The Medatlas format | 13 |
| Appendix 4. The fortran code for XBT data and q.c transformation in Medatlas format | 19 |
| Appendix 5. The geographical, temperature and salinity limits of the Mediterranean sub-areas (Medatlas) | 24 |
| Appendix 6. Example of Sippican export file | 25 |

1. Introduction

The first meeting of the MFSP project required the implementation of protocols for exchanging data and for quality control, according to the ‘MAST Guidelines and Practices’ <http://www.sea-search.net/>.

This document has the aim to allow an assessment of the data’s quality and limitations. It takes advantage of the protocols developed in other MAST projects (e.g. MEDATLAS).

Quality control and exchange protocols implemented in VOS MFSP are considering only XBT data and for deep waters. They are applied to both near-real time and delayed mode data.

VOS MFSP use the WOCE and TOGA definition:

- near-real time data are considered to be XBT observations coded for transmission on the GTS in the BATHY code forms. From this point of view they can also be defined as low-resolution data
- delayed mode data are considered to be the full resolution data which are processed within a month and submitted to replace the BATHY reports.

The acquisition/transmission system is based on consolidated technologies such as Sippican XBTs and ARGOS. However the VOS - MFSP is very demanding, since the XBT profile have to be collected every 10-12 nautical miles on nine tracks covering in an appropriate way the Mediterranean Sea. This means that a huge amount of data have to be collected, quality controlled and transmitted for forecasting with a short time delay.

The aim of this report is the description of the quality check procedures implemented for VOS MFSP and the format adopted for data exchange.

2. On board quality control of real-time data

Two controls will be performed on the XBT data. The first one will be done automatically on board and will be based on the following requirements:

| | |
|--|--------|
| 1. No test from 0 to 5 m | |
| 2. Maximum depth | 460 m |
| 3. Minimum temperature | 2°C |
| 4. Maximum temperature | 34.0°C |
| 5. Maximum temperature inversion (0 – 200 m) | 4.5°C |
| 6. Maximum temperature inversion (> 200 m) | 1.5°C |
| 7. Maximum temperature gradient | 3°C/m |

The software ARGOS has been changed with respect to that used in the world ocean in order to take into account the major characteristics of the Mediterranean waters: the existence of a relatively warm water at depth (the LIW), the major vertical homogeneity of the temperature profiles, the necessity to have as much points as possible.

LIW temperature increase. Due to the artificial increase of temperature caused by the XBT wire stretching, the old software is containing an ‘end of profile check’, which automatically eliminate the part of the profile below 200 m having a temperature increase. In the oceans this can be due to strong currents. In the Mediterranean the increase of temperature below 200 m is due to the presence of the relatively warm LIW. The ‘end of profile check’ has been eliminated.

Vertical homogeneity. The old version is controlling the temperature difference between the upper and lower layers which must be greater than 2-10 °C. Also in this case the control was changed in order to provide data in vertically homogeneous areas.

Number of significant points. The old software is providing only those significant points necessary to define the vertical profile, which can be less than 15. The New version is always calculating 15 significant points from surface up to 460 m.

3. Laboratory quality control of the near-real-time data

3.1 Near-real-time data

The profiles are collected by a Sippican system, decimated and transmitted by ARGOS in Toulouse and sent soon after the decoding to ENEA in La Spezia where a second more precise check will be performed, based on regional statistics and upper - lower temperature limits defined by the projects MEDATLAS

http://www.ifremer.fr/sismer/program/medatlas/fr/fr_medat.htm

| | Name | Latitude | | Longitude | | Max | Min |
|-----|----------------------|-----------|-----------|------------|------------|-----|-----|
| DF1 | Algerian Basin North | N42 00.00 | N39 18.00 | E009 18.00 | E004 30.00 | 30 | 12 |
| DF2 | Gulf Of Lions | N43 36.00 | N42 00.00 | E006 18.00 | E002 48.00 | 30 | 10 |
| DF3 | Ligurian Sea West | N44 30.00 | N42 00.00 | E009 24.00 | E006 18.00 | 30 | 10 |
| DF4 | Ligurian Sea East | N44 18.00 | N42 48.00 | E010 48.00 | E009 24.00 | 30 | 12 |
| DH1 | Aegean Sea | N41 12.00 | N35 15.00 | E027 18.00 | E022 30.00 | 30 | 8 |
| DH2 | Cretan Passage | N35 15.00 | N31 00.00 | E027 18.00 | E022 30.00 | 30 | 12 |
| DH3 | Levantine Basin | N37 04.00 | N30 42.00 | E036 30.00 | E027 18.00 | 30 | 12 |
| DI1 | Sardinia Strait | N39 18.00 | N36 48.00 | E010 00.00 | E008 24.00 | 30 | 12 |
| DI3 | Sicilia Strait | N38 00.00 | N36 00.00 | E014 00.00 | E010 00.00 | 30 | 12 |
| DJ1 | Adriatic North | N45 54.00 | N41 48.00 | E015 48.00 | E012 00.00 | 30 | 5 |
| DJ2 | Adriatic Middle | N43 54.00 | N40 36.00 | E018 00.00 | E015 48.00 | 30 | 10 |

| | | | | | | | |
|-----|------------------------|-----------|-----------|------------|------------|----|------|
| DJ3 | Adriatic South | N42 48.00 | N40 00.00 | E019 48.00 | E018 00.00 | 30 | 12 |
| DJ4 | Ionian 1 (Ne) | N40 00.00 | N38 00.00 | E022 30.00 | E018 00.00 | 30 | 12 |
| DJ5 | Ionian 2 (South) | N36 00.00 | N30 06.00 | E022 30.00 | E010 00.00 | 30 | 12 |
| DJ6 | Ionian 3 (Nw) | N40 36.00 | N38 00.00 | E018 00.00 | E016 07.80 | 30 | 12 |
| DJ7 | Ionian 4 (Middle) | N38 00.00 | N36 00.00 | E022 30.00 | E014 00.00 | 30 | 12 |
| DS1 | Gibraltar Strait | N37 42.00 | N33 00.00 | W005 36.00 | W009 00.00 | 26 | 2 |
| DS2 | Balearic Sea | N42 00.00 | N38 30.00 | E004 30.00 | W000 24.00 | 28 | 11 |
| DS3 | Algerian Basin Sw | N38 30.00 | N35 36.00 | E004 30.00 | W001 00.00 | 28 | 12.5 |
| DS4 | Algerian Basin Se | N39 18.00 | N36 30.00 | E008 24.00 | E004 30.00 | 28 | 12.5 |
| DS5 | Alboran Nw | N37 30.00 | N36 00.00 | W003 00.00 | W005 36.00 | 26 | 12 |
| DS6 | Alboran Sw | N36 00.00 | N35 00.00 | W003 00.00 | W005 36.00 | 27 | 12 |
| DS7 | Alboran Ne | N37 30.00 | N36 00.00 | W001 00.00 | W003 00.00 | 27 | 12 |
| DS8 | Alboran Se | N36 00.00 | N35 00.00 | W001 00.00 | W003 00.00 | 27 | 12 |
| DT1 | Tyrrhenian (Nw) 1 | N42 48.00 | N39 18.00 | E013 48.00 | E009 18.00 | 30 | 12 |
| DT2 | Tyrrhenian (Ne) 2 | N41 18.00 | N39 18.00 | E016 6.00 | E013 48.00 | 30 | 12 |
| DT3 | Tyrrhenian 3 | N39 18.00 | N38 30.00 | E016 18.00 | E010 00.00 | 30 | 12 |
| DT4 | Tyrrhenian 4 | N38 30.00 | N38 00.00 | E015 00.00 | E010 00.00 | 30 | 12 |
| DT5 | Tyrrhenian 5 (Messina) | N38 30.00 | N38 00.00 | E016 00.00 | E015 00.00 | 30 | 12 |

Furthermore, all the data received were processed in order to eliminate temperature values from surface to 5 metres depth, and create new values by interpolation or extrapolation in order to maintain 15 significant points.

