

U.S. DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
OCEAN PRODUCTS CENTER

TECHNICAL NOTE\*

SYNOPTIC SURFACE MARINE DATA MONITORING

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NOVEMBER 1987

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EXCHANGE OF INFORMATION

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OPC Contribution No. 24  
NMC Office Note No. 335

## OPC CONTRIBUTIONS

- No. 1. Burroughs, L. D., 1986: Development of Forecast Guidance for Santa Ana Conditions. National Weather Digest, Vol. 12 No. 1, 4pp.
- No. 2. Richardson, W. S., D. J. Schwab, Y. Y. Chao, and D. M. Wright, 1986: Lake Erie Wave Height Forecasts Generated by Empirical and Dynamical Methods -- Comparison and Verification. Ocean Products Center Technical Note, 23pp.
- No. 3. Auer, S. J., 1986: Determination of Errors in LFM Forecasts Surface Lows Over the Northwest Atlantic Ocean. Ocean Products Center Technical Note/NMC Office Note No. 313, 17pp.
- No. 4. Rao, D. B., S. D. Steenrod, and B. V. Sanchez, 1987: A Method of Calculating the Total Flow from A Given Sea Surface Topography. NASA Technical Memorandum 87799, 19pp.
- No. 5. Feit, D. M., 1986: Compendium of Marine Meteorological and Oceanographic Products of the Ocean Products Center. NOAA Technical Memorandum NWS NMC 68, 98pp.
- No. 6. Auer, S. J., 1986: A Comparison of the LFM, Spectral, and ECMWF Numerical Model Forecasts of Deepening Oceanic Cyclones During One Cool Season. Ocean Products Center Technical Note/NMC Office Note No. 312, 20pp.
- No. 7. Burroughs, L. D., 1986: Development of Open Fog Forecasting Regions. Ocean Products Center Technical Note/NMC Office Note No. 323, 36pp.
- No. 8. Yu, T., 1986: A Technique of Deducing Wind Direction from Altimeter Wind Speed Measurements. Mon. Wea. Rev., 6pp.
- No. 9. Auer, S. J., 1986: A 5-Year Climatological Survey of the Gulf Stream and Its Associated Ring Movements. Journal of Geophysical Research, 9pp.
- No. 10. Chao, Y. Y., 1987: Forecasting Wave Conditions Affected by Currents and Bottom Topography. Ocean Products Center Technical Note, 11pp.
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## I. INTRODUCTION

The oceans cover approximately seventy percent of the earth surface and have a significant influence on global weather and climate. However, the oceanic domain is less densely sampled for surface meteorological parameters as compared to land. For example, figures 1 and 2 show northern hemisphere synoptic surface data distribution at 00Z over land and sea, respectively. The number of land reports is five time larger and the data are better distributed spatially. It is clear that the marine data base is sparse and that maximum use should be made of this data in studies of atmospheric and oceanographic processes.

National Meteorological Center (NMC) receives real-time synoptic marine data from various platforms. All data that are available by the scheduled model run are used with first guess fields to produce initial analyses for use within the suite of operational numerical prediction models of NMC.

In view of the necessity for a real-time synoptic marine data base, it is important to ensure that all data arrives in time to be used within NMC's analyses and quality controlled in real time to maximize their impact on forecasts. Therefore, systems collecting surface marine reports must be monitored to ensure maximum availability of data. As a first step, synoptic surface marine platforms, observation parameters, and receipt time of all data received at NMC are being monitored. In addition, quarterly ship track summaries of all Voluntary Observing Ships (VOS) are compiled. These summaries are routinely provided to the Office of Ocean Services and the Marine Observing Program of the Observing System Branch to seek avenues to increase real-time synoptic surface marine data coverage over the oceans and improve receipt time at receiving centers.

## II. DATA ACQUISITION

Synoptic marine data are stored on a 10-day rotating file called, NWS.NMC.ARKV.SFCSHP. This data set consists of all observations reported by voluntary ships, naval and research vessels, drifting and fixed buoys, ocean weather stations and marine reporting stations. These reports are transmitted to NMC by coastal radio stations, the Global Telecommunication System (GTS) and the GOES data collection network. Table 1 shows a weekly scan for each platform per synoptic hour. The data are sorted by call sign, day and time, and saved on tape once a week.

