

## CHAPTER I - GENERAL INFORMATION

Naval Meteorology and Oceanography Command (NAVMETOCCOM) activities located throughout the western Pacific (WESTPAC) Ocean and Indian Ocean (IO) provide a wide range of meteorological and oceanographic (METOC) products and services. This enables the warfighter to fully exploit the operational environment through the effective and efficient deployment of assets. This guide is intended to inform our fleet users of the products and services available from NAVMETOCCOM activities located in the WESTPAC/IO region. METOC Support in this region is provided by the following NAVMETOCCOM activities:

- Naval Pacific Meteorology and Oceanography Center West/Joint Typhoon Warning Center, Guam (NAVPACMETOCCEN West/JTWC, Guam)
- Naval Pacific Meteorology and Oceanography Facility (NAVPACMETOCFAC) Yokosuka, Japan
- Naval Central Meteorology and Oceanography Facility (NAVCENTMETOCFAC) Bahrain
- Naval Pacific Meteorology and Oceanography Detachments (NAVPACMETOC DET)
  - NAVPACMETOC DET Atsugi, Japan
  - NAVPACMETOC DET Kadena, Japan
  - NAVPACMETOC DET Misawa, Japan
  - NAVPACMETOC DET Sasebo, Japan
  - NAVPACMETOC DET Diego Garcia

Phone numbers for NAVPACMETOCCEN West/JTWC Guam are as follows:

- |                                    |              |
|------------------------------------|--------------|
| a. Commanding Officer              | DSN 349-4170 |
| b. Executive Officer               | DSN 349-4170 |
| c. Operations Officer              | DSN 349-4230 |
| d. Assistant Operations Officer    | DSN 349-4230 |
| e. Fleet Services Officer          | DSN 349-5315 |
| f. Meteorological Services Officer | DSN 349-5314 |
| g. Tactical Services Officer       | DSN 349-5309 |
| h. Special Projects Officer        | DSN 349-7181 |
| i. Typhoon Duty Officer (JTWC)     | DSN 349-5302 |
| j. Command Duty Officer            | DSN 349-4230 |

Guam area codes are: DSN (315), Commercial (671), FTS (705).

## CHAPTER II - METEOROLOGICAL AND OCEANOGRAPHIC (METOC) PRODUCTS AND SERVICES

### A. METEOROLOGICAL FORECAST PRODUCTS

All of the products listed below use standard METOC symbols to depict important features. A key to the symbols is located in Appendix A. The symbols used on oceanographic products have not been provided, since each chart contains a legend. An example of each product listed below can be found in Appendix B. All charts are available through the NAVPACMETOCEN West/JTWC Guam websites (SIPRNET IP address: 206.36.192.40) (NIPRNET IP address: <http://www.npmocw.navy.mil> -OR- <http://198.97.95.26>) and upon request on the Guam Fleet Facsimile Broadcast (GFAX). Charts can also be faxed directly to the user upon request.

#### 1. WESTPAC and IO Prognosis and Sig Wave Series.

A series of locally produced surface prognoses for the western Pacific Ocean. Forecasters fuse output from several numerical models such as NOGAPS, NORAPS, NCEP, ECMWF and JMA with satellite imagery and input from JTWC to create this series. These charts depict pressure centers, frontal boundaries, surface winds and tropical cyclones.

The products in this series are listed below.

- WESTPAC 36-HOUR Weather Prognosis
- WESTPAC 36-HOUR Sig Wave Height Prognosis
- WESTPAC 84-HOUR Weather Prognosis
- WESTPAC 120-HOUR Weather Prognosis
- IO 36-HOUR Weather Prognosis
- IO 36-HOUR Sig Wave Height Prognosis
- FULL ACCOUNTING 48-HOUR Weather Prognosis

Tropical cyclone positions for the 36 and 48 hour products are derived from current JTWC warnings. Tropical cyclone positions for the 84 and 120-hour products are based on current numerical model runs and climatology.

2. WESTPAC 36/84/120-Hour Prognosis. Are forecasted outlooks of surface weather conditions for the western Pacific Ocean based on synoptic observations, satellite imagery and numerical model products such as NOGAPS, NORAPS, NCEP, ECMWF and JMA. This product depicts pressure centers, frontal boundaries, high winds and seas areas, and tropical cyclones.

3. WESTPAC 36-Hour Significant Wave Height Prognosis. A significant wave height and direction forecast for the western Pacific Ocean based on the WESTPAC 36-Hour Weather Depiction with sea heights indicated at the 3, 6, 9, 12, 18 and 24 foot contour levels. The height and position of the maximum seas is indicated inside the highest contour.

4. **IO 36-Hour Weather Prognosis.** A locally produced surface prognosis for the Indian Ocean region. Output from several numerical models such as NOGAPS, NORAPS, NCEP and ECMWF are fused together with satellite imagery by forecasters to create this product. This product depicts pressure centers, frontal boundaries, high winds and seas areas, and tropical cyclones.

5. **IO 36-Hour Significant Wave Height Prognosis.** A significant wave height and direction forecast for the Indian Ocean (IO), Arabian Gulf and Red Sea with sea heights indicated at the 3, 6, 9, 12, 18 and 24 foot contour levels. The height and position of the maximum seas are indicated inside the highest contour.

6. **FULL ACCOUNTING 48-Hour Prognosis.** A locally produced surface prognosis for the Southeast Asia region. Output from several numerical models such as NOGAPS, NCEP, NORAPS and ECMWF are fused together with satellite imagery by forecasters to create this product. This product depicts pressure centers, frontal boundaries, cloud masses with 5/8 coverage or greater, high wind and seas areas, and tropical cyclones.

#### **B. ENROUTE WEATHER FORECAST (WEAX)**

1. **General.** The purpose of the WEAX is to provide ships at sea with detailed and timely METOC forecasts in accordance with NAVMETOCCOMINST 3140.1(K). This service is available to ships conducting operations in a fixed area (MODLOC) as well as those units in transit from one point to another. WEAX may be utilized in conjunction with Optimum Track Ship Routing (OTSR). WEAX forecasts are issued daily for units operating under normal weather conditions. Units operating in heavy weather conditions will be issued WEAX twice daily or as conditions warrant. As the ship passes from one AOR to another, the forecast responsibility, will be coordinated and passed to the appropriate COMNAVMETOCCOM activity. WEAX and OTSR services are to be utilized by U.S. Naval units operating in or transiting WESTPAC as specified in COMTHIRDFLT/COMSEVENTHFLT OPOD 201. When submarines are operating under a MOVORD from CTF 74, a WEAX will be provided for the unit inport. WEAX support will commence during the forecast period the unit enters port, continue for the duration of the port visit, and end during the forecast period in which the unit gets underway. WEAX are generally disseminated via AUTODIN. For units not capable of receiving message traffic via AUTODIN, WEAX can be disseminated via other available means.

2. **WEAX Format.** The standardized format of a WEAX (See NAVMETOCCOMINST 3140.1(K)) consists of three parts: Synoptic situation, 24-hour forecast and 48-hour outlook. Aviation parameters are included on aviation WEAX's (AVWX) for ships with embarked helo detachments. A 3-day extended forecast is available for special

operations. An example of METOC terminology can be found in Appendix A and an example of common contractions use by the METOC community can be found in Appendix C.

a. **Meteorological Situation.** A brief description of the positions and expected movement of synoptic features (except below 20 N where wind flow and intensity are used) which influence the weather along the ship's track.

b. **24-Hour Forecast.** A forecast of environmental conditions along the ship's track for the 24-hour period commencing 12 hours after the time of the meteorological situation.

c. **48-Hour Outlook.** General forecast conditions and expected changes within the environment for the 24 hours immediately subsequent to the 24-hour forecast period.

\*\* A WEAX's level of classification will normally match the highest classification level of any message received (for example: MOVREP, MOVORD, or observations).

3. **Request Procedures.** Requests for WEAX services can be made by including the flagword "WEAX" in the movement report (MOVREP), in accordance with NWP 10-1-10 to: NAVPACMETOCEN WEST GU//30//. Foreign vessels not using the MOVREP system may provide plain language track intentions.

4. **GRAPHICAL WEAX Prognosis.** A 36-hour Prognosis chart valid for the mid point of a 24-hour forecast period and a current satellite picture. This product may be used to supplement the regular text WEAX. Graphical WEAX may be provided via e-mail, websites or AUTODIN. An example of a graphical WEAX can be found in Appendix A.

### C. OPTIMUM TRACK SHIP ROUTING (OTSR)

1. **General.** OTSR is an advisory service provided by NAVPACMETOCEN West/JTWC Guam for the western Pacific Ocean and Indian Ocean IAW CINCPACFLT OPORD 201. OTSR provides recommended ship routes and subsequent revisions (diverts), as appropriate. Recommendations are designed to minimize time enroute (and thus cost) and to minimize the risk of damage resulting from environmental phenomena. OTSR recommendations take into consideration individual ship handling and cargo characteristics, using specific operational requirements (constraints) provided by the requester. All ships, including those under OTSR advisory, are required to submit synoptic weather observations via message communication circuits in accordance with NAVMETOCCOMINST 3140.1(K) to the following CAD : OCEANO WEST.

2. **Applicability.** Since OTSR does not include tailored forecasts, ships are encouraged to use OTSR and WEAX services simultaneously. OTSR is most beneficial for voyages of 1500 miles or greater in unrestricted waters where storms and tropical cyclones are of great concern. Units may request OTSR for transits of less than 1500 miles in areas such as the East China Sea and South China Sea where navigational limitations constrain route selection/revision. Route surveillance is provided as an advisory service to monitor a unit's track. Recommendations for an early departure, a delay in departure or an evasion are based on predicted weather condition and ship's operational limits.

