The German Historical Archive

Workshop on Advances in the Use
of
Historical Marine Climate Data

Boulder, 29 January – 01 February 2002

The German Historical Data Base

Summary:
The total number of electronically available German historic marine meteorological data sets is ca. 11.2 Mill. This comprises all data typed from the very beginning of German data typing in 1940 up to ca. 1982 and consequently contains also those ca. 7.6 Mill. data, which have been transferred as duplicates to the UK Met Office in 1949 - probably forming the basis of the UK/215 and the US/192 deck. This whole material was to a great extent exchanged to the US in 1981.
There is still another bulk of ca. 6 Mill. Data being in different states of data processing and forming a potential of being added to the historical data base.
The comparison of two original logbooks from 1923 with the German data base and the US 192/215 deck showed that most of the data were conform.
Some problems appeared in: UTC allocation, truncation errors in the German data base, minor errors in the US data base and interpretation problems in the originals due to obscured hand writing.

1. Database

The numbers of available observations by year are in (**Fig 1**). The historical period (1850-1939) covers a total of ca 11,2 Mill. observations from ship journals.

The spatial coverage is world-wide (**Fig 2**), most of them in the North and South Atlantic Oceans, but small numbers also in the Pacific and Arctic region (**Fig 3**).

2. Further Potential and Exchange

Besides a number of ca. 11,2 Mill electronically available data there is further potential for historical data (**Fig4**):

a) ca. 2,7 mill. data which have been captured by an unmature optical reading technique and which have to be re-organised, corrected and amended.
b) ca. 1,2 Mill. Data from steam ships, which are from a period between 1875 and 1900 and which have been typed between 1983 and 2002. Most of these data are position checked but there was no meteorological quality check up to present.
c) ca. 1 Mill. Data from a Maury collection, comprising 804 journals, which have been shipped to NCDC and scanned in 2001, which is a substantial contribution to data rescue, as the journals are partly in a bad shape. It is hoped that the data can be typed in the near future.
d) ca. 1,2 Mill. Data still in journals and which are in an ongoing typing process. Typing rate has been ca. 150.000 – 200.000 per year during the last 3 years, depending on the funding.

First Exchange
The transfer from book to punch cards started in 1940 and never stopped. During 1946-1949 an amount of ca. 7 Mill. punch cards have been duplicated and transferred to UK (ref.: Report Deutsche Seewarte 1949). The exact number was 7.7 Mill. data that have been punched at the end of 1949. The UK Deck 215 input was 7,6 Mill.
This may implicate that the German historical Archive at that days has totally been transferred to the UK Met Ofice, which again may be the basis of the US deck 192. Details are in **Fig. 5**, numbers as communicated in March 2001.

Second Exchange
In 1981 the German historical archive was exchanged to NCDC/USA. It contained all available checked data plus a reliable subset from deck 2 a); the exact number is unknown. This data volume should comprise those data, which are in the US192/215 deck. The latest comparison between the German archive and the US192/215 however showed, that the US deck contains more data than to be expected.

3. The German Database and the US Deck 192/215

3.1 General comparison

The history of the database as can be traced back from German sources is in **Fig 5.** This implicates, that the US data collection should be a subset of the actual German archive.

The comparison of the German database and the US deck 192/215 for the years 1850 – 1939 now shows that

- More German data available than in the US Data base which is to be expected as ongoing punching since 1949.
- Double data are to be expected (double by code sheet No, Date, Time and Position)
- Surprisingly there was a subset of US data by 19 %, which was not available in the German Archive (**Fig.6)**. This can be traced back also year by year (**Fig. 7**).

3.2 Comparison of electronic with original logbooks from 1923

The basic problem is that the original journal number is not available in the archive. Instead there is a Code Sheet No, which may be used as a cross reference to the Journal Number. This cross reference is going to be created from thousands of old typing sheets, still available - as far as possible. From the first available cross references we identified two logbooks for comparison with the data in the German Archive and the 192/215 deck. These logbooks have been retyped for comparison.
The overall comparison showed, that the conversion of Marsden squares to tenths degrees positions was uniform. However there was obviously used a different scheme in transforming the local time into UTC, so that sometimes differences of 1 hour UTC appeared.

Case study Steamship „Rheinland“

An image of the „Rheinland“, a plot of the voyage under consideration and the numbers of datasets concerned are given in **Fig. 8**. The comparison was made for Air Pressure, Air Temperature and Water Temperature.
A series of different problems could be identified which were identical for all three elements under consideration and which are listed as follows:

A: obscured handwriting in the original.
This feature was discovered accidentally as the interpretation of the numbers concerned during the retyping process was different from the original typing. In all these cases the German and US Deck showed identical values.

B: Truncation error
This phenomenon was in the German archives for several values, where the tenths digits were set to zero, which occurred block wise. The US data were in accordance with he original in this respect.

C: deviations from the original in the US deck
These errors occurred sometimes, whilst the German Archive was in accordance with the original data.

D: Data not fitting well, not being in either data base.
These data have possibly been rejected by quality control activities and thus did not enter the original German database.

Air Pressure:
The absolute values of all sources fit quite well (**Fig. 9**). Special features are seen in taking the deviations of the different sources from the original (**Fig. 9**). These differences can be assessed to the cases A, B, C.
The deviations between the German Archive and the US deck is in **Fig. 10**, which again shows some of the errors classified above, but most data turned out to be identical.
The very few Deck 215 data in general showed very big errors, up to 5.7 HPa, so that they were left out from the considerations.

Air Temperature:
The data fit very well in general (**Fig. 11**). There were a lot of errors of type D only two of type C again one of Type A.

Water Temperature:
All deviations between the German and the US deck were zero, as well as a total identity to the originals (**Fig. 12**).

Case Study Steamship „Madeira“

There was a second comparison with the Steamship „Madeira“, which made an Atlantic voyage. The total number of original observations was 275 with 201 in both decks, the German and the US 192/215(**Fig.13)**. The results were principally analogue to those of the “Rheinland”. Additionally some few mispositionings were discovered. The results are in **Fig. 14-17,** analogue to Fig. 9 – 12.

Conclusions:

- There is a potential of ca. 6 Mill. German data with different status, which can be made available to the historical database.
- There is a German data base at NCDC, which should comprise the US192/215 deck already.
- The US192/215 deck and the data from actual German decks contain data which may complete each other.
- Direct comparison of originals from two German journals with the considered decks showed, that most data are identical to the originals, although some problems were identified as:
  - small series of truncation errors in the German data base
  - sometimes different UTC allocations
  - small series of 0.1 – 0.2 unit errors in the US deck
  - uncertainties to obscured hand writings, which normally can not be discovered.

