Translation Specifications
U.S. Navy Metar Reports

U.S. Navy METAR Reports
Conversion of Observations to IMMA Format

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Abstract

This document describes the field by field translation specification (TRANSPEC) for the data contained in the files 'NAVSHPyyyymmMTRx' and 'NAVSHPyyyymmMTRx_rev.txt'. There are a total of 62 files of data from August 2010 to November 2012.

1. Introduction

This document addresses the translation of digitized observations of weather elements taken by US Navy personnel and recorded in the Aviation Routine Weather Report, also known as Meteorological Aerodrome Report (METAR) (OFCM, 2005) format from August 2010 through November 2012. The coding standards conform to WMO Code Forms METAR FM 15-IX Ext. and SPECI FM 16-IX Ext. and the United States Exceptions filed with the WMO. These exceptions reflect national observing practices which differ from practices outlined in the WMO Manual on Codes No. 306.

In some cases there is more than one file per month and there are a total of 62 files covering the 31-month period. Some files contain an original and a revised version; the revised version made necessary by errors identified in the original by NCDC's CDMP program. The filename format is 'NAVSHPyyyymmMTRx' and 'NAVSHPyyyymmMTRx_rev.txt'.

The U.S. Navy Manual for Ship's Surface Weather Observations (NMOC, 2010) was referenced closely in the translation of these observations. This document is included in the archive along with this Transpec with filename '*USN Manual For Ships Surface Weather Observations-3144.1E.pdf*' .

1.1 The Observations

The files consist of 130-character length records of hourly observations recorded in METAR format.

1.2 Structure of this document

Section 2 describes the preparation of the data and the software used to perform the translation. Section 3 describes the mapping of the native format to the IMMA format. Section 4 contains references of works cited herein and one additional table. A summary is provided in Section 5. The software used to produce this translation is maintained in the ICOADS translation repository (http://icoads.noaa.gov/translation.html).

2. PREPARATION AND SOFTWARE

2.1 Software Used

The basis for the translations is the read/write IMMA FORTRAN program (icoads-immt5Ximma1.sh) written by Ms. Sandy Lubker of NOAA/ESRL. The shell script contains Fortran code that is compiled at run time. Additions were made by Mr. Jay Lawrimore of NOAA/NCDC to include conversions of present weather, visibility, sea level pressure, ship course and speed, wave and swell, wave and swell height, wave and swell period, wind direction adjustments for calm, conversion of Lat/Lon quadrants to Lat/Lon, and cloud coverage/heights. Icoads-immt5Ximma1.sh was copied to icoads-immt5ximma1-navy.sh before additions were made.

The processing was accomplished on NCDC's 'Wind' Linux server in /home/jlawrimo/ICOADS-related/. The input data files are in /home/jlawrimo/ICOADS-related/USNavy_marine_metar/. The dates in the Navy METAR filenames indicate when the files were keyed. They are not a reflection of dates contained in the files. A single file could span multiple months and years. *(e.g., NAVSHP201110MTR1.xls contains April and May 2011 data.* Each file was preprocessed using the Fortran program 'CleanMETARFiles.f'. This process consisted of removing characters '#', '@', '>', and '~'. The list of stations processed is contained in 'ListofStations.txt'. Once preprocessed, the records were written to a single file containing all data – 'NAVSHP-MTR-CLEAN.txt'. There are 7 revised METAR data files which were used in place of the original files. In total 54 METAR files were processed and the resulting concatenated file contains 401,284 records in total.

*Although # and ~ may be present to let the user know something was there and was either illegible or did not have the proper format for conversion during keying from original paper records, it in effect indicates a missing value and is replaced by a blank. The characters @ and > occurred in one record each. Their meaning is unclear.