3. **OTSR Request Procedures.** Initial OTSR route requests are required to be submitted IAW NAVMETOCCOMINST 3140.1(K) at least 72 hours prior to the estimated time of departure (ETD). If requesting surveillance only and no initial route recommendation is desired, ships are not required to submit an OTSR route request. The flagword "OTSR" must be included in their MOVREP. The following information should be provided in an OTSR Route Request:

- a. Name(s) and type(s) of ships(s).
- b. Point of departure, ETD and classification of movement. Advise by message if ETD changes by more than 12 hours.
- c. Destination and preferred ETA. Include any qualifying remarks deemed appropriate such as, "Entry governed by diplomatic clearance."
- d. Intended cruising speed and/or maximum acceptable SOA. Include cruising speed on any leg which differs significantly from the SOA.
- e. Draft. Include draft fore and aft if an unusual trim condition exists.
- f. Voyage and loading information. Commanding Officers and Masters must state highest operational limits for head, beam, following seas, and wind velocities.
- g. Indicate significant operations to be conducted enroute; the ship's max acceptable specific mission limits (i.e. towing, dive ops, etc...); and the highest operational limits. If forecast conditions exceed limits along the ship's track, the forecasting center will generally recommend divert or evasion.
- h. Any unusual communications channel (Navy or commercial) to be used to transmit OTSR messages to the routed unit.

\*\*\* An example of an OTSR request message can be found on page 8.

4. **OTSR Route Recommendation.** A route recommendation will be sent to the unit approximately 36 hours prior to ETD. A route recommendation will be sent by AUTODIN message or a communication path prescribed by the unit in the OTSR request. If the route recommendation has not been received 18 hours prior to ETD, a follow-up request should be sent to NAVPACMETOCCEN West/JTWC Guam by IMMEDIATE precedence message.

5. **OTSR Route Surveillance and Divert.** During the transit of a ship under OTSR surveillance, NAVPACMETOCEN West/JTWC Guam will closely monitor wind and sea conditions along the ship's intended track. Unless there is a need to recommend a change in the route, NAVPACMETOCEN West/JTWC Guam will not send any additional OTSR messages to the unit concerned. If conditions are forecast to exceed the unit's highest operational or mission limits, OTSR will contact the unit by the most expedient means and recommend a divert to the unit's track. An AUTODIN message will follow providing a record of the recommended divert. The first line of the divert message will contain the phrase: **"Request acknowledge receipt and advise intentions."** This statement will not be added if a unit is under EMCON or MINIMIZE conditions. If an acknowledgment is not received from the unit in a reasonable amount of time (normally 6 hours after the date time group of the message), the unit should be contacted via voice communications (telephone/radio patch) to ensure receipt of the message. If dangerous conditions appear imminent, independent action should be taken by the unit without waiting for OTSR recommendations. Such action is particularly advisable near the point of departure or destination when OTSR alternatives are not available. It is essential that NAVPACMETOCEN West/JTWC Guam be promptly advised of any significant deviations from the intended track, so proper surveillance can be maintained.

6. **Daily OTSR Route Surveillance Report.** The daily OTSR Route Surveillance Report, (the 0800 local weather observation), should be transmitted to OCEANO WEST by IMMEDIATE precedence if, winds are greater than 34 kts or sea conditions are 12 ft or greater as specified in NAVMETOCCOMINST 3140.1(K) by all ships receiving OTSR services. If conditions are less than the aforementioned criteria the report can be transmitted PRIORITY. This report is essential for continuous surveillance and evaluation of the recommended route. Additionally, it aids in determining the need for route revisions for the ship concerned and others units transiting/operating in the area. The daily report should include at a minimum the following information:

- a. DTG of observation (GMT).
- b. Position - latitude and longitude in degrees and minutes.
- c. Course, speed and RPM being ordered at the time of observation.
- d. Wind direction in degrees (true) and speed (knots).
- e. Seas (wind driven waves), direction (degrees true), period (seconds) and height (feet).
- f. Swell direction (degrees true), period (seconds) and height (feet).
- g. Barometer reading corrected to sea level in millibars or inches of mercury. Reading in millibars is preferred.
- h. Seawater temperature (degrees Celsius) at the time of observation or departure.

i. Changes in draft, structural damage, changes in course or speed, etc...

\*\*\* An example of an OTSR Route Surveillance Report can be found on page 8.

**SAMPLE OTSR REQUEST**

P 151710Z JAN 90  
FM USNS UNDERWAY  
TO OCEANO WEST  
BT  
UNCLAS //N03148//  
MSGID/GENADMIN/USNS UNDERWAY//  
SUBJ/OTSR ROUTE REQUEST//  
REF/A/DOC/NAVMETOCCOMINST 3140.1//  
RMKS/1. USNS UNDERWAY TA050  
2. SEATTLE WA/ETD 190100Z JAN 90  
3. GUAM/PREFERRED ETA 022300Z FEB 90  
4. MAX SOA 13.5 KTS  
5. DRAFT: FORE 29.5 FT/AFT 30 FT  
6. DECK LOAD 40 TONS; MISSION LIMITS: HEAD 12 FT, BEAM 12 FT,  
FOLLOWING 16 FT, WIND 30 KTS. HIGHEST LIMITS: HEAD 16 FT, BEAM 16  
FT, FOLLOWING 20 FT, WIND 35 KTS.  
7. NONE.//  
BT

**SAMPLE DAILY OTSR ROUTE SURVEILLANCE REPORT**

O 262340Z JAN 90  
FM USNS UNDERWAY  
TO OCEANO WEST  
BT  
UNCLAS //N03148//  
MSGID/GENADMIN/USNS UNDERWAY//  
SUBJ/OTSR REPORT//  
RMKS/WXYZ  
1. 262300Z 1947N 16336E CUS/SP/RPM 237/18.5/084 WIND 250/15G22 SEAS  
250/04/05 SWELL 230/12/08 SLP 1013 SEATEMP 21  
REMARKS: REVISED ETA 021000Z.//  
BT

## D. ADVISORIES AND WARNINGS

### 1. High Wind and Seas Warnings

a. **General.** NAVPACMETOCEN West/JTWC Guam issues warnings for areas of high wind and/or seas not associated with tropical cyclones. NAVPACMETOCEN West Guam AOR boundary is from 017E near the tip of South Africa to 60S, eastward to the International Date Line, then north to 66N, and west to land. The Northwest Pacific High Wind and Seas Warning (WWPW30/31) covers all water areas from the eastern boundary of the AOR north of the Equator to the Strait of Malacca. The Indian Ocean High Wind and Seas Warning (WWIO30/31) covers all water areas west of the Strait of Malacca to the east coast of Africa north of the Equator. Warnings for the Arabian Gulf (west of 60E and north of 23N into the Arabian Gulf), and the Red Sea are issued by NAVCENTMETOCFAC Bahrain. Warnings for the Southern Hemisphere are issued only when directed by CINCPACFLT or COMSEVENTHFLT. The following warning areas are depicted:

- GALE: sustained winds of 35 knots or greater but less than 50 knots.
- STORM: sustained winds of 50 knots or greater.
- HIGH SEAS: seas greater than 12, 18 and 24 feet.

b. **Availability.** High Wind and Seas Warnings are disseminated primarily via AUTODIN to AIG 127 for WWPW30/31 and AIG 498 for WWIO30/31. High Wind and Seas Warning are also available through the following media:

- AWN
- PMHH and IMWW
- NITES or JMCIS Overlay (SID 198/PAC MET OCEAN)
- Upon request on GFAX, via the 36-Hour WESTPAC and IO Weather Depiction charts
- NAVPACMETOCEN West/JTWC Guam Websites:

TS/SCI JWICS:  
<http://npmocw.pacom.ic.gov> -OR-  
<http://192.14.160.10>

SIPRNET:  
<http://206.36.192.40/> -OR-  
<http://www.npmocw.navy.smil.mil>

NIPRNET:  
<http://www.npmocw.navy.mil> -OR-  
<http://198.97.95.26>

## 2. Tropical Cyclone Warnings

a. **Area of Responsibility.** Responsibility for the issuance of tropical cyclone warnings in the Pacific Command west of 180/ is assigned by CINCPACFLT to NAVPACMETOCEN West/JTWC Guam. Tropical cyclone warnings are issued by the Joint Typhoon Warning Center for areas extending from west of 180/ to the east coast of Africa.

b. **Tropical Cyclone Formation Alert (TCFA).** Describes an area where highly favorable conditions exist for a circulation to develop into a tropical depression or significant tropical cyclone. A TCFA is issued as conditions warrant and is valid for a 24-hour period. The TCFA must be either canceled, reissued as a TCFA for an additional 24-hours or may be upgraded to a tropical depression or tropical cyclone at any time.

c. **Tropical Cyclone Classifications.** Tropical cyclone is the general term for a non-frontal low pressure system of synoptic scale, developing over tropical or sub-tropical waters and having a definable organized circulation. Tropical cyclones are classified according to intensity. The different classifications are listed below:

- (1) TROPICAL DEPRESSION (TD) - Sustained wind speed of 33 kts or less.
- (2) TROPICAL STORM (TS) - Sustained wind speed of 34-63 kts.
- (3) TYPHOON (TY)/HURRICANE - Sustained wind speed of 64-129 kts, or greater.
- (4) SUPER TYPHOON (STY)/HURRICANE - Sustained wind speed of 130 kts, or greater.

d. **Availability.** Tropical cyclone warnings for the northern Pacific Ocean west of 180/ (including the South China Sea) are issued every 6 hours and transmitted primarily via AUTODIN to the CAD: TYPHOON WARNING WESTPAC. Tropical cyclone warnings for the South Pacific and Indian Ocean are normally issued every 12 hours via AUTODIN to AIG 9229. If U.S. Government assets are threatened, tropical cyclone warnings for the Southern Hemisphere will be issued every 6 hours. Other methods used for disseminating tropical cyclone warnings include the following:

- AWN
- GFAX upon request
- PMHH and IMWW
- NITES or JMCIS Overlay (SID 198/MET OCEAN PAC)
- NAVPACMETOCEN West/JTWC Guam Websites:
  - TS/SCI JWICS: <http://npmocw.pacom.ic.gov> -OR-
  - <http://192.14.160.10>

SIPRNET: <http://206.36.192.40>

-OR-

<http://npmocw.navy.smil.mil>

NIPRNET: <http://www.npmocw.navy.mil> -OR-

<http://198.97.95.26>

3. **Local Area Warnings (Guam)**. All weather warnings and advisories affecting Guam and the surrounding islands are issued by the National Weather Service at Tiyan, Guam. NAVPACMETOCEN West/JTWC Guam will forward all local warnings and advisories via AUTODIN to U.S. Navy and MSC ships inport Apra Harbor or units operating in the vicinity of Guam.