3.2 Delayed mode data

For this check it will also be considered the changes occurring along the water column. In order to implement this check, the MODB (Mediterranean Oceanographic Data Base - <http://modb.oce.ulg.ac.be/>) data were analysed for all the Mediterranean sub-regions, as defined in MEDATLAS.

| | NAME | WINTER | | SPRING | | SUMMER | | AUTUMN | |
|-----|----------------------|--------|-------|--------|-------|--------|-------|--------|-------|
| | | 0-200 | >200 | 0-200 | >200 | 0-200 | >200 | 0-200 | >200 |
| DF1 | Algerian Basin North | 12:18 | 12:15 | 10:25 | 12:15 | 12:30 | 12:16 | 12:24 | 12:15 |
| DF2 | Gulf Of Lions | 10:17 | 12:14 | 10:20 | 12:14 | 10:26 | 12:15 | 10:21 | 12:15 |
| DF3 | Ligurian Sea West | 10:16 | 12:15 | 10:21 | 12:15 | 10:29 | 12:15 | 10:21 | 12:15 |
| DF4 | Ligurian Sea East | 12:17 | 12:16 | 12:22 | 12:15 | 12:27 | 12:15 | 12:22 | 12:15 |
| DH1 | Aegean Sea | 12:25 | 13:18 | 12:25 | 13:18 | 12:30 | 13:18 | 12:27 | 13:18 |
| DH2 | Cretan Passage | 12:20 | 13:17 | 12:23 | 13:17 | 12:31 | 13:17 | 12:33 | 13:17 |
| DH3 | Levantine Basin | 12:21 | 12:18 | 12:28 | 12:17 | 12:33 | 12:18 | 12:33 | 12:17 |
| DI1 | Sardinia Strait | 12:18 | 12:15 | 12:22 | 12:16 | 12:28 | 12:15 | 12:25 | 12:15 |
| DI3 | Sicilia Strait | 12:19 | 12:15 | 12:22 | 12:16 | 12:32 | 12:16 | 12:26 | 13:16 |
| DJ1 | Adriatic North | 05:28 | | 07:24 | | 10:28 | | 09:23 | |
| DJ2 | Adriatic Middle | 10:17 | 12:15 | 10:21 | 12:15 | 11:28 | 12:15 | 11:21 | 12:15 |
| DJ3 | Adriatic South | 12:18 | 12:16 | 12:24 | 12:16 | 12:27 | 12:16 | 12:22 | 12:16 |
| DJ4 | Ionian 1 (Ne) | 12:19 | 12:16 | 12:22 | 12:16 | 12:30 | 13:16 | 12:25 | 12:16 |
| DJ5 | Ionian 2 (South) | 12:21 | 13:17 | 12:23 | 13:16 | 12:30 | 13:16 | 12:26 | 12:17 |

| | | | | | | | | | |
|-----|---------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| DJ6 | Ionian 3 (Nw) | 12:18 | 12:16 | 12:23 | 13:16 | 12:28 | 12:16 | 12:23 | 12:16 |
| DJ7 | Ionian 4 (Middle) | 12:19 | 13:16 | 12:23 | 13:16 | 12:30 | 13:17 | 12:26 | 13:17 |
| DS2 | Balearic Sea | 11:18 | 12:15 | 11:25 | 12:15 | 11:30 | 12:15 | 11:24 | 12:15 |
| DS3 | Algerian Basin Sw | 12:18 | 12:15 | 12:21 | 12:15 | 12:28 | 12:15 | 12:24 | 12:15 |
| DS4 | Algerian Basin Se | 12:18 | 12:15 | 12:22 | 12:15 | 12:28 | 12:15 | 12:25 | 12:15 |
| DS5 | Alboran Nw | 12:19 | 12:15 | 12:21 | 12:15 | 12:26 | 12:15 | 12:22 | 12:15 |
| DS6 | Alboran Sw | 12:19 | 12:15 | 12:21 | 12:15 | 12:27 | 12:15 | 12:23 | 12:15 |
| DS7 | Alboran Ne | 12:18 | 12:15 | 12:23 | 12:15 | 12:27 | 12:15 | 12:23 | 12:15 |
| DS8 | Alboran Se | 12:18 | 12:15 | 12:21 | 12:15 | 12:27 | 12:15 | 12:23 | 12:15 |
| DT1 | Tyrrhenian (Nw) 1 | 12:18 | 12:16 | 12:23 | 12:16 | 12:30 | 12:16 | 12:26 | 12:16 |
| DT2 | Tyrrhenian (Ne) 2 | 12:18 | 12:16 | 12:22 | 12:16 | 12:29 | 12:16 | 12:24 | 12:16 |
| DT3 | Tyrrhenian 3 | 12:18 | 12:16 | 12:22 | 12:16 | 12:29 | 12:15 | 12:24 | 12:16 |
| DT4 | Tyrrhenian 4 | 12:18 | 12:16 | 12:22 | 12:16 | 12:29 | 12:15 | 12:24 | 12:16 |
| DT5 | Tyrrhenian 5 (Messina) | 12:18 | 12:16 | 12:23 | 12:16 | 12:28 | 12:16 | 12:23 | 12:16 |

This control is not yet approved by MEDATLAS/IOC and is intended only as an internal MFSP – VOS rule, which could be implemented during the project. The performance/implementation of this QC will be discussed also in MEDAR/MEDATLAS project.

Also in the delayed mode data all temperature values above 5 metres depth were eliminated.

4. Transmission Strategy

The transmission unit is composed by a transmitter, a GPS and a software running on a PC. The unit will pick up the data collected by the Sippican system, validate the profile, select significant points, code the data and transmit them via ARGOS.

The position of the XBT launch is provided by interpolating hourly GPS fixes.

Two kind of messages are transmitted trough ARGOS: the message containing 7 GPS fixes and the one containing a pile of 12 XBT decimated profiles.

The strategy is consisting on sending 1 message GPS followed by 4 messages from the data pile. The pile is updated every hour.

5. Format of decimated data

In a general way, the following requirements holds for the decimated data:

- a) the values shall be sufficient to reproduce basic features of the temperature profile

b) define the top and the bottom of isothermal layers

ARGOS produces two kind of files: BATHY and Simple Format.

- BATHY

```
JJXX  
10088 1200/ 73848 00015  
88888 05190 15181 30183 50170 80145 99901 20136 60134 99902 00133  
40133 80133 99903 40133 99904 20133  
JPJX
```

Or

```
JJXX  
DDMMY hhmm/ QcLaLaLaLa LoLoLoLoLo  
8888k zzTTT (.....) 999pp (.....)  
JPJX
```

Where

JJXX is indicating the start of the bathy message,

DDMMY is the day, month, year

hhmm is hour and minute

Qc is the quadrant of the globe (7 for the Mediterranean east of the Greenwich latitude and
1 west of Greenwich)

LaLaLaLa is the latitude in degrees and minutes

LoLoLoLo is the longitude in degrees and minutes

8888 is indicating the start of the decimated data

k is called indicator for digitisation and is equal to:

7 values are at selected depths (data points fixed by the instruments or
selected by any other method)

8 values are at significant depths (data points taken from traces at
significant depths)

zzTTT is indicating the depth (a number < 100) and the temperature (to be divided by 10)

999pp is indicating the change and the new depth (in 100 m)

The total depth is then given by summing pp and zz.

In particular the first five number underlined in the example are indicating a temperature of 19.0 °C at a depth of 5 m. The second underlined numbers are indicating a temperature of 13.6°C at 120 m.

In the particular case of the MFSP project, the number of selected significant points is 15.

- Simple format

```
088
LFPW 171836
BEGIN
21527,TEST27B,19991017183600,15
38.6609, 8.5884,19991017183715,00
SEATEMP ,WT_T , 0.0, 22.400000,000011
T1 ,WT_T , -4.0, 22.100000,000011
T2 ,WT_T , -18.0, 22.000000,000011
T3 ,WT_T , -26.0, 21.799999,000011
T4 ,WT_T , -30.0, 21.000000,000011
T5 ,WT_T , -34.0, 20.000000,000011
T6 ,WT_T , -39.0, 18.299999,000011
T7 ,WT_T , -40.0, 18.000000,000011
T8 ,WT_T , -47.0, 16.700001,000011
T9 ,WT_T , -55.0, 15.600000,000011
T10 ,WT_T , -67.0, 15.100000,000011
T11 ,WT_T , -72.0, 14.700001,000011
T12 ,WT_T , -93.0, 14.100000,000011
T13 ,WT_T , -118.0, 13.800000,000011
T14 ,WT_T , -163.0, 13.700000,000011
END
```

The line after BEGIN gives the number of the transmitter, the name of the project, year, month, day, hour and minutes. The line below gives the position and again the date, the temperature at 15 points is given.

6. Format of the WPI Web

For data dissemination to MFS community and external users in general, another format has been defined. The near real-time ASCII files are identified by the year, month and day in the following way:

19991106A.DAT

where:

1999 stands for the year

11 for the month

06 for the day

A for data collected from 00.00 to 12.00

(B for data collected from 12.00 to 24.00)

The content of the files is the following:

MFS040008A0210 28 08 20000704 12.1555 40.0988 IBEX MFSP40
5. 26.8 15. 26.7 20. 26.4 26. 25.1 29. 24.4 32. 23.6 41. 20.2 51. 18.0
60. 16.6 73. 15.3 79. 15.0 101. 14.1 121. 13.9 211. 14.0 251. 13.8

where:

MFS indicates the program

060 indicates the institution responsible for data collection (in this case NCMR)

0 stands for the year (2000)

04 stands for the month

A for data collected from 00.00 to 12.00

(B for data collected from 12.00 to 24.00)

0233 indicates the station number

Then there is the day (19), the month (04) and year (2000), followed by the time (h02.30) and geographical position (in degrees).

C6T2 is the ship call sign

MFSP60 is

The partners participating to the data collection are 7 and are identified in this way

010 SAHFOS

020 CSIC CEAB

030 CNRS LOB COM

040 CNR IOF

050 OGS

060 NCMR

070 FD LPO

These identification numbers are changed in the files in an appropriate way.

