Russian Marine Meteorological Data Set HIHMI—WDC

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The Russian historical set of marine meteorological data has been created on the basis of the archives being kept in RIHMI - WDC, the Russian Gidrometcentre, Oceanological Institute of Goskomgidromet, Main Geophysical Observatory, Institute of Oceanology of the Academy of Sciences, Marine Administrations of Meteorological Services and other organizations. The significant part of the archive consists of data received from other countries on an international exchange basis: Federal Republic of Germany, United Kingdom, United States, Japan, Netherlands (Table 1). Most of the historical data could not be identified with respect to their originating country. In the 1970s the reception of marine messages was organized via GTS in USSR Gidrometeorological Centre and since 1982 these messages have become available in RIHMI-WDC.

All data collected were recorded on various types of media including logs, punch cards, microfilms, magnetic tapes, and, naturally, in different formats. With the formation of the merged set the problem arose relating to reducing all data to a common format and their recording in a common medium. During 1986-1988 the combined set of marine meteorological information, "MORMET," was created.

The composition of MORMET corresponds to the code of data transmission by radio FM-IIV SHIP. But in contrast to the international format IMMT all data are recorded in binary mode except for ship identifier. This made it possible to reduce the length of record down to 100 bytes instead of 140 bytes in IMMT format. The format has some more specific features in addition to those mentioned. To facilitate the search for information needed, the World Ocean is divided into separate regions, to each of which a three-dimensional number is assigned. In Table 2 the list of regions selected and number of reports in thousands are presented. Apart from this, an additional quality sign Q19 is introduced, which jointly with Q7, allows one to distinguish between dew point or wet- bulb temperatures measured and those calculated.

In its composition and allotment the created set is similar to those of COADS Long Marine Reports (LMR). Observation reports of the set are organized over the regions in 10° x 10° and 1° x 1° squares, and chronologically organized within them.

Originally the set included the reports for 1891-1987; at present it is planned to extend it up to 1990. The necessary work is being performed with this in view. The total number of reports in the set is above 25 million, which is significantly less than in the COADS set. Figure 1 Presents yearly data reception.

In addition, information on distribution of the number of observations of particular meteorological Parameters for all reports is of interest. Table 3 shows these data given in percent.

The historical MORMET is updated every three years. Apart from this, the set of current data is available which is constantly updated. The main sources of data acquisition are:

• the Russian ship logs of meteorological observations;
• messages transmitted via the GTS;
• international data exchange;
• reports on the Russian RV cruises.

Data source and meteorological values have been checked in every particular case. This procedure was based on algorithms proposed in "Final Report on the Meeting of the Working Group on Marine Meteorology,- NCDC, Asheville, USA, 22-28 September 1980, and "Archiving and Marine Climatological Data Check: Quality Control Procedures," Geneva, 10-14 November 1986. But many of them have been complicated. Thus, for removing an error in coordinates Computerized map of the World Ocean has been created, which describes the shore line to an accuracy of 1 degree. The observations which happened to cover the land are excluded.

For checking water and air temperatures, tables of their limiting values in each 10° x l0° square have been created. If temperature values are exceeding those limits, they are considered suspect. An additional check is also introduced for logical relations. In checking cloudiness, values of air temperature, wind and geographical latitude are also used apart from weather conditions. For checking weather, cloud amount and visibility values are used. In the case of waves, not only wind values but empirical formulae are used as well, which show the relation between the waves' period and their height.

The MORMET data set is the main baseline set of observational data. The data Catalogue is a backup data set, containing information on the number of observations of main meteorological parameters in each 10° x 10° and 1° x 1° square of the World Ocean. This Catalogue is a source of reference information on the observational data that enables us to answer the following questions:

• data distribution according to regions and squares;.
• date distribution according to periods, years and months;
• the number of observations of any meteorological parameter.

The assignment of the Catalogue set is similar to those of the COADS inventories (INV). Information on distribution Of reports for the World Ocean squares is given in Fig. 2.

The MORMET data set serves as the basis for producing derivative and calculated data sets. Experience suggests that in most cases (up to 95%) not all characteristics contained in the reports are used. Most often used are the following characteristics: water and air temperatures, air pressure, cloud amount and height of cloud base, wind direction and speed, height and period of wind waves, visibility, weather. When checking these meteorological values, as well as ship location and observation time, it is possible to significantly reduce the length of each record. Data with quality characteristics (Qnn) ranked 1 or 5 are selected for recording. The length of the record of one report equals 18 bytes. The set is named MOKOMP, which is similar to COADS Compressed Marine Reports (CMR).