#### **E. OCEANOGRAPHIC PRODUCTS**

1. **Energy Savings Message**. Ships transiting the East China Sea and Northwestern Pacific Ocean can operate more efficiently and realize significant fuel savings by utilizing the flow of the Kuroshio Current on northbound transits and avoiding it on southbound transits. NAVPACMETOCEN West/JTWC Guam issues the Energy Savings Message twice weekly on Tuesdays and Fridays via AUTODIN, SIPRNET, and NIPRNET. This message provides a 3 or 4-day forecast on the axis, width and speed of the Kuroshio Current.

2. **Ocean Fronts & Eddies Messages**. An analysis of ocean fronts and eddies (OFE) for WESTPAC and the IO is produced once a week on Tuesday and is valid at 1200Z. This product depicts the position (points along the front) of ocean fronts and eddies in OTH-T (Overlay II) format and is disseminated via AUTODIN, and JMCIS overlay. The analysis is broken down into the five areas listed below:

- Northern Pacific
- Western Pacific
- East China Sea and Yellow Sea
- Sea of Japan
- Indian Ocean

These areas are subject to change based on user requirements.

#### **F. TACTICAL METOC SUPPORT**

1. **ASW Support Products**. ASW support packets with general weather briefings are routinely produced for maritime patrol missions. Packets normally include acoustic predictions (propagation loss, acoustic summary and sensor employment recommendations), oceanographic data (bathymetry, SST, wave height, layer depth, fronts and eddies

data), Integrated Refractive Effects Prediction System (IREPS) products (i.e. electromagnetic sensor detection ranges) and Forward Looking Infrared Radar (FLIR) data. Mission briefs are provided upon request. An example of three regions covered by MODAS analysis mixed layer depth and MODAS analysis sea surface temps can be found in Appendix B.

2. **METOC Support for Littoral Operations.** Specialized METOC support products for operations/exercises in littoral regions are produced upon request. These products cover a wide variety of METOC parameters which significantly affect littoral operations. These include surf forecasts, tidal data, solar/lunar data (SLAP), shallow water acoustic forecasts and oceanographic data (bottom composition, currents, bathymetry, sound velocity, temperature, salinity, density, visibility, ambient noise, shipping, marine life, coastal features and physical properties of a harbor area). Contact the NAVPACMETOCEN West/JTWC Guam Tactical Services Officer to request support.

#### **G. MOBILE ENVIRONMENTAL TEAM (MET) SERVICES**

Mobile Environmental Teams at NAVPACMETOCFAC Yokosuka and NAVCENTMETOCFAC Bahrain provide on-scene METOC services to ships that are deployed to the western Pacific Ocean, Indian Ocean and Arabian Gulf and are without permanently embarked Aerographer's Mates or Oceanographers. The teams are designed to provide METOC forecasts and tactical support products for surface and subsurface sensors while embarked. These services can include weather forecasts, acoustic range predictions, IREPS, upper air observations, surf and tide forecasts. In addition, shipboard training can be conducted on the proper techniques for taking, recording and reporting oceanographic and surface weather observations.

A MET normally consists of 1 to 3 personnel depending on mission requirements and can be assigned to a ship or Task Group Staff. MET's are assigned on a first come, first served basis, weighted against mission priority and available manpower. Funding, equipment and supplies will be provided entirely by the NAVMETOCCOM activity. Requests for MET services can be made via AUTODIN message to NAVPACMETOCFAC YOKOSUKA JA//MET// or NAVCENTMETOCFAC BAHRAIN//MET// with info copies to NAVPACMETOCEN PEARL HARBOR HI//30// and NAVPACMETOCEN WEST GU//30//. Although MET's can deploy on 24-hour's notice, ships should provide as much lead time as possible.

MET's require an air-conditioned space to operate various computer systems and the capability to receive the encrypted Fleet Multi-channel Broadcast.

## H. CLIMATOLOGICAL INFORMATION

1. **General.** Climatology is the scientific study of meteorological conditions that normally prevail in a particular region. In addition to the presentation of statistical data, climatology encompasses the analysis of the causes and changes of long-term environmental conditions and the application of statistical data to solve specific design and operational problems. A limited climatological library is maintained by NAVPACMETOCEN West/JTWC Guam for the western Pacific Ocean and Indian Ocean regions. METOCFAC's and METOCDET's located in these regions also maintain climatological databases via cd-roms and studies for their respective AORs. Most climatological products are sent by mail, facsimile or AUTODIN.

2. **Climatological Outlooks.** Outlooks for individual operating areas or countries are provided upon request. Climatological outlooks and studies are tailored to the specific requirements of the user.

3. **Voyage Planning.** Climatological summaries are prepared upon request for ships embarking on extended voyages or deployments. Such summaries are particularly helpful when transiting isolated ocean areas and for long range planning. Summaries include parameters such as average (or mean) and normal ranges for cloud cover, visibility, prevailing winds, occurrence of gale or storm force winds, sea conditions and temperatures. Climatological data for oceanographic conditions can also be provided.

4. **Astronomical and Tide Data.** Astronomical and tidal data are provided upon request. These charts include, but are not restricted to, the following parameters:

- a. Sunrise
- b. Sunset
- c. Lunar illumination forecast
- d. High/low tide times
- e. Tidal heights above/below the mean water level.

## I. IN-PORT SERVICES

1. **Fleet Liaison Program.** The Fleet Liaison Program was established to achieve closer coordination with operating forces. NAVPACMETOCEN West/JTWC Guam, NAVPACMETOCFAC Yokosuka, NAVPACMETOC DET Diego Garcia, NAVCENTMETOCFAC Bahrain, and NAVPACMETOC DET Sasebo maintain active Fleet Liaison Programs. NAVPACMETOC DET Kadena also has a Fleet Liaison program, but provides limited support. Specifically, the program is designed to do the following:

- a. Advise fleet units concerning the availability of METOC products and services and their application to fleet operations.

b. Provide training, advice and assistance in METOC matters, including technical assistance concerning equipment.

c. Emphasize the need for and the value of METOC observations provided by fleet units.

## 2. METOC Briefings

a. **Flight Weather Briefings.** Complete domestic and international flight weather briefings are available upon request. Navy flight weather briefing packets normally include a DD175-1, Horizontal Weather Depiction (HWD), flight level winds charts, ditch headings, altimeter settings and satellite imagery. Optimum Aircraft Routing System (OPARS) products are also available upon request. Flight weather briefings can be obtained by contacting the Forecast Duty Officer (FDO) at the following locations:

|   |                       |
|---|-----------------------|
| NAVPACMETOC DET Atsugi .....              | DSN 315-264-3208/3648 |
| NAVCENTMETOCFAC Bahrain .....             | DSN 318-439-4039      |
| NAVPACMETOC DET Diego Garcia .....        | DSN 315-370-3670/3590 |
| NAVPACMETOC DET Kadena (OPARS only) ..... | DSN 315-634-8380      |
| USAF Weather Office Kadena .....          | DSN 315-634-3572      |
| NAVPACMETOC DET Misawa (OPARS only) ..... | DSN 315-226-3298      |
| USAF Weather Office Guam.....             | DSN 315-366-3382      |
| USAF Weather Office Misawa .....          | DSN 315-226-3065      |

b. **Pre-Sail/Pre-Deployment METOC Briefings.** Special weather briefings for ships leaving port are available and highly recommended. These briefings may be conducted either aboard ship or at a NAVMETOCCOM activity. The briefs cover the general synoptic situation, a 24-hour forecast, a 72-hour outlook for conditions along the ship's intended track, a climatological summary and pertinent tropical cyclone information. These briefings are normally conducted within two hours of departure time but can be conducted at a specific time as requested by the requesting unit.

c. **Activity Briefings and Tours.** Visits to NAVMETOCCOM activities are highly encouraged, particularly by ship's officers, quartermasters and ASW personnel. Tours may be arranged by contacting a NAVMETOCCOM activity by message, letter or telephone. A minimum of 24 hours advance notice is preferred, but not required.

d. **Tactical METOC Support Briefings.** Tactical METOC support briefings are available to commands embarking on special operations or exercises. Such briefings vary greatly in content and are tailored to the specific exercise or operation, and customer requirements. Briefings can include forecast weather conditions, sea conditions, acoustic forecasts, oceanographic data, IREPS data, FLIR data and climatological information for advanced planning.

