WP15

Assessment of temperature and salinity data obtained from in-situ platforms in the Mediterranean and Black Sea (historical data from 1990 to 2012)

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1. INTRODUCTION

MyOcean is the implementation project of the GMES Marine Core Service, aiming at deploying the first concerted and integrated pan-European capacity for Ocean Monitoring and Forecasting (http://www.myocean.eu.org). The project objective is to analyze, forecast and observe the oceans at global and regional (European Seas) scales in order to provide a monitoring service for marine environment and security.

The MyOcean Service aims to provide the best data available on the global ocean and regional seas related to temperature, salinity, currents, ice extent, sea level and biogeochemical properties. There are several fields of applications related to marine safety, marine resources, climate and seasonal forecasting as well as marine and coastal environment.

Within INS TAC (Technical Assembly Centres) WP15 historical data collection with the data providers in the regions will be organised and for the time period between 1990 and 2012. These data will be integrated into global and regional products for the identified WP18.4 users.
As part of Work Package (WP) 18, the scientific and technical validation of the historical data extracted from the in-situ TAC portal at a fix date is performed in order to assure an excellent quality of data. This scientific document describes the method developed at the Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS) in order to perform the quality assessment of the physical variables (temperature and salinity) in the Mediterranean and the Black Sea, collected with moorings, profiling floats, gliders, drifters and vessels. The procedure is similar to the one periodically applied in the Mediterranean Sea (Notarstefano et al., 2011) and follows the specifications contained in the Validation Plan (2010) and is also based on the validation procedure described in Von Schuckmann (2010).

2. METHODOLOGY

OGS is in charge of the DM validation of the historical physical variables (temperature and salinity) in the Mediterranean and Black Sea collected with in-situ platforms belonging to several European research institutes. In Figure 1 a schematic view of the entire process of the validation is shown. The NetCDF files stored in the Mediterranean and in the Black Sea servers at HCMR and IOBAS institutes respectively, are the input of the assessment procedure.

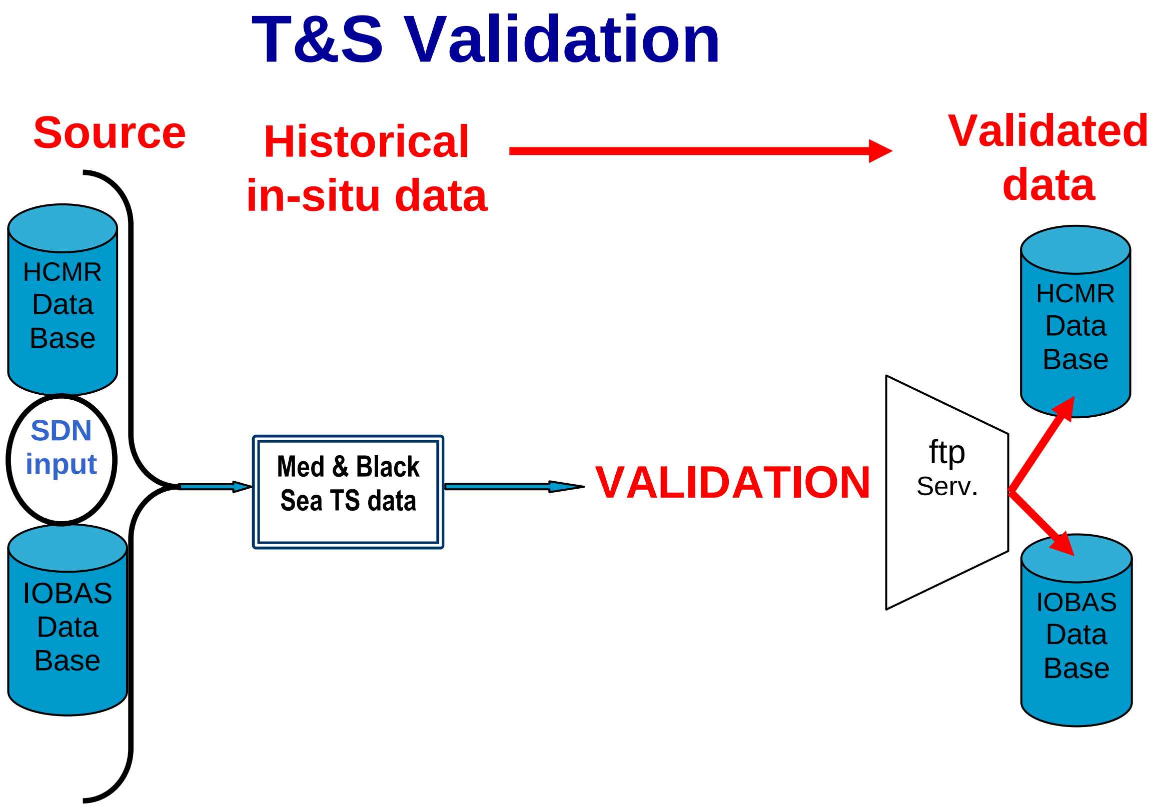

Figure 1. schematic view of the validation process.

The first step is to split the NetCDF files in monthly files. This is done because the historical files are organized in the sense "one file per platform" and hence too large to be managed by the validation procedure. Ad-hoc *matlab* scripts have been created to split the files in time and space; the global attributes for the time and space limits are modify accordingly. Hence, the number of NetCDF files generated from an original historical file corresponds to the number of months in which the platform recorded the data. Once the monthly files have been validated, they are grouped together (using other ad-hoc *matlab* scripts) to built again the original historical NetCDF file.

The method combines a comparison to a climatology and among the nearest platforms (cross-validation). After these checks the operator decides to change or not the quality flag associated to the data.

The target is to analyze the differences as a function of the spatial and temporal distances between the measurements: for this purpose, spatial and temporal windows have been set and the consistency check of the measurements is performed within these windows. The comparison is performed in a 2X2 degrees square, between -6° to 36° longitude East and 30° to 46° latitude North. The depth ranges and the vertical resolution adopted are presented in Table 1. The resolution decreases while increasing depth (like the thermohaline variability). The choice of these windows is a compromise: they have to be set large enough to contain a fair amount of reference data; on the contrary, the dimension has to take in account the correlation scales of temperature and salinity.

Depth ranges	Vertical resolution
0-100 m	10 m
100-800 m	25 m
800-2000 m	100 m
2000-4000 m	200 m

Table 1. Depth ranges (left) and the vertical resolution (right) adopted.

The comparison is therefore done in a portion (volume) of the water column and all the real time (RT) good data (hence data with the quality control (QC) flag equal to 1, 2, 5, 7, 8) pass through the validation procedure. In the framework of the WP 15, it was decided to perform the validation even if the QC for the pressure data is not done: the

DEPTH, DEPH and PRES values inferred by moorings and vessels and the PRES_ADJUSTED values with RT QC flags 0 are also accepted; moreover, the depth or pressure variables of surface platforms (except the surface moorings) with RT QC set to "fillvalue" are accepted and the default surface pressure value is in case set. The files without the depth or pressure variables are discarded.

The cross-validation technique allows to compare data provided by different platforms in a small time window (60 days → month to be validated ±30 days). In this way a reliable consistency check is performed. The limit of this technique could be the scarcity of data and hence the condition to be applied is to have at least 2 different platforms and at least 5 data points.

The MEDAR-MEDATLAS climatology is used to perform the comparison with the in-situ data whenever the cross-validation technique cannot be adopted due to scarcity of data. In this case, a larger time window (years → month to be validated minus several years) is adopted. The use of climatology has been introduced in order to check as many files as possible: the comparison with the Medar-Medatlas climatology to perform the validation is maybe not as reliable as the cross-validation method due to the high variability of the Mediterranean thermohaline properties and the scarcity of recent data. Hence, only major spikes and data inconsistencies are detected. But, this part of the validation procedure could be improved using the upcoming and more recent SeaDataNet climatology. The spatial and temporal distribution of the climatological profiles is presented in Figure 2 and 3.

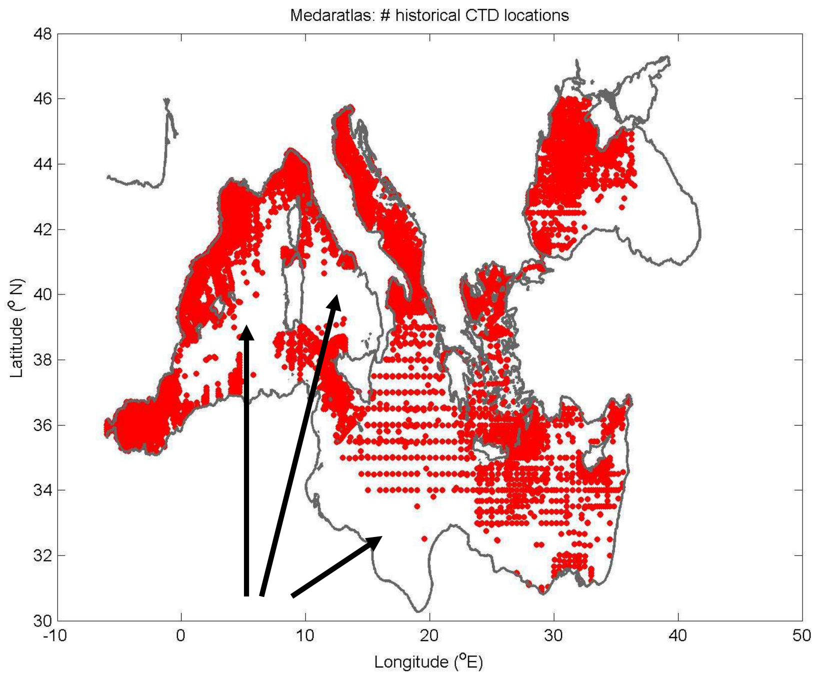

Figure 2. Spatial distribution of the climatological profiles. Black arrows indicate areas with scarcity of data.

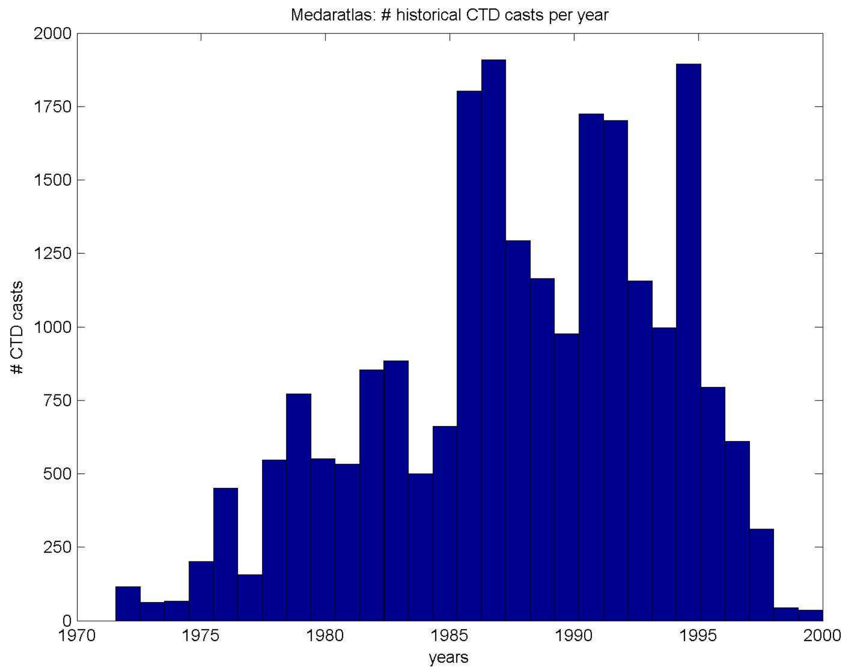

Figure 3. Temporal distribution of the climatological profiles.