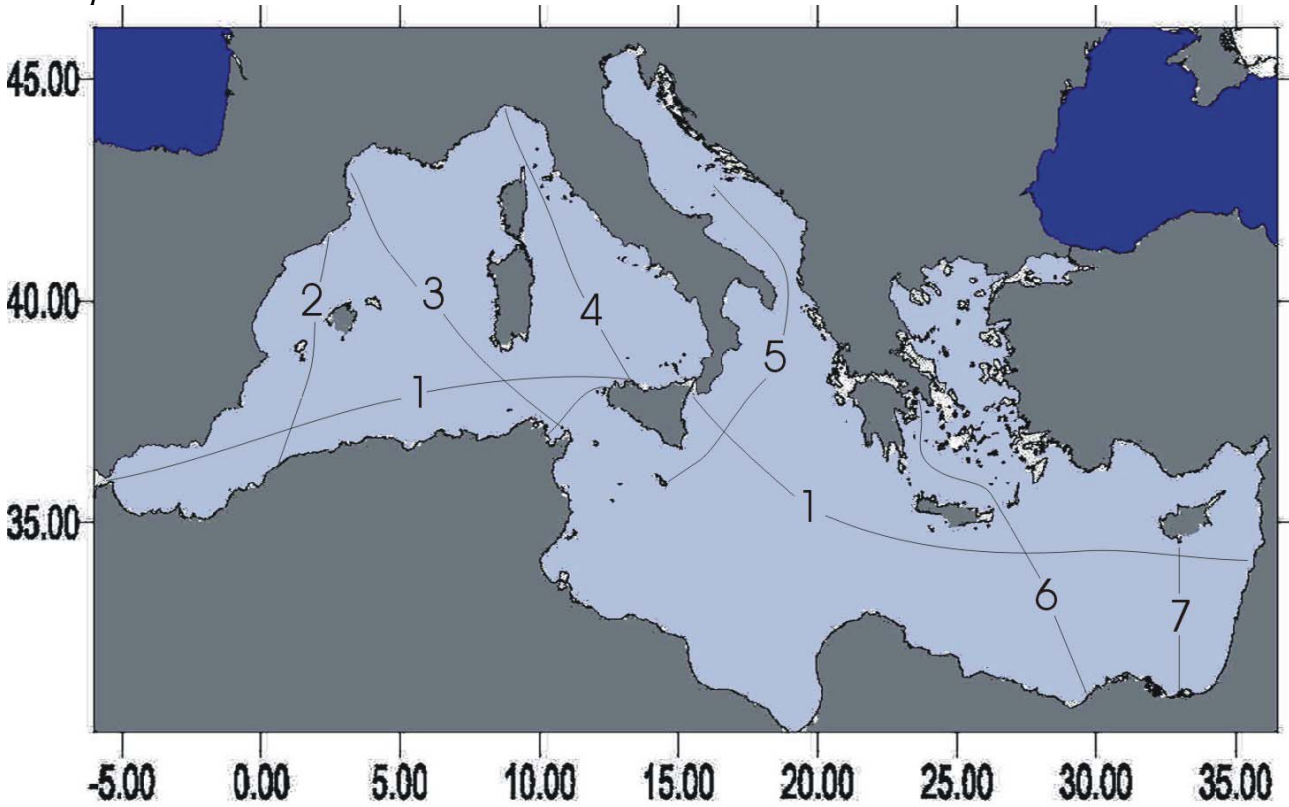
7. Format of the full resolution data

The data files are organised by cruises. The profiles are organised in the Medatlas, which is presented in appendix 3, downloaded from the Sismar web site.

The scheme of the XBT data flow has been presented in the VOS-MFSP User Guide n. 1. During the 1st VOS MFSP meeting in S. Teresa (February 1999) 9 tracks were defined. During the 1st Data Management meeting in Rome (March 1999) it was decided to name each XBT track as follows: MFSPxxx, where xxx represents the number of the track.

Ex: MFSP030 for the line Sète (France) – Tunis (Tunisia).

8. Ship lines



The final design of the MFSP - VOS programme is schematically shown in the figure above. More in particular these are the starting and end ports of the various tracks:

| Institution | Ship name | Track number | Initial and last port |
|--------------|-------------------|--------------|------------------------|
| SAHFOS | City of Dublin | 1.1 | Palermo - Gibraltar |
| SAHFOS | City of Dublin | 1.2 | Haifa - Messina |
| CSIC CEAB | Isabella | 2.1 | Barcelona - Mostaganem |
| CSIC CEAB | Isabella | 2.2 | Barcelona - Skikda |
| CNRS LOB COM | Cap Canaille | 3.1 | Sete - S. Antioco |
| CNRS LOB COM | Cap Canaille | 3.2 | Tunis - S. Antioco |
| CNR IOF | Excelsior | 4.0 | Genova - Palermo |
| OGS | Lipa | 5.0 | Ploze - Malta |
| NCMR | Mariska | 6.0 | Pyreus - Alexandria |
| FD LPO | Princesa Victoria | 7.0 | Limassol - P. Said |

The time schedule of the monitoring system is the following:

1. training period (September - November): once a month;
2. pre-top period (December - February): twice a month (dates to be decided during the first MFSP annual meeting)

3. top period (March - May): twice a month.

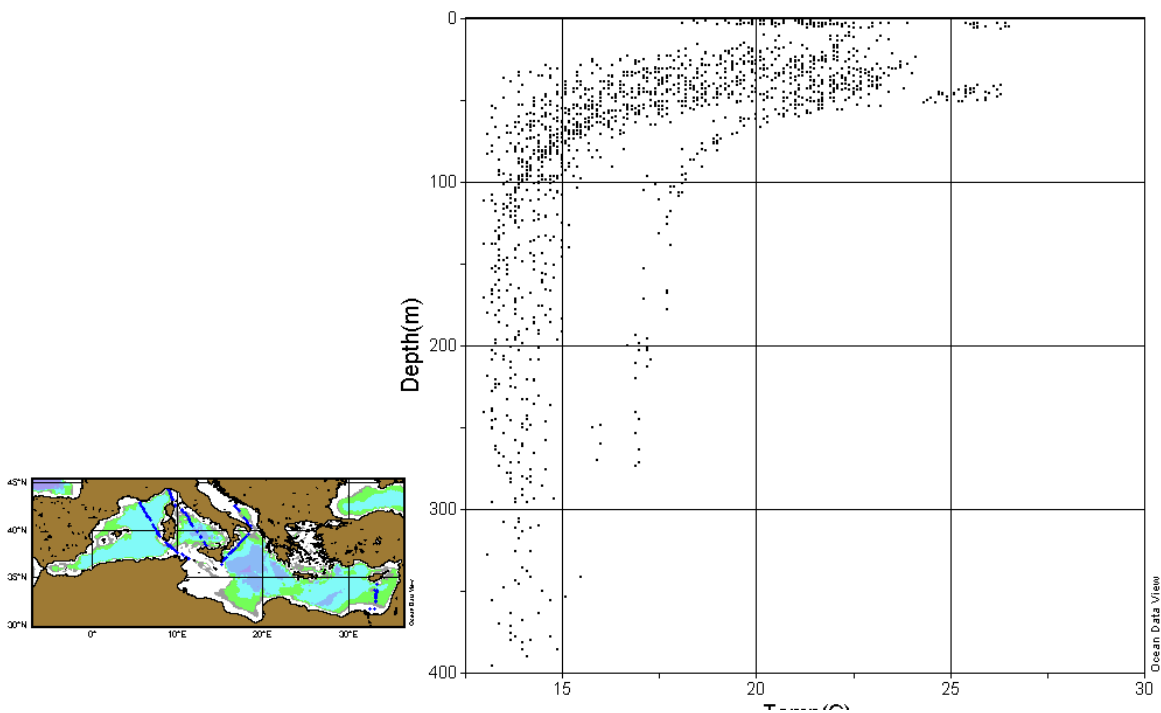
The long route managed by SAHFOS (Haifa-Messina and Palermo-Gibraltar) will be done once a month for the entire project period.

The lines 2.1 and 2.2 are two alternative tracks. Data are collected on the base of ship availability on one track or the other.

8. Data distribution

A web page has been prepared in order to give the basic information on the work package 1. It allow to download the data in a user-friendly way.

The web allow also to download a software for the graphical representation of the data (geographic coverage, vertical section, scatters, etc.).



Appendix 1
Code Lists

Mediterranean data centres codes

| | |
|----------------|----|
| Belgium GHER | BG |
| Denmark ICES | DI |
| France IFREMER | FI |
| France SHOM | FS |
| Greece NCMR | GN |
| Italy OGS | IO |
| Italy ENEA | IE |
| Italy IRPEM | II |
| Spain UIB | SB |
| Spain IEO | SI |

Appendix 2
IOC Country Codes

CY Cyprus
35 France
36 Greece
48 Italy
29 Spain
74 United Kingdom
99 Unknown/Unspecified

Appendix 3. The MEDATLAS Format (from the Sismar web site).