## III. DATA TABULATIONS

Table 2 summarizes the monthly tabulations of surface marine data received at NMC for the year 1986. The report types are ships with unique call signs (UNISHP), ships without call signs (UNKSHP), fixed buoys (FBUOYS), drifting buoys (DBUOYS), marine reporting stations (MARS), ocean weather stations (OWS), and all reports with position errors (LAND).

During 1986, NMC received 2,209,566 synoptic marine observations. The last column of Table 2 shows the percentage of this total for each data type. Ships remain the dominant data source (56.2%). Fixed buoys represent less than 7 percent of the total. The second largest contribution to the surface marine data base comes from drifting buoys (22.0%). Position errors (1.3%) refer to all synoptic surface marine observations on land. Table 3 shows the monthly tabulation of synoptic surface marine data received at NMC during 1987.

The monthly parameter list, Table 4, contains the frequency of air temperature, sea surface temperature, wind speed and direction, dew point depression, present and past weather, sea level and station pressure, pressure quality marks, cloud coverage, swell direction swell height, swell period, wave direction and height, and the number of position errors for each report type.

The timely dissemination of surface marine data is vital to improving and updating NMC's analyses and forecasts. Time-delay refers to the interval between the time an observation is taken and the time it is received at NMC. Table 5 shows time-delay distributions for ships, buoys, ocean weather and marine reporting stations for September, 1987.

Surface marine reports transmitted directly through the GOES network to NMC are delivered in a timely fashion. As can be seen in Table 5, time-delay tabulations for FBUOYS, OWS, and MARS show that 93 to 96 percent of the data arrive within one hour or less. However, most ship reports are transmitted during the radio officer's watch by radio message to a coastal receiving station. Because of economic constraints, shippers have been forced to reduce the number of radio officers. The results have been a continued reduction in the timely transmission of ship reports (Richardson, Gerald, 1987). Presently, less than 50 percent of ship data are received within one hour.

The amount of drifting buoy data arriving within one hour are low, less than 27 percent, due to the data processing system i.e., DBUOYS reports are collected by polar orbiting satellites and transmitted via Service Argos to the Argos data processing center in Toulouse, France; then the data must be decoded from engineering to metric units, compiled into the standard World Meteorological Organization (WMO) format, and finally entered onto the GTS network.

Quarterly ship track summaries of all VOS observations are tabulated and distributed to the Marine Observing Program of the Observing System Branch. Each reporting VOS receives a mercator map depicting it's track north of the equator during the past three months and the total number of reports received at NMC. Figures 3 and 4 show typical VOS distributions in the Atlantic and Pacific oceans during July, August, and September, 1987 for selected ships.

#### IV. CONCLUSIONS

As a routine monitoring activity OPC summarizes various aspects of synoptic surface marine observations received at NMC. These include summaries of ship tracks, observation parameters, and receipt time tabulations. As a result of

this monitoring effort it is clear that while the amount of surface marine data available at NMC has increased tremendously, the receipt of ship and drifting buoy data remain low and needs improvement.

In an attempt to increase the number of surface ship observations received at NMC, monthly and quarterly surface marine tabulations are delivered to the Marine Observing Program of the Observing System Branch and the National Ocean Services for distribution to voluntary ship operators. It is hoped that this will encourage timely and complete transmission of ship observations to NMC.