The temporal data coverage exhibits two peaks in the years 1987 and 1995 with about 2000 CTD casts per year; the sampling is generally good within this period but before 1986 and after 1995 the number of CTD casts decreases drastically. The spatial coverage is quite good, but the southern Ionian, Tyrrhenian and Algerian seas have not been completely sampled. For this reason we prefer not to interpolate the data in these areas but to use the nearest data of the nearest 2X2 boxes to do the comparison.

The reference data and the data to be assessed are searched into a specific geographical area, time window and water volume. The mean value and standard deviation are computed in each water column portion. Anomalous values are those which are out of the predefined statistical thresholds listed in Table 2.

Depth interval	Range
Surface – 400 meters	5 x standard deviation
400 – 800 meters	4 x standard deviation
800 meters - bottom	3 x standard deviation

Table 2. Depth intervals (left) and respective accepted ranges (right).

The final output of the validation procedure is the production of delayed-mode (DM) validated files. Within the DM files, the QC flags are, in case, changed; the data mode is changed to “D”; the data mode attribute is changed to “M” or “D”; the global attribute data mode is changed to “M” or “D”. The "comment" field of the global attribute is properly filled with the information about the validation and also the "date_update" field is updated. Finally, other ad-hoc matlab functions are used to built again the original historical NetCDF files: the DM monthly files are grouped together and then the files are sent to the HCMR and IOBAS server.

3. SOFTWARE

A briefly description of the software that was developed for the validation purpose is useful to understand the architecture of the validation procedure. The first step consists in downloading (automatically and, in case, manually) the data from the HCMR and IOBAS servers: a *perl* script was written in order to make a copy of the remote files (via FTP protocol) on the local server. Ad-hoc scripts (written in *matlab*) are then run to split the NetCDF platform-life based files into monthly NetCDF files. A *matlab* script named “Validation” is the main function that lists the monthly files to be processed, sets some parameters and starts the validation procedure that calls about 50 *matlab* functions. The NetCDF files are red and only the parts of files that are really needed for the validation are extracted and used: files (or part of them) with bad QC flags and in general not useful for the validation purpose are rejected. The files to be assessed follow the procedure described in this technical report and specific functions are called to perform the “cross-validation” or the comparison to the climatology. The NetCDF files on the local server are then overwritten including the information about the validation that was performed. Several *ascii* files are produced to list the validation results, the reasons for rejecting the files and the anomalies encountered. Others ad-hoc *matlab* scripts are run to built again the original historical NetCDF files. The last step consists of uploading the validated files on the HCMR and IOBAS servers: another *perl* script copies the NetCDF files from the OGS local server to the remote servers (via FTP protocol).

4. RESULTS OF THE VALIDATION - MEDITERRANEAN SEA

The total amount of files (or platforms that recorded temperature and salinity) in the Mediterranean Sea between 01-01-1990 and 31-12-2012 is 1202 (Figure 4): the largest number of files belongs to the vessel folder (742 files, 61.7% of the total number), then there are 249 drifter files (20.7%), 190 profiler-glider files (15.8%) and 21 mooring files (1.7%). The Mediterranean spatial coverage for the different platforms is reported in Figures from 5 to 8: the data are well spatially distributed with some exceptions in the southern Ionian Sea and the shallower areas of the Northern Adriatic, the Aegean Sea and the Sicily Channel.

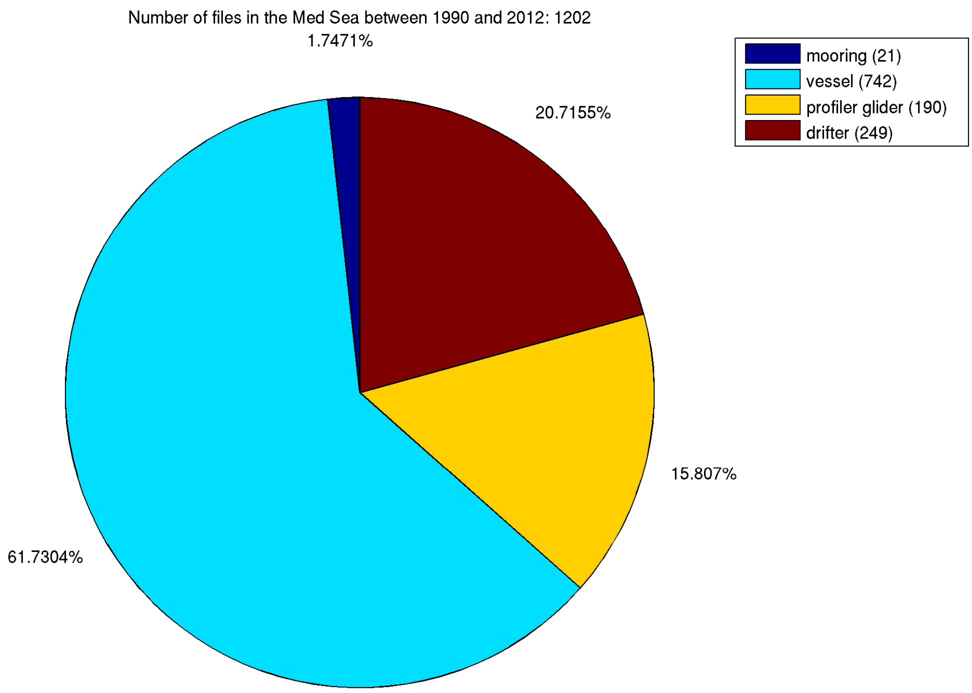

Figure 4. Percentage and number of files for different platforms used in the validation procedure in the Mediterranean Sea between 1 January 1990 and 31 December 2012.

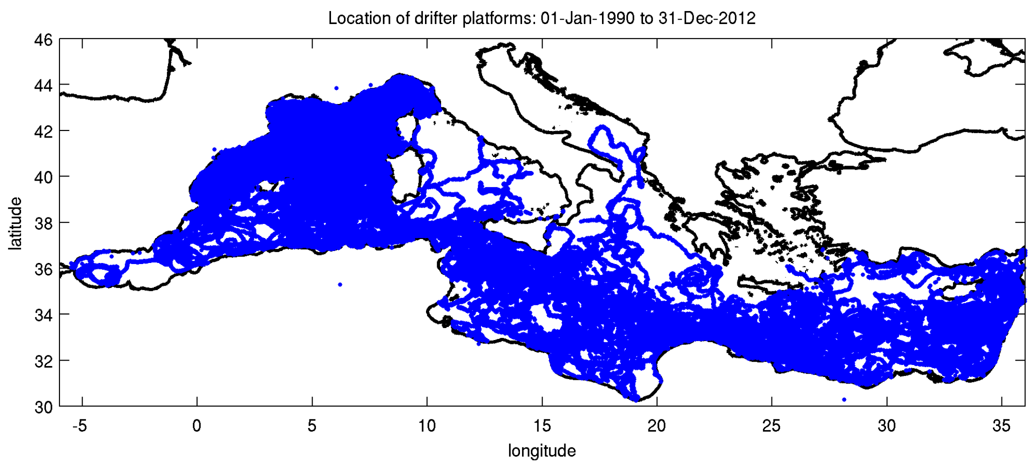

Figure 5. Locations of drifter platforms in the Mediterranean Sea between 1 January 1990 and 31 December 2012.

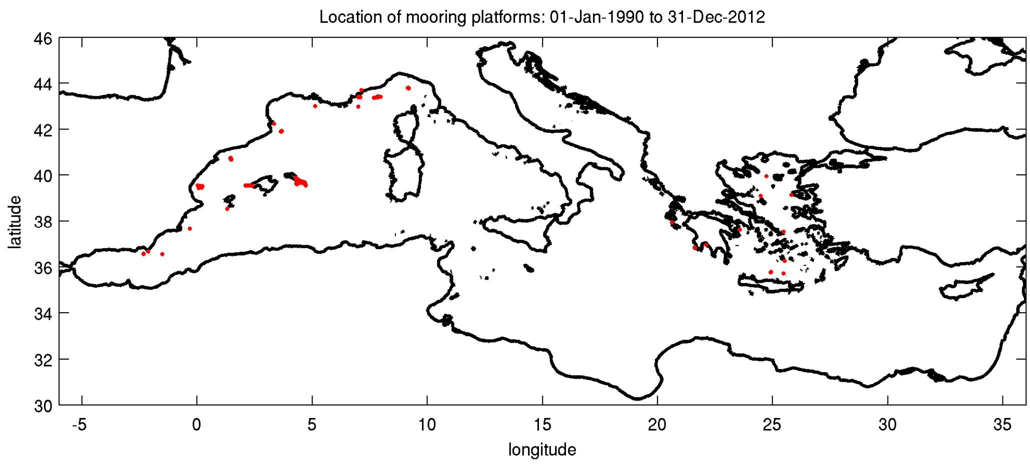

Figure 6. Locations of mooring platforms in the Mediterranean Sea between 1 January 1990 and 31 December 2012.

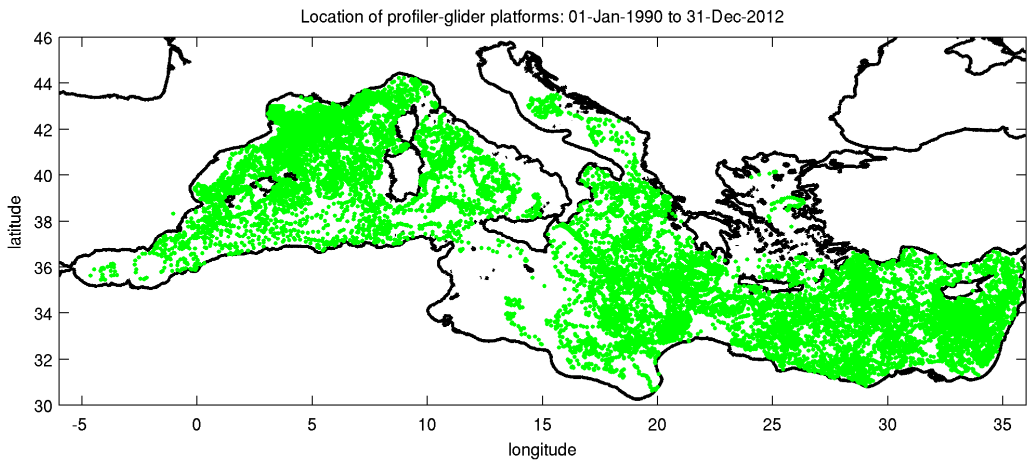

Figure 7. Locations of profiler-glider platforms in the Mediterranean Sea between 1 January 1990 and 31 December 2012.