MEDATLAS FORMAT

- [Objectives and General Description](#)
- [Cruise summary format](#)
- [Profile header format](#)
- [Profile format](#)
- Description of the [main fields](#)
- [Identifiers and codes](#)

OBJECTIVES

Vertical profiles of temperature and salinity nutrients, are basic core parameters which have been widely exchanged since the beginning of oceanography. A common format is necessary to exchange data originating from dispersed sources, to merge them in an integrated data set, and to be able to use any processing software. It is important, to insure the data quality and to avoid the duplicates, not only to archive the data points, but also to keep information (meta-data) about the source and the processing of the data : cruise, laboratory, parameter accuracy, methodology, time and location etc.. According to the ICES/IOC GETADE recommendations (see references), a good exchange format must fulfil the following requirements :

- 1) To facilitate the reading of the data, (and not to optimise the data archiving on the magnetic medium, neither to speed up the data processings).
 - 2) To be independent of the computer.
- The consequence of these two points is that an auto-descriptive ASCII format will be preferred.
- 3) To keep track of the history of the data including the data collection and the processing. Then each cruise must be documented.
 - 4) To allow the processing of profile independently. Therefore the date, time and geographical co-ordinate must be reported on each profile header.
 - 5) To be flexible and accept (almost) any number of different parameters.
 - 6) The real numbers (floating numbers must remain in the same way as they have been transmitted, not transcoded into integer numbers). The number of decimals must implicitly indicate the accuracy of the measurements.

These requirements have been taken into account in the MEDATLAS exchange format which has been designed by the MEDATLAS and MODB consortia, in the frame of the European MAST II programme. The profiles measured with the same instrument (eg. bottles, CTD, XBT..) during the same cruise, are grouped within the same file which includes :

- a cruise header based on the international ROSCOP information;
- a profile (station) header including the cruise reference, the originator station reference within the cruise and the time and location .
- the data points of the profile.

The sequence 'profile header + data records ' is repeated for each profile. The main fields are described further on.

CRUISE SUMMARY FORMAT

BP = Beginning Position, SL = string length, NDT= Number of data types (ROSCOP)
 NCO = Number of comment lines (textual information on the cruise)

| LINE | FIELD | DESCRIPTION | BP | SL | TYPE |
|------|-------|-------------|----|----|------|
|------|-------|-------------|----|----|------|

| | | | | | |
|-----------|-----------------|---------------------------------|----|----|------|
| 1 | 1st character * | | 1 | 1 | char |
| | cruise | MEDATLAS reference | 2 | 13 | char |
| | name | originator cruise name/ref. | 16 | 32 | char |
| | ship code | standardised WDCA/ICES/IOC code | 49 | 4 | char |
| | ship name | full ship name | 54 | 25 | char |
| 2 | start date | DD/MM/YYYY | 1 | 10 | char |
| | end date | DD/MM/YYYY | 12 | 10 | char |
| | region | GF3 table | 23 | 35 | char |
| 3 | country | Source laboratory country code | 1 | 2 | char |
| | address | Laboratory, institution, town | 4 | 75 | char |
| 4 | name | chief scientist full name | 1 | 40 | char |
| | key word | 'Project=' | 42 | 8 | char |
| | project | name of the project | 50 | 28 | char |
| 5 | key | 'Regional Archiving=' | 1 | 19 | char |
| | data centre | regional archiving centre code | 21 | 2 | char |
| | key word | 'Availability=' | 42 | 13 | char |
| | availability | Data Availability code (P/L/C) | 55 | 1 | char |
| 5+1 | key word | 'Data Type=' | 1 | 10 | char |
| | data type | ROSCOP code | 11 | 3 | char |
| TO | key word | 'n=' | 15 | 2 | char |
| | number | number of profiles for the type | 17 | 4 | num |
| 5+NDT | key word | 'QC=' | 22 | 3 | char |
| | QC | Y/N (Yes or No) | 25 | 1 | char |
| 6+NDT | key word | 'COMMENT' | 1 | 7 | char |
| | | | | | |
| 5+NDT+NCO | key word | any other cruise information | 1 | 80 | char |

EXAMPLE

```
*FI35199406006 SUIVILION 09                35EU EUROPE
26/06/1994 05/07/1994 MED. WESTERN BASIN
35 CNRS, Universites de Perpignan, Paris VI et Aix-Marseille II
DURRIEU de MADRON Xavier                    Project=Prog National Oceano Cotiere
Regional Archiving= FI                      Availability=P
Data Type=H10 n= 45 QC=Y
Data Type=H17 n= 45 QC=N
COMMENT
CTD casts were completed using the SEABIRD 9/11 plus CTD probe of the
Observatoire Oceanologique de Banyuls. The CTD data were recorded into 24 HZ
time-series during data acquisition.
The Pressure, temperature and conductivity channels were calibrated in
laboratory. Light transmission was measured with a 25 cm optical pathlength
Seatech transmissiometer.
No calibration in situ.
```

PROFILE HEADER FORMAT

NP = number of observed parameters incl. the reference (pressure); BP = Beginning Position
NCO = number of comment lines in the header; SL = string length

| LINE | FIELD | DESCRIPTION | BP | SL | TYPE |
|-----------------|-------------------------|---|----|----------|------|
| 1 | start character | * | 1 | 1 | char |
| | reference | MEDATLAS ref. (cruise+station+cast) | 2 | 18 | char |
| | key word | 'Data Type=' | 21 | 10 | char |
| | data type | ROSCOP code | 31 | 3 | char |
| 2 | date | '*DATE=', DDMMYYYY | 1 | 14 | char |
| | time | 'TIME=', HHMM | 16 | 9 | char |
| | latitude N/S | 'LAT=', N or S | 26 | 5 | char |
| | lat. degrees | latitude degrees (0 to 90) | 31 | 2 | char |
| | lat. minutes | latitude minutes.hundredth | 34 | 5 | char |
| | longitude E/W | 'LON=', E or W | 40 | 5 | char |
| | long. degrees | longitude degrees (0 to 180) | 45 | 3 | char |
| | long. minutes | minutes.hundredth | 49 | 5 | char |
| | key word | 'DEPTH=' | 55 | 6 | char |
| | bottom depth | bottom depth in metres | 61 | 6 | num |
| | key word | 'QC=' | 68 | 3 | char |
| | time flag | QC flag on date and time | 71 | 1 | num |
| | lat. flag | QC flag on latitude | 72 | 1 | num |
| long. flag | QC flag on longitude | 73 | 1 | num | |
| depth flag | QC flag on bottom depth | 74 | 1 | num | |
| 3 | key word | *NB PARAMETERS= ' | 1 | 15 | char |
| | nb. of columns | number of measured parameters (NP) | 16 | 2 | num |
| | key word | 'RECORD LINES=' | 19 | 13 | char |
| | number of lines | number of observations records (NL) | 32 | 5 | num |
| 4 | 1st character | * | 1 | 1 | char |
| | title column p | GF3 code for parameter p | 2 | 4 | char |
| TO | parameter p | parameter full name (IOC def.) | 7 | 30 | char |
| | unit p | ('IS/IOC unit') | 37 | 30 | char |
| 3+NP | key word | 'def.=' | 68 | 5 | char |
| | default val. | string of '9'.string of '9' same format as the parameter p | 73 | nlen(np) | num |
| 4+NP | key word | '*GLOBAL PROFILE QUALITY FLAG=' | 1 | 29 | char |
| | profile QC | global quality flag for the profile | 30 | 1 | num |
| | key word | 'GLOBAL PARAMETERS QC FLAGS=' | 32 | 27 | char |
| | profile QC | global quality flags for the NP parameters | 50 | NP | num |
| 5+NP | collect hist.1 | '*DC HISTORY='method, instrum. etc | 1 | 80 | char |
| 6+NP | collect hist.2 | '*', continuation | 1 | 80 | char |
| 7+NP | archv. hist.1 | '*DM HISTORY', data mangt. history | 1 | 80 | char |
| 8+NP | archv. hist.2 | '*', end of data management | 1 | 80 | char |
| 9+NP | comment 1 | '*COMMENT ', free comment | 1 | 80 | char |
| | TO comments n | '*', end of comments | 1 | 80 | char |
| 8+NP+NCO | | | | | |

```

9+NP+NCO  surface obs. 1  '*SURFACE SAMPLES=', samples 1      80      char
10+NP+NCO surface obs. 2  '*', end of surface samples 1      80      char
  
```

EXAMPLE

```

*FI351994060060B020 Data Type=H10
*DATE=30061994 TIME=0900 LAT=N42 34.00 LON=E003 17.00 DEPTH=88      QC=1111
*NB PARAMETERS=04 RECORD LINES=00090
*PRES SEA PRESSURE sea surface=0      (DECIBAR=10000 PASCALS)      def.= -999.9
*TEMP SEA TEMPERATURE      (CELSIUS DEGREE)      def.= 99.999
*PSAL PRACTICAL SALINITY      (P.S.U.)      def.= 99.999
*TUR2 TURBIDITY-attenuation coeff      (m-1)      def.= 99.999
*GLOBAL PROFILE QUALITY FLAG=1 GLOBAL PARAMETERS QC FLAGS=1110
*DC HISTORY=
*
*DM HISTORY
*
*COMMENT
* Depth Above Bottom      :      0.000000
*SURFACE SAMPLES=
*
  
```

Each parameter p can have any length nlen(p), but this length must be constant in the profile, and the decimal points at a constant position. The separators are blanks of one character (or more), after each parameter value. The quality flags are grouped after the last separator, with no blank between them.