On the basis of MOKOMP the sets of daily, ten-day period and monthly values are created within 10° x 10° and 1° x 1° squares for the period 1961-1987. The calculations are made on the following statistics: mean value, RMS deviation, max and min value and also nine quantiles: 1, 5,

10, 25, 50, 75, 90, 95, and 99 per cent. Vector values (wind, wave) are calculated in accordance with corresponding rules.

The period of 30 years is chosen for making calculations as the most appropriate one which is considered sufficient for the description of current climate according to the WMO recommendations. This part of the set represents data chronologically ordered. These sets are similar to those of the COADS Monthly Summaries Trimmed and Untrimmed (MST and MSU), but they do not contain derivative characteristics such as the difference between water and air temperatures, heat balance values, etc.

Using the MOKOMP data set meteorological values are also calculated which are interpolated to 1° and 10° geographical grid points on a daily, ten-day and monthly basis. The calculation results are chronologically ordered for regions as synoptical fields.

The MORMET data set and its derivatives were created as the data bank information base "Marine Aerometeorology" which contains current and historical upper-air observations as well as the weather ship data set, in addition to the above mentioned historical and current marine meteorological observations. Using the data bank "Marine Aerometeorology" some work has been done on the climatology of particular World Ocean regions, and hydrometeorological maps have been prepared and issued for a number of seas bordering Russia. Hydrometeorological maps of the Caribbean Sea, Gulf of Mexico, the Yellow Sea and the Eastern China Sea are in the state of production. Atlases of dangerous and disastrous hydrometeorological phenomena for navigation and fishery have been prepared and issued for the North Atlantic, the North Pacific, the South Atlantic and the Pacific and Indian Oceans.

Table 1. Russian Marine Ship Data, 1881-1989. Top 20 Country Code Summary.

Code	Country	Number of Reports
25	USSR	11491646
nn	blank	11360601
21	West Germany	305929
03	United Kingdom	302560
02	United States	237077
17	Japan	230355
40	East Germany	137574
00	Netherlands	110990
04	France	41205
14	Belgium	28000
13	Canada	25009
01	Norway	19803
29	Portugal	18714
19	Argentina	17663
05	Denmark	16497
22	Iceland	15636
33	Poland	13649
34	Brazil	12603
20	Sweden	10201
15	South Africa	7707

Table 2. Regional Area Counts

Area	Name	Rec. Grp. (nn*1000)
100	Arctic ocean (high 80°N)	16
101	Barents sea	687
102	White sea	131
103	Kara sea, Ob gulf	65
104	Laptev sea	14
105	East Siberian sea	14
106	Chuckchi sea	20
107	Beaufort sea, Larry bay	22
108	Greenland sea	178
109	Baffin bay, Davis strait	335
1NN	Total	1453
210	North Atlantic (30°N-80°N)	5389
211	Norwegian sea	996
212	North sea, Irish sea, English channel	532
213	Baltic sea, Kattegat strait	548
214	Mediterranean sea	915
215	Black sea, Sea of Asov	246
216	Hudson strait, Hudson bay	5
220	Tropical Atlantic (30°N-30°S)	3278
221	Caribbean sea, Gulf of Mexico	561
230	South Atlantic (30°S-60°S)	377
231	Drake strait	10
2NN	total	13500
301	Caspian Sea	249
302	Aral Sea	19
3NN	total	268

Table 2 (continued).

Area	Name	Rec. Grp. (nn*1000)
410	North Pacific (30°N-80°N)	3200
411	Bering sea	938
412	Sea of Okhotsk	915
414	Japan sea	598
420	Tropical Pacific (30N-30S)	1692
421	South China sea	328
422	Malay archipelago seas and straits	92
430	South Pacific (30°S-60°S)	326
4NN	total	8222
510	Red sea, Arabian sea, Bay of Bengal, Persian Gulf	445
520	Tropical Indian Ocean (10°N-30°S)	366
530	South Indian ocean (30°S-60°S)	331
5NN	total	1142
600	Antarctic water (high 60°S)	101
	total	25300

Table 3. Observation amount of meteorological parameters (%)