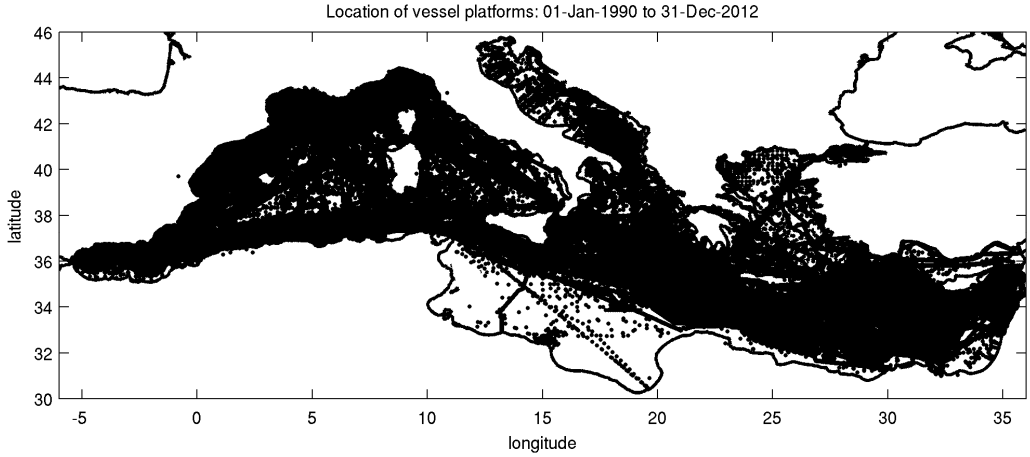

Figure 8. Locations of vessel platforms in the Mediterranean Sea between 1 January 1990 and 31 December 2012.

The quality control flags have been change according to the validation procedure results (Figure 9). In particular, the QC flag was changed for some temperature and salinity variables of 440 files (32% of the total number of the validated files): about 19% of the flag changing is due to temperature and about 13% to salinity.

67 files (about 5%) contain variables whose QC flags are always 9 (missing value) or 3 and 4 (probably bad and bad data); in Figure 10 the variables with this kind of flags are listed.

118 files (8.5%) are excluded by the validation procedure mainly for the following reasons (Figure 11): the QC flags of one or more variables are always equal to zero in the file and the files are not in the Mediterranean Sea. The largest part of files were excluded for the second reason (not in the Mediterranean Sea).

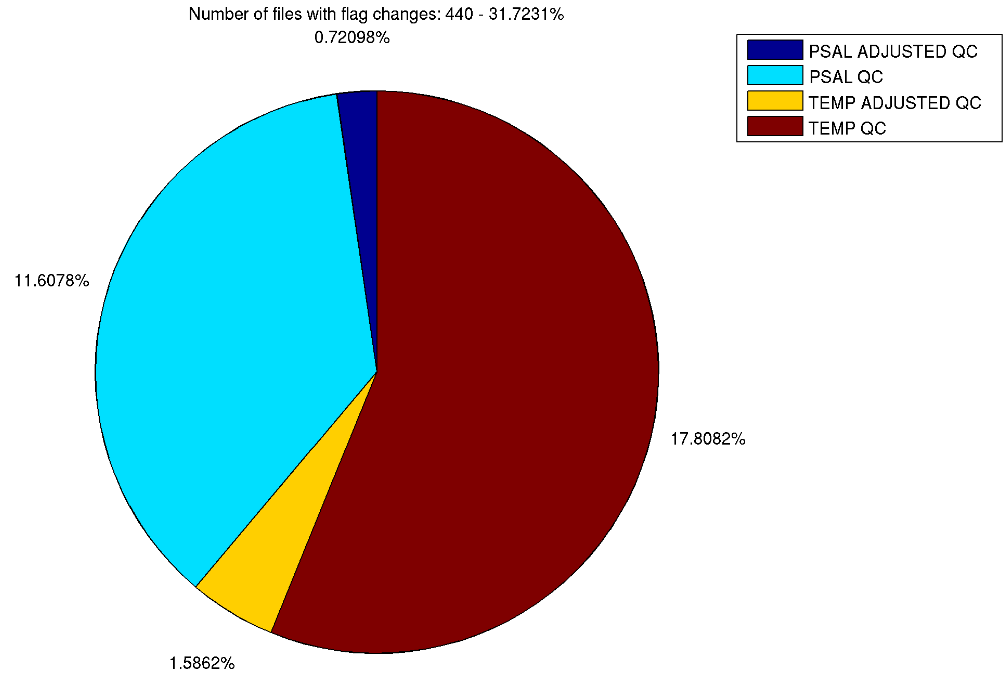

Figure 9. Percentage and number of files in which some quality control flags have been changed during the validation procedure.

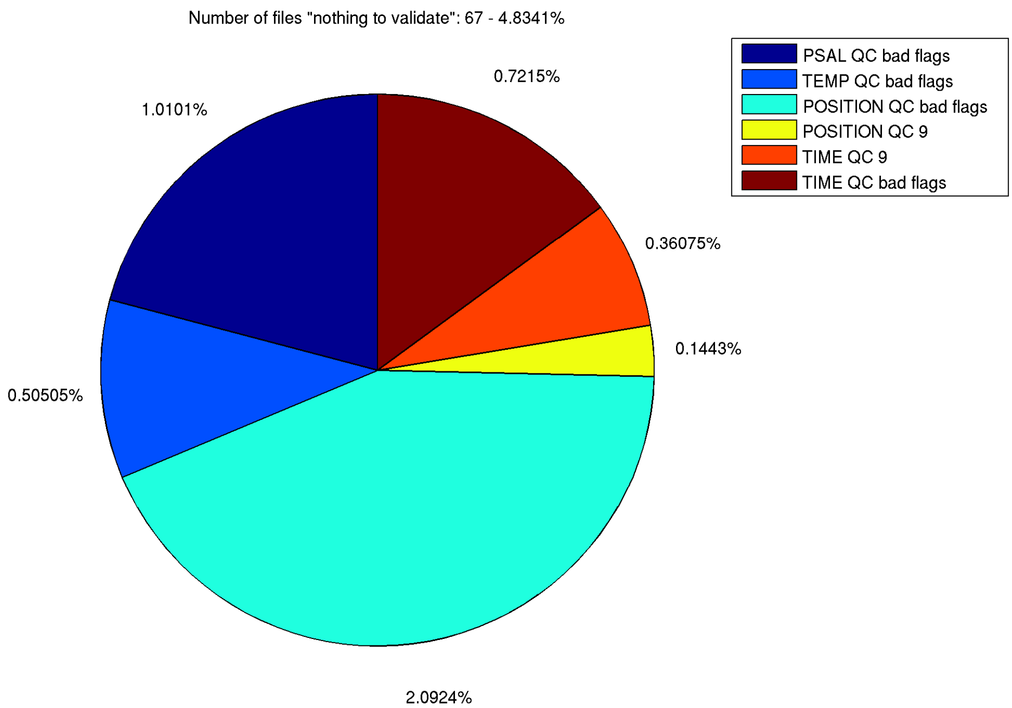

Figure 10. Percentage and number of files that contain missing or bad data.

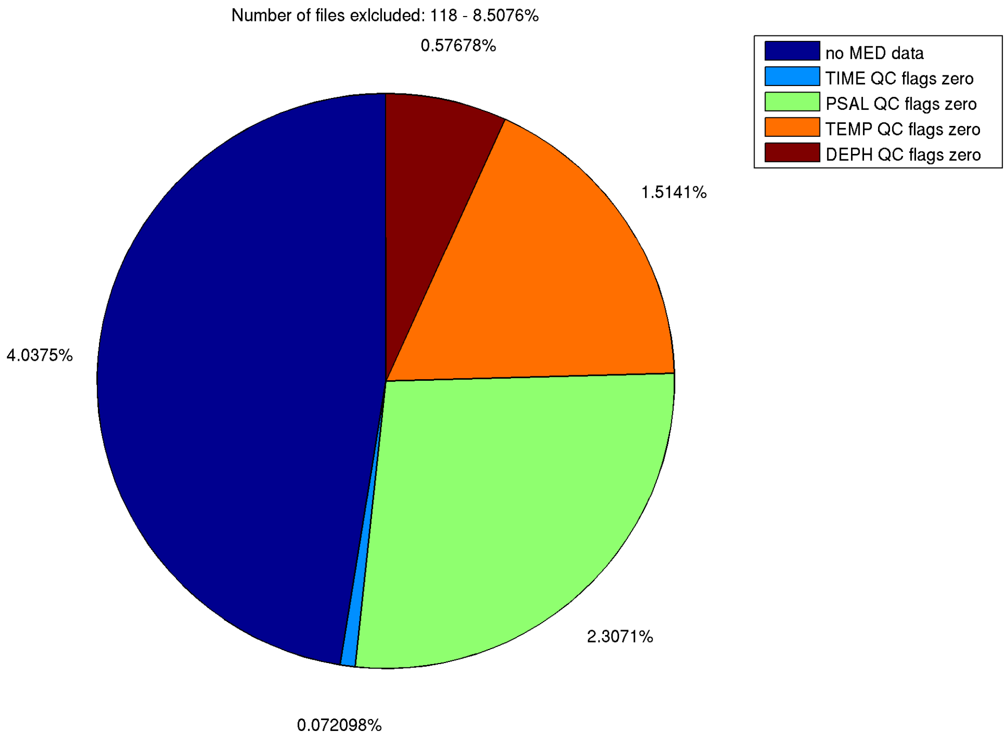

Figure 11. Percentage and number of excluded by the validation procedure.

In summary, the result of the application of the DM assessment method is that some QC flags of 440 files have been changed for temperature and/or salinity data for the period January 1990 - December 2012 (see list of files in annex 1). 129 files whose data have the RT QC flags always equal to 0, 3, 4, 9 for one or more variables, have been discarded by the validation method and their data mode remain set to “R”; 56 files are out of the Mediterranean Sea (see list in annex 2). Data are duplicated in 10 files: see list of anomalous files in annex 3.

4. RESULTS OF THE VALIDATION - BLACK SEA

The total amount of files (or platforms that recorded temperature and salinity) in the Black Sea between 01-01-1990 and 31-12-2012 is 568 (Figure 12): the largest number of files belongs to the vessel folder (529 files, 93.1% of the total number), then there are 22 drifter files (3.9%), 15 profiler-glider files (2.6%) and 2 mooring files (0.4%). The Black Sea spatial coverage for the different platforms is reported in Figures from 13 to 16: the data are well spatially distributed especially for vessel and profiler-glider platform, with some exceptions in the Northwestern part of the basin.