The position of the first character of parameter p in the record line is then :

$$bp(p) = nlen(1) + \dots + nlen(p-1) + p$$

and the position of the first quality flag :

$$bp(q1) = bp(NP) + nlen(NP) + 1$$

nlen(p) = number of digits of parameter p; NP = number of measured parameters (columns)

NL = number of observations records (lines)

hheader = NP+NCO +11 = total number of header lines; NCO = number of comment lines

BP = Beginning Position, SL = string length

| LINE | FIELD | DESCRIPTION | BP | SL | TYPE |
|----------------|-----------------|--------------------------|-----------|-------------|------|
| nheader | start character | * | 1 | 1 | char |
| | title 1 | 'PRES' or ref. parameter | 2 | 4 | char |
| | separator | blank | 6 | nlen(1)-4 | |
| blank | | | | | |
| | title 2 | GF3 code parameter 2 | bp(2) | 4 | char |
| | separator | blank | bp(p-1)+4 | nlen(p-1)-3 | |
| | title par. P | GF3 code parameter p | bp(p) | 4 | char |
| | title NP | GF3 code parameter NP | bp(np) | 4 | char |
| nheader | parameter 1 | parameter 1 in IS units | 1 | nlen(1) | num |
| +1 | separator | blank | bp(2)-1 | 1 | |
| to | parameter 2 | parameter 2 in IS units | bp(2) | nlen(2) | num |
| +NL | separator | blank | bp(np)-1 | 1 | |
| | | | | | |
| | parameter NP | parameter NP in IS units | bp(np) | nlen(np) | num |

| | | | | | | |
|-----------------|------------------|-----------------------------|---|-----------|----------|-----|
| | separator | blank | | bp(q1)-1 | 1 | |
| | QC Flag 1 | Quality Flag parameter 1 | | bp(q1) | 1 | num |
| | | | | | | |
| | QC Flag NP | Quality Flag parameter NP | | bp(q1)+np | 1 | num |
| nheader | def. val. par.1 | '-999.9' or string of '9' | 1 | | nlen(1) | num |
| +NL+1 | separator | blank | | bp(2)-1 | 1 | |
| (Last | def. val. par.2 | string of '9'as in header | | bp(2) | nlen(2) | num |
| line | | | | | | |
| of the | def. val. par.NP | string of '9'as in header | | bp(NP) | nlen(NP) | num |
| profile) | separator | blank | | bp(q1)-1 | 1 | |
| | QC Flag 1 | '9' (Def. val.Quality Flag) | | bp(q1) | 1 | num |
| | | | | | | |
| | QC Flag NP | '9' (Def. val.Quality Flag) | | bp(q1)+np | 1 | num |

EXAMPLE

```
*PRES TEMP    PSAL    TUR2
  0.0 19.441 37.596  0.525 1110
  1.0 19.441 37.596  0.525 1110
  2.0 19.441 37.596  0.525 1110
  3.0 19.306 37.595  0.526 1110
  4.0 19.234 37.592  0.530 1110
  5.0 19.208 37.591  0.532 1110
  6.0 19.188 37.591  0.531 1110
  7.0 19.169 37.593  0.530 1110
  8.0 19.067 37.599  0.525 1110
  9.0 18.848 37.610  0.525 1110
 10.0 18.621 37.603  0.530 1110
 11.0 18.501 37.595  0.537 1110
.....
.....
-999.9 99.999 99.999 99.999 9999
```

DESCRIPTION OF THE MAIN FIELDS

Files

All the profiles measured with the same instrument (eg. bottles, CTD, XBT..) is grouped within the same file. The data file begins with a short cruise descriptor based on the ROSCOP information forms. The profiles are attached behind an each of them begins with a profile header giving all the necessary environmental information on the observations. Each observed parameter represent a separate column. There is no limitation to the number of parameters (columns) but the number of parameters within the same cruise must be constant. If a parameter is missing in one station, the corresponding column must be fulfilled by default values.

Records

The records consists in data collected at the same level. The record (line) length is not limited for observed data but reasonable (<120) number of characters in the lines is recommended.

Missing data

For missing data, the default characters are :

- in character strings : 'X' as many times as the missing string length or 'UNKNOWN'
- in numbers : 9 or -9 at the same format as the expected numbers.

Latitude and Longitude

In order to avoid ambiguity, N/S and E/W will be specified for latitude and longitude instead of signs.

Pressure/depth vertical reference parameter

- Pressure is the reference co-ordinate (first column) for the vertical profiles.
- When the pressure is not explicitly defined (mainly the oldest historical data sets), the vertical co-ordinate is supposed to be pressure in decibars (which makes no significant differences on historical data).
- The first column parameter which is the reference (the pressure for vertical profiles) must be recorded in increasing order.

Temperature and Salinity and other parameters

- Temperature, salinity and any archived parameters are observed parameters. The calculated parameters like density or potential temperature are not archived.
- Other measured parameters like nutrients are archived with the GF3 parameter code as the column title. The parameter code is related to the same unit, normally the International System (IS). A different unit corresponds to a different parameter code.

History and information on the data processing

In order to maintain some flexibility with the format and not to lose existing complementary information on the data processing, meteorological observations etc. not taken into account in the format, three specific fields terminate each header profile :

- *DC HISTORY for the information linked to the data collection at sea (like instrument, calibration)
- *DM HISTORY for the information linked to the data management and archiving (like the source latitude if the sign has been changed)
- *COMMENT for all optional data and meta data like time and location at the end of the profile, meteorological observations. Avoid to repeat character strings already used (ex use LATEND= and not LAT=). The number of *COMMENT lines is not limited.

REFERENCES

-
- ICES/IOC 1995. GETADE Formatting Guidelines for Oceanographic Data Exchange (Preliminary report)
 - UNESCO 1989. A General Formatting System for Geo-reference Data. IOC. Manuals and Guides N0. 17
 - UNESCO 1991. Manual on International Oceanographic Data Exchange. Manuals and Guides N0. 9

Appendix 4. Fortran code for XBT Q.C. and transformation into Medatlas

```

PROGRAM ATLAS
C PROGRAM FOR xbt DATA EXCHANGE IN THE MEDITERRANEAN FORECASTING SYSTEM
C CHANGES XBT DATA FROM 'SIPPICAN' FORMAT TO MEDATLAS EXCHANGE FORMAT
C -----
C THE TOTAL FILE IS COMPOSE BY:
C CRUISE SUMMARY
C FULL RESOLUTION PROFILE
C -----
C QUALITY CHECK IS PERFORMED FOLLOWING THE MEDATLAS PROTOCOLS
C (OVERALL QC, INCREASING DEPTH, TEMPERATURE RANGE)
C -----
C NZ      NUMBER OF MEDITERRANEAN DIVISION SUB-BASINS
C NUMPAR  NUMBER OF PARAMETERS (DEPTH INCLUDED) NVAR=NUMPAR-1
C P(1,K)  VECTOR CONTAINING THE PROFILE DEPTH
C P(IV,K)                OTHER MARINE PARAMETERS
C T(IV,NZ) PARAMETERS' RANGES IN EACH SUB-BASIN
C IQP(IV), IQT QUALITY FLAGS FOR DEPTH AND TEMPERATURE
C
C CHECK IN THE OUTPUT FORMAT THE NUMBER OF VARIABLES TO BE WRITTEN
C
PARAMETER (NZ=29)
PARAMETER (NUMPAR=2)
PARAMETER (NVAR=1)
PARAMETER (NTZ=1500)
DIMENSION P (NUMPAR,NTZ) , IQP (NUMPAR,NTZ)
DIMENSION TMAX (NVAR,NZ) , TMIN (NVAR,NZ)
DIMENSION RLO1 (NZ) , RLO2 (NZ) , RLA1 (NZ) , RLA2 (NZ)
DIMENSION IFLAS (NUMPAR)
C -----
CHARACTER*12 INFILE
CHARACTER*5 ENEA
C
C PARTICULAR CASE FOR mfsp -----|
C                                     |
C                                     V
CHARACTER*6 IDEPTH
IDEPTH='  '
C -----
P(1,1500)=-999.9
P(2,1500)=99.999
DO K=1,NUMPAR
  IQP(K,1500)=9
ENDDO
ENEAS=' *IE48 '
C -----
C PARAMETER LIMITS BY REGION
C
OPEN(20,FILE='C:\MFS\CLIM.DAT',STATUS='OLD',READONLY)
C -----
C INPUT FORMAT WITH NUMPAR=2
DO NNZ=1,NZ
  READ(20,22) RLO1(NNZ),RLO2(NNZ),RLA1(NNZ),RLA2(NNZ),
&TMAX(1,NNZ),TMIN(1,NNZ)
22  FORMAT(2X,4(1X,F5.2),3X,(1X,F4.1,1X,f4.1))
ENDDO