### 3. METOC Training

A wide range of METOC training services is available at NAVPACMETOCEN West/JTWC Guam and NAVPACMETOCFAC Yokosuka, and to a limited degree, at NAVCENTMETOCFAC Bahrain, NAVPACMETOC DET Diego Garcia, NAVPACMETOC DET Atsugi, NAVPACMETOC DET Kadena, NAVPACMETOC DET Misawa, and NAVPACMETOC DET Sasebo. Training is available on the following topics:

- a. Weather observations
- b. Tropical cyclone evasion
- c. Bathythermograph observations
- d. Acoustic products

Training will be scheduled at a mutually agreeable time and location with priority given to the requester's requirements.

### J. **MAPPING**

The Defense Logistics Agency (DLA) is responsible for providing maps, charts and related products for the Department of Defense (DOD). DLA maintains a branch office at Naval Air Facility Atsugi, Japan. DLA Map Support Office Atsugi staffs a small office at Fleet Activities Yokosuka twice a week to issue hydrographic and navigational charts. DLA Map Support Office Atsugi is stocked to supply supplemental and contingency quantities of hydrographic, topographic and aeronautical maps, charts and related publications. Products are stocked primarily for the western Pacific Ocean and the Indian Ocean. Yokosuka stocks only hydrographic and navigational charts. These products are available for over-the-counter distribution in limited quantities. To reduce the need for emergency high priority requisitions, units should establish internal re-order procedures based on consumption rates and requisition 30-45 days prior to projected stock depletion. For additional information on product availability or ordering procedures, contact the DLA branch office at Atsugi.

DLA Map Office, Atsugi  
PSC 477 BOX 47  
FPO AP 96306-2947  
Phone 011-81-0462-51-1520  
ext. 264-3209/3695  
FAX 011-81-0467-70-1829  
e-mail: iamqmcds@hotmail.com

If DLA Map Support Office Atsugi is unable to provide all of the requested products, DOD units can obtain them through the DLA Map Support Office Honolulu, HI.

DLA Map Office, Hickham AFB  
900 Hangar Ave  
Hickam AFB, HI 96853-5246  
Phone 808-449-2100  
FAX 808-449-5390

## CHAPTER III - PRODUCT DISSEMINATION METHODS

### A. GUAM FLEET FACSIMILE BROADCAST (GFAX)

1. **General.** NAVPACMETOCEN West/JTWC Guam has the capability to maintain two continuous unclassified HF facsimile broadcasts (GFAX) for the western Pacific and Indian Ocean regions. This service will be provided upon request. An example of both the western Pacific and Indian Ocean broadcast is available in Appendix D. Both the content and quality of each broadcast is monitored by NAVPACMETOCEN West/JTWC Guam. GFAX is an unencrypted broadcast available to any unit with HF facsimile reception capabilities. GFAX reception is subject to propagation anomalies experienced by all HF broadcasts. Units experiencing reception problems should submit a COMSPOT via IMMEDIATE precedence AUTODIN message to NAVCOMTELSTA GUAM GU, info NAVPACMETOCEN WEST GU.

#### 2. Products Available

a. **FNMOOC Products.** Meteorological and oceanographic products available on GFAX are standard, computer-generated meteorological fields derived from the NOGAPS model at Fleet Numerical Meteorology and Oceanography Center (FLENUMMETOCEN) in Monterey, CA. These charts include analyses and prognoses out to 120 hours for various levels of the atmosphere from the surface to 300 mb. Significant wave height analyses and prognoses are also included.

b. **Value-added METOC Products.** All products from the NAVPACMETOCEN West/JTWC Guam Weather Depiction series for western Pacific and the Indian Ocean are included on both broadcasts. See Chapter II-A for a brief description of these products.

c. **Satellite Imagery.** Satellite imagery of the western Pacific can be included on the GFAX. The IO GFAX broadcasts satellite imagery covering the Arabian Gulf, North Arabian Sea, Bay of Bengal, Indian Ocean and the western Pacific.

d. **Tropical Cyclone Warnings.** In the Western Pacific Ocean tropical cyclone warnings can be updated and transmitted four times daily on both broadcasts. The warnings are in graphic format and contain the current position and 12, 24, 36, 48 and 72-hour forecasts for position and wind speed. In the Indian Ocean, tropical cyclone warnings are updated twice daily. The warnings are in the same graphic format as the Western Pacific Ocean but extend out to 48 hours. This is increased to four times daily and extended out to 72 hours if an U.S. asset is threatened.

e. **Request for activation of GFAX.** Units should formally request activation of the broadcast via a message. There are more favorable options to the HF broadcast (AUTODIN NODDS, email, SALTS support etc...) and if a unit has the capability to receive our support by other means, it would be preferred.

f. **GFAX Broadcast Schedules.** The schedules would be transmitted daily over both broadcasts, when activated by request. The WESTPAC GFAX Broadcast Schedule and IO GFAX Broadcast Schedule are transmitted from 0000Z to 0015Z and 1200Z to 1215Z daily. These broadcast schedules are subject to change on short notice. The broadcast schedules for the WESTPAC GFAX and IO GFAX can be found in Appendix D.

3. **WESTPAC GFAX Broadcast.** The WESTPAC GFAX Broadcast makes METOC products available to units operating in the Western Pacific. The area of coverage of the products available on this broadcast extends from 60N to 10S latitude and from 180/ to 100E longitude. Value-added products for this area include the western Pacific 36, 60, 84 and 120-HR Hour Weather Depiction and the western Pacific 36-Hour Significant Wave Height Prog. WESTPAC GFAX Broadcast frequencies are listed below:

| <u>TRANSMISSION SITE</u> | <u>FREQUENCIES</u>                            |
|--------------------------|---|
| Barrigada, Guam          | 10255 LSB/USB<br>16029.6 LSB<br>19860 LSB/USB |
| Totsuka, Japan           | 4965 LSB<br>12777 USB<br>22324.5 USB          |

4. **Indian Ocean GFAX Broadcast.** The IO GFAX Broadcast makes METOC products available to units operating in the Indian Ocean, Arabian Gulf and Red Sea. The area of coverage of products available on this broadcast extends from 60N to 20S latitude and from 100E to 20E longitude. Value-added products include the Indian Ocean 36-Hour Weather Depiction and the Indian Ocean 36-Hour Significant Wave Height Prog. IO GFAX Broadcast frequencies are listed below:

| <u>TRANSMISSION SITE</u> | <u>FREQUENCIES</u>  |
|--------------------------|---|
| Barrigada, Guam          | 5260 LSB/USB<br>23010 LSB                                       |
| Diego Garcia, BIOT       | 7580 USB (24 HRS)<br>12804 USB (00Z-12Z)<br>20300 USB (12Z-00Z) |

\*\*\* Ships copying the IO GFAX Broadcast should drive the broadcast receiver with external frequency standard and set the KG-4 delay switch for synchronization within four pulses.

5. **Contingency Broadcasts.** When a broadcast is activated, broadcast schedules may occasionally be temporarily interrupted due to an equipment casualty or a communication problem. Every effort will be made to bring the broadcast back on line without diminishing the level of support to fleet users. This may be accomplished by delaying lower priority charts until the normal broadcast schedule can be resumed or through schedule substitutions. In the event that NAVPACMETOCCEN West/JTWC Guam experiences an extended outage, NAVPACMETOCCEN Pearl Harbor, HI will assume broadcast responsibilities for either the WESTPAC GFAX broadcast, the IO GFAX broadcast or both. A combined Northern Pacific Fleet Facsimile broadcast (FFAX) will be created to include an abridged schedule of products from the WESTPAC GFAX broadcast and/or the IO GFAX broadcast. Bulletins updating the status of broadcast outages will be transmitted on the fleet environmental broadcasts PMHH and IMWW under the following MANOP headers:

AAPA 1 PGFW  
AAIO 1 PGFW

## **B. FLEET ENVIRONMENTAL BROADCASTS**

1. **General.** NAVPACMETOCCEN West/JTWC Guam monitors two 75bps radioteletype broadcasts which are carried on Channel 8 on the WESTPAC MILSAT Broadcast and IO MILSAT Broadcast. These broadcasts contain weather forecasts, observations and bulletins normally found on the Automated Weather Network (See Appendix D). The broadcasts are designed to provide vital environmental data to assist units with embarked METOC personnel. Routine data is unclassified and is intended for fleet-wide use. Classified data such as ship observations and Tomahawk support data is encrypted and periodically sent over this channel. Users must have "crypto" gear in order to copy the classified data. The data on the circuit is monitored and managed by NAVPACMETOCCEN West/JTWC Guam. Special data requirements should be directed to NAVPACMETOCCEN West/JTWC Guam.

2. **PMHH (WESTPAC).** The fleet environmental broadcast for the Western Pacific is transmitted via the WESTPAC MILSAT. The area of coverage for the PMHH broadcast extends from 180/ to 105E.

3. **IMWW (IO).** The fleet environmental broadcast for the Indian Ocean region is transmitted via the IO MILSAT. The area of coverage for the IMWW broadcast extends from 17E to 115E.

4. **Contingency Plans.** When either the PMHH or IMWW broadcast is down, a combined broadcast will be put on the other functional broadcast or on the Eastern Pacific (EPAC) Fleet Environmental Broadcast (PMOO) for transmission to the fleet. These combined broadcasts will contain an abridged version of the data received on the normal broadcast.