2.2 Software additions

Additions to icoads-immt5ximma1.f90 were made in the main body of the program. No changes to the subroutines portion of the program were made.
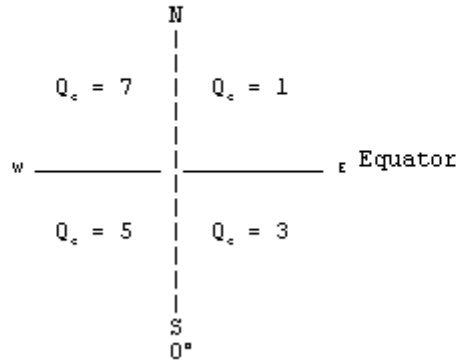
Conversion of Lat/Lon quadrants to Lat/Lon (LAT; Field 5) (LON; Field 6)

US Navy location reports consist of a quadrant of the globe along with a latitude and longitude specific to the quadrant.

Table III-2-1 in the US Navy manual defines the quadrants.

Q₍c₎ - Quadrant of the Globe

```
                          N
                          |
                          |
            Q  = 7        |    Q  = 1
             c            |     c
                          |
                          |
        w _____|_____  E  Equator
                          |
                          |
            Q  = 5        |    Q  = 3
             c            |     c
                          |
                          |
                          |
                          S
                          0°
```

Code Figure	Latitude	Longitude
1	North	East
3	South	East
5	South	West
7	North	West

NOTE: The choice is left to the observer in the following cases:

When the ship is on the Greenwich meridian or the 180th meridian
($L_aL_aL_aL_a$ = 0000 or 1800 respectively):

Q_c = 1 or 7 (northern hemisphere) or
Q_c = 3 or 5 (southern hemisphere)

When the ship is on the Equator ($L_aL_aL_a$ = 000):

Q_c = 1 or 3 (eastern longitude) or
Q_c = 5 or 7 (western longitude)

Lat/Lon values were placed in the correct hemisphere (conversion to Southern and/or Western Hemisphere) by adding a negative sign to the reported lat/lon value when appropriate.

```
  cquad=ctrue(supd)(13:13)
  ctrue(LAT)(:16)=' '//ctrue(supd)(14:16)//'0'        !LAT,  ADDING BLANK AT BEGINNING
                                  !ALSO ADDING '0' AT END FOR HUNDREDTHS
  ctrue(LON)(:16)=' '//ctrue(supd)(17:20)//'0'          !LON

  if(cquad.eq.'3'.or.cquad.eq.'5') then        !SOUTHERN HEMISPHERE
    ctrue(LAT)(1:1)='-'
  endif
  if(cquad.eq.'5'.or.cquad.eq.'7') then        !WESTERN HEMISPHERE
    ctrue(LON)(1:1)='-'
  endif
```

Ship course (DS; Field 11) and speed (VS; Field 12)

Ship Course reports in METAR are given in degrees/10. Each ship course value was converted to a WMO code 0700 (0 through 8).

```
if(iships.eq.0) ctrue(DS)(:16)='0'                    !SHIP STATIONARY
if(ishipc.gt.22.and.ishipc.le.67) ctrue(DS)(:16)='1'         !SHIP MOVING NE
if(ishipc.gt.67.and.ishipc.le.112) ctrue(DS)(:16)='2'        !SHIP MOVING E
if(ishipc.gt.112.and.ishipc.le.157) ctrue(DS)(:16)='3'        !SHIP MOVING SE
if(ishipc.gt.157.and.ishipc.le.202) ctrue(DS)(:16)='4'       !SHIP MOVING S
if(ishipc.gt.202.and.ishipc.le.247) ctrue(DS)(:16)='5'       !SHIP MOVING SW
if(ishipc.gt.247.and.ishipc.le.292) ctrue(DS)(:16)='6'       !SHIP MOVING W
if(ishipc.gt.292.and.ishipc.le.337) ctrue(DS)(:16)='7'       !SHIP MOVING NW
if(ishipc.gt.337.or.(ishipc.ge.0.and.ishipc.le.22)) ctrue(DS)(:16)='8'   !SHIP MOVING N
```