```

```

C-----
C START THE FILES READING
C
      OPEN(50,file='OUTA.DAT',status='unknown')
      WRITE(*,*) ' NUMBER OF PROFILES TO BE INCLUDED'
      READ(*,*) NPF
C
C LOOP ON THE FILES
C
      DO 1000 IMAN=1,NPF
C
      WRITE(*,*) 'INPUT FILE'
      READ(*,*) INFILE
      OPEN(10,defaultfile='c:\mfs\xbtda',file=INFILE,status='old',readonly)
C-----
C DEFINE THE DATA COLLECTING CENTERS
C FOR MFSP USE (CHANGE WHERE APPROPRIATE) -----
C
      IF(IMAN.GT.1) GO TO 1001
      WRITE(*,*) ' INSTITUTE CODE'
      WRITE(*,*) '          1 = SAHFOS          011, 012'
      WRITE(*,*) '          2 = CSIC-CEAB          020'
      WRITE(*,*) '          3 = LOB-COM           030'
      WRITE(*,*) '          4 = CNR-IOF           040'
      WRITE(*,*) '          5 = OGS              051, 052'
      WRITE(*,*) '          6 = NCMR             060'
      WRITE(*,*) '          7 = FD-LPO           070'
      READ(*,*) ISTD
      WRITE(*,*) ' TRANSECT NUMBER DEFINITION (3 DIGITS)'
      READ(*,*) NT
C
C
60  FORMAT(A5,'0MFSP',I3.3,
X' MEDITERRAEAN FORECASTING SYSTEM')
C
611 FORMAT('01/09/1999 31/05/1999 MEDITERRANEAN SEA')
C
61  FORMAT('74 SAHFOS, Plymouth, England',/
*'WALNE Anthony                      Project= MFSP')
C
62  FORMAT('29 CSIC, Centro de Estudios Avanzados de Blanes ',/
*'CRUZADO Antonio                      Project= MFSP')
C
63  FORMAT('35 CNRS LOB COM, Antenne de Toulon ',/
*'MILLOT Claude                        Project= MFSP')
C
64  FORMAT('48 CNR, Istituto Oceanografia Fisica, Italy',/
*'GASPARINI Gianpietro                 Project= MFSP')
C
65  FORMAT('48 OGS, Dipartimento di Oceanografia, Italy',/
*'GAGIC Miroslav                       Project= MFSP')
C
66  FORMAT('36 NCMR Oceanography Department, Greece',/
*'TZIAVOS Christos                    Project= MFSP')
C
67  FORMAT('CY FD Laboratory of Physical Oceanography',/
*'ZODIATIS George                      Project= MFSP')
C

```

```

671  FORMAT('Regional Archiving= IE                      Availability=L')
C
68   FORMAT('Data Type=H13 n=',I4,' QC=Y')
69   FORMAT('COMMENT')
691  FORMAT('DM=TEMP controlled with MODB release 4')
C
C END OF THE CRUISE SUMMARY DESCRIPTION
1001 CONTINUE
C
C READ XBT FILES -----
C
10   FORMAT(17X,I2,1X,I2,1X,I4)
      READ(10,*)
      READ(10,*)
      READ(10,10) IMONTH, IDAY, IEARS
C-----
C
C CRUISE SUMMARY REPORT FOR MFSP AND ENEA USE - VOS PROGRAMME
      IF(IMAN.GT.1) GO TO 1002
      WRITE(50,60) ENEA, IEARS, IMONTH, IDAY, NT
      WRITE(50,611)
C-----
      IF(ISTC.EQ.1) WRITE(50,61)
      IF(ISTC.EQ.2) WRITE(50,62)
      IF(ISTC.EQ.3) WRITE(50,63)
      IF(ISTC.EQ.4) WRITE(50,64)
      IF(ISTC.EQ.5) WRITE(50,65)
      IF(ISTC.EQ.6) WRITE(50,66)
      IF(ISTC.EQ.7) WRITE(50,67)
C-----
      WRITE(50,671)
C
      WRITE(50,68) NPF
      WRITE(50,69)
      WRITE(50,691)
C
1002 CONTINUE
      READ(10,10) IHOURS, MINUT, ISEC
      READ(10,*)
      READ(10,20) LATITU, RLAMIN
      READ(10,20) LONGIT, RLOMIN
C
20   FORMAT(17X,I2.2,1X,F5.2)
C
      DO L=1,23
      READ(10,*)
      ENDDO
      WRITE(*,*) ' END LABEL READING'
C-----
      NUMREC=0
C READ TEMPERATURE AND DEPTH DATA
C
      DO K=1,10000
      READ(10,*,END=999) (P(IV,K), IV=1, NUMPAR)
      ENDDO
999  CONTINUE
      NUMREC=K-1
      WRITE(*,*) NUMREC

```

```

C
C-----
C SET QUALITY CODES
C
      IQC1=9
      IQC2=9
      IQC3=9
      IQC4=9
      IFLAG=0
C-----
C CHECK DATE
C
      MONTH, IDAY, IEARS
C      IF ( (IDAY.GT.1.AND.IDAY.LT.31.AND.IMONTH.GT.9.AND.IMONTH.LT.12.
C      1.AND.IEARS.EQ.1999) .OR.
C      2 (IDAY.GT.1 .AND. IDAY.LT.31 .AND. IMONTH.GT.1 .AND. IMONTH.LT.5.
C      3 AND.IEARS.EQ.2000) ) IQC1=1
C
C CHECK POSITION
C
      RLAT=FLOAT(LATITU)+RLAMIN/60.
      RLONG=FLOAT(LONGIT)+RLOMIN/60.
      write(*,*) rlat,rlong
      IF(RLONG.GT.-6.0.AND.RLONG.LT.36.0 ) IQC3=1
      IF(RLAT.GT.30.0.AND.RLAT.LT.46.0 ) IQC2=1
C-----
C CHECK POSITION AND TEMPERATURE RANGE
C
      DO NNZ=1,NZ
      IF(RLAT.GE.RLA1(NNZ) .AND. RLAT.LE.RLA2(NNZ) .AND.
&RLONG.GE.RLO1(NNZ) .AND. RLONG.LE.RLO2(NNZ) ) GO TO 44
      ENDDO
44      IFLAZ=NNZ-1
C-----
C CHECK THE PARAMETER RANGE
C
C      0 NO QC
C      1 CORRECT
C      2 INCONSISTENT
C      3 DUBIOUS
C      4 FALSE
C      5 INTERPOLATED/MODIFIED
C
      DO K=1,NUMREC
      IF(K.GT.1) GO TO 889
      IF(P(1,1).LT.P(1,2)) IQP(1,1)=1
      GO TO 888
889      CONTINUE
      IF(P(1,K).GT.P(1,K-1)) IQP(1,K)=1
888      CONTINUE
      DO IV=2,NUMPAR
      IF(P(IV,K).GT.TMIN(IV-1,IFLAZ) .AND. P(IV,K).LE.TMAX(IV-1,IFLAZ))
X IQP(IV,K)=1
      IF(P(IV,K).LT.TMIN(IV-1,IFLAZ) .OR. P(IV,K).GT.TMAX(IV-1,IFLAZ))
X IQP(IV,K)=4
      DIFF=ABS(P(IV,K)-P(IV,K-1))
      IF(P(1,K).GT.200.AND.DIFF.GT.0.1) IQP(IV,K)=4
      ENDDO