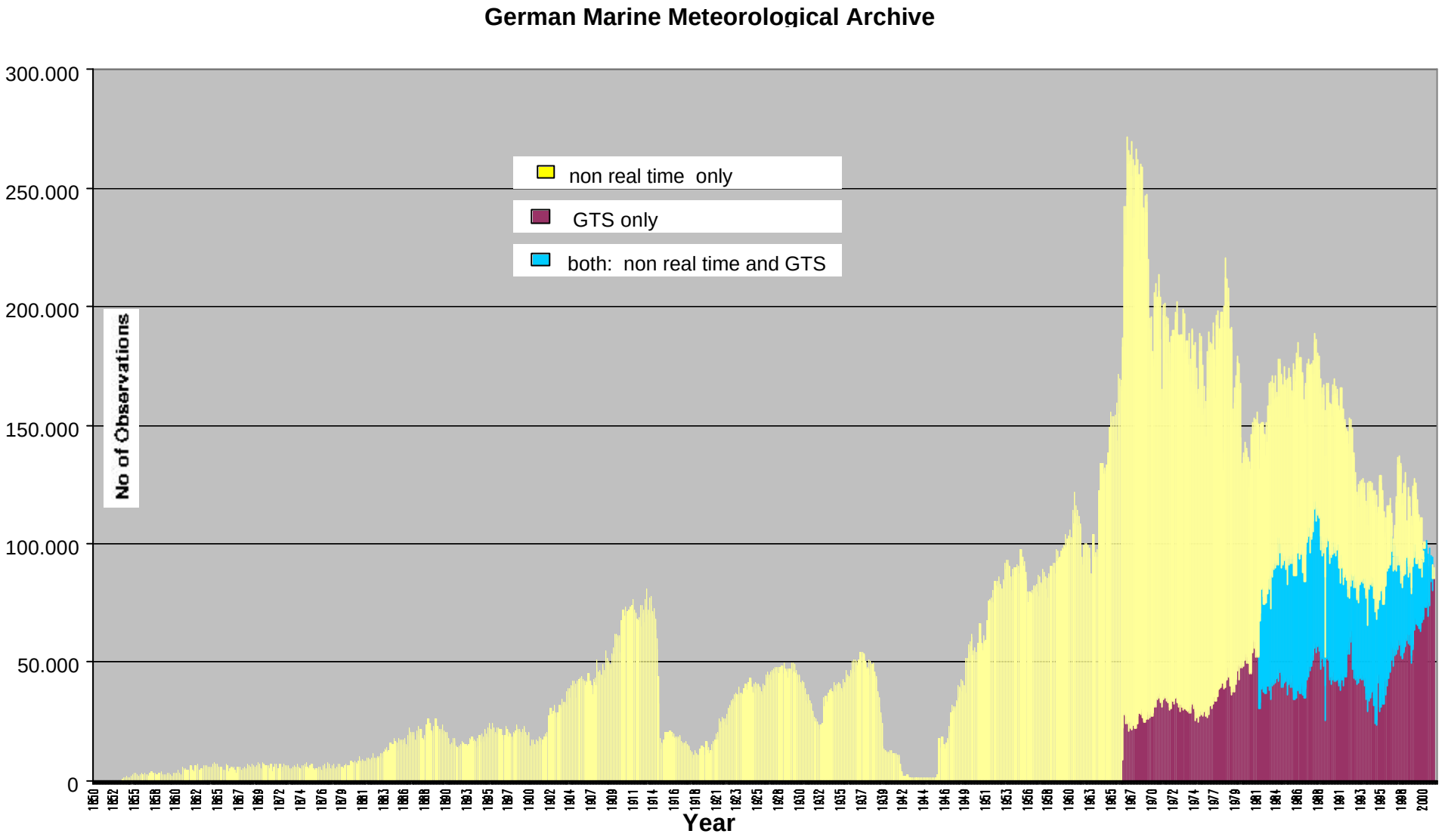
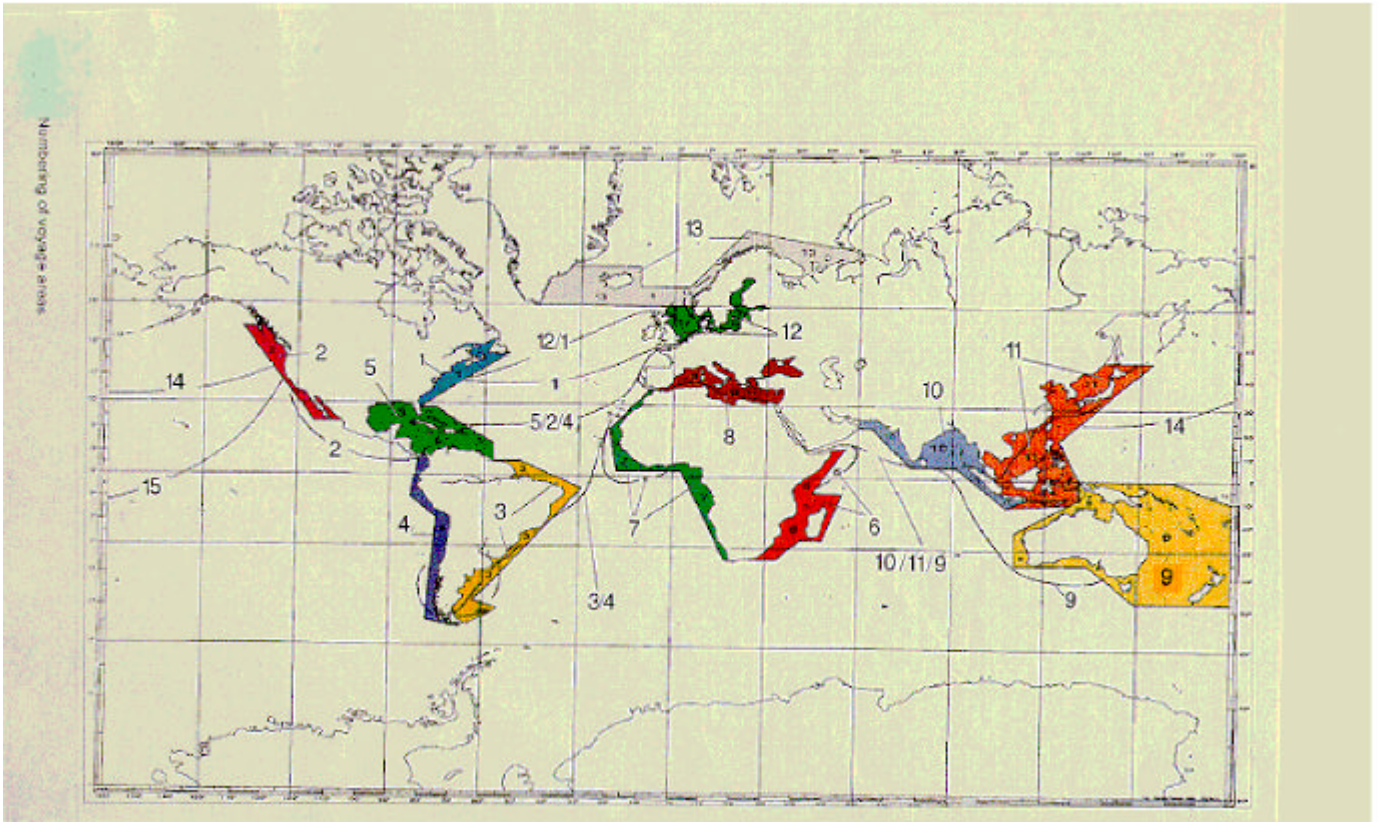

German Marine Meteorological Archive
300.000
250.000
200.000
150.000
100.000
50.000
0
No of Observations
non real time only
GTS only
both: non real time and GTS
Year

Fig. 1



Area					
1	North America East Coast	6	African East Coast	11	Eastern Asia
2	North America West Coast	7	African West Coast	12	North Sea , Baltic Sea
3	South Amarica East Coast	8	Mediterranean	13	Nordmeer
4	South Amarica West Coast	9	Australia	14	Northern Pacific
5	West Indies ans Gulf	10	India and Java	15	Southern Pacific

German Historical Marine Meteorological Archive (Geographical Coverage)

Fig. 2

Number of Cruises per Area
(total ca. 43.000)

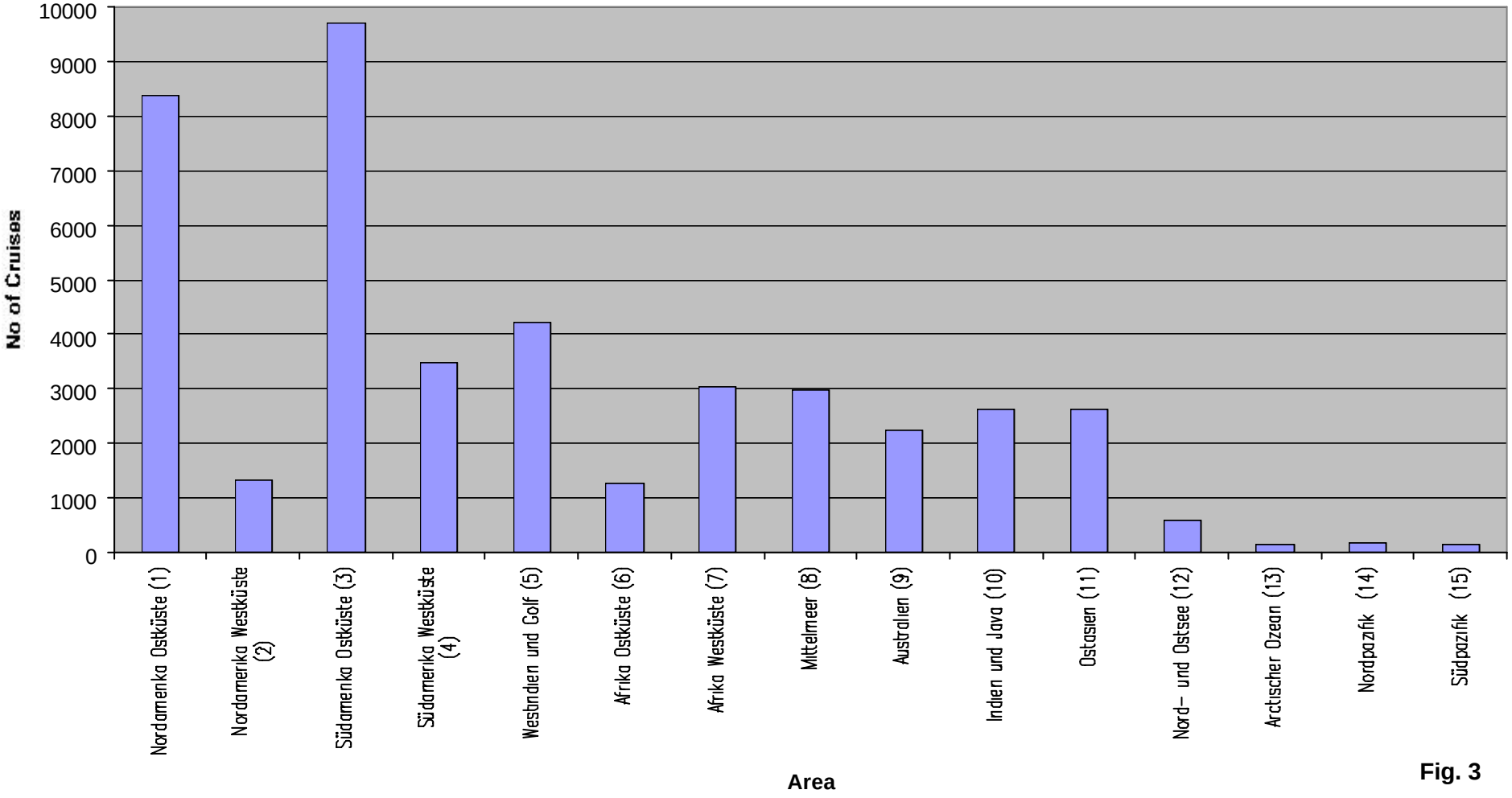
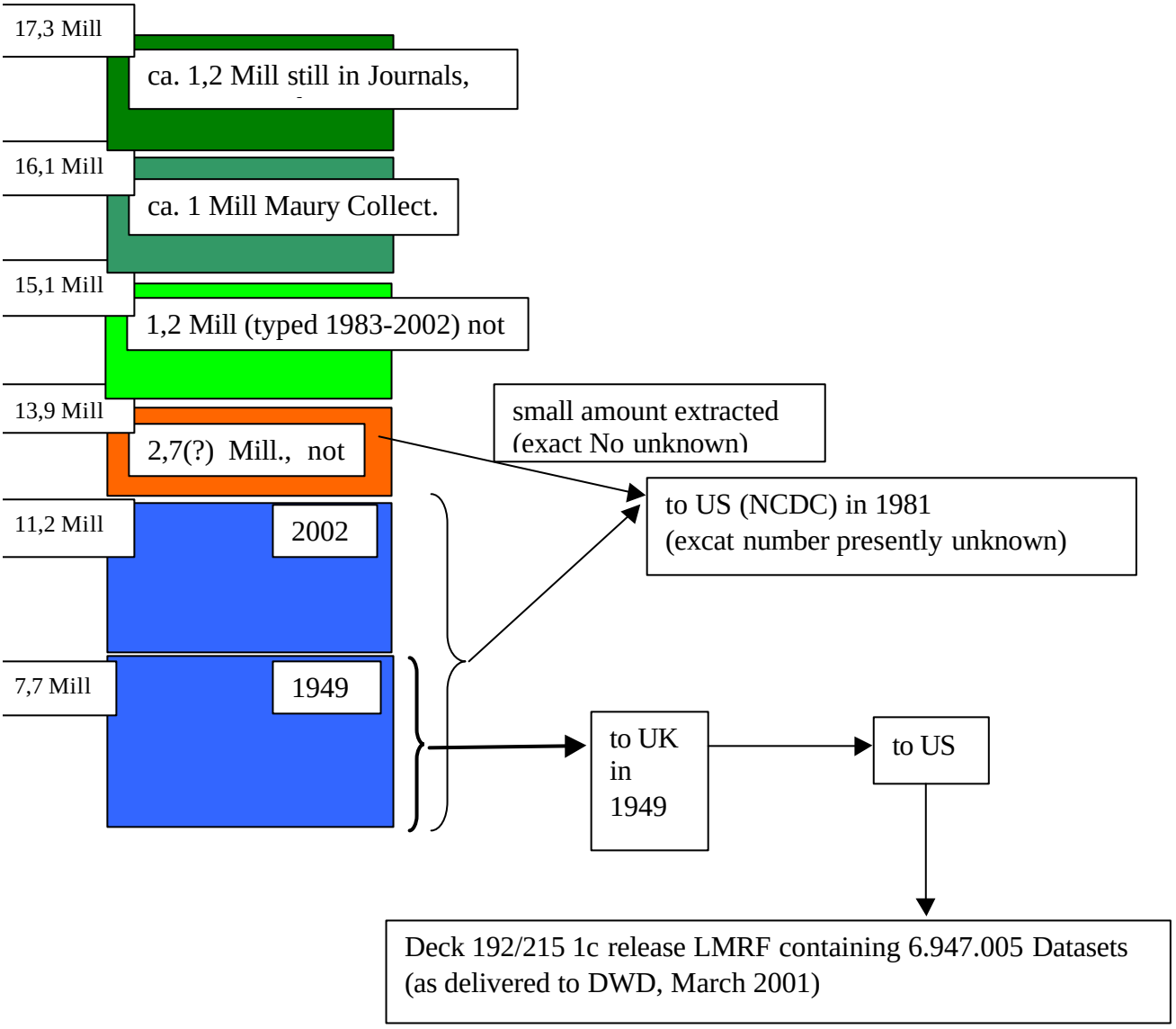