### **C. AUTOMATIC DIGITAL NETWORK (AUTODIN)**

1. **General.** AUTODIN is the system through which standard Navy messages, classified SECRET or below, are transmitted and received. NAVPACMETOCEN West/JTWC Guam disseminates many routine METOC products, as well as some specialized products in support of exercises and contingency operations, via AUTODIN. Products routinely disseminated via AUTODIN include:

- High Wind and Seas Warning
- WEAX
- OTSR Route Recommendations and Updates
- Tropical Cyclone Warnings
- Ocean, Fronts & Eddies Message
- Energy Savings Message

2. **AUTODIN REQUESTS.** Message traffic at NAVPACMETOCEN West/JTWC Guam is monitored 24 hours a day, seven days a week using the GATEGUARD system. AUTODIN requests for METOC support should be addressed to NAVPACMETOCEN WEST GU//30// or any one of the NAVMETOCCOM activities listed in Chapter V. NAVPACMETOCEN WEST GU//30// is also included on AIG SIX ZERO and AIG FIVE FIVE for receipt of MOVREPS/MOVORDS. Units operating in the western Pacific or the Indian Ocean should address all meteorological and oceanographic observations to the following CAD: OCEANO WEST. This Collective Address Designator (CAD) includes the following action addrees:

- NAVPACMETOCEN PEARL HARBOR HI//30//
- NAVPACMETOCEN WEST GU//30//
- FLENUMMETOCEN DATA MONTEREY CA//30//
- NAVOCEANO DATA STENNIS SPACE CENTER MS//N321//
- AFGWC OFFUTT AFB NE//WFO//

Requests for METOC support can also be addressed to OCEANO WEST.

### **D. AUTOMATED WEATHER NETWORK (AWN)**

The U.S. Air Force (USAF) is responsible for collecting and distributing meteorological data for the Department of Defense via the AWN. Access to the AWN requires special hardware and software, therefore most AWN terminals are located at NAVMETOCCOM activities. The AWN carries a wide variety of real-time meteorological data such as surface weather observations, upper air observations, terminal aerodrome forecasts (TAF), tropical cyclone warnings, high wind and seas warnings

and various bulletins. This data is available via the Fleet Environmental Broadcasts, PMHH and IMWW. Contact your nearest NAVPACMETOCCOM activity (See Chapter V) for a complete list of bulletins and data available.

#### **E. JOINT MARITIME COMMAND INFORMATION SYSTEM (JMCIS)**

1. **General.** JMCIS integrates Command, Control, Communications, Computers and Intelligence (C4I) functions into an automated, classified networked system. A variety of networks, hardware, software and communication interfaces forms the JMCIS architecture.

2. **Joint Operational Tactical System II (JOTS II).** The JOTS II is an automated Command, Control and Communications display and decision-aid system. It is designed to meet the tactical situation assessment needs of battle group/force commanders, warfare commanders, ship CO's and shore commands. It receives tactical information from a variety of sources and automatically correlates this data with its existing tactical contact database, which is used to generate computer graphic images for use by tactical decision makers. The TESS(3) Remote Workstation (TRWS) receives gridded fields from the main TESS(3) computer for manipulation and display via JMCIS overlay. JMCIS communication capabilities allow for transmission and receipt of OPNOTES between NAVPACMETOCCEN West/JTWC Guam and similarly equipped units. The NAVPACMETOCCEN West/JTWC Guam JMCIS address is "NPMOCW GU."

3. **Navy Integrated Tactical Environmental Subsystem (NITES).** NITES consists of a collection of application programs and system services. Its primary purpose is to collect, manage, display, and disseminate environmental datasets which are useful as tactical decision aids to tactical commanders and operators. NITES Central Site Product Display (NCSPD) allows users to retrieve, display, annotate, and save METOC data from either the TESS(3) systems or directly from FLENUMMETOCCEN. IREPS is also available on NITES. Image viewer software allows the viewing of satellite imagery received from the TESS(3), the SMQ-11, or outside sources via File Transfer Protocol (FTP).

#### **F. WEBSITES**

NAVPACMETOCCEN West/JTWC Guam maintains one classified and one unclassified website containing a complete collection of the latest METOC products for the western Pacific Ocean, Indian Ocean and Arabian Gulf. The classified website (SIPRNET) can be accessed at: <http://206.36.192.40> -OR- <http://www.npmocw.navy.smil.mil>, and the unclassified website (NIPRNET) can be accessed at: <http://www.npmocw.navy.mil>. -OR- <http://193.97.95.26>

**G. CLASSIFIED/UNCLASSIFIED E-MAIL**

NAVPACMETOCEN West/JTWC Guam can distribute METOC products via e-mail. The Command Duty Officer's unclassified e-mail address is: cdo@npmocw.navy.mil. The classified e-mail address is: cdo@npmocw.navy.smil.mil.

## **CHAPTER IV - METEOROLOGICAL AND OCEANOGRAPHIC (METOC) EQUIPMENT SERVICES**

### **A. INTRODUCTION**

The accurate measurement of meteorological and oceanographic (METOC) parameters is vital to providing timely, accurate METOC support to fleet units. Such measurements require properly installed, operated and maintained equipment. METOC equipment personnel are available to assist with maintenance problems beyond the capabilities of ship's force personnel. Technical assistance ranges from the calibration of relatively simple, but precise, instruments to the troubleshooting and repair of complex electronic devices. METOC equipment services are provided to ashore and afloat units by NAVPACMETOCEN West/JTWC Guam and NAVPACMETOCFAC Yokosuka. Technical assistance is available for the equipment listed below:

- Aneroid Barometer (ML-448/UM Precision Aneroid Barometer or the SK-12509 General Purpose Aneroid (Taylor) Barometer)
- Wind Measuring Device (UMQ-5)
- Portable Wind Measuring Kit (AN/PMQ-3)
- Electric Psychrometer (ML-450/UM)
- Mini Rawinsonde System (MRS)
- AN/SMQ-11
- Tactical Environmental Support System (TESS(3))

### **B. METOC EQUIPMENT SERVICES PERSONNEL**

Technical assistance teams are normally staffed by Electronics Technicians (ET), Data Systems Technicians (DS), Radioman (RM), and Aerographer's Mates (AG) specifically trained in the repair of meteorological equipment. These personnel are available to visit ships to ensure all equipment is operating properly and that adequate spare parts are available. "Tech assist" personnel are also available for training equipment operators and maintenance technicians. METOC equipment services personnel will ride ships if necessary, and as available.

### **C. REQUEST FOR SERVICES**

Requests for technical assistance may be forwarded by AUTODIN (admin message or CASREP), letter, e-mail or telephone to NAVPACMETOCEN West/JTWC Guam and NAVPACMETOCFAC Yokosuka. See Chapter I and Chapter V for PLA's, addresses and phone numbers. Requests should include the following information:

- Name and location of activity. Include dates of availability at a specific location.

- Nomenclature of equipment.
- Description of technical difficulty and availability of spare parts/test equipment.

## CHAPTER V - OTHER COMNAVMETOCCOM ACTIVITIES

### A. GENERAL

COMNAVMETOCCOM activities located throughout the Pacific Ocean and Indian Ocean are under the operational and administrative control of Commanding Officer, Naval Pacific Meteorology and Oceanography Center (NAVPACMETOCCEN), Pearl Harbor, Hawaii. CINCPACFLT coordinates METOC requirements in the Pacific Ocean and Indian Ocean. Consequently, COMSEVENTHFLT, COMFIFTHFLT and others in the operational chain of command execute coordinating responsibilities as outlined in OPORDS, OPLANS and directives. METOC support in the western Pacific Ocean and Indian Ocean is also provided by other NAVMETOCCOM activities. Each activity and the scope of METOC support provided is outlined in the succeeding paragraphs.

### B. NAVPACMETOCFAC YOKOSUKA, JAPAN

1. **General.** Naval Pacific Meteorology and Oceanography Facility (NAVPACMETOCFAC), Yokosuka is located in Building F-3304 on Yokosuka Naval Base. This facility operates 24 hours a day, seven days a week. NAVPACMETOCFAC Yokosuka provides a wide range of METOC services to staffs and ships operating from or homeported at Fleet Activities (FLEACT) Yokosuka.

2. **Request For Services.** To request METOC services, units may contact NAVPACMETOCFAC Yokosuka via AUTODIN message, commercial or DSN phone, or DSN facsimile, mail, e-mail, or by visiting the facility in person. The address and phone numbers are listed below.

**PLA:** NAVPACMETOCFAC YOKOSUKA JA//N3// (Operations)  
NAVPACMETOCFAC YOKOSUKA JA//N4// (Equipment Services)  
NAVPACMETOCFAC YOKOSUKA JA//MET// (MET Services)

**Address:** Commanding Officer  
U.S. Naval Pacific Meteorology and  
Oceanography Facility  
PSC 473 Box 68  
FPO AP 96349-2902

**Comm. Phone:** 011-81-311-734-5595  
**Fax:** 011-81-311-734-5596  
**DSN Phone:** 315-243-5595  
**Fax:** 315-243-5596  
**STU-III:** 315-243-6232  
**e-mail:** yo-cdo@fnoc.navy.mil  
**NIPRNET Website:** <http://metoc.npmof.navy.mil>  
**SIPRNET Website:** <http://206.36.216.132>

### 3. METOC Products and Services

a. **Advisories and Warnings.** Warnings and advisories are issued in accordance with NAVMETOCCOMINST 3140.1(K) and cover the local Yokosuka area. The local area is considered the area within a 25 nm radius of NAVPACMETOCFAC Yokosuka and/or COMFLEACT Sasebo. This area includes Yokohama, the Tsurumi Fuel Depot and the three fuel depots located in the vicinity of Sasebo (Akasaki, Iorisaki and Yokose).

(1) Small Craft Warning. Issued when sustained winds of 20 to 33 kts or frequent gusts of 30 kts are occurring or are forecast in the local area, or when conditions are hazardous to small craft operations.

(2) Gale Warning. Issued when sustained winds of 34-47 kts or frequent gusts of 40 kts, not associated with a tropical cyclone, are occurring or are forecast in the local area.

(3) Storm Warning. Issued when sustained winds of 48-63 kts, not associated with a tropical cyclone, are occurring or are forecast in the local area.