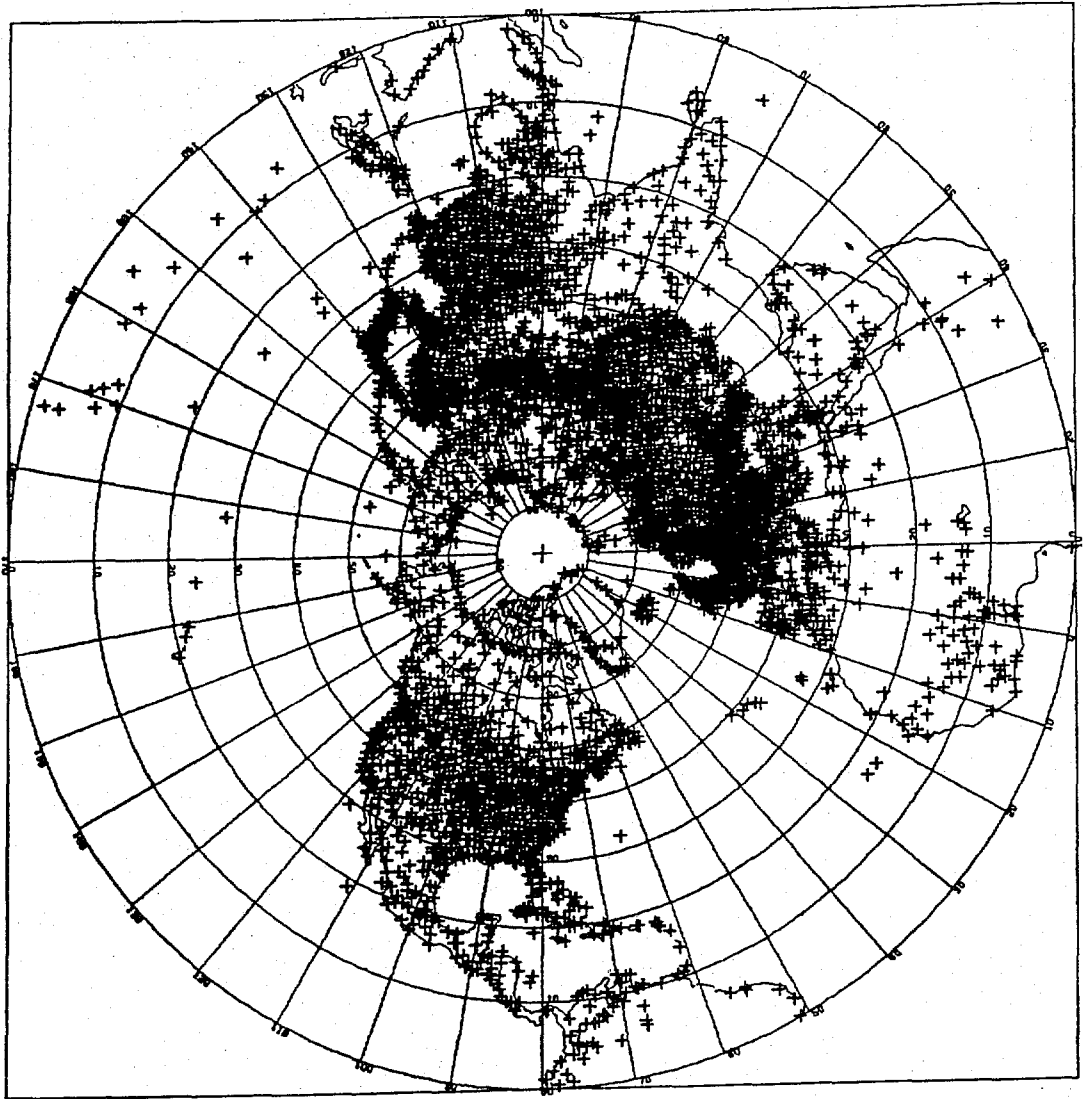
Future plans to improve the availability of drifting buoy data at NMC involves the establishment of a direct data link to the Service Argos data center in Landover, MD. This will make drifting buoy data available 2 hours earlier.