Fig. 3

German Historical Marine Meteorological Database
Exchange and further Potential



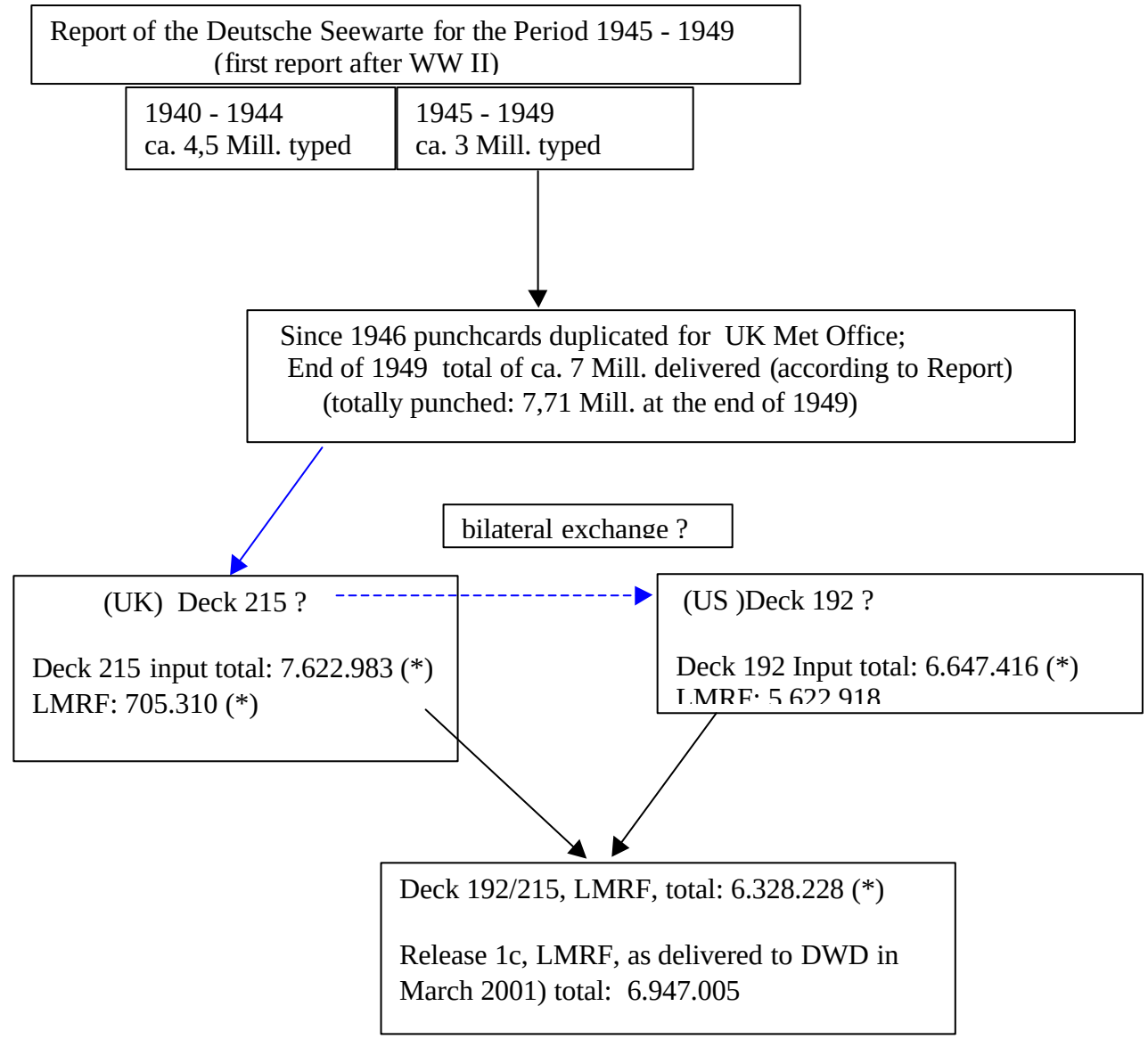

Report of the Deutsche Seewarte for the Period 1945 - 1949
(first report after WW II)
1940 - 1944
ca. 4,5 Mill. typed
1945 - 1949
ca. 3 Mill. typed
Since 1946 punchcards duplicated for UK Met Office;
End of 1949 total of ca. 7 Mill. delivered (according to Report)
(totally punched: 7,71 Mill. at the end of 1949)
bilateral exchange ?
(UK) Deck 215 ?
Deck 215 input total: 7.622.983 (*)
LMRF: 705.310 (*)
(US)Deck 192 ?
Deck 192 Input total: 6.647.416 (*)
LMRF: 5.622.918
Deck 192/215, LMRF, total: 6.328.228 (*)
Release 1c, LMRF, as delivered to DWD in
March 2001) total: 6.947.005
(*) Woodruff, communic. March 2001
1933-1939: original logbooks lost. Most of the data had been typed;
number of observations 1933-1939 in the German Archive: 1.207.461