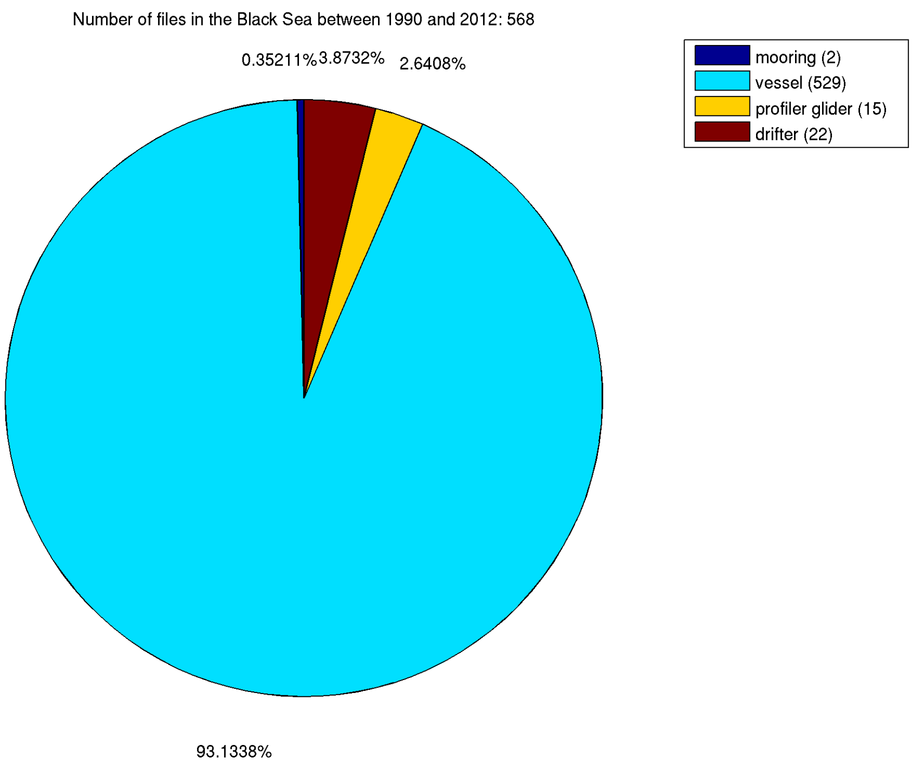

Figure 12. Percentage and number of files for different platforms used in the validation procedure in the Mediterranean Sea between 1 January 1990 and 31 December 2012.

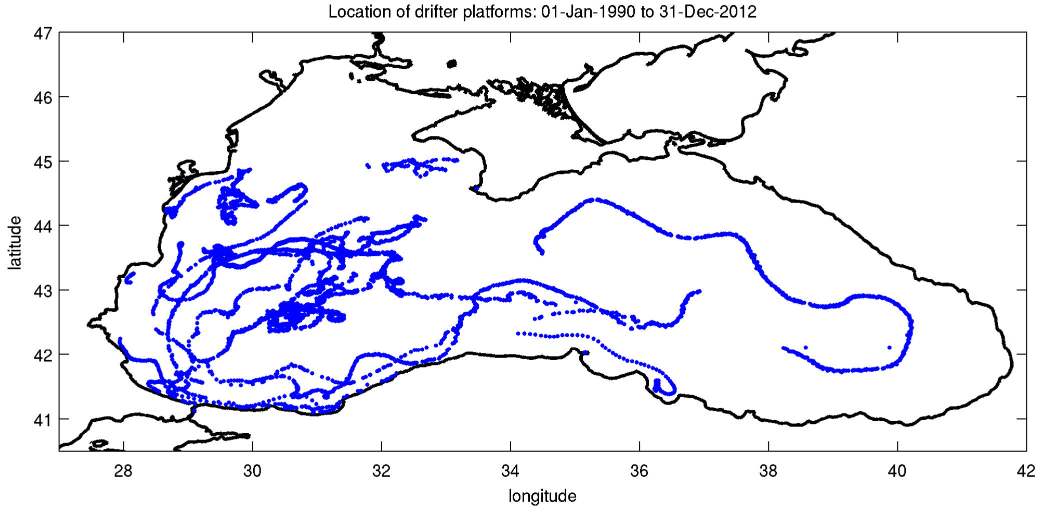

Figure 13. Locations of drifter platforms in the Black Sea between 1 January 1990 and 31 December 2012.

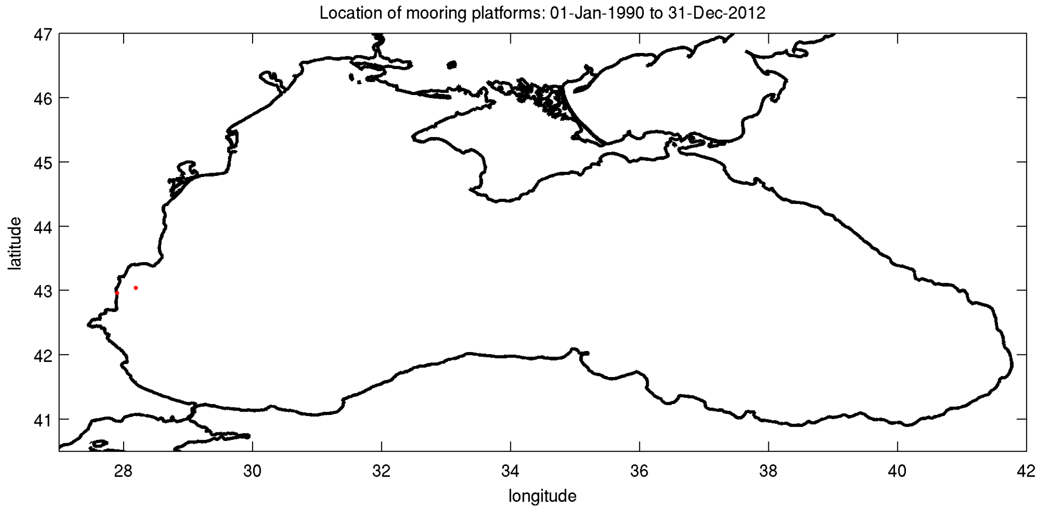

Figure 14. Locations of mooring platforms in the Black Sea between 1 January 1990 and 31 December 2012.

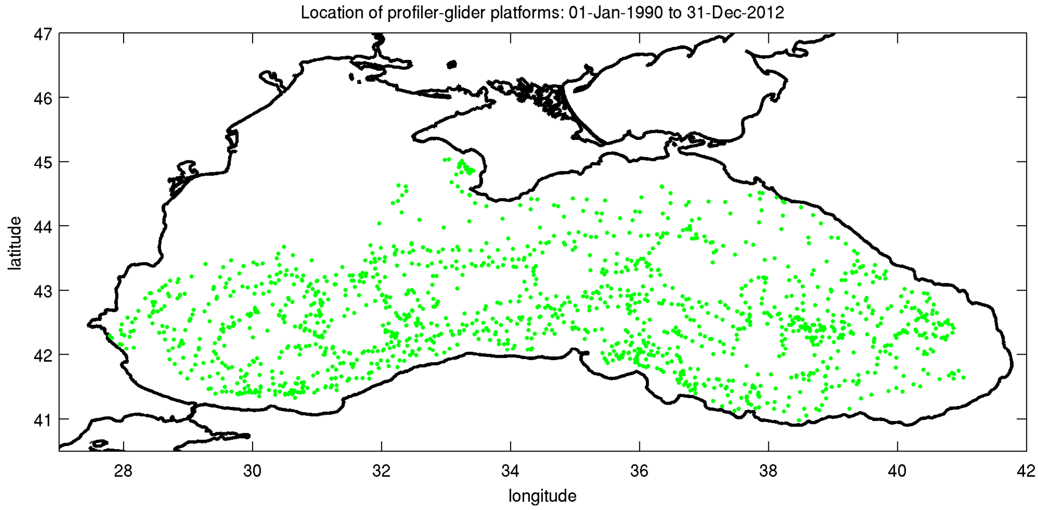

Figure 15. Locations of profiler-glider platforms in the Black Sea between 1 January 1990 and 31 December 2012.

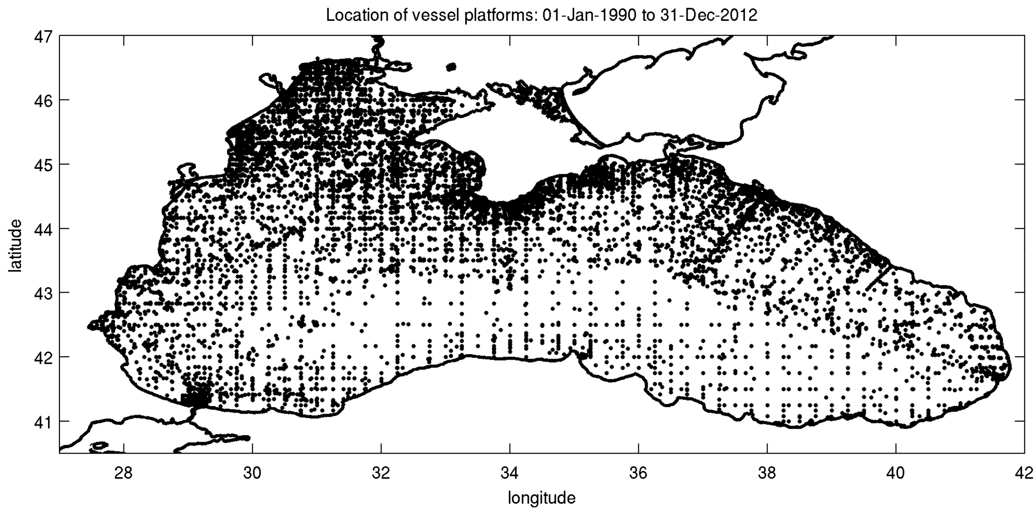

Figure 16. Locations of vessel platforms in the Black Sea between 1 January 1990 and 31 December 2012.

The quality control flags have been change according to the validation procedure results (Figure 17). In particular, the QC flag was changed for some temperature and salinity variables of 317 files (54% of the total number of the validated files): about 27% of the flag changing is due to temperature and about the same quantity is due to salinity.

17 files (about 3%) contain variables whose QC flags are always 9 (missing value) or 3 and 4 (probably bad and bad data); in Figure 18 the variables with this kind of flags are listed.

1 file (0.2%) are excluded by the validation procedure (Figure 19) because the QC flags of the temperature variable are always equal to zero.