Ship Speed reports in METAR are given in knots. Each ship speed value was converted to a WMO code 4451 (0 through 9)

```
if(iships.eq.0) ctrue(VS)(:16)='0'
if(iships.ge.1.and.iships.le.5) ctrue(VS)(:16)='1'
if(iships.ge.6.and.iships.le.10) ctrue(VS)(:16)='2'
if(iships.ge.11.and.iships.le.15) ctrue(VS)(:16)='3'
if(iships.ge.16.and.iships.le.20) ctrue(VS)(:16)='4'
if(iships.ge.21.and.iships.le.25) ctrue(VS)(:16)='5'
if(iships.ge.26.and.iships.le.30) ctrue(VS)(:16)='6'
if(iships.ge.31.and.iships.le.35) ctrue(VS)(:16)='7'
if(iships.ge.36.and.iships.le.40) ctrue(VS)(:16)='8'
if(iships.gt.40) ctrue(VS)(:16)='9'
```

Wind direction adjustments for calm and variable winds (D; Field 18)

Wind speed reports of zero knots require that wind direction be set to 361.

There are some cases where wind direction is reported as 0 or 00. This should coincide with a wind speed report of zero knots, but that is often not the case. Wind direction reports of 0 or 00 were reset to 360 unless wind speed was also zero.

Variable winds do not require an adjustment. Variable winds were keyed as 362. They were written to IMMA format as such.

Horizontal Visibility (VV; Field 22)

The Navy METAR reports visibility in nautical miles to a maximum (unrestricted) visibility of 10 NM. This required a conversion to the synoptic codes (IMMA format). Nautical miles were first converted to meters and the visibility placed into synoptic categories according to WMO Code 4377. Because the

maximum horizontal visibility reported is 10 nautical miles, the highest code used in this conversion is 97.

90 – less than 0.05 km
91 – 0.05 to <0.2 km
92 – 0.2 to <0.5 km
93 – 0.5 to <1 km
94 – 1 to <2 km
95 – 2 to <4 km
96 – 4 to <10 km
97 – 10 to <20 km
98 – 20 to <50 km
99 – 50 or more

Present weather (WW; Field 23)

Conversion from METAR present weather codes (e.g., -RA, +TS; see Table 1) to the 2-digit IMMA (Synoptic) ships code was based on guidance provided in the Navy manual for ship surface weather observations (NMOC, 2010), Table III-3-6, 'Present Weather Code Specification In Order of Priority'. Up to three present weather elements could be reported in any METAR record. However, only one present weather element can be reported in IMMA format. When more than one present weather element was reported, the first synoptic weather element that matched any of the three METAR present weather elements was converted to IMMA.

The conversion consists of the following steps.
1. Determine if a present weather element was reported for any of 3 possible reports.
2. For all observed present weather elements, compare to the list of synoptic codes by looping from 1 to 99; lowest to highest priority present weather element.
3. Find the last one (highest priority) that matches any of the 3 possible METAR weather elements.
4. Write the synoptic code to IMMA.

A special case was made for synoptic elements 83 and 84 (Rain/Snow Mixed). A report of Light rain showers and light snow showers is converted to synoptic code 83. A report of moderate rain showers and moderate snow showers is converted to synoptic code 84.

Sea level pressure (SLP; Field 25)

Sea level pressure was keyed in METAR as the last 3 digits of the pressure in 0.1hPa. These values were converted to the full pressure reading, and as such, in this conversion assumptions were made based on reported wind speed. For wind speed less than 64 knots, any pressure report from 0 to 500 was divided by 10 and added to 1000. Any other report was divided by 10 and added to 900. For any hurricane force wind speed, all reported pressures were assumed to be less than 1000. It was also assumed that no Navy vessel during this era would traverse through areas with a hurricane of intensity and pressure less than 900 mb.

Cloud amount and heights

Cloud amount (N; Field 36)

The total cloud amount was taken directly from the METAR report of total cloud amount. Values are in oktas (no conversion necessary).