Fig. 5

Period 1850 - 1939

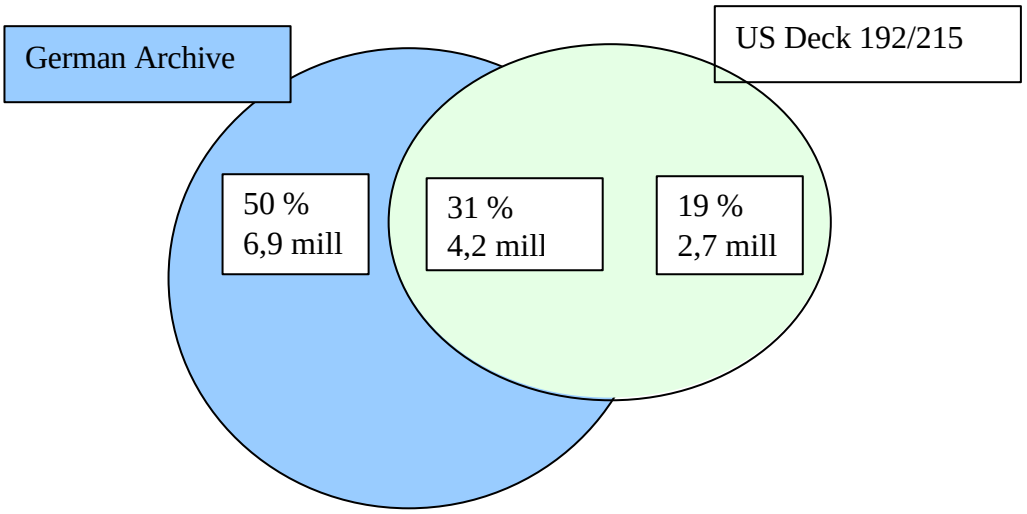
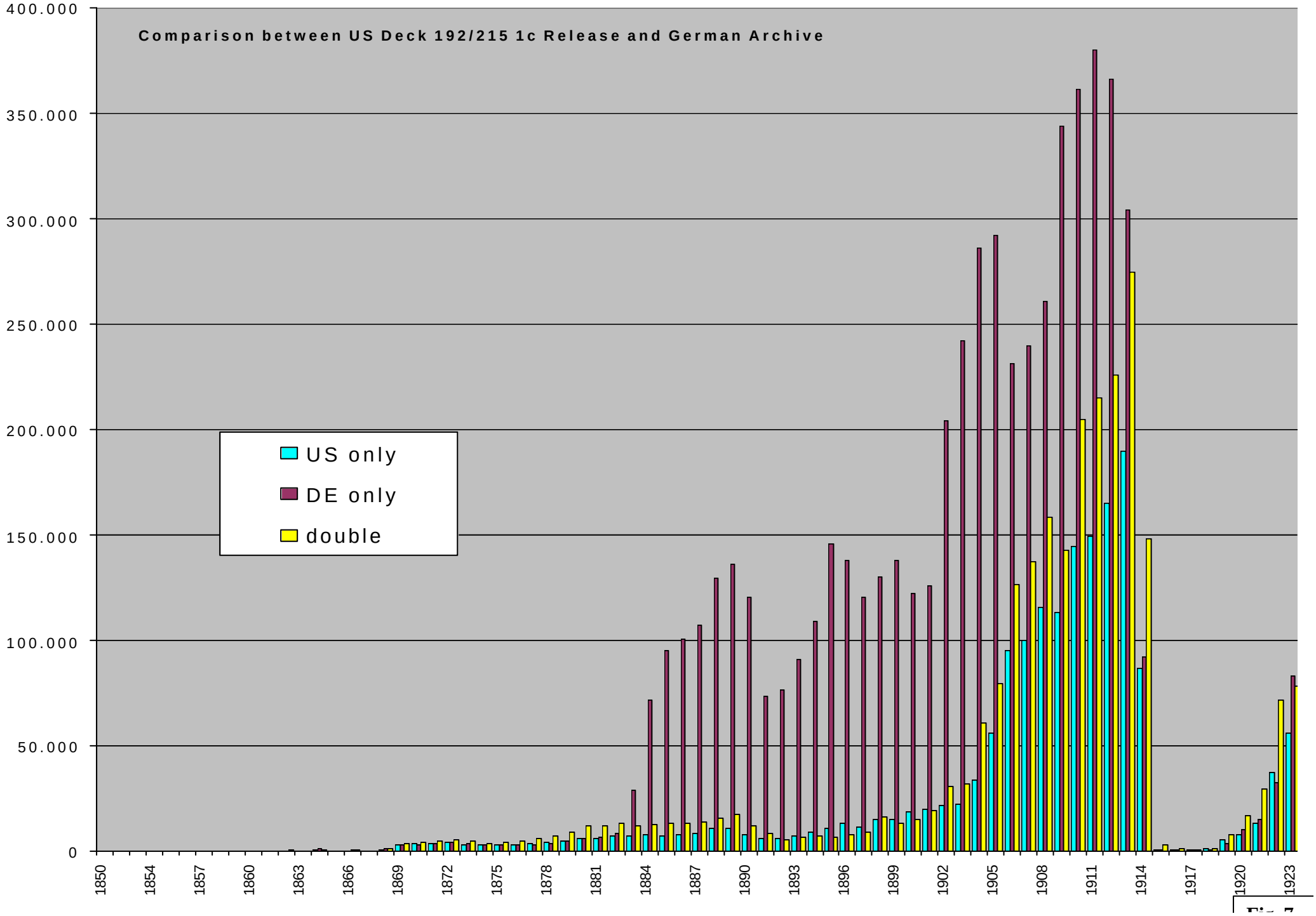
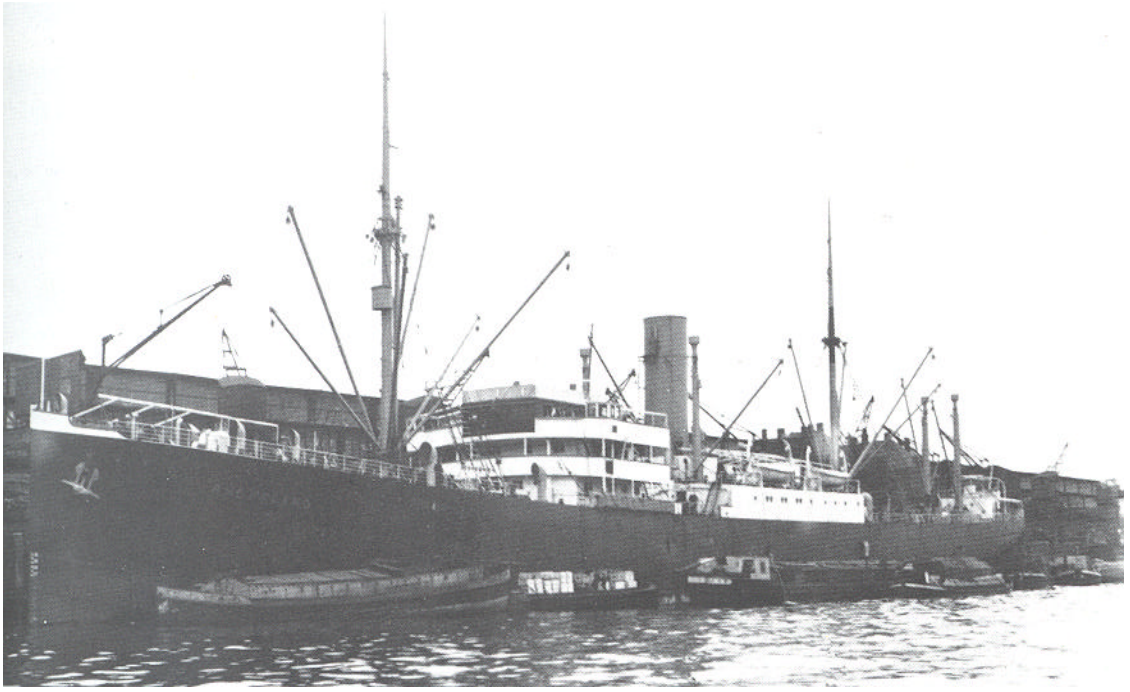


Fig. 6


Comparison between US Deck 192/215 1c Release and German Archive
US only
DE only
double
400.000
350.000
300.000
250.000
200.000
150.000
100.000
50.000
0
1850
1854
1857
1860
1863
1866
1869
1872
1875
1878
1881
1884
1887
1890
1893
1896
1899
1902
1905
1908
1911
1914
1917
1920
1923

Steamship „Rheinland“



„Rheinland“	Number of Observations
Original	521
German Archive	322 (+ 47 more than D192)
D192	432 (+ 157 more than Germ Arch)
D215	15 (not fitting)
Both: Germ, D192	275