#### ACKNOWLEDGMENT

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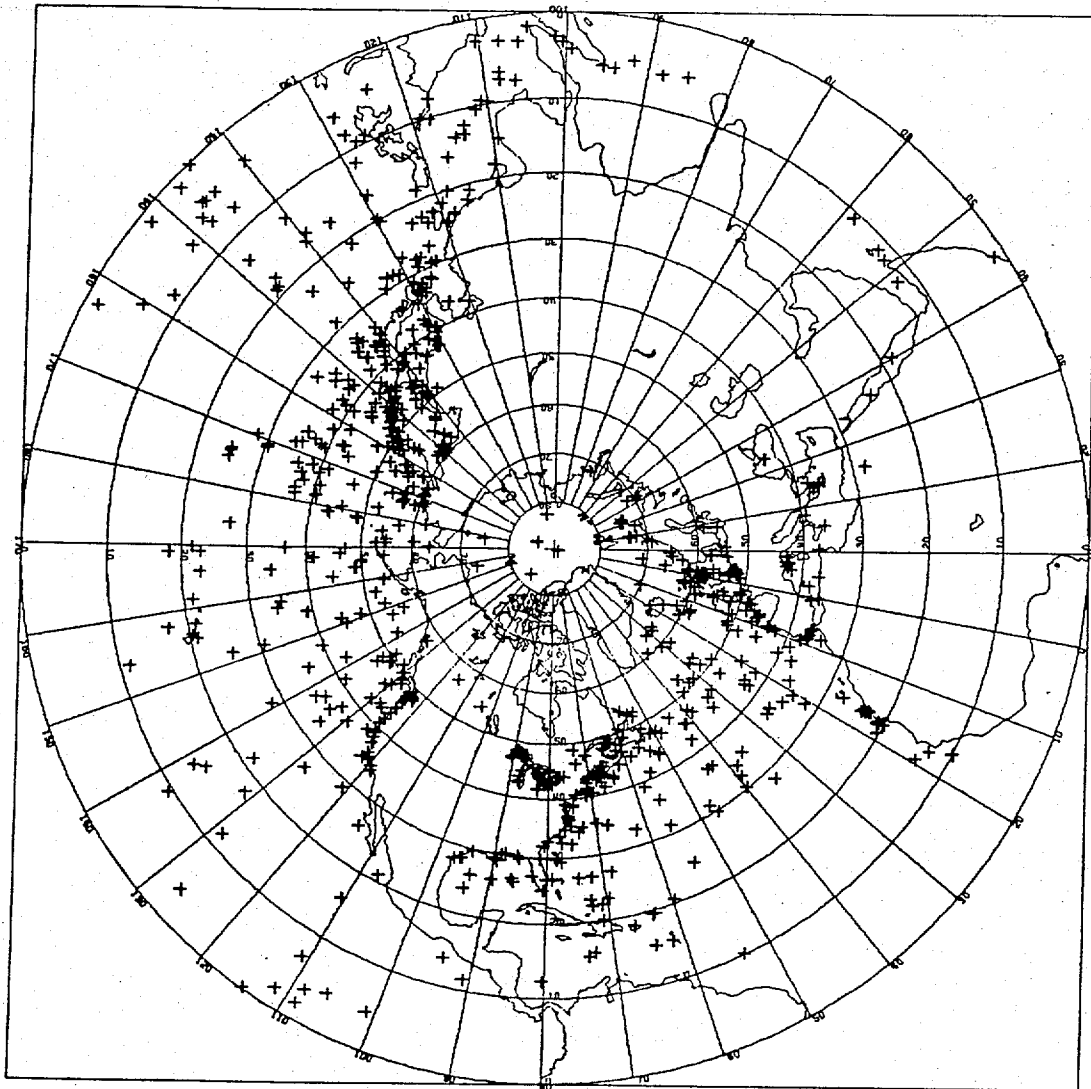
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N.H. SURFACE OBS. RECEIVED AT NMC WASHINGTON BY 02.25 UCT 87/11/20  
DATA COUNT = 5106

FIGURE 1.  
Land Stations



N.H. SURFACE OBS. RECEIVED AT NMC WASHINGTON BY 02.31 UCT 87/11/20  
DATA COUNT = 968

FIGURE 2.

Marine Reports

LAST WEEK RUN EXTRACTED SFC MARINE DATA FOR 87102606 TO 87110200

LDATE = 87110300

THIS WEEK SCAN OF SFC MARINE DATA IS FOR 87110205 TO 87110900

YEAR	MONTH	DAY	TIME	NUMBER	SHIPS	BJDY(F)	BJDY(D)	BUDY(C)	JWS	LAND	DSM
1987	11	2	600Z	1312	924	136	161	73	8	5	C06B
1987	11	2	1200Z	991	536	119	244	78	7	7	C12B
1987	11	2	1800Z	1483	994	135	253	73	13	10	C18B
1987	11	3	000Z	1442	994	124	232	77	8	7	C00C
1987	11	3	600Z	1417	970	138	204	73	12	15	C06C
1987	11	3	1200Z	1482	966	134	274	79	12	18	C12C
1987	11	3	1800Z	1484	971	125	281	73	12	17	C18C
1987	11	4	000Z	1374	933	136	207	73	10	10	C00D
1987	11	4	600Z	1419	982	146	197	78	8	8	C06D
1987	11	4	1200Z	1325	925	132	164	79	9	16	C12D
1987	11	4	1800Z	1365	802	120	54	73	6	5	C18D
1987	11	5	000Z	1248	977	131	39	78	11	12	C00E
1987	11	5	600Z	1396	948	127	223	78	12	8	C06E
1987	11	5	1200Z	1370	991	124	155	73	11	11	C12E
1987	11	5	1800Z	1374	946	133	199	79	9	10	C18E
1987	11	6	000Z	1441	1014	132	194	73	12	11	C00F
1987	11	6	600Z	1452	973	130	254	78	11	6	C06F
1987	11	6	1200Z	1369	889	129	257	78	11	6	C12F
1987	11	6	1800Z	1329	877	132	212	80	11	17	C18F
1987	11	7	000Z	1356	920	119	222	80	12	3	C00G
1987	11	7	600Z	1356	935	123	203	79	9	7	C06G
1987	11	7	1200Z	1327	905	120	205	80	6	11	C12G
1987	11	7	1800Z	1516	979	125	308	80	11	13	C18G
1987	11	8	000Z	1322	917	120	184	80	11	10	C00H
1987	11	8	600Z	1332	889	121	230	80	5	7	C06H
1987	11	8	1200Z	1367	918	121	220	80	9	19	C12H
1987	11	8	1800Z	1300	870	124	205	80	6	15	C18H
1987	11	9	000Z	1365	939	124	200	80	10	12	C00I