Lower cloud amount (NH; Field 37)

Up to four cloud layers were keyed in the Navy METAR. Cloud amount was keyed as a single character (F, S, B, O), except in cases where SKC or CLR are reported with a height. Otherwise they were keyed as SK or C, respectively. The height follows in the last 3 positions, in hundreds of feet, so BKN010 was keyed as B010 (Broken at 1000ft).

From NMOC (2010): The terms used to reflect the degree of cloudiness or sky coverage in sky condition evaluations.
a. Sky Clear (SKC). An abbreviation used to describe the absence of layers of clouds or other obscurations.
b. Few (FEW). A sky cover of 1/8 to 2/8, based on a summation of sky cover at and below the level of a layer aloft.
c. Scattered (SCT). A sky cover of 3/8 through 4/8, based on a summation of sky cover at and below the level of a layer aloft.
d. Broken (BKN). A sky cover of 5/8 through less than 8/8 based on a summation of sky cover at and below the level of a layer aloft. More than 7/8 but less than 8/8 is considered as 7/8 for reporting purposes.
e. Overcast (OVC). A sky cover of 8/8 based on a summation of sky cover at and below the level of a layer aloft.

The total cloud amount (position 105) and the height of the lowest clouds reported (either H1, H2, H3, or H4) were retained for the IMMA formatted data (since they are not always ordered from lowest to highest).

If there was at least one layer with clouds at or below 6500 feet, then low clouds were present. If no low clouds were present, mid-level clouds were identified for any of the four cloud layers below 20,000 feet and processed and included in the low cloud variable in IMMA. If there were clouds but the height was above 20,000 feet, no values were included for this variable.

The cloud layer amounts for the four possible layers were evaluated to determine the total low cloud amount. The greatest cloud amount for any of the low clouds was assigned as the cloud amount (each succeeding reported cloud layer includes the coverage from the layers below). This value was not allowed to exceed the total cloud amount reported value.

Cloud height (H; Field 40)

Cloud height was taken to be the lowest height for any of the reported cloud layers if they were below 20,000 feet. In some cases the first reported layer was not the lowest layer. The height was converted

from hundredths of feet to meters then converted to the IMMA synoptic code as described in the IMMA2.5 documentation.

```
    if(icldhm.le.50) then
     icldcode=0
    else if(icldhm.gt.50.and.icldhm.le.100) then
     icldcode=1
    else if(icldhm.gt.100.and.icldhm.le.200) then
     icldcode=2
    else if(icldhm.gt.200.and.icldhm.le.300) then
     icldcode=3
    else if(icldhm.gt.300.and.icldhm.le.600) then
     icldcode=4
    else if (icldhm.gt.600.and.icldhm.le.1000) then
     icldcode=5
    else if (icldhm.gt.1000.and.icldhm.le.1500) then
     icldcode=6
    else if (icldhm.gt.1500.and.icldhm.le.2000) then
     icldcode=7
    else if (icldhm.gt.2000.and.icldhm.le.2500) then
     icldcode=8
    else if (icldhm.gt.2500) then
     icldcode=9
    endif
```

If there were no cloud reports (i.e., missing), NH was set to missing (space) and H was set to 'A'.

Refer to the Navy manual for ship surface weather observations for additional information on the METAR format (NMOC, 2010).

Wave Height (WH; Field 45) and Swell Height One (SH; Field 48) and Two (SH2; Field 113)

METAR records of wave height and swell height are in feet. Each reported value was converted to meters (*0.3048). The IMMA wave heights are reported in code that corresponds to ½ meter increments. Thus the heights in meters were multiplied by 2 in order to convert to the IMMA code (i.e. 1=0.5 m, 2=1 m, etc.).

Wave Period (WP; Field 44) and Swell Period One (SP; Field 47) and Two (SP2; Field 112)

For observations after 1968 no conversion was necessary. Wave and swell periods are reported in seconds in the METAR record and were written to IMMA in the same form.