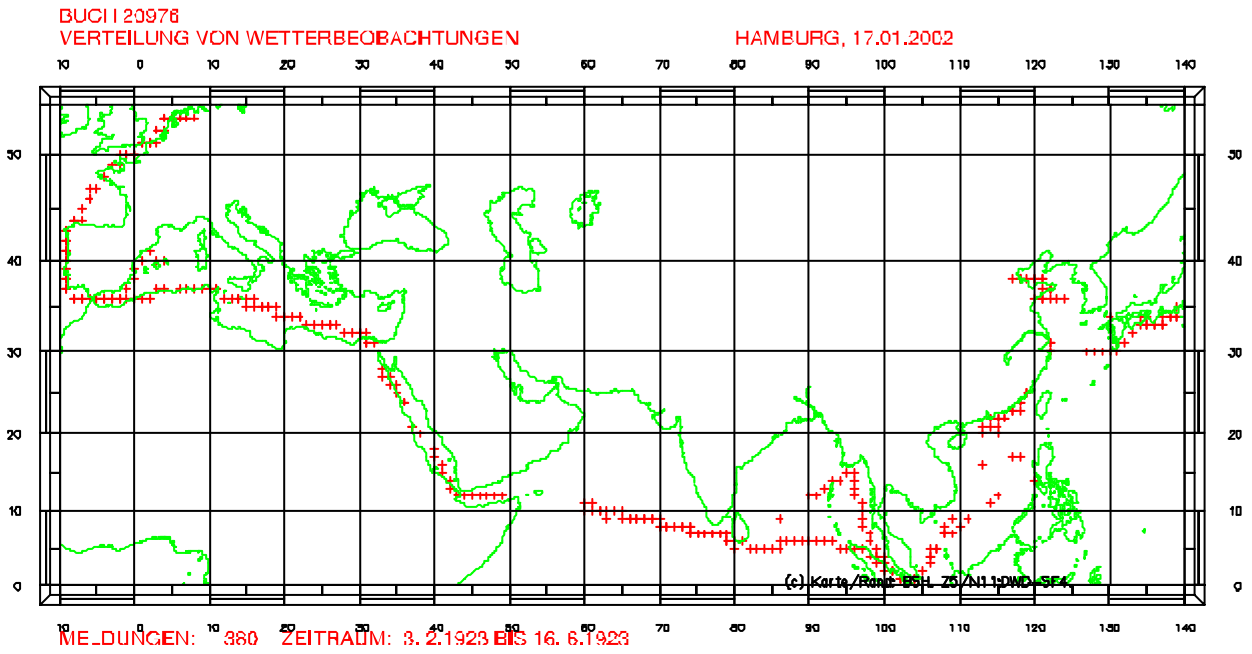
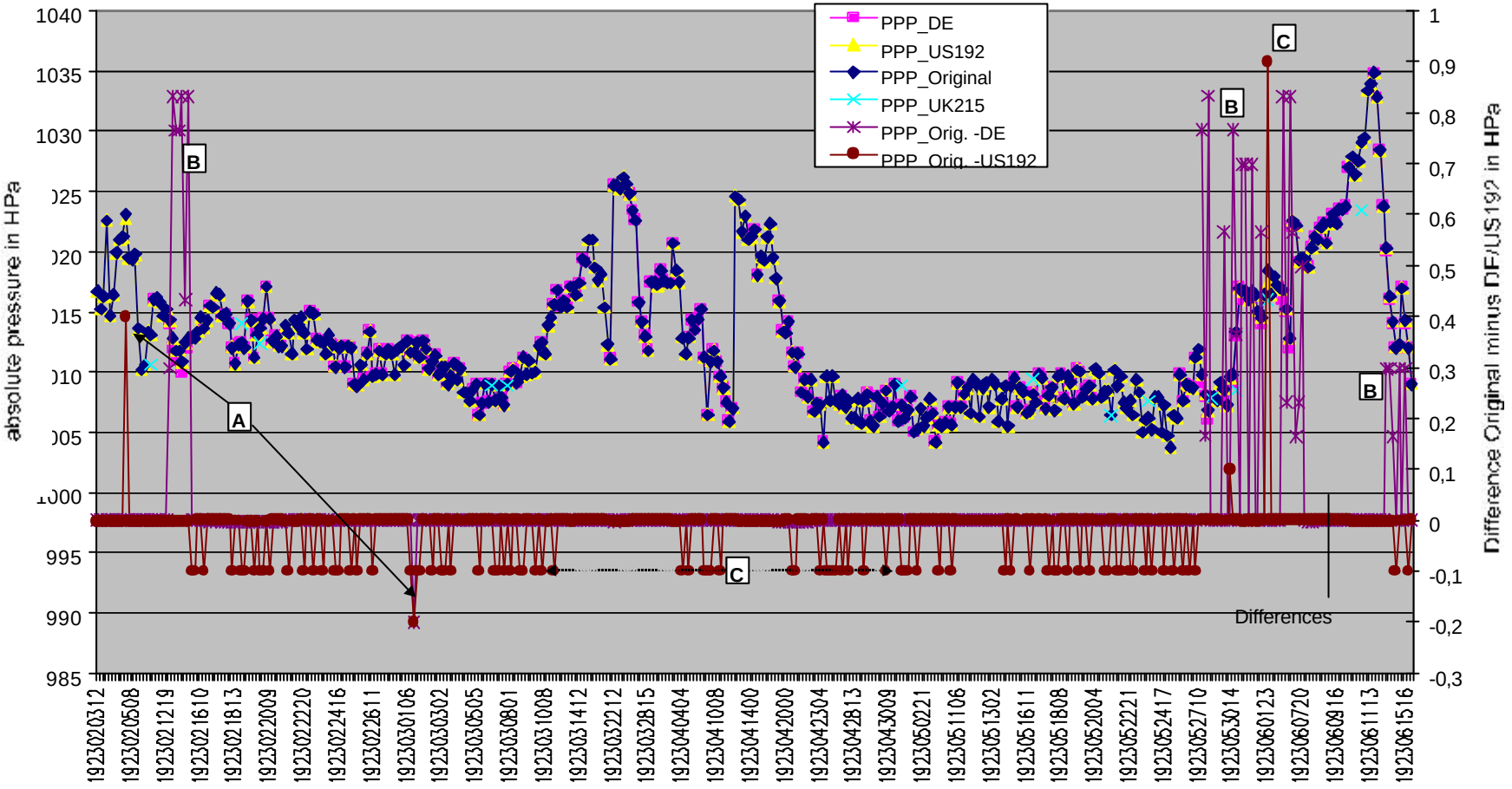


Fig. 8

Steamship "Rheinland" 1923

Air Pressure



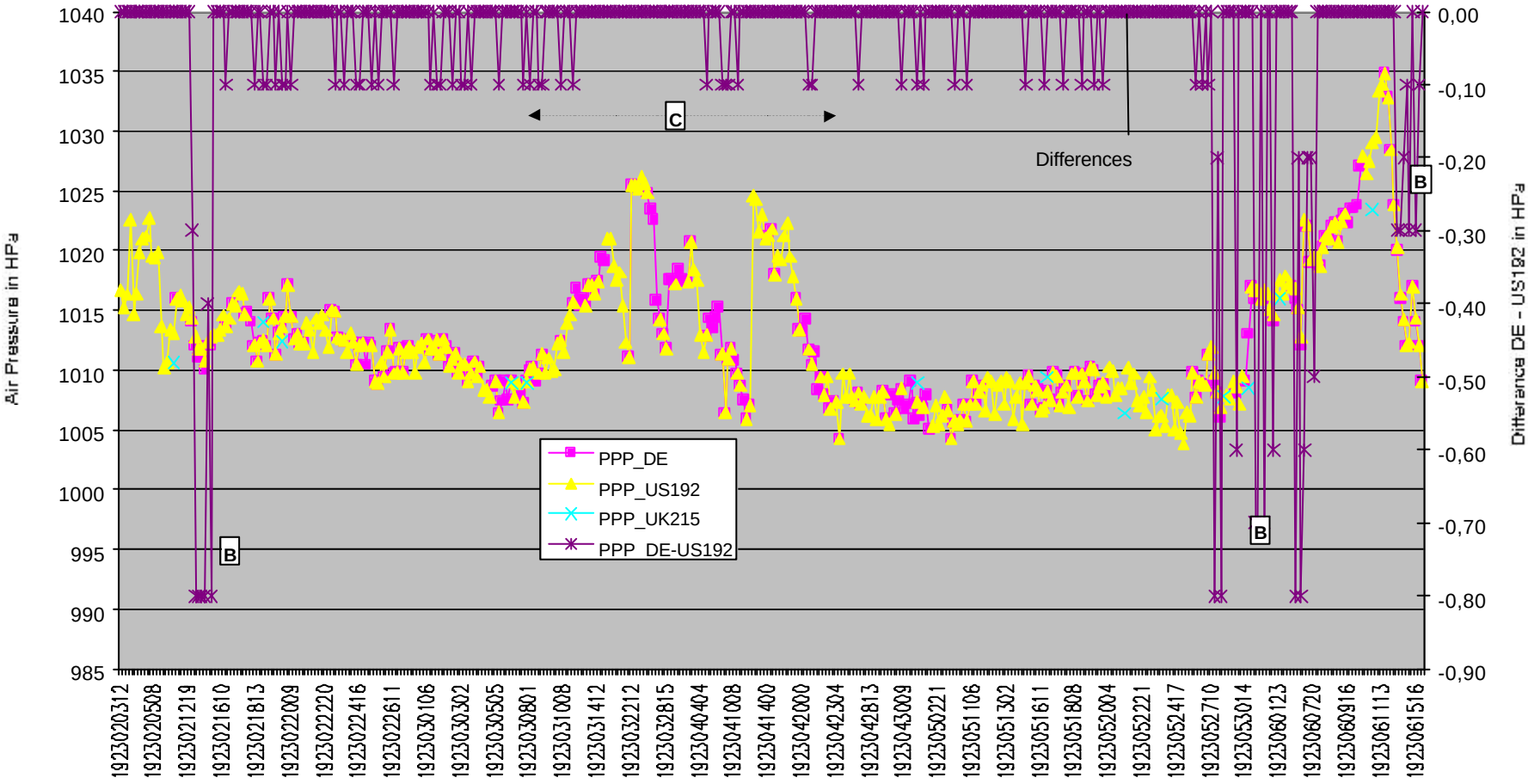
A ,B,.. Error Type (see Text)

Date

Fig. 09

Steamship "Rheinland" 1923

Air Pressure



B, C, ... Error Type (see Text)