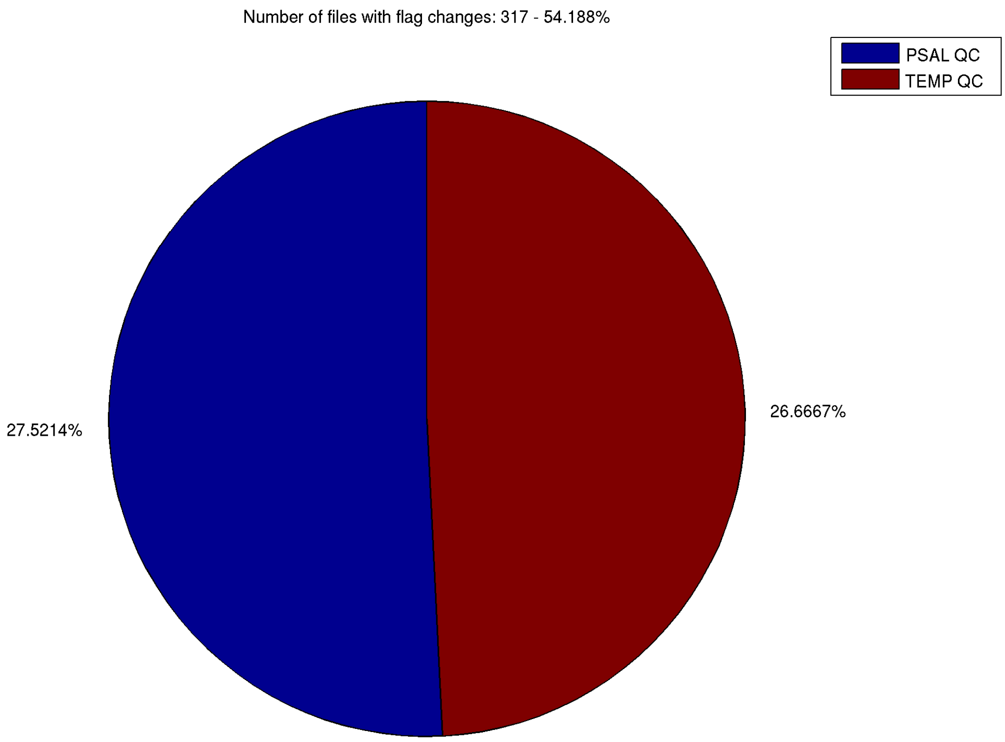

Figure 17. Percentage and number of files in which some quality control flags have been changed during the validation procedure.

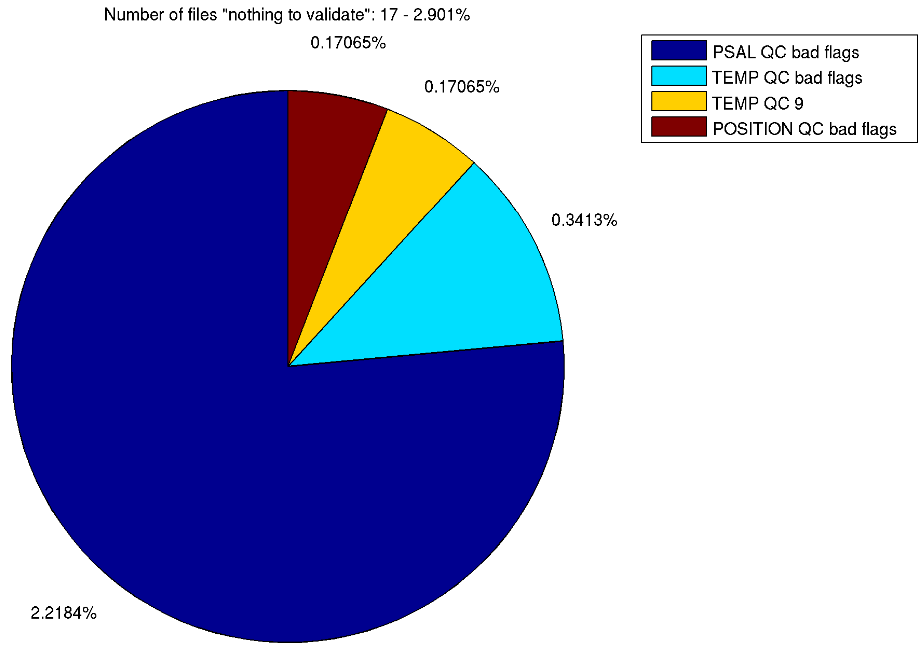

Figure 18. Percentage and number of files that contain missing or bad data.

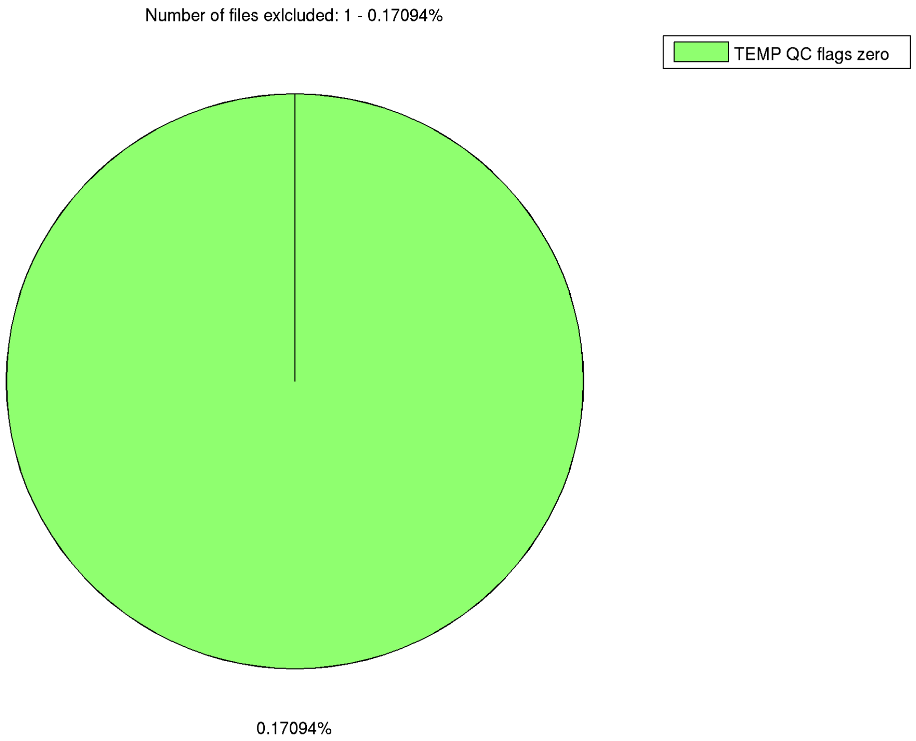

Figure 19. Percentage and number of excluded by the validation procedure.

In summary, the result of the application of the DM assessment method is that some QC flags of 317 files have been changed for temperature and/or salinity data for the period January 1990 - December 2012 (see list of files in annex 4). 18 files whose data have the RT QC flags always equal to 0, 3, 4, 9 for one or more variables, have been discarded by the validation method and their data mode remain set to "R" (see list in annex 2). Data are duplicated in 2 files: see list of anomalous files in annex 3.

ANNEX: MEDITERRANEAN SEA

ANNEX 1

List of files whose some/all temperature and/or salinity QC flags have been changed

SALINITY QC FLAGS CHANGED FOR FILES:

GL_PR_PF_4900556
GL_PR_PF_6900278
GL_PR_PF_6900282
GL_PR_PF_6900292
GL_PR_PF_6900317
GL_PR_PF_6900371
GL_PR_PF_6900457
GL_PR_PF_6900664
GL_PR_PF_6900700
GL_PR_PF_6900712
GL_PR_CT_68951
GL_PR_CT_9013220_1996
GL_PR_CT_EGES_1991
GL_PR_CT_EGES_1994
GL_PR_CT_EHUU_1993
GL_PR_CT_EHUU_1999
GL_PR_CT_FGTO_1997
GL_PR_CT_FGTO_1998
GL_PR_CT_FGTO_2001
GL_PR_CT_FGTO_2003
GL_PR_CT_FGTO_2004
GL_PR_CT_FGTO_2005
GL_PR_CT_FGTO_2010
GL_PR_CT_FGTO_2011
GL_PR_CT_FKJB_1994
GL_PR_CT_FKJB_1995
GL_PR_CT_FKJB_1996
GL_PR_CT_FKJB_1998
GL_PR_CT_FKJB_2001
GL_PR_CT_FKJB_2002
GL_PR_CT_FKJB_2003
GL_PR_CT_FKJB_2004
GL_PR_CT_FNCM_1991
GL_PR_CT_FNCM_1998
GL_PR_CT_FNCM_2008
GL_PR_CT_FNFP_1997
GL_PR_CT_FZVN_1992
GL_PR_CT_FZVN_1995
GL_PR_CT_FZVN_1998

GL_PR_CT_FZVN_1999
GL_PR_CT_GACA_1991
GL_PR_CT_GLNE_1993
GL_PR_CT_MJPX9_1993
GL_PR_CT_NIGD_1992
GL_PR_CT_NIGD_1993
GL_PR_CT_OCL0424_2006
GL_PR_CT_OCL0424_2008
GL_PR_CT_SHIP_2003
GL_PR_CT_SXYY_2000
GL_PR_GL_18956
GL_PR_GL_18957
GL_PR_GL_61786A
GL_PR_GL_61864
GL_PR_GL_68451
GL_PR_GL_68456
GL_PR_GL_68951
GL_PR_GL_68953
GL_PR_GL_68954
GL_PR_GL_EGO-Pheidippides
GL_PR_ML_EXRE0103_2011
GL_PR_PF_6900453
GL_PR_PF_6900501
GL_PR_PF_6900503
GL_PR_PF_6900956
GL_PR_PF_6900993
GL_PR_XB_FABB_2007
GL_PR_XB_FABB_2008
GL_PR_XB_FABB_2010
GL_PR_XB_FZVN_2000
GL_TS_TS_A8IG2_2008
GL_TS_TS_A8IG2_2009
GL_TS_TS_A8IG2_2010
GL_TS_TS_A8IG2_2011
GL_TS_TS_A8IG2_2012
GL_TS_TS_C6TN4_2010
GL_TS_TS_C6TN4_2011
GL_TS_TS_C6TN4_2012
GL_TS_TS_DBBH_1995
GL_TS_TS_DBKV_2009
GL_TS_TS_EDSV_2007
GL_TS_TS_EDSV_2009
GL_TS_TS_EDSV_2010
GL_TS_TS_EDSV_2011
GL_TS_TS_EDSV_2012
GL_TS_TS_ELVX4_2000
GL_TS_TS_ELVZ5_1999
GL_TS_TS_ELVZ6_1999
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GL_TS_TS_FABB_2006

GL_TS_TS_FABB_2008
GL_TS_TS_FABB_2010
GL_TS_TS_FABB_2011
GL_TS_TS_FGTO_2005
GL_TS_TS_FGTO_2012
GL_TS_TS_FKJB_2010
GL_TS_TS_FKJB_2011
GL_TS_TS_FKJB_2012
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GL_TS_TS_FMCY_2011
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GL_TS_TS_FNAV_2010
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GL_TS_TS_FZVN_2009
GL_TS_TS_FZVN_2011
GL_TS_TS_KS059_2011
GL_TS_TS_KS066_2011
GL_TS_TS_KS077_2011
GL_TS_TS_KS088_2010
GL_TS_TS_KS094_2011
GL_TS_TS_ZCDJ6_2010
GL_TS_TS_ZCDJ6_2012
MO_PR_BO_18230
MO_PR_BO_18339
MO_PR_BO_18340
MO_PR_BO_18425
MO_PR_BO_18440
MO_PR_BO_18836
MO_PR_BO_18863
MO_PR_BO_BIODYPAR
MO_PR_BO_BIOMED
MO_PR_BO_ECOMALAGA
MO_PR_BO_ECOMURCIA
MO_PR_BO_FLIPERI
MO_PR_BO_Mesoescala