Swell Direction One (SD; Field 46) and Two (SD2; Field 111)

No conversion was necessary for swell direction one and two. Directions are provided in tens degrees and were written to IMMA in the same form.

<u>INDICATORS</u>

Time Indicator (TI; Field 9)

All times are hour plus minutes. Indicator=2.

Lat/Lon Indicator (LI; Field 10)

All locations are degrees and tenths. Indicator=0.

ID Indicator (II; Field 14)

All observations are taken from ships. Indicator=1.

Country Code Indicator (C1; Field 16)

All measurements are taken from US Ships. Indicator=2.

Wind Direction Indicator (DI; Field 17)

360-point compass. For non-missing wind direction reports. Indicator=5.

Wind Speed Indicator (WI; Field 19)

Wind speed measurements are in knots. Indicator=4.

Visibility Indicator (VI; Field 21)

Visibility measurements were assumed to be estimated. Indicator=0 in all cases of non-missing visibility.

Indicator for Air Temperatures (IT; Field 28)

All observations (air temperature, dew point temperature, wet bulb temperature, and sea surface temperature) are reported in tenths of a degree Celsius. Indicator=0.

Wet Bulb Temperature Indicator (WBTI; Field 30)

All wet bulb temperature measurements were assumed to be measured. Indicator=0.

Dew Point Temperature Indicator (DPTI; Field 32)

All dew point temperature measurements were assumed to be computed. Indicator=1.

SST Measurement Method Indictor (SI; Field 34)

SST measurement methods are not reported in METAR observations. All SST observations were assumed to be unknown/non-bucket methods. Indicator=9.

Cloud Height Indicator (HI; Field 39)

Cloud height measurements were assumed to be estimated. Indicator=0.

Deck ID (DCK; Field 54) and Source ID (SID; Field 55)

Deck ID set to 706. Source ID set to 109.

Platform Type Indicator (PT; Field 56)

The PT indicator was set to 0 for US Navy.

Wave Measurement Indicator (WMI; Field 108)

WMI was set to missing in all cases since wave recorders are not likely in NAVY METAR.

3. DATA TRANSLATION TABLE

Note: grey shading indicates that the input METAR format does not provide any information used to populate this IMMA field, or that IMMA does not have a dedicated field in which to store this input information. Dash ("-") in the IMMA "Units or Value" column indicates that the IMMA field is set to missing.

IMMA						NAVY METAR					
Fie ld	Var. Cod e	Var. Name	Units or Value	Fiel d Len gth	Posit ion	Field (s)	Var. Code	Unit s or Val.	Len gth	Posit ion	Notes
C0											
1	YR	Year	YYYY	4	1-4	1	YR	YY YY	4	1-4	No conversion
2	MO	Month	MM	2	5-6	2	MO	MM	2	5-6	No conversion
3	DY	Day	DD	2	7-8	3	DAY	DD	2	7-8	No conversion
4	HR	Hour	HHHH utc	4	9-12	4	HR	UTC	4	9-12	No conversion
							Quadr ant	1,3,5 ,7	1	13	Used to determine hemisphere of location
5	LA T	Latitude	0.01 deg S-	5	13-17	6	Lat	0.1 0-90	3	14-16	Append hundredths
6	LO N	Longitud e	0.01 deg E	6	18-23	7	Lon	0.1 0000 - 1800	4	17-20	Append hundredths and convert from W to 359.99E
7	IM	IMMA ver.	1	2	24-25						
8	AT TC	ATTM Count	4	1	26						
9	TI	Time Indicator	2	1	27						
10	LI	Lat/Lon Indicator	0	1	28						
11	DS	Ship Course	Code	1	29	29	Shp. Crse.	1deg 000-359	3	106-108	Convert to code
12	VS	Ship	Code	1	30	30	Shp.	1 kt	2	109-	Convert to code