(4) Thunderstorm Condition TWO. Issued when conditions are favorable for the development of thunderstorms in the local area. This condition is normally valid for six hours.

(5) Thunderstorm Condition ONE. Issued when thunderstorms are imminent or are occurring in the local area.

(6) Tropical Cyclone Advisories. Issued when Tropical Cyclone Condition of Readiness (COR) TWO or ONE are in effect at Fleet Activities, Yokosuka.

All local area warnings and advisories are transmitted via IMMEDIATE precedence message to CAD's: AIG ONE ONE ONE SIX ZERO and ALL SHIPS PRESENT YOKOSUKA JA. In-port ships will be notified via telephone through their quarterdecks.

#### b. **Area Forecasts**

(1) 72-Hour Daily Forecast. A 72-hour forecast is distributed to in-port ships daily by 0600L. This forecast covers the Yokosuka/Yokohama area and includes a surface analysis and forecast discussion for the northwest Pacific.

(2) Yokosuka Local Area Forecast (includes the approaches to Tokyo Bay). A 72-hour forecast for the Yokosuka approaches is transmitted via immediate precedence AUTODIN message twice daily at 0700Z and 1900Z. This forecast covers the Yokosuka/Yokohama area, as

well as the waters and coastal areas extending from the southern tip of Miura Peninsula to Yokohama. The message is transmitted to addressees under the following CAD's:

AIG ONE ONE ONE FIVE NINE and ALL SHIPS PRESENT YOKOSUKA JA. Visiting ships and ships operating in the Yokosuka area can receive this forecast by sending a request via AUTODIN message to NAVPACMETOCFAC YOKOSUKA JA//N3//. The request should include inclusive dates of desired service.

(3) Yokosuka OPAREA Forecast. A 72-hour forecast which is transmitted daily at 1900Z. The OPAREA includes the R-116 Training Area plus Sagami Wan and is bounded by 35.1N, 141.5E; 33.0N, 141.5E; 33.0N, 138.5E; and 35.1N, 138.5E. It is disseminated by AUTODIN message to local commands and all ships transiting the OPAREA during the next 72 hours.

(4) Recorded Local Area Forecast. A recorded local area forecast is available by telephone (DSN 243-5155). This forecast is updated every six hours at 0000L, 0500L, 1200L and 1700L. This forecast notifies the user of all local warnings and advisories in effect.

(5) Aviation Forecasts. Terminal Aerodrome Forecasts (TAF's) are issued every 6 hours and hourly surface weather observations are recorded in support of helicopter operations.

c. **Mobile Environmental Team (MET)**. MET Yokosuka provides on-scene METOC services to ships deployed in the western Pacific, Indian Ocean and Arabian Gulf. The advantages of an on scene MET are immense. In addition to providing real-time data, informative briefings and specialized training, the MET contributes environmental expertise to the tactical situation, allowing full exploitation of the environment for optimum weapon systems deployment. See Chapter II-G for more information on MET services.

#### 4. In-Port Services

a. **Fleet Liaison Program**. See Chapter II-I.

b. **METOC Training**. Training is available to ships and staffs inport Yokosuka. Training can be scheduled through the Forecast Duty Officer (FDO) to accommodate the ship's training requirements and schedule. Training is normally conducted at NAVPACMETOCFAC facilities but can be conducted aboard ship. Topics available for discussion include Synoptic Weather Observations, Shipboard Expendable Bathythermograph (SXBT) and Tropical Cyclone Evasion.

c. **Pre-sail METOC Briefings**. Ships preparing to get underway can request a Pre-sail METOC Brief. This brief includes a synoptic weather chart, a 12-hour weather forecast for departure, satellite

data, sea height forecast and climatology (if required). Requests can be made through the FDO. A minimum of 24 hours notice is requested.

d. **Climatological Information.** Climatology packets are available to ships preparing for major deployments or exercises in the Pacific and Indian Oceans. These packets include information such as average sky cover, visibility, prevailing winds, sea conditions, temperatures, occurrence of gale/storm force winds, occurrence of tropical cyclones and oceanographic/ acoustic data (if required). Climatology requests can be made through the FDO. A minimum of 48 hours notice is requested. See Chapter II-H.

e. **Activity Briefings and Tours.** See Chapter II-I.

f. **METOC Equipment Services.** See Chapter IV.

### C. NAVPACMETOC DET ATSUGI, JAPAN

1. **General.** NAVPACMETOC DET Atsugi is located on the second deck of the NAF Atsugi Air Operations Terminal (Building 206). The Japan Maritime Self Defense Force (JMSDF) Weather Division is located on the second deck of the JMSDF Air Operations Building, near the control tower. The JMSDF is the official synoptic reporting agency for NAF Atsugi. JMSDF is responsible for taking and reporting hourly surface weather observations and synoptic observations and issuing 12-hour forecasts and local area weather warnings for NAF Atsugi, as well as providing flight weather briefing services to Japanese squadrons.

2. **Request For Services.** To request METOC services, units may contact NAVPACMETOC DET Atsugi via AUTODIN, commercial or DSN phone, mail, e-mail, or by visiting the detachment in person. The address and phone numbers are listed below.

**PLA:** NAVPACMETOC DET ATSUGI JA//00//

**Address:** Officer in Charge  
U.S. Naval Pacific Meteorology and  
Oceanography Detachment  
U.S. Naval Air Facility  
PSC 477 Box 77  
FPO AP 96306-2977

**Comm. Phone:** 011-81-311-728-3208/3648

**DSN Phone:** 315-264-3208/3648

**STU-III:** 315-264-3208/3320

**e-mail:** yo-atsugi-ops@fnoc.navy.mil

**NIPRNET Website:** <http://www.atsugi.navy.mil/weather/index.htm>

### 3. METOC Products and Services

#### a. **Advisories and Warnings**

(1) High Wind Advisory. Issued when sustained winds of 20 to 33 kts with gusts up to 45 kts are expected.

(2) Gale Advisory. Issued when sustained winds of 34 to 47 kts and/or gusts up to 60 kts are expected.

(3) Thunderstorm Advisory (Condition II). Issued when thunderstorms are within 25 nm of the airfield or are forecast to occur on station within 6 hours.

(4) Thunderstorm Warning (Condition I). Issued when thunderstorms are within 10 nm of the airfield or are expected to occur on station within 1 hour.

(5) Snow Advisory. Issued when an accumulation of snow is forecast.

(6) Heat Stress Advisory. Issued in accordance with OPNAVINST 5100.19C when high temperature in combination with high humidity are forecasted to occur for the local area.

(7) Air Quality Advisory. Issued when the quality of air is high in pollutants over the local area.

b. **Area Forecasts**. A 72-hour forecast for NAF Atsugi is issued daily at 0700L.

### 4. Additional Services Provided

a. **Flight Weather Briefings**. Flight weather briefings are available upon request. See Chapter II-I.

b. **Tactical METOC Support**. Tailored support products/packets are available for maritime patrol missions. See Chapter II-F and Chapter II-I.

c. **Activity Briefings and Tours**. See Chapter II-I.

### D. **NAVPACMETOC DET KADENA, JAPAN**

1. **General**. NAVPACMETOC DET Kadena is located on the first deck of Building 3674 adjacent to the PATWING ONE DET Kadena hangar and just north of the Navy flight line and base runway complex.

2. **Request For Services.** To request METOC services, units may contact NAVPACMETOC DET Kadena via AUTODIN, commercial or DSN phone, mail, e-mail, or by visiting the detachment in person. The address and phone numbers are listed below.

**PLA:** NAVPACMETOC DET KADENA JA//00//

**Address:** Officer in Charge  
U.S. Naval Pacific Meteorology and  
Oceanography Detachment  
Fleet Activities  
PSC 480  
FPO AP 96370-0051

**Comm. Phone:** 011-816-117-348380/8379

**DSN Phone:** 315-634-8379/8380

**STU-III:** 315-634-9113

**e-mail:** yo-det-kadena@fnoc.navy.mil

**NIPRNET Website:** <http://132.15.154.52/index.html>

**SIPRNET Website:** <http://206.36.216.84>

### 3. **METOC Products and Services**

a. **Advisories and Warnings.** The 18th Operations Support Squadron Weather Office issues all weather warnings and advisories for Kadena AB and the surrounding OPAREA.

(1) Crosswind Advisory. Issued when the wind speed is 15 kts or greater and the wind is at an angle of 30 to 40 degrees off the runway heading.

(2) Thunderstorm Advisory. Issued when the potential for thunderstorm activity is within 25 nm of Okinawa exists.

(3) Thunderstorm Watch. Issued when thunderstorm activity is within 5 nm or over NAF Kadena.

#### b. **Area Forecasts**

(1) General Aviation Forecast. A general weather discussion with forecast and satellite imagery is available to USN and USMC aviation assets operating at Kadena AB.

### 4. **Additional Services Provided**

a. **Flight Weather Briefings.** Flight weather briefings are provided by the Air Force Weather Flight, 18th Operations Support Squadron, Kadena Air Base. OPARS products are available from NAVPACMETOC DET Kadena upon request. See Chapter II-I.

- b. **Climatological Information.** See Chapter II-H.
- c. **Tactical METOC Support.** See Chapter II-F and Chapter II-I.
- d. **METOC Briefings.** Pre-Exercise/Operations Briefings and Typhoon Briefings are available upon request. See Chapter II-F.
- e. **Activity Briefings and Tours.** See Chapter II-I.

**E. NAVPACMETOC DET MISAWA, JAPAN**

1. **General.** NAVPACMETOC DET Misawa is located at the south end of the Base Operations Building (Bldg. 998) adjacent to the runway at Misawa AB, Japan.