MO_PR_BO_Monitoring
MO_PR_BO_NIBEWN_F
MO_PR_BO_RHOFI
MO_PR_CT_AIRWIN
MO_PR_CT_ALMOFRONTLEG
MO_PR_CT_BIODYPAR
MO_PR_CT_CYBOCYPRUSBASINOCEANOGRAPHY
MO_PR_CT_DICAMUF
MO_PR_CT_DYNAMO
MO_PR_CT_EUROMARGE
MO_PR_CT_FE
MO_PR_CT_FLIPERI
MO_PR_CT_HYGAM
MO_PR_CT_MARNAUT
MO_PR_CT_MDASSEMBLAGE
MO_PR_CT_METROMEDFEB
MO_PR_CT_MODELFOS
MO_PR_CT_MOOGLI
MO_PR_CT_OMEGA
MO_PR_CT_RHOFI
MO_PR_CT_SHOM
MO_PR_CT_SUIVILION
MO_PR_XB_MFSVOS
MO_TS_MO_68422
MO_TS_MO_ATHOS
MO_TS_MO_KALAM
MO_TS_MO_LESVO
MO_TS_MO_MYKON

TEMPERATURE QC FLAGS CHANGED FOR FILES:

GL_PR_PF_1900590
GL_PR_PF_1900606
GL_PR_PF_1900832
GL_PR_PF_1900947
GL_PR_PF_1900949
GL_PR_PF_4900556
GL_PR_PF_6900087
GL_PR_PF_6900229
GL_PR_PF_6900280
GL_PR_PF_6900281
GL_PR_PF_6900285
GL_PR_PF_6900286
GL_PR_PF_6900292
GL_PR_PF_6900302
GL_PR_PF_6900371
GL_PR_PF_6900455
GL_PR_PF_6900457
GL_PR_PF_6900699
GL_PR_PF_6900700
GL_PR_PF_6900816
GL_PR_PF_6900843

GL_PR_PF_6900848
GL_PR_BA_06SW_2009
GL_PR_BA_06SW_2010
GL_PR_BA_3FRY9_2001
GL_PR_BA_A8HE4_2009
GL_PR_BA_C6T2007_2000
GL_PR_BA_FQRQ_2000
GL_PR_BA_NDQV_1999
GL_PR_BA_NSDT_1998
GL_PR_BA_NWEQ_1996
GL_PR_BA_PGBB_1998
GL_PR_BA_SHIP_1997
GL_PR_BA_SHIP_1998
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GL_PR_BA_SHIP_2005
GL_PR_BA_SHIP_2006
GL_PR_BA_SHIP_2008
GL_PR_BA_ZCDJ2_2008
GL_PR_BA_ZCDJ5_2007
GL_PR_BA_ZCDJ6_2009
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GL_PR_CT_EHUU_1993
GL_PR_CT_FGTO_1997
GL_PR_CT_FGTO_1998
GL_PR_CT_FGTO_2000
GL_PR_CT_FGTO_2005
GL_PR_CT_FGTO_2011
GL_PR_CT_FGTO_2012
GL_PR_CT_FKJB_2000
GL_PR_CT_FKJB_2003
GL_PR_CT_FNCM_2008
GL_PR_CT_FZVN_2012
GL_PR_CT_GACA_1990
GL_PR_CT_GACA_1991
GL_PR_CT_GLNE_1993
GL_PR_CT_MJPX9_1993
GL_PR_CT_NIGD_1992
GL_PR_CT_NIGD_1993
GL_PR_CT_SHIP_1999
GL_PR_GL_18956
GL_PR_GL_18957
GL_PR_GL_61864
GL_PR_GL_68451
GL_PR_GL_68456
GL_PR_GL_68950
GL_PR_GL_68951

GL_PR_GL_68953
GL_PR_GL_68954
GL_PR_ML_EXRE0163_2012
GL_PR_PF_1900602
GL_PR_PF_1900848
GL_PR_PF_1900849
GL_PR_PF_6900098
GL_PR_PF_6900099
GL_PR_PF_6900102
GL_PR_PF_6900103
GL_PR_PF_6900119
GL_PR_PF_6900284
GL_PR_PF_6900287
GL_PR_PF_6900293
GL_PR_PF_6900294
GL_PR_PF_6900453
GL_PR_PF_6900502
GL_PR_PF_6900504
GL_PR_PF_6900505
GL_PR_PF_6900635
GL_PR_PF_6900659
GL_PR_PF_6900660
GL_PR_PF_6900661
GL_PR_PF_6900665
GL_PR_PF_6900677
GL_PR_PF_6900679
GL_PR_PF_6900794
GL_PR_PF_6900850
GL_PR_PF_6900903
GL_PR_PF_6900939
GL_PR_PF_6900981
GL_PR_PF_6900998
GL_PR_PF_6901084
GL_PR_PF_6901818
GL_PR_TE_1900024
GL_PR_TE_1900025
GL_PR_TE_1900026
GL_PR_TE_1900029
GL_PR_TE_61501
GL_PR_TE_61504
GL_PR_TE_6900089
GL_PR_TE_6900092
GL_PR_TE_6900093
GL_PR_TE_69011
GL_PR_TE_69013
GL_PR_TE_Pylos
GL_PR_XB_ELZJ3_2004
GL_PR_XB_FABB_2004
GL_PR_XB_FABB_2006
GL_PR_XB_FABB_2008
GL_PR_XB_FABB_2009
GL_PR_XB_FABB_2010

GL_PR_XB_FABB_2011
GL_PR_XB_FABB_2012
GL_PR_XB_FMCY_2007
GL_PR_XB_FNCM_2003
GL_PR_XB_FNCM_2007
GL_PR_XB_FNCM_2008
GL_PR_XB_FNOY_1992
GL_PR_XB_FZVN_2000
GL_PR_XB_FZVN_2001
GL_PR_XB_FZVN_2002
GL_PR_XB_FZVN_2003
GL_PR_XB_FZVN_2009
GL_PR_XB_IBEX_1999
GL_PR_XB_ICGK_2005
GL_PR_XB_IXWQ_2005
GL_PR_XB_KRHG_1995
GL_PR_XB_KVWA_1992
GL_PR_XB_NDPG_1991
GL_PR_XB_NJUL_1991
GL_PR_XB_NODC31XY_1992
GL_PR_XB_NRGB_1990
GL_PR_XB_NTSG_1994
GL_PR_XB_NYKN_1991
GL_PR_XB_NZXF_1990
GL_PR_XB_PJJU_1993
GL_PR_XB_SVCQ_1999
GL_PR_XB_SVCQ_2000
GL_PR_XB_YTFL_2003
GL_PR_XB_YTFL_2005
GL_PR_XB_ZCKU_1992
GL_PR_XB_ZMCR_1993
GL_TS_DB_61501
GL_TS_DB_61503
GL_TS_DB_61653
GL_TS_DB_61687
GL_TS_DB_61691
GL_TS_DB_61700
GL_TS_DB_61755
GL_TS_DB_61785
GL_TS_DB_61786
GL_TS_DB_61789A
GL_TS_DB_61791
GL_TS_DB_61792A
GL_TS_DB_61805
GL_TS_DB_61806
GL_TS_DB_61807
GL_TS_DB_61812
GL_TS_DB_61815
GL_TS_DB_61820
GL_TS_DB_61824
GL_TS_DB_61825
GL_TS_DB_61827

GL_TS_DB_61828
GL_TS_DB_61829
GL_TS_DB_61830
GL_TS_DB_61831
GL_TS_DB_61832
GL_TS_DB_61833
GL_TS_DB_61835
GL_TS_DB_61836
GL_TS_DB_61838
GL_TS_DB_61839
GL_TS_DB_61842
GL_TS_DB_61843
GL_TS_DB_61846
GL_TS_DB_61847
GL_TS_DB_61850
GL_TS_DB_61850B
GL_TS_DB_61850C
GL_TS_DB_61851C
GL_TS_DB_61852C
GL_TS_DB_61853C
GL_TS_DB_61854C
GL_TS_DB_61856C
GL_TS_DB_61857
GL_TS_DB_61862
GL_TS_DB_61866
GL_TS_DB_61867
GL_TS_DB_61881
GL_TS_DB_61882
GL_TS_DB_61883
GL_TS_DB_61886
GL_TS_DB_61888
GL_TS_DB_61889
GL_TS_DB_61892
GL_TS_DB_61893
GL_TS_DB_61894
GL_TS_DB_61895
GL_TS_DB_61896
GL_TS_DB_61947
GL_TS_DB_61948
GL_TS_DB_61952
GL_TS_DB_61958
GL_TS_DB_61959
GL_TS_DB_61965
GL_TS_DB_61968
GL_TS_DB_61974
GL_TS_DB_62772B
GL_TS_TS_DBBH_1995
GL_TS_TS_DBKV_2009
GL_TS_TS_ELVX4_2000
GL_TS_TS_ELVX4_2003
GL_TS_TS_ELVX4_2004
GL_TS_TS_ELVZ5_1999

GL_TS_TS_ELVZ5_2000
GL_TS_TS_ELVZ5_2001
GL_TS_TS_ELVZ6_2005
GL_TS_TS_FABB_2008
GL_TS_TS_FABB_2010
GL_TS_TS_FABB_2011
GL_TS_TS_FGTO_2012
GL_TS_TS_FKJB_2011
GL_TS_TS_FZVN_2001
GL_TS_TS_FZVN_2007
GL_TS_TS_KS007_2011
MO_PR_BO_18338
MO_PR_BO_18340
MO_PR_BO_18425
MO_PR_BO_18440
MO_PR_BO_18863
MO_PR_BO_BABA
MO_PR_BO_BIOMED
MO_PR_BO_Monitoring
MO_PR_BO_NIBEWN_F
MO_PR_BO_OSTRA
MO_PR_BO_Rhodiber-EU
MO_PR_BO_VILLEFRANCHEPOINTB
MO_PR_CT_BOUSSOLE#
MO_PR_CT_CYBOCYPRUSBASINOCEANOGRAPHY
MO_PR_CT_DYNAPROC
MO_PR_CT_MAD
MO_PR_CT_MDASSEMBLAGE
MO_PR_CT_MFSPPVOS
MO_PR_CT_MFSTEP
MO_PR_CT_MPHMED
MO_PR_CT_SeaGliders
MO_PR_XB_ALMOFRONTLEG
MO_PR_XB_MFSVOS
MO_PR_XB_SHOM
MO_TS_MO_68422
MO_TS_MO_ATHOS
MO_TS_MO_LESVO
MO_TS_MO_MYKON
MO_TS_MO_SANTO

ANNEX 2

List of not validated files (discarded by the validation procedure)