NUM. SFC MARINE REPTS 38014 NJ. OF SEAS REPTS. 653  
 NUM. SFC MARINE REPTS. MISSING CAT51 0 NUM. SFC MARINE REPTS. MISSING CAT52 3266

TABLE 1.



MONTHLY TABULATIONS OF SURFACE MARINE REPORTS RECEIVED AT NMC FOR 1986

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL FOR YEAR '86 (%)	TOT
UNISHP	100014	93791	102068	99356	108143	103153	107018	109423	105664	107075	107761	98762	1241218	56.2%
UNK SHP	4310	4322	4552	4184	4729	4533	4632	4141	4349	4181	4122	3433	51468	2.3%
FBUOYS	11343	10885	11344	11444	11328	12712	14164	13660	13372	13564	12646	11779	148240	4.7%
DBUOYS	48125	39884	50905	57275	55198	48350	45460	52350	49417	55445	58828	57546	618783	24.0%
MARS	8862	7822	8895	8868	9221	8832	9304	9344	8860	9106	9205	9513	107832	4.0%
OWS	632	586	634	635	882	1496	1526	1383	1362	1469	1465	1583	13653	0.6%
LAND	4635	3365	2266	1508	1574	1519	1465	2159	2189	2454	3001	2217	28352	1.3%
TOTAL	1177921	1160655	1180664	1183270	1191075	1180595	1183569	1191460	1185213	1193294	1197027	1184823	2209566	100.0%

TABLE 2.

MONTHLY TABULATIONS OF SURFACE MARINE REPORTS RECEIVED AT NMC FOR 1987

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
UNISHP	90293	82807	93401	95475	101656	102261	104254	105543	105280			
UNK SHP	3681	3436	4093	4056	4584	5030	5093	5025	5184			
FBUOYS	11661	10137	11159	11945	13690	13780	13812	14002	12860			
DBUOYS	54003	40317	31923	32996	33817	26954	24010	24776	24100			
MARS	9336	8567	9757	9194	9325	9252	9399	9702	8887			
OWS	1299	962	994	960	1066	1047	1070	985	1071			
LAND	1507	1364	1488	1717	1819	2067	1805	2030	1613			
TOTAL	1171780	1147590	1152815	1156343	1165957	1160391	1159443	1162063	1158995			