2. **Request For Services.** To request METOC services, units may contact NAVPACMETOC DET Misawa via AUTODIN, DSN phone, mail, e-mail, or by visiting the detachment in person. The address and phone numbers are listed next page.

**PLA:** NAVPACMETOC DET MISAWA JA//00//

**Address:** Officer in Charge  
 U.S. Naval Pacific Meteorology and  
 Oceanography Detachment  
 PSC 76 Box 5052  
 FPO AP 96319-5052

**DSN Phone:** 315-226-3298

**STU-III:** 315-226-3298

**e-mail:** yo-det-misawa@fnoc.navy.mil

**NIPRNET Website:**

<http://www.misawa.af.mil/orgs/350sw/navy/npmmod.htm>

**SIPRNET Website:**<http://206.36.216.97>

3. **METOC Products and Services.**

a. **Advisories and Warnings.** The 35th Operations Support Squadron Weather Office issues all weather warnings and advisories for Misawa AB and the surrounding OPAREA.

b. **Local Area Forecasts.** All local area weather briefs and forecasts are issued by the Air Force Weather Office at Misawa AB.

c. **Tactical METOC Support.** Tactical METOC briefing support is provided to the Tactical Support Center (PATWING ONE DET Misawa) and to naval aviation assets operating out of Misawa AB. Mission briefs normally include acoustic predictions (propagation loss, acoustic summary and sensor employment recommendations), oceanographic data (SST, wave height, layer depth, fronts and eddies), IREPS and FLIR data. OPARS flight plans are available upon request.

d. **Aviation Weather Briefings.** All domestic and international flight weather briefings are provided by the Air Force Weather Office at Misawa AB.

4. **Additional Services Provided.** Strike and special mission briefs are available by request.

**F. NAVPACMETOC DET SASEBO, JAPAN**

1. **General.** NAVPACMETOC DET Sasebo is located in the tower of the Headquarters Building (Bldg. 80) of Commander Fleet Activities, Sasebo.

2. **Request For Services.** To request METOC services, units may contact NAVPACMETOC DET Sasebo via AUTODIN, DSN phone, mail, e-mail, or by visiting the detachment in person. The address and phone numbers are listed below.

**PLA:** NAVPACMETOC DET SASEBO JA//00//

**Address:** Officer in Charge  
U.S. Naval Pacific Meteorology and  
Oceanography Detachment  
PSC 476 Box 1  
FPO AP 96322-1100

**DSN Phone:** 315-252-3825  
**e-mail:** weather@cfas.navy.mil  
**NIPRNET Website:** <http://weather.cfas.navy.mil>

3. **METOC Products and Services**

a. **Advisories and Warnings**

(1) **Small Craft Warning.** Issued when sustained winds (or frequent gusts) of 20-33 kts are forecast or are occurring, or when severe weather which is otherwise hazardous to small boat operations is expected.

(2) **Thunderstorm Condition TWO.** Issued when thunderstorms are expected in the local area within 6 hours.

(3) **Thunderstorm Condition ONE.** Issued when thunderstorms are imminent or are occurring in the local area.

(4) **Tropical Cyclone Advisory.** Issued every 6 hours when Commander, Fleet Activities Sasebo sets Tropical Cyclone Condition of Readiness TWO or ONE. This advisory includes a forecast of expected weather conditions associated with the approach of a tropical cyclone.

b. **Area Forecasts**

(1) Local Area Forecast. A 36-hour plain language forecast issued daily to local Navy activities.

(2) Sasebo and Approaches Forecast. A 36-hour forecast issued via AUTODIN message to ships transiting to or already in port Sasebo.

(3) Recorded Local Area Forecast. A recorded local area forecast is available by telephone (DSN 252-3824).

4. **In-Port Services**. METOC briefing services for units preparing to get underway are available by request. METOC briefing support for contingency operations and exercises is also available by request. See Chapter II-I.

**G. NAVCENTMETOCFAC BAHRAIN**

1. **General**. NAVCENTMETOCFAC Bahrain is a facility of NAVPACMETOCEN West/JTWC Guam. It is located at the Administrative Support Unit (ASU), Southwest Asia within the Naval Forces Central Command Compound in Building 46R and Building 115R. NAVCENTMETOCFAC Bahrain provides METOC services 24 hours a day, 7 days a week to units operating in the FIFTHFLT AOR.

2. **Request For Services**. To request METOC services, units may contact NAVCENTMETOCFAC Bahrain via AUTODIN, DSN phone or facsimile, mail, e-mail, or by visiting the facility in person. The address and phone numbers are listed below.

**PLA:** NAVCENTMETOCFAC BAHRAIN//30//

**Address:** Commanding Officer  
U.S. Naval Central Meteorology and  
Oceanography Facility  
ASU SWA  
PSC 451 Box 562  
FPO AE 09834-2800

**DSN Phone:** 318-439-4083/4039

**Fax:** 318-439-4035

**e-mail:** wxcc@cusnc.navy.mil

**SIPRNET Website:** <http://205.0.216.21/ops/weax/wx.html>

3. **METOC PRODUCTS AND SERVICES**

a. **Advisories and Warnings**

(1) Wind and Seas Warnings. Wind and seas warnings are issued for the Arabian Gulf once daily at 2200Z. The warning is valid at 0001Z. Additional warnings are issued if conditions warrant under the following MANOP header:

MSAR1 PGFW dd0001

(2) Local Area High Wind Warning. Issued when sustained surface winds of 20 kts or greater are forecast or are occurring over ASU, the Mina Salman piers and/or the approaches.

**b. Area Forecasts**

(1) Arabian Gulf WEAX. A plain language 36-hour forecast for the Arabian Gulf and Gulf of Oman. This product is issued twice daily at 0012Z and 1212Z under the following MANOP header:

FZAR1 PGFW dd0012

FZAR1 PGFW dd1212

(2) Mina Salman and Approaches Forecast. A 24-hour forecast for the approaches to Mina Salman and port facilities. It is issued once daily at 2215Z to those units in port or preparing to enter port.

(3) The Red Sea Forecast. A plain language 24-hour forecast for the Red Sea. Aviation parameters are provided. This product is issued once daily at 1231Z.

**4. In-Port Services**

a. **Flight Weather Briefings**. Flight forecasts and OPARS are issued upon request for all DOD aviation assets operating in the FIFTHFLT AOR. See Chapter II-I.

b. **Fleet Liaison Program**. See Chapter II-I.

c. **Climatological Information**. See Chapter II-H.

d. **METOC Briefings**. See Chapter II-I.

e. **METOC Training**. See Chapter II-I.

f. **Mobile Environmental Team (MET)**. See Chapter II-G.

g. **Activity Briefings and Tours**. See Chapter II-I.

## H. NAVPACMETOC DET DIEGO GARCIA

1. **General.** NAVPACMETOC DET Diego Garcia is located on the island of Diego Garcia, British Indian Ocean Territories (BIOT) in the Southern Indian Ocean. It is located in Building 301 (Air Operations) which is located on the northeast side of the parallel taxiway of the airfield.

2. **Request For Services.** To request METOC services, units may contact NAVPACMETOC DET Diego Garcia via AUTODIN, commercial or DSN phone, commercial or DSN facsimile, mail, e-mail or by visiting the detachment in person. The address and phone numbers are listed below.

**PLA:** NAVPACMETOC DET DIEGO GARCIA//00//

**Address:** Officer in Charge  
U.S. Naval Pacific Meteorology and  
Oceanography Detachment  
PSC 466 Box 10  
FPO AP 96464-0010

**Comm. Phone:** 011-246-370-3670/3590

**Fax:** 011-246-370-3592

**DSN Phone:** 315-370-3670/3590

**Fax:** 315-370-3592

**STU-III:** 315-370-3670

**e-mail:** wxoco@cusn.navy.mil  
metoc@nctsdg.navy.mil

**NIPRNET Website:** <http://www.npmocw.navy.mil/npmocw/dgar/index.html>

**SIPRNET Website:** <http://206.36.192.40/metoc/dgar/sindex.html>

### 3. METOC Products and Services

#### a. Advisories and Warnings

(1) Small Craft Warning. Issued when sustained winds of 16 to 33 kts are forecast or are already occurring in the lagoon and/or the immediate waters surrounding the island.

(2) Gale Warning. Issued when sustained winds of 34 to 47 kts are forecast or are already occurring in the lagoon and/or the immediate waters surrounding the island.

(3) Thunderstorm Condition II. Issued when conditions are favorable for the formation of thunderstorms within 25 nm or the next 6 hours.

(4) Thunderstorm Condition I. Issued when thunderstorms are expected to occur within 1 hour, or are already occurring on station or within 5 nm of the airfield.

b. **72-Hour Local Area Forecast.** A 72-hour plain language forecast for the Diego Garcia local area is issued once daily at 0400L. This product contains a 24-hour forecast of weather conditions, a 48-hour outlook and astronomical, tide and climatic data. It is disseminated via AUTODIN to all ships in port or operating within 100 nm.

c. **OP-AREA FORECAST.** A 24-hour plain language forecast for the Diego Garcia local area is issued once daily at 0230L. This product contains a 24-hour forecast of weather conditions, and a 24-hour outlook. It is disseminated via AUTODIN to all ships in port or operating within 100 nm.

d. **METOC Data.** Terminal Aerodrome Forecasts (TAF) are issued every six hours at 0400Z, 1000Z, 1600Z and 2200Z. Surface weather observations are taken hourly and upper air soundings taken twice daily and transmitted by 00Z and 12Z. All METOC data is available via the AWN. Units operating in the Indian Ocean may receive this data via AUTODIN upon request.

e. **Indian Ocean Fleet Facsimile Broadcast (GFAX).** The IO GFAX is available upon request to units operating in the Indian Ocean region with HF reception capabilities. Various METOC products are available on this broadcast. See Chapter III, Section A for transmission frequencies and other specific information regarding this service.