Bad SALINITY RT QC flags for files:

GL_PR_PF_1900849
GL_PR_TE_69013
GL_PR_XB_FZVN_2001
GL_TS_MO_61196
GL_TS_MO_61197
GL_TS_MO_61430
MO_PR_BO_OSTRA
MO_PR_CT_MFSPPVOS
MO_PR_XB_ALMOFRONTLEG
MO_PR_XB_CALMAR
MO_PR_XB_MFSVOS
MO_PR_XB_NCMRXB
MO_PR_XB_PRISMED
MO_PR_XB_SHOM

Bad TEMPERATURE RT QC flags for files:

GL_PR_BA_62845
GL_PR_XB_MNDC9_2007
GL_PR_XB_ZCDJ2_2007
GL_TS_DB_61300
GL_TS_MO_61196
GL_TS_MO_61197
GL_TS_MO_61430

Bad TIME RT QC flags for files:

GL_TS_BO_FMCY_2010
GL_TS_BO_FMCY_2011
GL_TS_BO_FNCM_2009
GL_TS_BO_FNCM_2011
GL_TS_BO_FVHY_2010
GL_TS_BO_FZVN_2009
GL_TS_BO_FZVN_2010
GL_TS_BO_FZVN_2011
GL_TS_TS_EDSV_2006
GL_TS_TS_MCSJ9_2011

Bad POSITION RT QC flags for files:

GL_PR_BA_61501
GL_PR_BA_GACJ_1998
GL_PR_PF_6900675
GL_PR_XB_IABA_2006
GL_PR_XB_IXWQ_2006
GL_PR_XB_MNDC9_2007

```
GL_TS_BO_FMCY_2010
GL_TS_BO_FMCY_2011
GL_TS_BO_FNCM_2009
GL_TS_BO_FNCM_2011
GL_TS_BO_FVHY_2010
GL_TS_BO_FZVN_2009
GL_TS_BO_FZVN_2010
GL_TS_BO_FZVN_2011
GL_TS_TS_FGTO_1998
GL_TS_TS_FGTO_2001
GL_TS_TS_FGTO_2002
GL_TS_TS_FGTO_2003
GL_TS_TS_FGTO_2004
GL_TS_TS_FGTO_2006
GL_TS_TS_FGTO_2007
GL_TS_TS_FGTO_2009
GL_TS_TS_FGTO_2010
GL_TS_TS_FGTO_2011
GL_TS_TS_FNCM_2002
GL_TS_TS_FNCM_2003
GL_TS_TS_FQBE_2001
GL_TS_TS_FQBE_2011
GL_TS_TS_FZVN_2002
```

SALINITY RT QC flags is equal to 0 for files:

```
GL_TS_BO_FMCY_2010
GL_TS_BO_FMCY_2011
GL_TS_BO_FNCM_2009
GL_TS_BO_FNCM_2011
GL_TS_BO_FVHY_2010
GL_TS_BO_FZVN_2009
GL_TS_BO_FZVN_2010
GL_TS_BO_FZVN_2011
GL_TS_DB_KS065_2008
GL_TS_DB_KS066_2008
GL_TS_DB_KS077_2008
GL_TS_DB_KS088_2009
GL_TS_DB_KS089_2009
GL_TS_TS_DBKV_2008
GL_TS_TS_FGTO_2001
GL_TS_TS_FGTO_2002
GL_TS_TS_FGTO_2003
GL_TS_TS_FGTO_2004
GL_TS_TS_FQBE_2001
GL_TS_TS_FQBE_2011
GL_TS_TS_KS026_2010
GL_TS_TS_KS034_2009
GL_TS_TS_KS065_2008
GL_TS_TS_KS066_2009
GL_TS_TS_KS066_2010
```

GL_TS_TS_KS076_2009
GL_TS_TS_KS080_2009
GL_TS_TS_KS080_2010
GL_TS_TS_KS085_2010
GL_TS_TS_KS088_2009
GL_TS_TS_KS089_2009
GL_TS_TS_KS089_2010

TEMPERATURE RT QC flags is equal to 0 for files:

GL_TS_DB_KS065_2008
GL_TS_DB_KS066_2008
GL_TS_DB_KS077_2008
GL_TS_DB_KS088_2009
GL_TS_DB_KS089_2009
GL_TS_TS_DBKV_2008
GL_TS_TS_FGTO_2002
GL_TS_TS_FGTO_2003
GL_TS_TS_FGTO_2004
GL_TS_TS_FGTO_2006
GL_TS_TS_FGTO_2007
GL_TS_TS_FGTO_2010
GL_TS_TS_FQBE_2011
GL_TS_TS_KS026_2009
GL_TS_TS_KS034_2009
GL_TS_TS_KS065_2008
GL_TS_TS_KS076_2009
GL_TS_TS_KS080_2009
GL_TS_TS_KS085_2010
GL_TS_TS_KS088_2009
GL_TS_TS_KS088_2011

TIME RT QC flags is equal to 0 for files:

GL_PR_GL_61786

DEPH RT QC flags is equal to 0 for files:

GL_TS_BO_FMCY_2010
GL_TS_BO_FMCY_2011
GL_TS_BO_FNCM_2009
GL_TS_BO_FNCM_2011
GL_TS_BO_FVHY_2010
GL_TS_BO_FZVN_2009
GL_TS_BO_FZVN_2010
GL_TS_BO_FZVN_2011

TIME RT QC flags are equal to 9 for files:

GL_TS_TS_FABB_2003
GL_TS_TS_FNCM_2002
GL_TS_TS_FNCM_2003
GL_TS_TS_FNFP_2003
GL_TS_TS_FZVN_2002

POSITION RT QC flags are equal to 9 for files:

GL_TS_TS_FABB_2003
GL_TS_TS_FNFP_2003

Out of Mediterranean Sea files:

GL_PR_BA_DACF_2003
GL_PR_BA_KWAL_1997
GL_PR_PF_7900466
GL_PR_TE_JRFC_2009
GL_PR_XB_DLEZ_1992
GL_PR_XB_WSRL_1995
GL_TS_DB_13901
GL_TS_DB_41852
GL_TS_DB_44607
GL_TS_DB_44616
GL_TS_DB_46514
GL_TS_DB_61353
GL_TS_DB_61670
GL_TS_DB_61671
GL_TS_DB_6202508
GL_TS_DB_6202514
GL_TS_DB_6202542
GL_TS_DB_62503
GL_TS_DB_62716
GL_TS_DB_62772
GL_TS_DB_62773
GL_TS_DB_62774
GL_TS_DB_62775
GL_TS_DB_62776
GL_TS_DB_62810
GL_TS_DB_62811
GL_TS_DB_62828
GL_TS_DB_62899
GL_TS_DB_62948
GL_TS_DB_62961
GL_TS_DB_63525
GL_TS_DB_66862
GL_TS_DB_DJOK_2006
GL_TS_DB_IF000175
GL_TS_DB_IF000177

GL_TS_DB_IF000178
GL_TS_DB_IF000184
GL_TS_DB_IF000186
GL_TS_DB_IF000239
GL_TS_DB_IF000380
GL_TS_DB_IF000394
GL_TS_DB_IF000481
GL_TS_DB_IF000484
GL_TS_DB_IF000492
GL_TS_MO_62091
GL_TS_TS_DBFO_2008
GL_TS_TS_DJOK_2008
GL_TS_TS_ELWX5_2007
GL_TS_TS_FNCM_1999
GL_TS_TS_IF000087_1991
GL_TS_TS_IF000087_1992
GL_TS_TS_IF000087_1993
GL_TS_TS_IF000087_1994
GL_TS_TS_IF000087_1995
GL_TS_TS_IF000088_1993
GL_TS_TS_KS085_2011

ANNEX 3

List of anomalous files

DATA DUPLICATION:

```
GL_PR_BA_IBEX_1999
GL_PR_BA_SHIP_1997
GL_PR_BA_SHIP_1998
GL_PR_BA_SHIP_1999
GL_PR_BA_SHIP_2001
GL_PR_BA_SHIP_2006
GL_PR_TE_61501
GL_PR_XB_FABB_2004
GL_PR_XB_FABB_2010
GL_TS_TS_FZVN_2007
```

ANNEX: BLACK SEA

ANNEX 4

List of files whose some/all temperature and/or salinity QC flags have been changed

SALINITY QC FLAGS CHANGED FOR FILES:

BS_PR_CT_0699_1990-2000
BS_PR_CT_10077
BS_PR_CT_10078
BS_PR_CT_10079
BS_PR_CT_10083
BS_PR_CT_10089
BS_PR_CT_10093
BS_PR_CT_10094
BS_PR_CT_10095
BS_PR_CT_10096
BS_PR_CT_10097
BS_PR_CT_10098
BS_PR_CT_10099
BS_PR_CT_10106
BS_PR_CT_10133
BS_PR_CT_10201
BS_PR_CT_10205
BS_PR_CT_12287
BS_PR_CT_15AK1995077
BS_PR_CT_15AK2002084
BS_PR_CT_15AK2002086
BS_PR_CT_15AK2003089
BS_PR_CT_15AK2003091
BS_PR_CT_15AK2003092
BS_PR_CT_15AK2004096
BS_PR_CT_15AK2004100
BS_PR_CT_15AK2005103
BS_PR_CT_15AK2005104
BS_PR_CT_15AK2005108
BS_PR_CT_15AK2005110
BS_PR_CT_15AK2006112
BS_PR_CT_15AK2006113
BS_PR_CT_15AK2006114
BS_PR_CT_15AK2006120
BS_PR_CT_15AK_2001-2002
BS_PR_CT_15BO1998002
BS_PR_CT_15BO2000006
BS_PR_CT_170
BS_PR_CT_171

BS_PR_CT_223
BS_PR_CT_260
BS_PR_CT_316N_2001-2003
BS_PR_CT_7301_1994-1994
BS_PR_CT_89CU_1992-1996
BS_PR_CT_89M1_1996-1997
BS_PR_CT_89M2_1996-1996
BS_PR_CT_9018_1990-1991
BS_PR_CT_9065_1990-1990
BS_PR_CT_907Z_1995-1995
BS_PR_CT_908R_1991-1991
BS_PR_CT_90AK_1990-1991
BS_PR_CT_90B8_1994-1994
BS_PR_CT_90CK_1991-1995
BS_PR_CT_90D4_1990-1998
BS_PR_CT_90H7_1995-1996
BS_PR_CT_90KE_1990-1992
BS_PR_CT_90ML_1990-1992
BS_PR_CT_90PY_1990-1990
BS_PR_CT_90T3_1990-1991
BS_PR_CT_90V2_1990-1998
BS_PR_CT_90VT_1991-1993
BS_PR_CT_90YG_1990-1991
BS_PR_CT_AK119
BS_PR_CT_AK122
BS_PR_CT_AKVANAVT_03_1995
BS_PR_CT_AKVANAVT_10_1994
BS_PR_CT_AQUALOG Moored Profiler
BS_PR_CT_AR_VO9405
BS_PR_CT_BUG54a
BS_PR_CT_CKL1990
BS_PR_CT_CKL1991
BS_PR_CT_DBUO
BS_PR_CT_GAK38A
BS_PR_CT_GALS1990
BS_PR_CT_GD91-07
BS_PR_CT_GD92-05
BS_PR_CT_GD93-05
BS_PR_CT_GD94-05
BS_PR_CT_GD95-05
BS_PR_CT_GD95-10
BS_PR_CT_GOPT25
BS_PR_CT_Ilyichevsk
BS_PR_CT_K.GALL9007
BS_PR_CT_K.KOMS9006
BS_PR_CT_K.KOMS9007
BS_PR_CT_K.KOMS9108
BS_PR_CT_KREN57
BS_PR_CT_MECH9
BS_PR_CT_ML54
BS_PR_CT_NPT1990
BS_PR_CT_NPT1991