Date

Fig 10

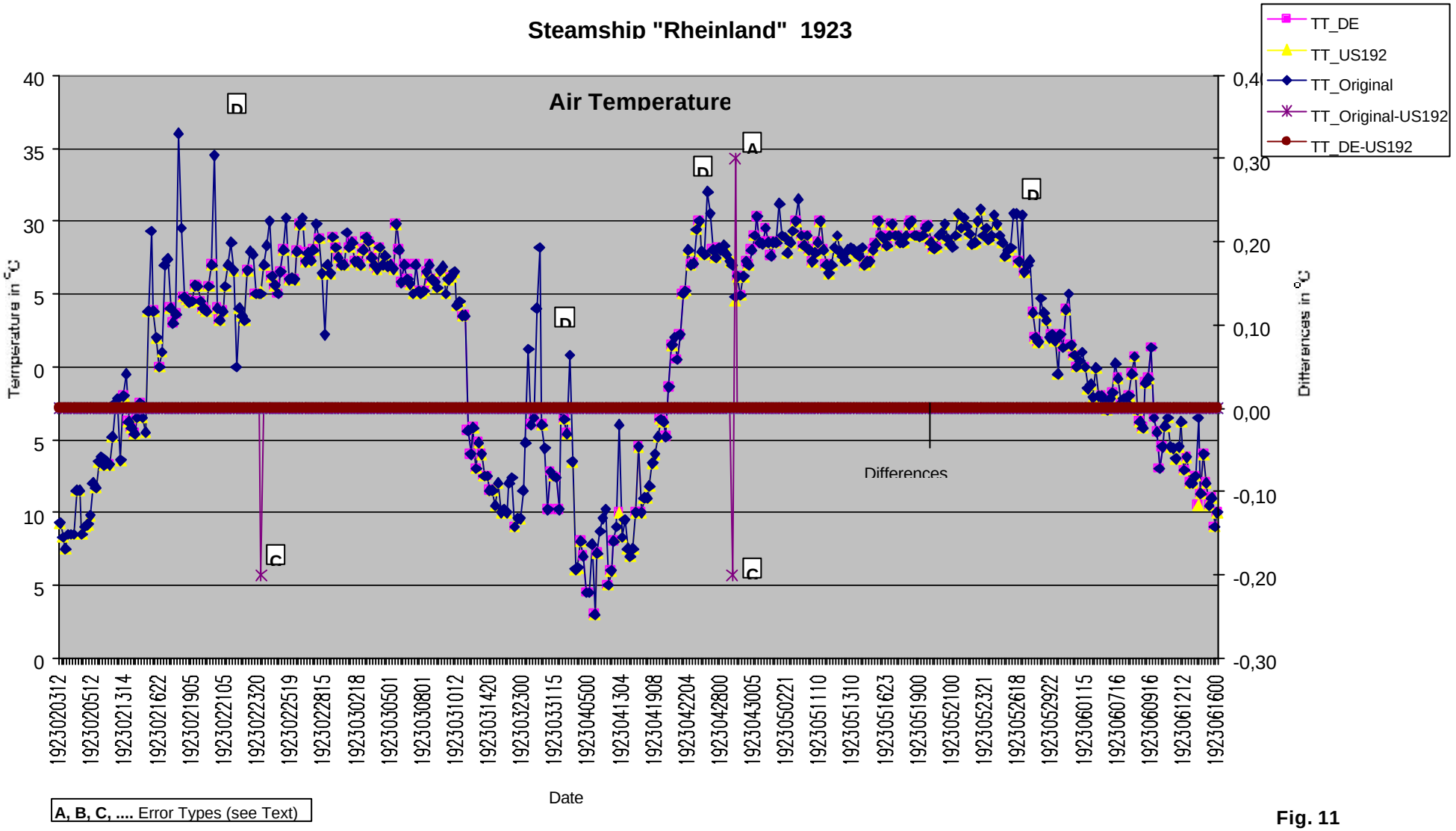

Steamship "Rheinland" 1923
Air Temperature
TT_DE
TT_US192
TT_Original
TT_Original-US192
TT_DE-US192
Temperature in °C
Differences in °C
Differences
Date
A, B, C, ... Error Types (see Text)

Fig. 11

Steamship "Rheinland" 1923

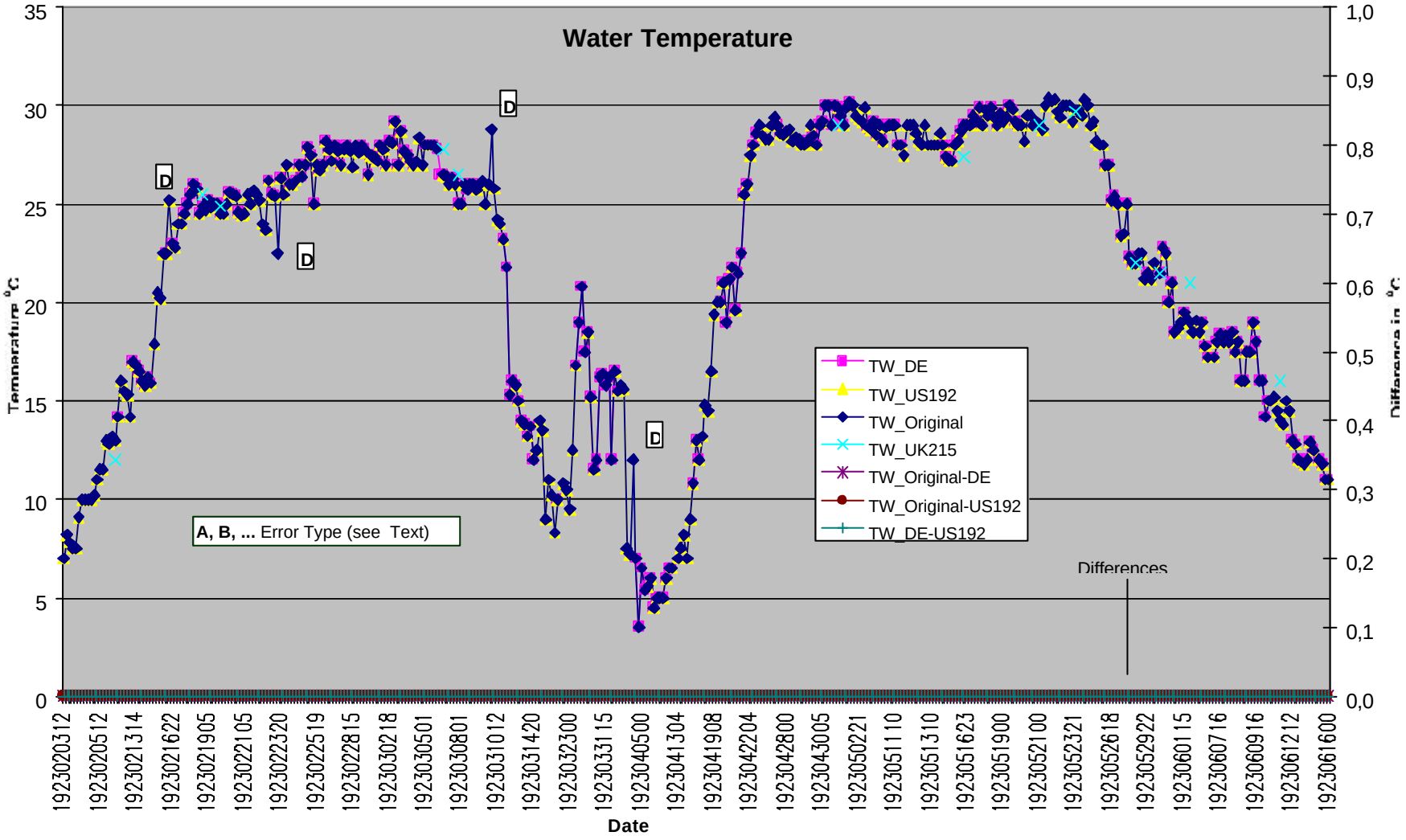
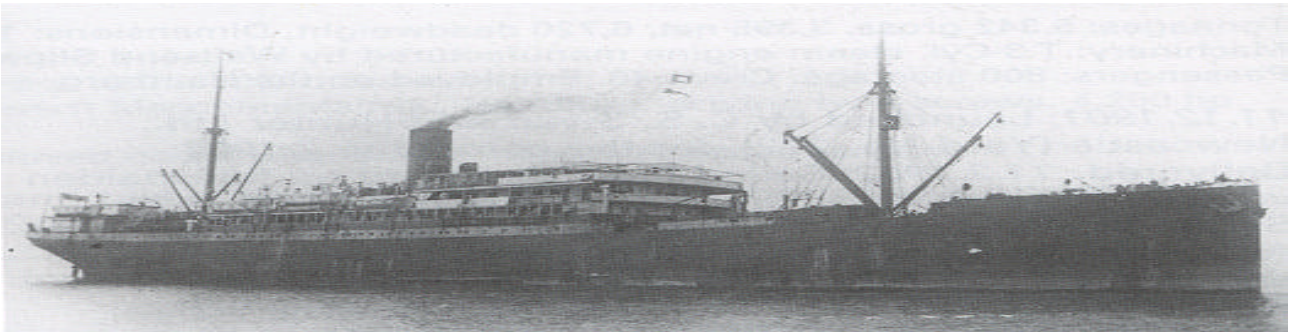


Fig. 12

Steamship „Madeira“



„Madeira“	Number of Observations
Original	275
German Archive	207 (+ 6 more than US192)
D192	233 (+ 31 more than Germ. Arch.)
D215	13
Both: Germ, D192	201