```



```

      ENDDO
C
      NOKP=0
      NOKT=0
C
C CHECK THE GLOBAL PROFILE -----
C
      ITOTD=NUMREC*NUMPAR*0.8
      IQTP= NUMREC*0.8
      DO IV=1,NUMPAR
      DO K=1,NUMREC
      IF (IQP (IV,K) .EQ. 1) NOKP=NOKP+1
      IF (IQP (IV,K) .EQ. 1) NOKT=NOKT+1
      ENDDO
      IF (NOKP .GT. IQTP) IFLAS (IV)=1
      IF (NOKP .LT. IQTP) IFLAS (IV)=2
      ENDDO
      IF (NOKT .GT. ITOTD) IFLAG=1
      IF (NOKT .LT. ITOTD) IFLAG=2
C
C -----END OF QUALITY CONTROL-----
C
C -----WRITE MEDATLAS FORMAT-----
C
C PROFILE HEADER -----
C
      WRITE (50,100) ENEA,NT,IEARS,
      1IDAY,IMONTH,IEARS,IHOURS,MINUT,
      1LATITU,RLAMIN, LONGIT, RLOMIN, IDEPTH, IQC1, IQC2, IQC3,
      2IQC4, NUMPAR, NUMREC, IFLAG, IFLAS (1) , IFLAS (2)
C
100  FORMAT (A5, '0MFSP', I3.3, I4.4, '0', 1X, 'Data Type=H13', /,
1' *DATE=' I2.2, I2.2, I4.4, 1X, 'TIME=' , I2.2, I2.2, 'LAT=N' , I2.2, 1X, F5.2,
21X, 'LON=W' , I3.3, 1X, F5.2, 1X, 'DEPTH=' , A6, 1X, 'QC=' , 4 (I1) , /,
3' *NB PARAMETERS=' , I2.2, 1X, 'RECORDS LINES=' , I5.5, /,
4' *PRES SEA PRESSURE, SEA SURF=0          (DECIBAR) ' , /,
5' *TEMP SEA TEMPERATURE                    (CELSIUS DEGREE) ' , /,
6' *GLOBAL PROFILE QUALITY FLAG=' , I1, 1X, 'GLOBAL PARAMETERS QC FLAGS=
7' , 2 (I1) , /,
8' *DC HISTORY=XBT Sippican' , /,
9' *' , /,
9' *DM HISTORY' , /,
9' *' , /,
$' *COMMENT=' , /,
$' *' , /,
$' *SURFACE SAMPLES=' , /,
$' *' , /,
$' *PRES TEMP' )
C OUTPUT FORMAT WITH NUMPAR=2 -----
      DO K=1,NUMREC
      WRITE (50,300) (P (IV,K) , IV=1, NUMPAR) , (IQP (IV,K) , IV=1, NUMPAR)
300  FORMAT (F6.1, 1X, F7.3, 1X, 2 (I1.1))
      ENDDO
      WRITE (50,300) (P (IV,1500) , IV=1, NUMPAR) , (IQP (IV,1500) , IV=1, NUMPAR)
      CLOSE (10)
1000 CONTINUE
      STOP
      END

```

Appendix 5. The geographical, temperature and salinity limits for the Mediterranean sub-areas.

| n. | geographical limits | | | | temp. | | Sal. | | | |
|----|---------------------|-------|-------|-------|-------|------|------|------|-----|------------------|
| 1 | 4.50 | 9.30 | 39.30 | 42.00 | 30.0 | 12.0 | 39.0 | 36.0 | DF1 | Algerian N |
| 2 | 2.80 | 6.30 | 42.00 | 43.60 | 30.0 | 10.0 | 39.0 | 34.0 | DF2 | G. Lions |
| 3 | 6.30 | 9.40 | 42.00 | 44.50 | 30.0 | 10.0 | 39.0 | 36.0 | DF3 | Ligurian W |
| 4 | 9.40 | 10.80 | 42.80 | 44.30 | 30.0 | 12.0 | 39.0 | 33.0 | DF4 | Ligurian E |
| 5 | 22.50 | 27.30 | 35.25 | 41.20 | 30.0 | 12.0 | 40.0 | 34.0 | DH1 | Aegean |
| 6 | 22.50 | 27.30 | 31.00 | 35.25 | 30.0 | 12.0 | 40.0 | 36.0 | DH2 | Cretan Passage |
| 7 | 27.30 | 36.50 | 30.70 | 37.07 | 30.0 | 12.0 | 40.0 | 36.0 | DH3 | Levantine |
| 8 | 8.04 | 10.00 | 36.80 | 39.30 | 30.0 | 12.0 | 39.0 | 36.0 | DI1 | Sardinia Channel |
| 9 | 10.00 | 14.00 | 36.00 | 38.00 | 30.0 | 12.0 | 39.0 | 36.0 | DI3 | Sicily Strait |
| 10 | 12.02 | 15.80 | 41.80 | 45.90 | 30.0 | 5.0 | 39.0 | 19.0 | DJ1 | Adriatic N |
| 11 | 15.80 | 18.00 | 40.60 | 43.90 | 30.0 | 10.0 | 39.0 | 30.0 | DJ2 | Adriatic M |
| 12 | 18.00 | 19.80 | 40.00 | 42.80 | 30.0 | 12.0 | 39.0 | 36.0 | DJ3 | Adriatic S |
| 13 | 18.00 | 22.50 | 38.00 | 40.00 | 30.0 | 12.0 | 40.0 | 36.0 | DJ4 | Ionian NE |
| 14 | 10.00 | 22.50 | 30.10 | 36.00 | 30.0 | 12.0 | 40.0 | 36.0 | DJ5 | Ionian S |
| 15 | 16.13 | 18.00 | 38.00 | 40.60 | 30.0 | 12.0 | 39.0 | 36.0 | DJ6 | Ionian NW |
| 16 | 14.00 | 22.50 | 36.00 | 38.00 | 30.0 | 12.0 | 40.0 | 36.0 | DJ7 | Ionian M |
| 17 | -9.00 | -5.60 | 33.00 | 37.70 | 26.0 | 2.0 | 38.7 | 34.0 | DS1 | Gibraltar |
| 18 | -0.40 | 4.50 | 38.50 | 42.00 | 28.0 | 11.0 | 39.0 | 35.5 | DS2 | Balearic |
| 19 | -1.00 | 4.50 | 36.60 | 38.50 | 28.0 | 12.5 | 39.0 | 36.0 | DS3 | Algerian SW |
| 20 | 4.50 | 8.40 | 36.50 | 39.30 | 28.0 | 12.5 | 39.0 | 36.3 | DS4 | Algerian SE |
| 21 | -5.60 | -3.00 | 36.00 | 37.50 | 26.0 | 12.0 | 38.7 | 35.5 | DS5 | Alboran NW |
| 22 | -5.00 | -3.00 | 35.00 | 36.00 | 27.0 | 12.0 | 38.8 | 35.5 | DS6 | Alboran SW |
| 23 | -3.00 | -1.00 | 36.00 | 37.50 | 27.0 | 12.0 | 38.8 | 36.0 | DS7 | Alboran NE |
| 24 | -3.00 | -1.00 | 35.00 | 36.00 | 27.0 | 12.0 | 38.8 | 36.0 | DS8 | Alboran SE |
| 25 | 9.30 | 13.80 | 39.30 | 42.80 | 30.0 | 12.0 | 39.0 | 36.0 | DT1 | Tyrrhenian NW |
| 26 | 13.80 | 16.10 | 39.30 | 41.30 | 30.0 | 12.0 | 39.0 | 36.0 | DT2 | Tyrrhenian NE |
| 27 | 10.00 | 16.30 | 38.50 | 39.30 | 30.0 | 12.0 | 39.0 | 36.0 | DT3 | Tyrrhenian 3 |
| 28 | 10.00 | 15.00 | 38.00 | 38.50 | 30.0 | 12.0 | 39.0 | 36.0 | DT4 | Tyrrhenian 4 |
| 29 | 15.00 | 16.00 | 38.00 | 38.50 | 30.0 | 12.0 | 39.0 | 36.0 | DT5 | Messina |

```
// This is a MK12 EXPORT DATA FILE (EDF)
//
Date of Launch: 07/20/1997
Time of Launch: 11:56:46
Sequence # : 1
Latitude : 0 0.000N
Longitude :
Serial # : 0
//
// Here are the contents of the memo fields.
//
//
// Here is some probe information for this drop.
//
Probe Type : T-7
Terminal Depth : 760 m
Depth Coeff. 1 : 6.691
Depth Coeff. 2 : -0.00225
//
Raw Data Filename: C:\MFS\XBTDA\T7_PROV1.RDF
//
Display Units : Metric
//
// This XBT export file has not been noise reduced or averaged.
//
// Sound velocity derived with assumed salinity: 30.00 ppt
//
Depth (m) - Temperature (°C) - Sound Velocity (m/s)
0.7 27.67 1535.32
1.3 26.47 1532.57
2.0 26.01 1531.48
2.7 25.85 1531.11
3.3 25.77 1530.93
4.0 25.73 1530.84
4.7 25.69 1530.78
5.4 25.67 1530.74
6.0 25.65 1530.69
6.7 25.63 1530.66
7.4 25.62 1530.65
8.0 25.61 1530.62
8.7 25.61 1530.63
9.4 25.59 1530.61
10.0 25.59 1530.61
.....
752.0 13.77 1509.28
752.7 13.77 1509.28
753.3 13.77 1509.31
753.9 13.77 1509.31
754.5 13.77 1509.33
755.1 13.77 1509.33
755.7 13.77 1509.34
756.4 13.77 1509.35
757.0 13.77 1509.35
757.6 13.77 1509.37
758.2 13.77 1509.37
758.8 13.77 1509.39
759.4 13.77 1509.40
760.0 13.77 1509.41
```