#	Abbr	Name	Units	Len	Cols	#	Name	Units	Len	Cols	Notes
		Speed					Spd.			110	
13	NID	National Source Indicator	-	2	31-32						
14	II	ID Indicator	1	2	33-34						
15	ID	Call Sign	CALL	9	35-43	8	Call sign	CCCC	4s	21-24	No conversion required, except left justified
16	C1	Country Code	2	2	44-45						
17	DI	Wind Dir. Indicator	5	1	46						
18	D	Wind Dir.	1 deg 1-360, plus special codes 361, 362	3	47-49	10	Wind Dir	1 deg 0-359	3	26-28	Adjust range
19	WI	Wind Spd Indicator	4	1	50						
20	W	Wind Spd	0.1 m/s	3	51-53	11	Wind Spd.	1 kt	3	30-32	Convert
21	VI	Vis. Indicator	0	1	54						
22	VV	Visibility	Code 90-99	2	55-56	14	Viz	nm	5	45-49	Convert to km and code
23	WW	Pres. Wx	Code 00-99	2	57-58	15-17	Pres. Wx	Metar code 1	5	50-54, 55-59, 60-64	Conversion needed
24	W1	Past Wx.	-	1	59						
25	SLP	Sea Level Pressure	0.1 hPa	5	60-64	27	SLP	0.1hPa last 3digits	3	102-104	Add in missing first numbers 9 or 10
26	A	Characteristic of PPP	-	1	65						
27	PPP	Amt. Pres. Tendency	-	3	66-68						
28	IT	Indic. For Temperatures	0	1	69						
29	AT	Air Temp.	0.1 C	4	70-73	22	Tair	0.1C	4	81-84	No Conversion

30	WBTI	WBT Indic.	0	1	74						
31	WBT	Wet Bulb T.	0.1 C	4	75-78	24	Twet	0.1C	4	89-92	No Conversion
32	DPTI	DPT Indic.	1	1	79						
33	DPT	Dew Point T.	0.1 C	4	80-83	23	Tdew	0.1C	4	85-88	No Conversion
34	SI	SST meas. Method	9	2	84-85						
35	SST	Sea Surface Temperature	0.1 C	4	86-89	31	SST	0.1 C	4	111-114	No Conversion
36	N	Total Cloud Amount	0-9 oktas	1	90	28	Total Sky Cover	Oktas	1	105	No Conversion
37	NH	Lower Cloud Amount	0-9 oktas	1	91	18	Sky Cond (Coverage for clouds below 6.5K feet or else for the lowest cloud below 20K feet)	Code	1 (2 in the case of SK)	65, or 69, or 73, or 77	See page 43 of http://icoads.noaa.gov/e-doc/imma/R2.5-imma.pdf and page 7 of http://icoads.noaa.gov/ivad/IMMA-Rev.pdf. Convert from code (Few, Sct, Bkn, Ovc, SKc/Clr) This shows the amount of low cloud, <6.5K feet (or middle cloud, 6.5K-20K, if low cloud not present).
38	CL	Low Cloud Type	-	1	92						
39	HI	H Indicator	0	1	93						
40	H	Cloud Height	Code meters	1	94	18 19 20 21	Sky Cond 1-4	100s feet	3 3 3 3	66-68 70-72 74-76 78-80	Base of lowest cloud. Select lowest base cloud height from 4 possibilities.
41	CM	Middle Cloud Type	-	1	95						
42	CH	High Cloud Type	-	1	96						
43	WD	Wave Dir.	-	2	97-98						
44	WP	Wave	Secs.	2	99-	32	Wave	First	4 (2)	115-	No conversion