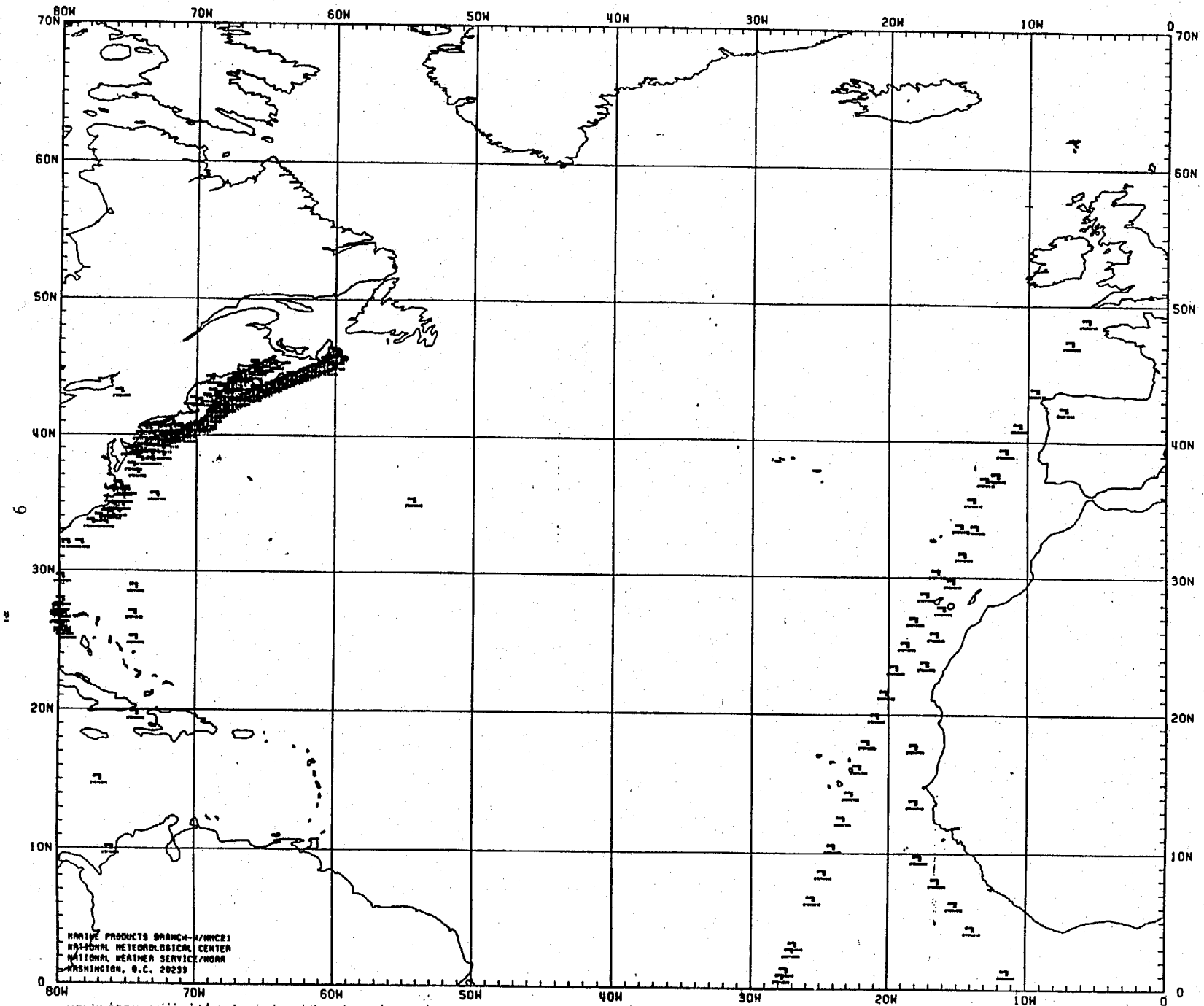
TABLE 3.

## PARAMETERS QUANTITY SUMMARIES FOR

1987 09 01 00Z TO 1987 09 30 23Z

	UNIQUE SHIPS	UNKNOWN SHIPS	OWS FIXED	MARS FIXED	FIXED BUOYS	DRIFT BUOYS	TOTAL NO. PARAMETER
STATION ELEVAT	106080	5243	1072	8887	12861	24852	158995
SEA LEVEL PRESS	99610	4971	1070	8540	12829	20635	147655
STATION PRESS	1864	18	0	0	0	0	1882
WIND DIRECTION	102193	4984	1060	8879	12099	2303	131518
WIND SPEED	102193	4984	1060	8879	12099	3046	132261
AIR TEMPERATURE	102958	5089	1072	8879	12467	16612	147077
DEW POINT DEPRES	54152	4103	1067	0	1299	122	60743
PRESENT WEATHER	44294	3207	629	0	4	78	48212
PAST WEATHER	43846	3184	629	0	5	78	47742
CLOUD COVER	106080	5243	1072	0	1440	594	114429
LOW CLOUD COVER	76354	4103	1039	0	12	116	81624
HGHT ABV GRND CL	106080	5243	1072	0	1440	594	114429
QUALITY MARKERS	106080	5243	1072	8887	12861	24852	158995
PERIOD WAVES	71734	3920	813	0	11373	107	87947
HEIGHT WAVES	79810	4067	936	0	11374	108	96295
PERIOD SWELL	41927	2484	511	0	12	94	45028
HEIGHT SWELL	43525	2507	658	0	12	94	46796
DIR SWELL MOVNT	45331	2677	655	0	12	94	48769
SEA SURFACE TMP	82800	4416	1062	3101	12517	18876	122772
NO. RPTS. ON LAND	800	59	1	0	1	752	1613
TOTAL AVAILABLE	106080	5243	1072	8887	12861	24852	158995
NO CAT 51 DATA	0	0	0	0	0	0	0
NO CAT 52 DATA	9455	394	7	0	0	5973	15829

TABLE 4.