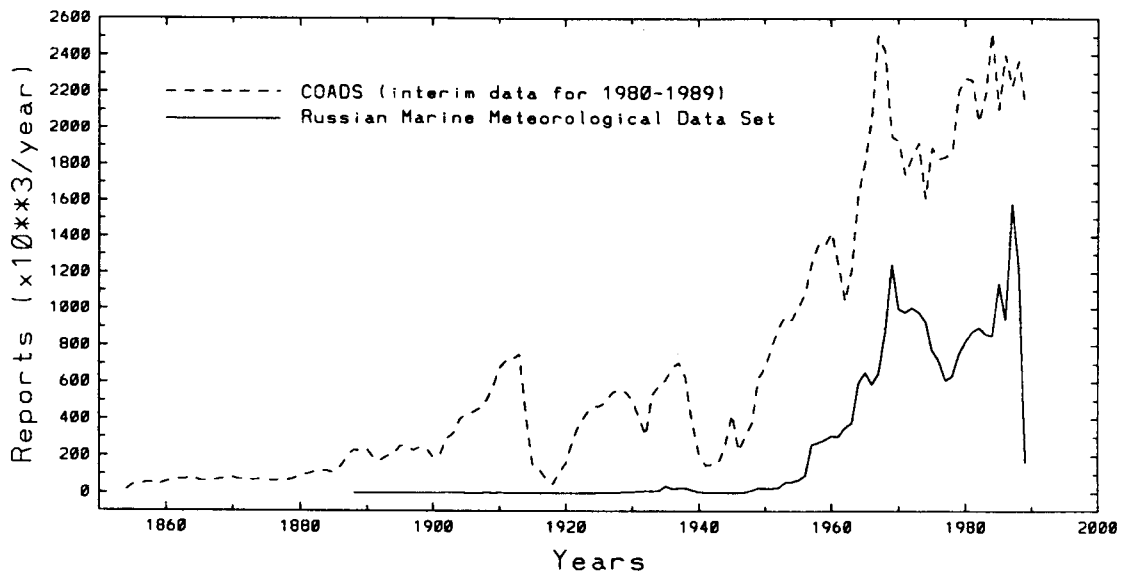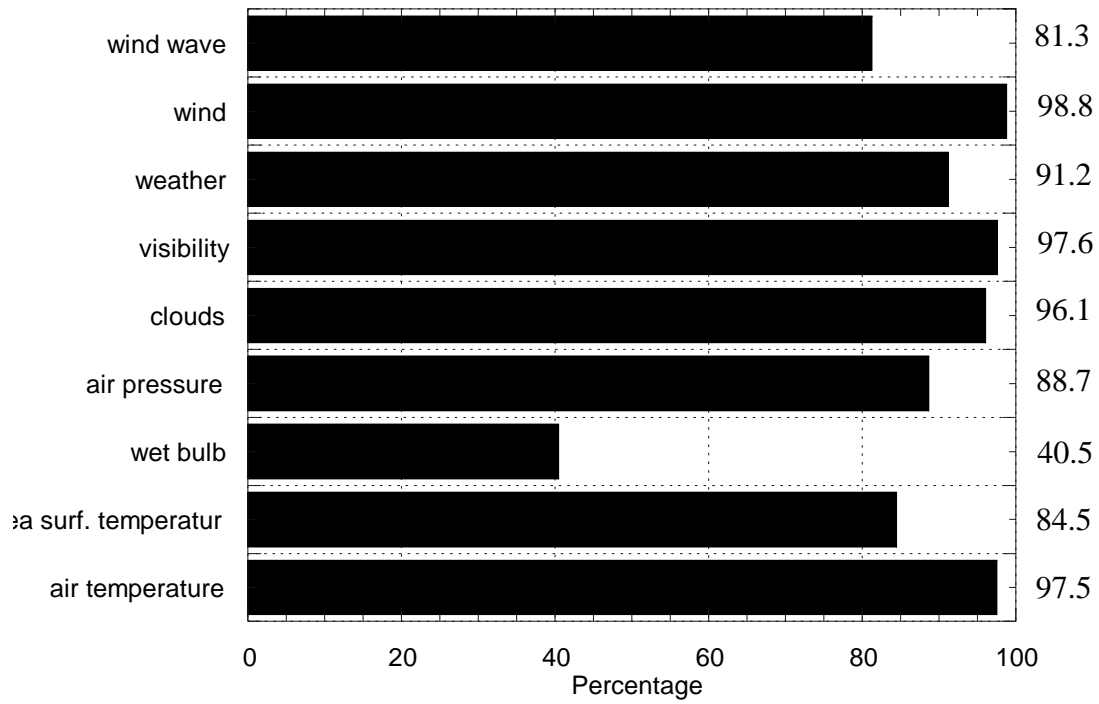| Parameter	Percentage
wind wave	81.3
wind	98.8
weather	91.2
visibility	97.6
clouds	96.1
air pressure	88.7
wet bulb	40.5
sea surf. temperatur	84.5
air temperature	97.5

Figure 1. Distribution of Ship Reports 1854-1989

Figure 2. Thousands of reports per 10° box, 1890-1990 (0 indicates less than 500 reports).