Appendix

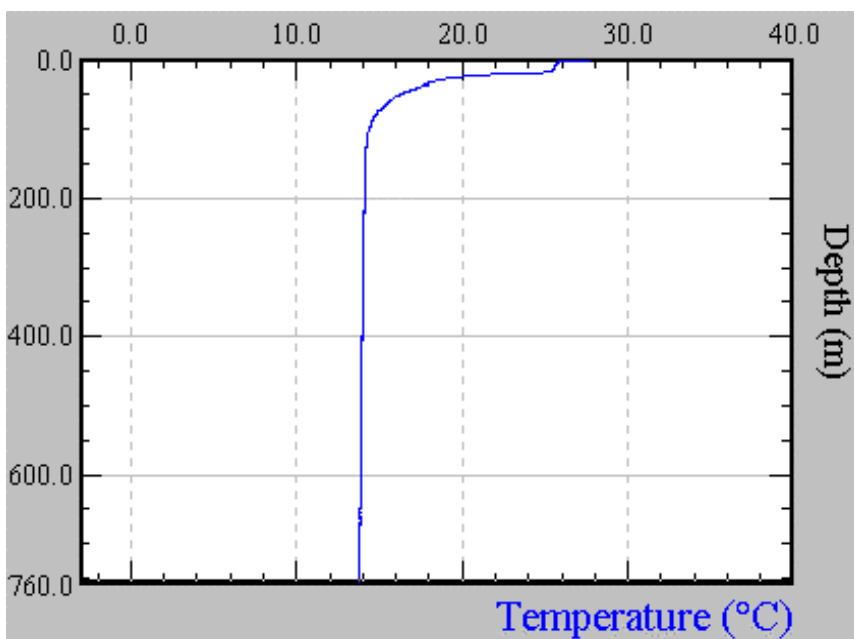
Definition of the Argos message

In order to increase the accuracy of the temperature and depth data, a new XBT message format has been defined. Also other information have been added, such as:

- the kind of probe used
- the version of the ARGOS transmitter
- checksum in order to verify the validity of the ARGOS message as it arrives in Toulouse (it is compared with that calculated on the message through the GTS chain treatment)

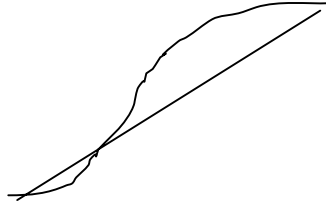
Selection of significant points in the profile

Since it is impossible to transmit a full resolution profile (having data every 60 cm) due to the fact that ARGOS transmit only 256 bits, a decimation software was originally developed by CLS and ORSTOM. The figure show an example of temperature profile obtained from a XBT probe.

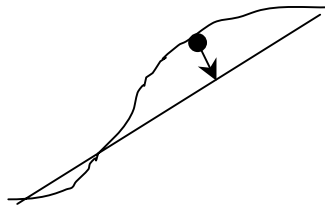


The determination of the significant points has been done with the method of the ‘cord’, on applying the following algorithm:

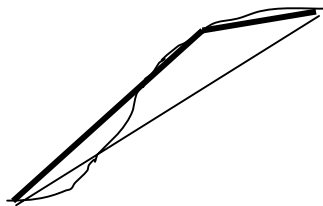
- two extreme points of the profile are chosen, the first and the last, and connected by a line.



The point having the maximum distance from the line is selected



Starting from this point other two lines are defined and again the same choice is done for another significant point



The algorithm is repeated until 15 significant points are selected, the first being the sea surface temperature.

Code of the significant points

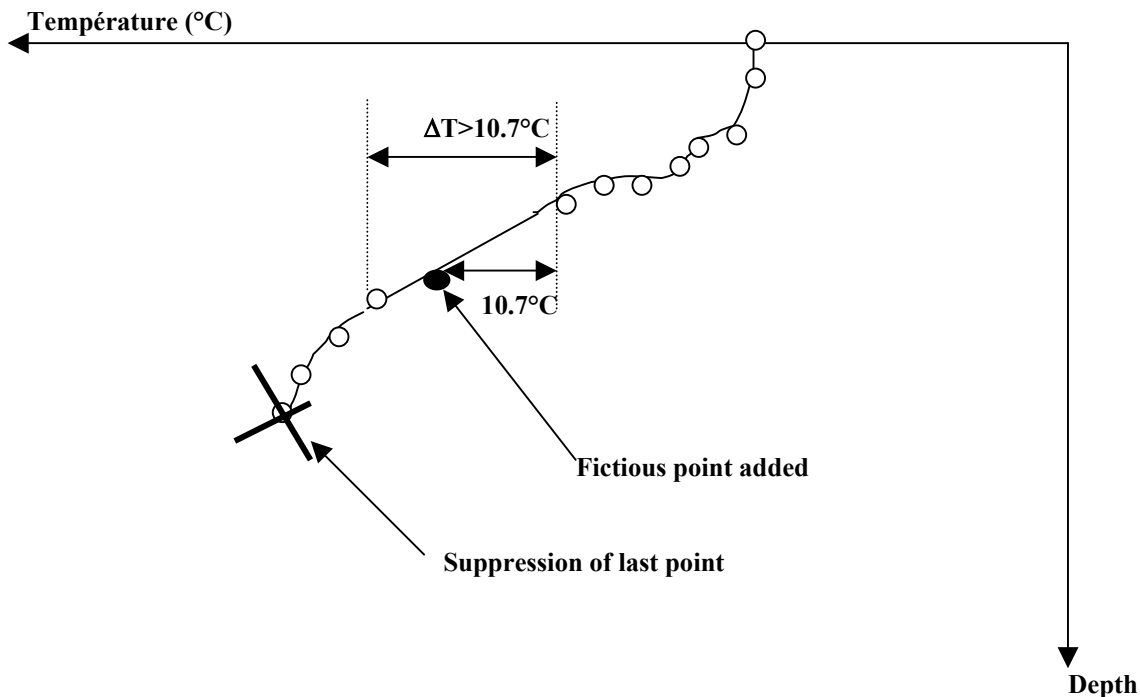
| | Unité | précision | Bits (nb) | max | Etendue mesure |
|-------------|--------|-----------|-----------|-----|----------------|
| Type | | | 4 | | |
| date | Minute | 2min48s | 8 | 255 | 0 → 714 |
| latitude | Minute | 4min42 | 6 | | |
| longitude | Minute | 4min42 | 6 | | |
| SST | °C | 0.1333 | 8 | 255 | -2 → + 34.1 |
| profondeur | Mètres | 2 | 8 | 255 | 2 → 514 |
| température | °C | 0.1333 | 8 | 255 | -2 → +34.1 |
| | | | | | |
| total | | | 256 | | |

In the new code for data transmission position and temperature, depth data are part of two different messages. The objective is to reach an higher accuracy in data transmitted.

The temperature data are not absolutes but relatives, that means that only the sea surface temperature is transmitted as an absolute value an the other as difference to the previous one.

$$\Delta T = \text{Temperature}(i - 1) - \text{Temperature}(i)$$

Normally $\Delta T > 0$ since the temperature decreases with depth up to the Levantine layer. Negative inversions can occur (warm currents). It is assumed that the range of temperature variation is comprised between -2 and 10.7 °C. This allow to encode the variation in tens of degree centigrade on 7 bits



- Point calculated with the 'cord' method
- Fictitious point

In the case the distance between two successive points having a difference of 10.7 °C is too big, a fictitious point is added in between, in order to maintain 15 significant points.

New format of XBT message

| Version XBT | Type sonde | Date | SST | Prof(i) | ΔTemp(i) | CRC |
|-------------|------------|---------|--------|---------|----------|--------|
| 1 bits | 2 bits | 10 bits | 9 bits | 9 bits | 7 bits | 10bits |

←————→
 14 couples (Prof(i), ΔTemp(i))

Version XBT : version of XBT transmission

Type sonde : probe type :

00 : probe T4

01 : probe T6

10 : probe T7

Date : Acquisition time over 24 hours. The precision is 2 min ($24 * 60 / 2 = 1440 < 1024 * 2 = 2048$)

SST : Sea surface temperature (-2°C $+49.2^{\circ}\text{C}$). Code over 9 bits and precision of 0.1°C

Prof(i) : Starts from the second point and is coded in absolute value up to 460 m.

$\Delta\text{Temp}(i)$: the temperature are defined as difference with respect to the previous value. The variations comprised between -2°C and $+10.7^{\circ}$ have an accuracy of 0.1°C

CRC (checksum) : is used to validate a message. The CRC coming from the transmitter is compared with the CRC obtained from GTS.

| | Unité | précision | Bits (nb) | max | Etendue mesurée |
|--|---------------|--|------------|------------|--------------------|
| Version XBT | | | 1 | | |
| Type sonde | | | 2 | | |
| Date | Minute | 2min | 10 | 719 | 0 → 1438 |
| SST | °C | 0.1 | 9 | 511 | -2 → + 49.2 |
| Prof(i) | Mètres | 1m (p<560m) 2m (p>560m) | 9 | 511 | 0 → 760 |
| $\Delta\text{temp}(i)$ | °C | 0.1°C | 7 | 127 | -2 → +10.7 |
| CRC | | | 10 | | |
| | | | | | |
| Total | | | 256 | | |