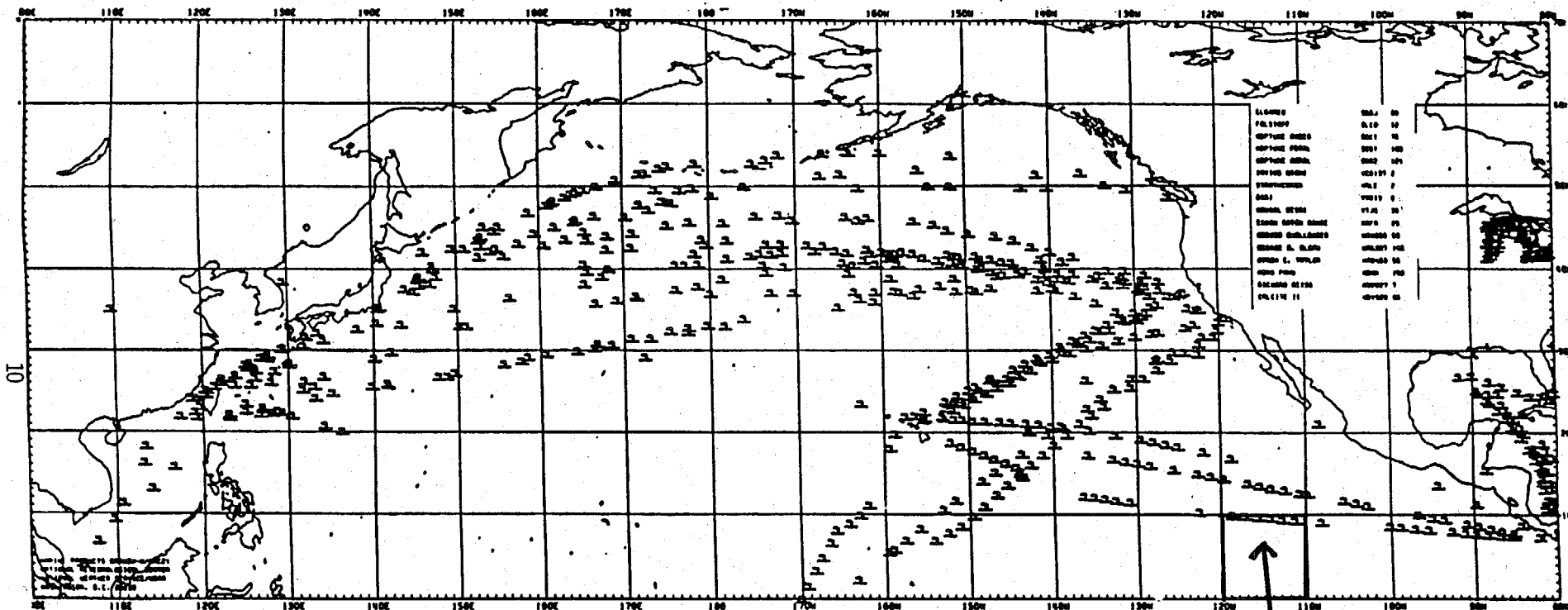


GYPSUM COUNTESS      6N2R  
 ACT 6                    6BVR  
 GYPSUM KING         6U0T  
 ACT 7                    6WRN

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 WASHINGTON, D.C. 20239

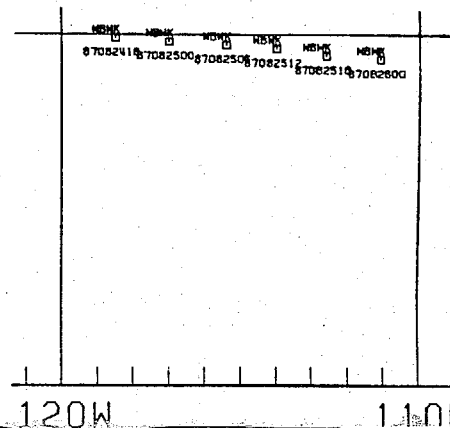
VOLUNTARY SHIP REPORTS FOR JUL AUG SEPT 87  
 420 POSITIONS PLOTTED OUT OF 2205 OBSERVATIONS

FIGURE 3.



VOLUNTARY SHIP REPORTS FOR JUL AUG SEPT 87  
 935 POSITIONS PLOTTED OUT OF 11555 OBSERVATIONS

FIGURE 4.