#	Abbr	Name	Code	Len	Pos	#	Name	Detail	Len	Pos	Notes
		Period			100		Prd/Ht	2 digits seconds		118 (115-116)	
45	WH	Wave Height	Code in 0.5 m increments	2	101-102	32	Wave Prd/Ht	Secd 2 digits ft	4(2)	115-118 (117-118)	Convert from ft to m, then half m counts
46	SD	Swell Dir.	00-38 10deg	2	103-104	33	First swell	First 2 digits	6(2)	119-124 (119-120)	No conversion
47	SP	Swell Period	Secs.	2	105-106	33	First swell	Second 2 digits secs	6(2)	119-124 (121-122)	No conversion
48	SH	Swell Height	Code in 0.5 m increments	2	107-108	33	First swell	Third 2 digits ft	6(2)	119-124 (123-124)	Convert from ft to m, then half m counts
C1 (unused fields omitted)											
49	ATTI	ATTM ID	1	2	109-110						
50	ATTL	ATTM Len.	65	2	111-112						
51-53				6	113-118						
54	DCK	Deck	706	3	119-121						
55	SID	Source ID	109	3	122-124						
56	PT	Platform Type	0	2	125-126						
57-99				47	127-173						
C2 (unused fields omitted)											
100	ATTI	ATTM ID	2	2	174-175						
101	ATTL	ATTM Len.	76	2	176-177						
102-107				11	178-184						
108	WMI	Wave Meas. Ind.	Missing	1	185						
109	SD2	2nd Swell Dir.	00-38 10 deg	2	189-190	34	Second Swell	First 2 digits	6(2)	125-130 (125-126)	No Conversion

								tens deg			
110	SP2	2nd Swell Prd.	Code	2	191-192	34	Second Swell	Second 2 digits secs	6(2)	125-130 (127-128)	Use IMMA Table D5b to convert from seconds to Code.
111	SH2	2nd Swell Hgt	Code in 0.5 m increments	2	193-194	34	Second Swell	Third 2 digits ft	6(2)	125-130 (129-130)	Convert from ft to m, then half m counts
114-153				55	195 - 249						Length of 114-153. C3,4,5 length set to zero (omitted)
C3 (not used)											
154-174											
C4 (not used)											
175-196											
C5 (not used)											
tbd											
C6											
197	ATTI	ATTM ID	99	2	250-251						
198	ATTL	ATTM Len	0	2	252-253						
200	SUPL	Original Data	String	Var		All data from line as string					

4. REFERENCES

OFCM (Office of the Federal Coordinator for Meteorology), 2005: Federal Meteorological Handbook No. 1– Surface Weather Observations and Reports September 2005 (FMH-1-2005) [available from: http://www.ofcm.gov/fmh-1/fmh1.htm].

NMOC, 2010: U.S. Navy manual for ship's surface weather observations. COMNAVMETOCCOMINST 3144.1E, Naval Meteorology and Oceanography Command, various paging.

Table 1.

Intensity	Descriptor	Precipitation	Obscuration	Other
- Light	**MI** Shallow	**DZ** Drizzle	**BR** Mist	**PO** Dust/Sand whirls
Moderate (no qualifier)	**BC** Patches	**RA** Rain	**FG** Fog	**SQ** Squalls
+ Heavy	**DR** Low Drifting	**SN** Snow	**FU** Smoke	**FC** Funnel Cloud
VC In the vicinity	**BL** Blowing	**SG** Snow Grains	**DU** Dust	**+FC** Tornado or Waterspout
	SH Showers	**IC** Ice Crystals	**SA** Sand	**SS** Sandstorm
	TS Thunderstorm	**PL** Ice Pellets	**HZ** Haze	**DS** Duststorm
	FZ Freezing	**GR** Hail	**PY** Spray	
	PR Partial	**GS** Small Hail or Snow Pellets	**VA** Volcanic Ash	
		UP Unknown Precipitation*		

*Automated stations only

For example: light snow would be -SN, heavy thunderstorm with rain +TSRA, moderate freezing drizzle FZDZ, etc.

5. Summary

Figure 1 shows the resulting quality of the translated US Navy METAR data. This figure reflects an acceptable level of quality with six key variables (SST, air temperature, u and v winds, sea level pressure, and relative humidity).