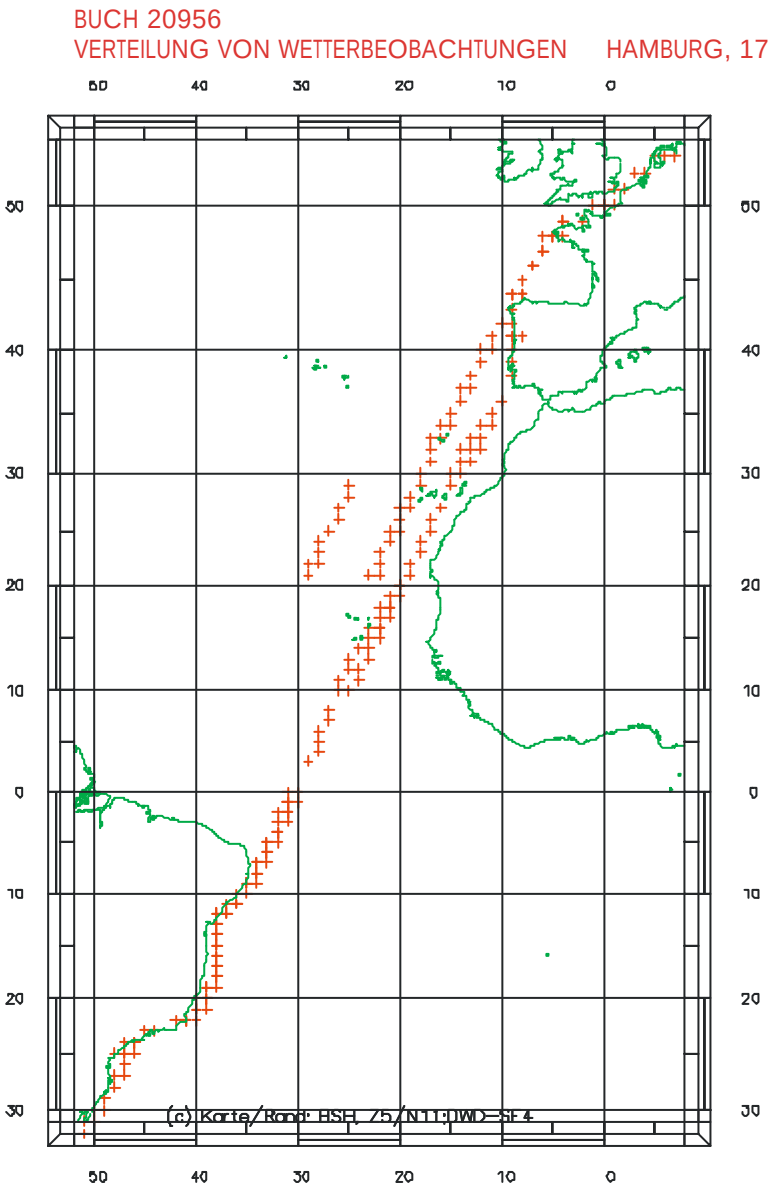


Fig 13

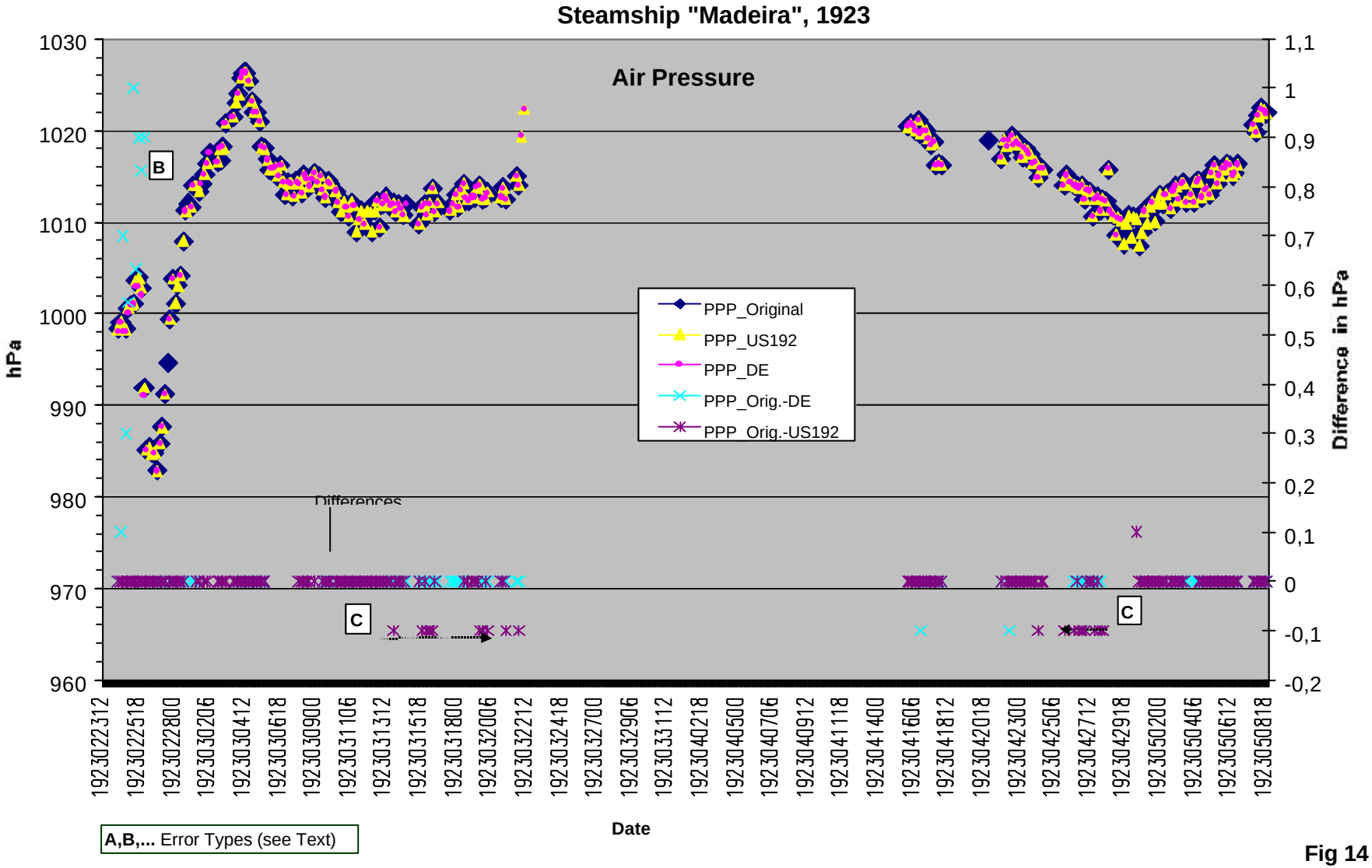
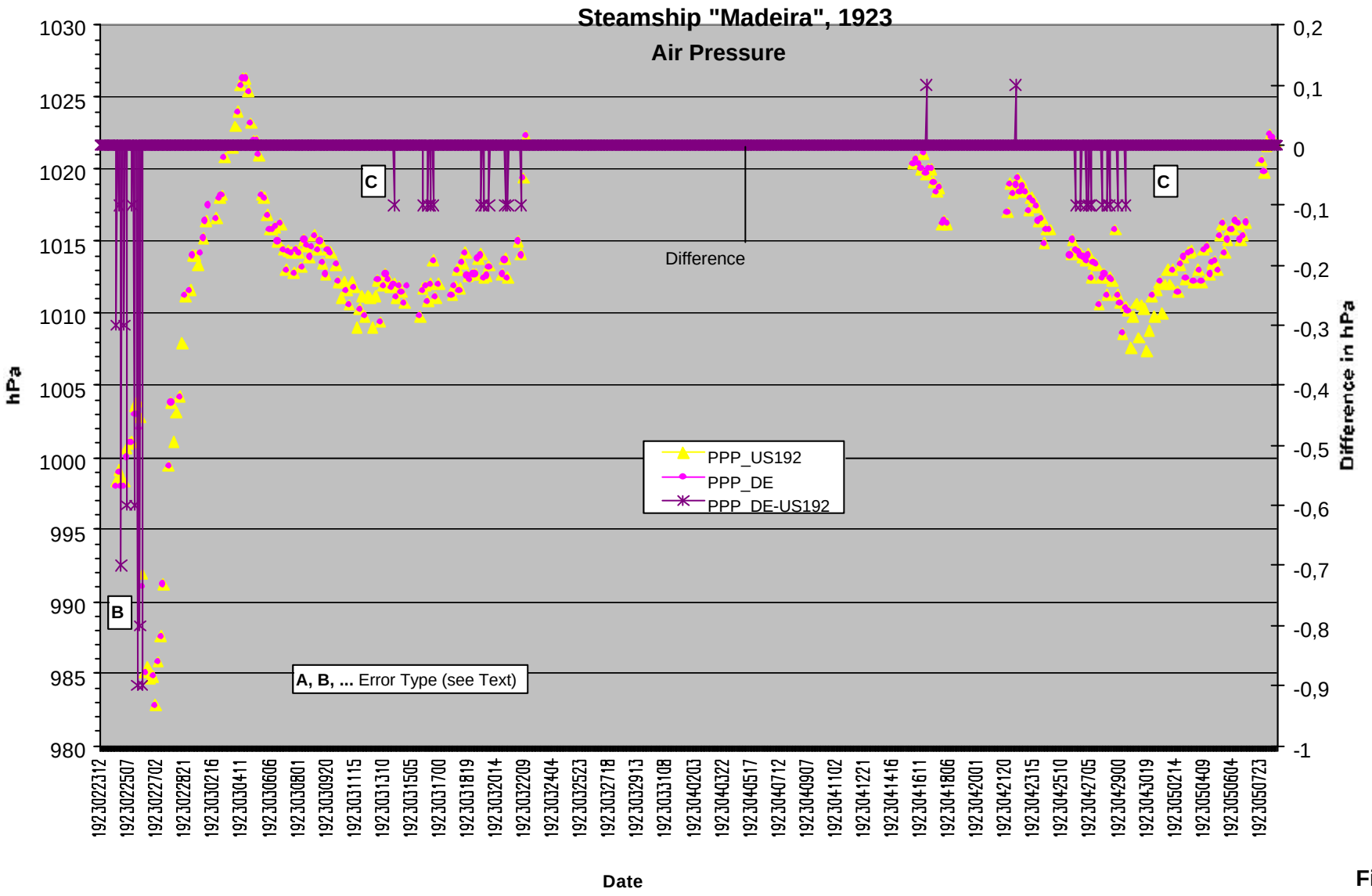