TIME DELAY DISTRIBUTION FOR SURFACE MARINE OBSERVATIONS RECEIVED BETWEEN 1987 09 01 00Z TO 1987 09 30 23Z  
 NUMBER OF SURFACE MARINE OBSERVATIONS 158995 NUMBER OF SURFACE MARINE OBSERVATIONS WITH TIME MISSING 4  
 NUMBER OF SURFACE MARINE OBSERVATIONS TAKEN 30 MIN (OR LESS) BEFORE SYNOPTIC HOUR 3202

TIME-DELAY DISTRIBUTION FOR UNISHP

HOURS (( OR =) :	1	2	3	4	5	6	7	8	9	10	UP-TO-DATA CUT-OFF
TOTAL BY BIN	46031	31861	8701	4736	2933	1652	3492	4796	1432	302	140
CUMULATIVE TOTAL	46031	77892	86593	91329	94262	95914	99406	104202	105634	105936	106076
CUMULATIVE PCT	43.39	73.43	81.63	86.10	88.86	90.42	93.71	98.23	99.58	99.87	100.00

TIME-DELAY DISTRIBUTION FOR UNKSHP

HOURS (( OR =) :	1	2	3	4	5	6	7	8	9	10	UP-TO-DATA CUT-OFF
TOTAL BY BIN	1371	1465	845	569	411	158	129	160	97	30	8
CUMULATIVE TOTAL	1371	2836	3681	4250	4661	4819	4948	5108	5205	5235	5243
CUMULATIVE PCT	26.15	54.09	70.21	81.06	88.90	91.91	94.37	97.43	99.28	99.85	100.00

TIME-DELAY DISTRIBUTION FOR OWS

HOURS (( OR =) :	1	2	3	4	5	6	7	8	9	10	UP-TO-DATA CUT-OFF
TOTAL BY BIN	1027	24	10	6	0	4	0	1	0	0	0
CUMULATIVE TOTAL	1027	1051	1061	1067	1067	1071	1071	1072	1072	1072	1072
CUMULATIVE PCT	95.80	98.04	98.97	99.53	99.53	99.91	99.91	100.00	100.00	100.00	100.00

TIME-DELAY DISTRIBUTION FOR MARS(C)

HOURS (( OR =) :	1	2	3	4	5	6	7	8	9	10	UP-TO-DATA CUT-OFF
TOTAL BY BIN	8582	156	45	49	16	39	0	0	0	0	0
CUMULATIVE TOTAL	8582	8738	8783	8832	8848	8887	8887	8887	8887	8887	8887
CUMULATIVE PCT	96.57	98.32	98.83	99.38	99.56	100.00	100.00	100.00	100.00	100.00	100.00

TIME-DELAY DISTRIBUTION FOR FBDOYS

HOURS (( OR =) :	1	2	3	4	5	6	7	8	9	10	UP-TO-DATA CUT-OFF
TOTAL BY BIN	11998	251	61	63	5	51	0	2	0	0	430
CUMULATIVE TOTAL	11998	12249	12310	12373	12378	12429	12429	12431	12431	12431	12861
CUMULATIVE PCT	93.29	95.24	95.72	96.21	96.24	96.64	96.64	96.66	96.66	96.66	100.00

TIME-DELAY DISTRIBUTION FOR DBDOYS

HOURS (( OR =) :	1	2	3	4	5	6	7	8	9	10	UP-TO-DATA CUT-OFF
TOTAL BY BIN	6644	10469	4418	1601	744	527	242	100	99	8	0
CUMULATIVE TOTAL	6644	17113	21531	23132	23876	24403	24645	24745	24844	24852	24852
CUMULATIVE PCT	26.73	68.86	86.64	93.08	96.07	98.19	99.17	99.57	99.97	100.00	100.00

TIME-DELAY DISTRIBUTION FOR ALL RPTS

HOURS (( OR =) :	1	2	3	4	5	6	7	8	9	10	UP-TO-DATA CUT-OFF
TOTAL BY BIN	75653	44226	14080	7024	4109	2431	3863	5059	1628	340	578
CUMULATIVE TOTAL	75653	119879	133959	140983	145092	147523	151386	156445	158073	158413	158991
CUMULATIVE PCT	47.58	75.40	84.26	88.67	91.26	92.79	95.22	98.40	99.42	99.64	100.00

TABLE 5.

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