BS_PR_CT_NPT1992
BS_PR_CT_NPT1993
BS_PR_CT_NPT1994
BS_PR_CT_NPT1995
BS_PR_CT_NPT1996
BS_PR_CT_NPT1997
BS_PR_CT_NPT1998
BS_PR_CT_ODV-Sozopol01-1990-0
BS_PR_CT_ODV-Sozopol01-1990-1
BS_PR_CT_OSIP9205
BS_PR_CT_OSIP9206
BS_PR_CT_Ochakov
BS_PR_CT_PAR10
BS_PR_CT_PAR11
BS_PR_CT_PAVL9209
BS_PR_CT_PK27_1
BS_PR_CT_PK27_2
BS_PR_CT_PK28
BS_PR_CT_PK29
BS_PR_CT_PK30
BS_PR_CT_PK33
BS_PR_CT_PRB1990
BS_PR_CT_PSKVK9005
BS_PR_CT_PSKVK9011
BS_PR_CT_PSKVK9204
BS_PR_CT_PSKVK9309
BS_PR_CT_PSKVK9507
BS_PR_CT_PSKVK9809
BS_PR_CT_PV32
BS_PR_CT_PV33
BS_PR_CT_PV34
BS_PR_CT_PV35
BS_PR_CT_PV37
BS_PR_CT_PV45
BS_PR_CT_PV48
BS_PR_CT_PV49
BS_PR_CT_PV52
BS_PR_CT_PV55
BS_PR_CT_SH-9303
BS_PR_CT_SH-9704
BS_PR_CT_SH-9705
BS_PR_CT_SH-9706
BS_PR_CT_SH-9809
BS_PR_CT_SH-9909
BS_PR_CT_SNU-FF_04-04
BS_PR_CT_Sozopol _03
BS_PR_CT_Sozopol_04
BS_PR_CT_TFN1990
BS_PR_CT_TFN1991
BS_PR_CT_TR10
BS_PR_CT_TR15
BS_PR_CT_TR16

BS_PR_CT_TR17
BS_PR_CT_TR9
BS_PR_CT_URGP_1992-1992
BS_PR_CT_URME_1990-1993
BS_PR_CT_UROS_1992-1993
BS_PR_CT_URQH_1990-1998
BS_PR_CT_URTR_1992-1993
BS_PR_CT_USH61
BS_PR_CT_V200409
BS_PR_CT_V2010B04
BS_PR_CT_VA200302
BS_PR_CT_VEGA1991
BS_PR_CT_Yalta
GL_PR_PF_1901200
GL_PR_PF_4900541
GL_PR_PF_4900542
GL_PR_PF_6900804
GL_PR_PF_6900805

TEMPERATURE QC FLAGS CHANGED FOR FILES:

BS_PR_CT_0699_1990-2000
BS_PR_CT_10076
BS_PR_CT_10077
BS_PR_CT_10079
BS_PR_CT_10082
BS_PR_CT_10084
BS_PR_CT_10093
BS_PR_CT_10094
BS_PR_CT_10095
BS_PR_CT_10097
BS_PR_CT_10098
BS_PR_CT_10099
BS_PR_CT_10104
BS_PR_CT_10105
BS_PR_CT_10106
BS_PR_CT_15AK1995077
BS_PR_CT_15AK2002086
BS_PR_CT_15AK2003088
BS_PR_CT_15AK2003089
BS_PR_CT_15AK2003092
BS_PR_CT_15AK2004096
BS_PR_CT_15AK2004100
BS_PR_CT_15AK2005104
BS_PR_CT_15AK2005108
BS_PR_CT_15AK2005110
BS_PR_CT_15AK2006113
BS_PR_CT_15AK2006116
BS_PR_CT_15AK2006117
BS_PR_CT_15AK2006120
BS_PR_CT_15AK2007131
BS_PR_CT_15AK_2001-2002

BS_PR_CT_15BO1998002
BS_PR_CT_15BO2000006
BS_PR_CT_15BO_1998-2000
BS_PR_CT_167
BS_PR_CT_222
BS_PR_CT_233
BS_PR_CT_260
BS_PR_CT_316N_2001-2003
BS_PR_CT_89CU_1992-1996
BS_PR_CT_89M1_1996-1997
BS_PR_CT_902B_1990-1995
BS_PR_CT_90AK_1990-1991
BS_PR_CT_90CK_1991-1995
BS_PR_CT_90H7_1995-1996
BS_PR_CT_90JU_1996-1996
BS_PR_CT_90ML_1990-1992
BS_PR_CT_90V2_1990-1998
BS_PR_CT_90VC_1990-1993
BS_PR_CT_90YG_1990-1991
BS_PR_CT_A9801
BS_PR_CT_AK122
BS_PR_CT_AR_VO9405
BS_PR_CT_AR_VO9611
BS_PR_CT_BUG54a
BS_PR_CT_BUG54b
BS_PR_CT_BUG56
BS_PR_CT_BUG57
BS_PR_CT_CKL1991
BS_PR_CT_GAK38A
BS_PR_CT_GAK38B
BS_PR_CT_GD94-05
BS_PR_CT_GD95-10
BS_PR_CT_Ilyichevsk
BS_PR_CT_KIEV4
BS_PR_CT_KREN57
BS_PR_CT_KREN58
BS_PR_CT_KREN59
BS_PR_CT_MECH9
BS_PR_CT_MERAC9002
BS_PR_CT_ML53_A
BS_PR_CT_ML54
BS_PR_CT_NPT1990
BS_PR_CT_NPT1991
BS_PR_CT_NPT1992
BS_PR_CT_NPT1993
BS_PR_CT_NPT1995
BS_PR_CT_NPT1996
BS_PR_CT_NPT1997
BS_PR_CT_NPT1998
BS_PR_CT_ODV-Sozopol01-1991-1
BS_PR_CT_OSIP9206
BS_PR_CT_Odessa

BS_PR_CT_PAR11
BS_PR_CT_PAR1600
BS_PR_CT_PAR4141
BS_PR_CT_PAR7b
BS_PR_CT_PAVL9209
BS_PR_CT_PK27_1
BS_PR_CT_PK29
BS_PR_CT_PK30
BS_PR_CT_PK33
BS_PR_CT_PSKVK9005
BS_PR_CT_PSKVK9011
BS_PR_CT_PSKVK9102
BS_PR_CT_PSKVK9105
BS_PR_CT_PSKVK9205
BS_PR_CT_PSKVK9410
BS_PR_CT_PSKVK9506
BS_PR_CT_PSKVK9507
BS_PR_CT_PSKVK9809
BS_PR_CT_PV31
BS_PR_CT_PV33
BS_PR_CT_PV35
BS_PR_CT_PV36
BS_PR_CT_PV37
BS_PR_CT_PV40
BS_PR_CT_PV45
BS_PR_CT_PV48
BS_PR_CT_PV49
BS_PR_CT_PV55
BS_PR_CT_SH-9202
BS_PR_CT_SH-9302
BS_PR_CT_SH-9402
BS_PR_CT_SH-9705
BS_PR_CT_SH-9901
BS_PR_CT_SH-9909
BS_PR_CT_SHOM-1994
BS_PR_CT_SHOM-1997
BS_PR_CT_SHOM-1998
BS_PR_CT_SHOM-1999
BS_PR_CT_SHOM-2000
BS_PR_CT_SHOM-2001
BS_PR_CT_SNU-FF_B_09-11
BS_PR_CT_TR15
BS_PR_CT_TR17
BS_PR_CT_TR18
BS_PR_CT_URKI_1994-1995
BS_PR_CT_URME_1990-1993
BS_PR_CT_URQH_1990-1998
BS_PR_CT_URTR_1992-1993
BS_PR_CT_USH1570
BS_PR_CT_USH59a
BS_PR_CT_USH61
BS_PR_CT_V2006B01

BS_PR_CT_VA200301
BS_PR_CT_VA200504
BS_PR_CT_VOL1584
BS_PR_CT_YN1995
BS_PR_CT_YN1996A
BS_TS_MO_Galata_00001
GL_PR_PF_1901200
GL_PR_PF_4900489
GL_PR_PF_4900540
GL_PR_PF_4900541
GL_PR_PF_4900542
GL_PR_PF_6900803
GL_PR_PF_6901960
GL_PR_PF_6901961
GL_PR_TE_61546
GL_PR_TE_61768
GL_PR_TE_61769
GL_TS_DB_61557
GL_TS_DB_61767
GL_TS_DB_61768
GL_TS_DB_61769

ANNEX 5

List of not validated files (discarded by the validation procedure)

Bad SALINITY RT QC flags for files:

BS_PR_CT_ODV-Sozopol01-1993-1
BS_PR_CT_PSKVK9806
BS_PR_CT_RP_1
BS_PR_CT_SH-9407_2
BS_PR_CT_SHOM-1994
BS_PR_CT_SHOM-1995
BS_PR_CT_SHOM-1997
BS_PR_CT_SHOM-1998
BS_PR_CT_SHOM-1999
BS_PR_CT_SHOM-2000
BS_PR_CT_SHOM-2001
BS_PR_CT_SHOM-2002
BS_PR_CT_SSSS

Bad TEMPERATURE RT QC flags for files:

BS_PR_CT_RP_1
BS_PR_CT_SSSS

Bad POSITION RT QC flags for files:

GL_TS_DB_61554

TEMPERATURE RT QC flags is equal to 0 for files:

GL_TS_DB_61553

TEMPERATURE RT QC flags are equal to 9 for files:

BS_PR_CT_15AK2010200

ANNEX 6

List of anomalous files

DATA DUPLICATION:

```
BS_TS_MO_Galata_00001
GL_PR_TE_61768
```

REFERENCES

Karina von Schuckmann and Cécile Cabanés (2010): Validation methods of temperature and salinity measurements: Application on global measurements performed at the Coriolis data center.

Notarstefano G., Bussani A. and Bolzon G. (2011). Assessment of temperature and salinity data obtained from in-situ platforms in the Mediterranean Sea (2011) 2011/67 OGA 27 SIRE dd. 3/8/2011

Scientific Calibration (ScCp) and Validation Plan (ScVP). Calibration report for WP15 InSitu TAC V1 (2010). Technical note.