The Navy METAR data converted to IMMA format are available at http://rda.ucar.edu/datasets/ds530.0/#sfol-hl. This Transpec (navy-metar-transpec-20May15.pdf) and the fields summary (fort.10 output) are available at http://icoads.noaa.gov/translation.html. The processing software and input data are also available (icoads-immt5Ximma1-navy.sh, CleanMETARFiles.f, and NAVSHP-MTR-CLEAN.txt).

Translation Specifications
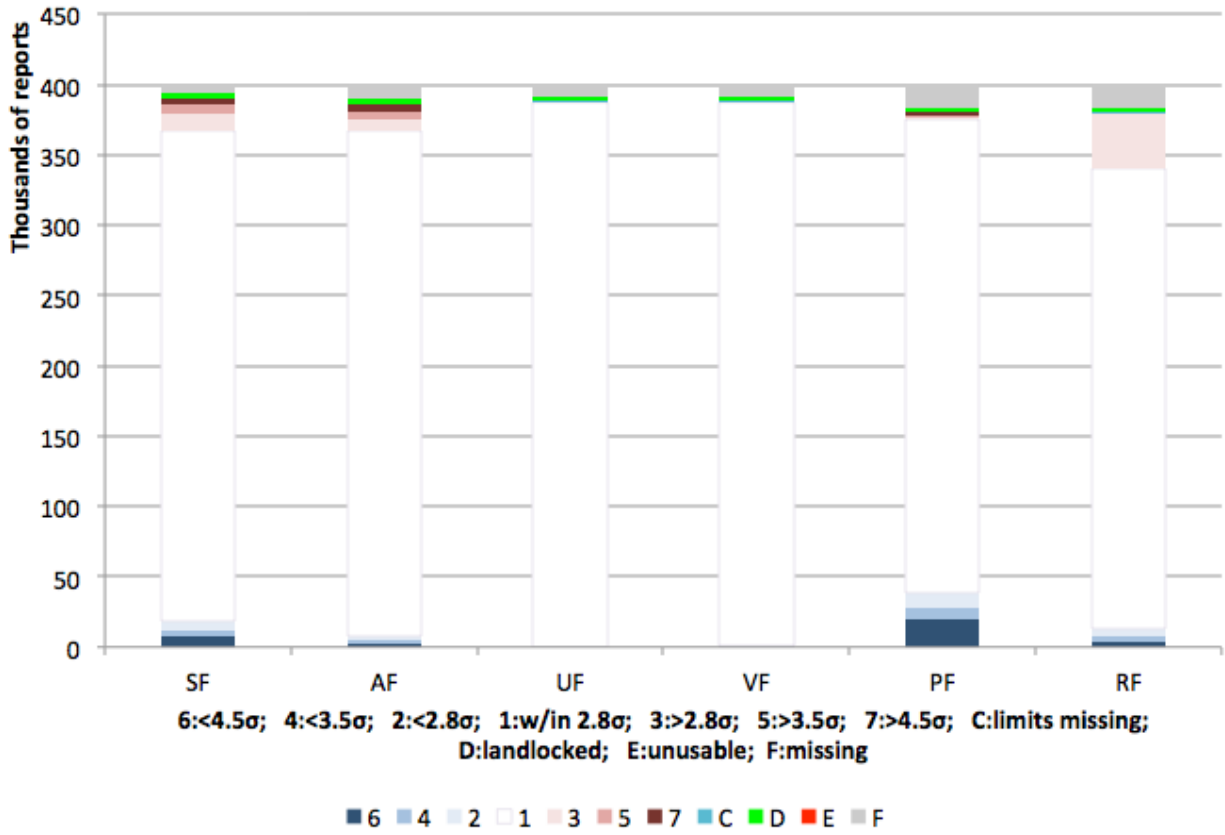## U.S. Navy Metar Reports

Figure 1. Number of reports exceeding quality control trimming limits (within 2.8σ, </> 2.8σ , </> 3.5σ, and </> 4.5σ for six elements; SST (SF), Air Temperature (AF), U-wind (UF), V-wind (VF), SLP (PF), and Relative Humidity (RF).