Steamship "Madeira", 1923
Air Pressure
hPa
Difference in hPa
Date
PPP_Original
PPP_US192
PPP_DE
PPP_Orig.-DE
PPP_Orig.-US192
Differences
B
C
C
A,B,... Error Types (see Text)

Fig 14


Steamship "Madeira", 1923
Air Pressure
hPa
Difference in hPa
Date
Difference
PPP_US192
PPP_DE
PPP_DE-US192
A, B, ... Error Type (see Text)
B
C
C
1030
1025
1020
1015
1010
1005
1000
995
990
985
980
0,2
0,1
0
-0,1
-0,2
-0,3
-0,4
-0,5
-0,6
-0,7
-0,8
-0,9
-1
19230322312
19230322507
19230322702
19230322821
19230330216
19230330411
19230330606
19230330801
19230330920
19230331115
19230331310
19230331505
19230331700
19230331819
19230332014
19230332209
19230332404
19230332523
19230332718
19230332913
19230333108
19230340203
19230340322
19230340517
19230340712
19230340907
19230341102
19230341221
19230341416
19230341611
19230341806
19230342001
19230342120
19230342315
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19230350214
19230350409
19230350604
19230350723

Fig 15

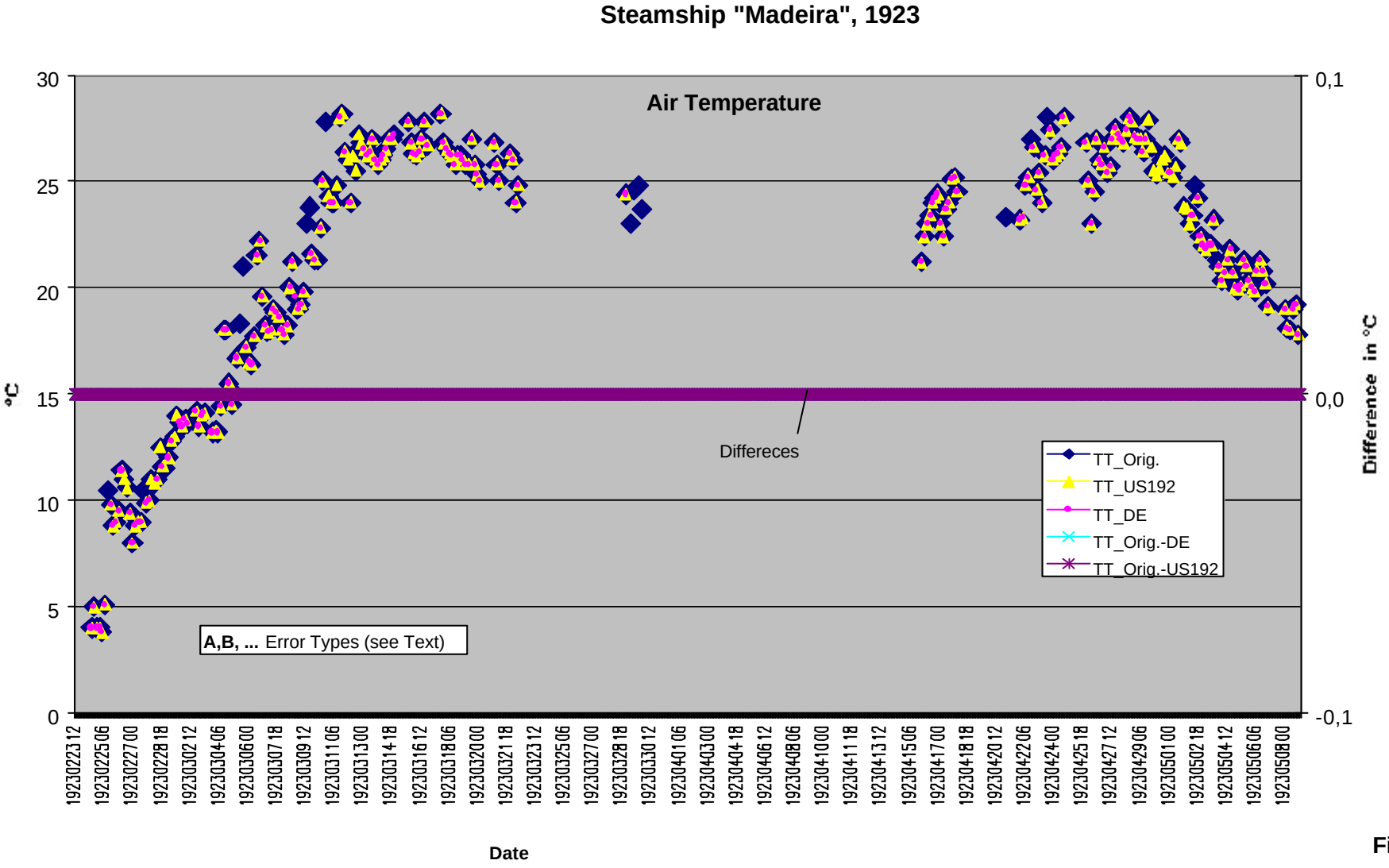
Steamship "Madeira", 1923
Air Temperature
°C
Difference in °C
30
25
20
15
10
5
0
0,1
0,0
-0,1
Differeces
TT_Orig.
TT_US192
TT_DE
TT_Orig.-DE
TT_Orig.-US192
A,B, ... Error Types (see Text)
Date

Fig. 16

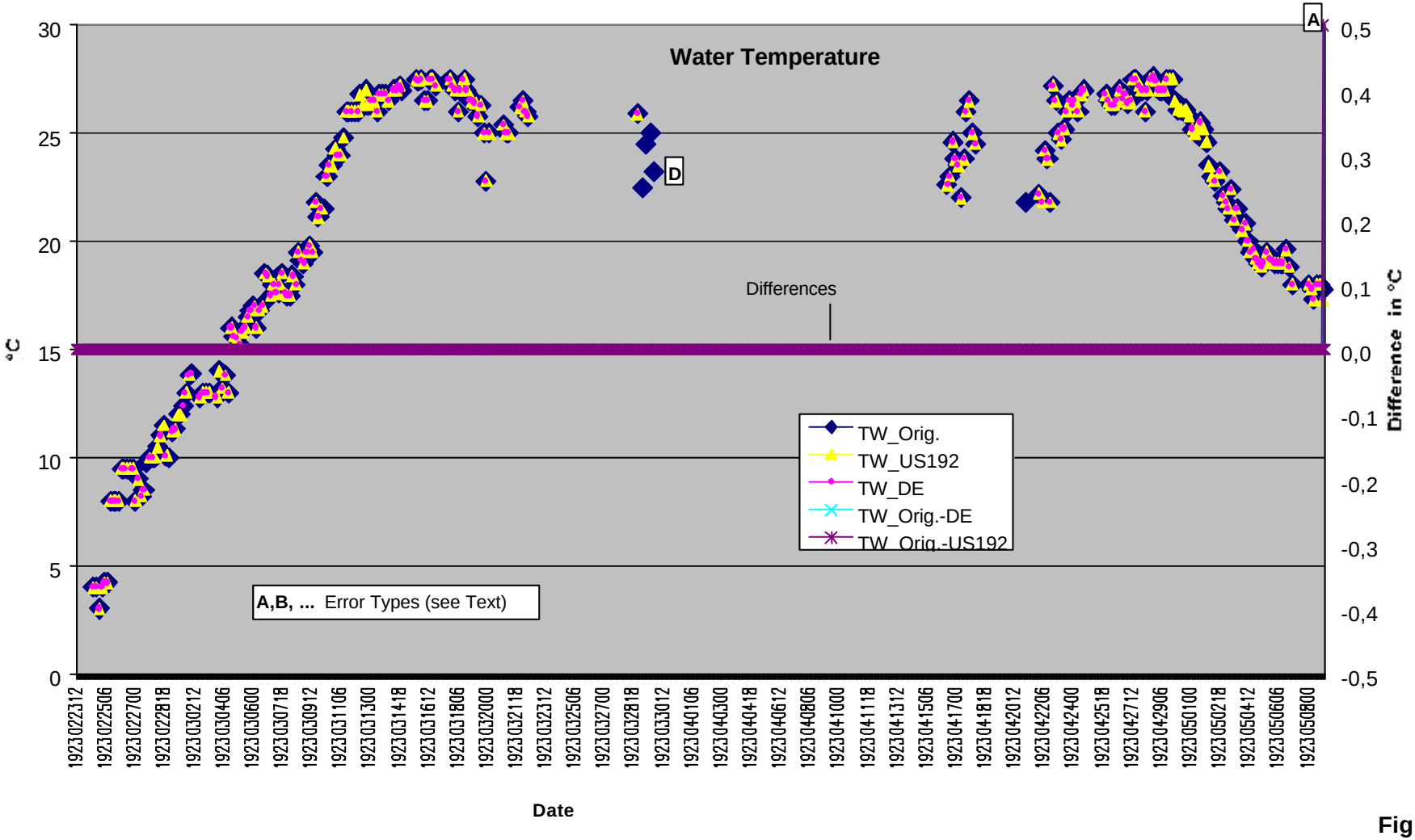
Steamship "Madeira", 1923
Water Temperature
°C
Difference in °C
Differences
A
D
TW_Orig.
TW_US192
TW_DE
TW_Orig.-DE
TW_Orig.-US192
A,B, ... Error Types (see Text)
Date

Fig 17