#### 4. In-Port Services

- a. **Fleet Liaison Program.** See Chapter II-I.
- b. **Climatological Information.** See Chapter II-H.
- c. **METOC Briefings.** See Chapter II-I.
- d. **METOC Training.** See Chapter II-I.
- e. **Activity Briefings and Tours.** See Chapter II-I.

## CHAPTER VI - SHIPBOARD METOC OBSERVATIONS

### A. GENERAL

All ships are requested to report weather observations via immediate precedence to OCEANO WEST in accordance with the following documents:

- USS ships                   CINCPACFLT OPORD 201 ANNEX H  
                                  COMSEVENTHFLT OPORD 201 ANNEX H
- USNS ships                COMSCINST 3121.9
- MSC contract ships       COMSCINST 3121.9
- Foreign vessels          International Ships Weather Code

### B. FREQUENCY

Under normal conditions, weather observations should be transmitted every six hours. CINCPACFLT OPORD 201 requires PACFLT ships to make 3-hourly reports when within 300 nm of a tropical cyclone or when heavy weather is encountered (winds 34 kts or greater or seas 12 ft or greater). All ships are requested to transmit 3-hourly reports under above conditions.

### C. ELECTROMAGNETIC CONDITIONS

COMSEVENTHFLT OPORD 201 requires all SEVENTHFLT units to make qualitative assessments of surface electromagnetic refractive conditions in all observations. When available, use surface radar detection and UHF/VHF communications ranges to assess normal (30 nm or less), extended (30-90 nm) or greatly extended (greater than 90 nm) ranges. Include these assessments after the coded portion of the synoptic weather observation as "COMMS AND RADAR EXTENDED", "COMMS NORMAL, RADAR EXTENDED", "RADAR NOT OBSERVED, COMMS EXTENDED", etc... as appropriate.

## APPENDIX A - GLOSSARY OF METOC TERMINOLOGY

### A. METEOROLOGICAL TERMINOLOGY

#### 1. Cloud Cover

- a. **Clear.** Less than 1 eighth of the sky is covered by clouds.
- b. **Few.** 1-2 eighths of the sky is covered by clouds.
- c. **Scattered.** 3-4 eighths of the sky is covered by clouds.
- d. **Broken.** 5-7 eighths of the sky covered by clouds.
- e. **Overcast.** Greater than 7 eighths of the sky is covered by clouds.
- f. **Clearing.** Cloudiness decreasing markedly during the forecast period (decreases by at least 4 eighths coverage).
- g. **Decreasing Cloudiness.** Progressively decreasing cloud cover.
- h. **Partial Clearing.** A portion of the sky is clearing, as from overcast to 5 eighths coverage (broken).
- i. **Increasing Cloudiness.** Progressively increasing cloud cover.
- j. **Mostly clear.** Less than 1 eighth of the sky is covered by clouds.
- k. **Partly cloudy.** 3-4 eighths of the sky is covered by clouds.
- l. **Mostly cloudy.** 5-7 eighths of the sky is covered by clouds.
- m. **Cloudy.** More than 7 eighths of the sky is covered by clouds.

#### 2. Precipitation

- a. **Rain.** Liquid water droplets, large or small, which fall to the earth's surface in a continuous manner.
- b. **Rainshower.** Liquid water droplets, large or small, which fall to the earth's surface with rapid changes in intensity.
- c. **Drizzle.** Fine droplets of liquid water which float with the air currents and slowly reach the earth's surface. Drizzle is too small to disturb still water.
- d. **Snow.** Ice crystals, mostly branched in the form of a six-pointed star.
- e. **Hail.** Small balls or pieces of ice (hail stones) which fall to the earth's surface separately or frozen together in irregular lumps. Hail is normally associated with thunderstorms.

#### 3. Classification of Precipitation by Frequency

- a. **Intermittent.** Precipitation which stops and restarts at least once within an hour. Normally falls from cumuliform or stratocumulus.

b. **Continuous.** The intensity of precipitation changes gradually, if at all. Normally falls from stratus type clouds.

#### 4. Precipitation Intensity (Rain)

a. **Slight.** Individual droplets are easily identifiable; the spray over hard surfaces is slight; pools form very slowly. A way to estimate the intensity is by watching the amount of time required for rain to wet decks and similar dry surfaces. If it takes over 2 minutes, it is considered to be slight in intensity; if it takes less, the intensity of the rain is greater. Visibility is only slightly reduced or not reduced at all.

b. **Moderate.** Individual droplets are not clearly identifiable; some spray over hard surfaces is evident; pools form rapidly. Visibility is reduced.

c. **Heavy.** Rain falling seemingly in sheets; individual droplets are not clearly identifiable; heavy spray to the height of several inches is observable over hard surfaces. Visibility is greatly reduced.

#### 5. Precipitation Intensity (Snow or Drizzle)

a. **Slight.** Visibility is 5 eighths of a statute mile or greater.

b. **Moderate.** Visibility is less than 5 eighths of a statute mile, but not less than 5 sixteenths of a statute mile.

c. **Heavy.** Visibility is less than 5 sixteenths of a statute mile.

#### 6. Frequency of Showers (Area of Coverage)

- a. **Isolated.** 10 percent.
- b. **Widely Scattered.** 20 percent.
- c. **Scattered.** 30-50 percent.
- d. **Numerous.** 60-70 percent.

#### 7. Wind

a. **Wind.** The horizontal motion of air past a given point.

b. **Wind Direction.** The direction from which the wind is blowing.

c. **Variable Wind Direction.** Wind direction that fluctuates by 30 degrees or more during the period of the observation.

d. **Gust.** Rapid fluctuations in wind speed with a variation of 10 knots or greater between the peak and the lull.

e. **Squalls.** A sudden increase of the wind speed by at least 15 knots and sustained at 20 knots or greater which lasts for at least one minute.

f. **Wind Shift.** A change in wind direction of 45 degrees or more which takes place in less than 15 minutes.

- g. **Veering.** A clockwise change in wind direction in the Northern Hemisphere and counter-clockwise in the Southern Hemisphere.
- h. **Backing.** A counter-clockwise change in wind direction in the Northern Hemisphere and clockwise in the Southern Hemisphere.
- i. **Calm.** 0 to 1 knot of wind speed (Beaufort Force 0).
- j. **Light Air.** 1 to 3 knots of wind speed (Beaufort Force 1).
- k. **Light Breeze.** 4 to 6 knots of wind speed (Beaufort Force 2).
- l. **Gentle Breeze.** 7 to 10 knots of wind speed (Beaufort Force 3).
- m. **Moderate Breeze.** 11 to 16 knots of wind speed (Beaufort Force 4).
- n. **Fresh Breeze.** 17 to 21 knots of wind speed (Beaufort Force 5).
- o. **Strong Breeze.** 22 to 27 knots of wind speed (Beaufort Force 6).
- p. **Near Gale.** 28 to 33 knots of wind speed (Beaufort Force 7).
- q. **Gale.** 34 to 40 knots of wind speed (Beaufort Force 8).
- r. **Strong Gale.** 41 to 47 knots of wind speed (Beaufort Force 9).
- s. **Storm.** 48 to 55 knots of wind speed (Beaufort Force 10).
- t. **Violent Storm.** 56 to 63 knots of wind speed (Beaufort Force 11).

## 8. Pressure Systems

- a. **Anticyclone.** A clockwise circulation (Northern Hemisphere), a counter-clockwise circulation (Southern Hemisphere). Associated with high pressure and generally good weather.
- b. **Cyclone.** A counter-clockwise circulation (Northern Hemisphere), a clockwise circulation (Southern Hemisphere). Associated with low pressure and generally poor weather.
- Ridge.** An elongated area of relatively high pressure that extends from the center of a high pressure center. The wind circulation is anticyclonic. Usually associated with good weather.
- d. **Trough.** An elongated area of relatively low pressure that extends from the center of a low pressure center. The wind circulation is cyclonic. Usually associate with poor weather.
- e. **Lee-Side Trough.** A pressure trough formed on the lee-side of a mountain range or an island to where the wind direction is perpendicular.

## 9. Fronts

a. **Cold Front.** A line of discontinuity along which a wedge of cold air is undercutting and displacing a warm air mass. Cold fronts are normally located in well-defined pressure troughs whenever there is a marked temperature contrast between the two air masses.

b. **Warm Front.** A line of discontinuity along which the forward edge of a warm air mass is overrunning and replacing a retreating cold air mass. Warm fronts are generally located in pressure troughs, although these troughs are not as well-defined as those in which cold fronts are located.

c. **Occluded Front.** Occlusions are a combination of overtaking cold fronts and warm fronts. The resulting weather is a combination of the conditions which exist with both frontal types.

d. **Quasi-stationary Front.** A line of discontinuity along which one air mass does not appreciably replace the other.

## 10. Tropical Meteorology

a. **Shearline.** Generally, shearlines are the extreme southern (Northern Hemisphere) extension of a cold front along which the cold air mass has been modified to the point that discontinuities exist only in terms of wind velocity, and to some degree, direction. Often associated with clouds and precipitation.

b. **Line of Convergence.** A line or area in which the horizontal wind field is converging (coming together). Associated with cloudiness and precipitation.

c. **Tropical Wave.** A tropical wave, sometimes referred to as an "Easterly Wave", is defined as a trough or cyclonic curvature maximum located in the easterly tradewinds.

a. **Tropical Cyclone.** A non-frontal, low pressure system of synoptic scale, developing over tropical or sub-tropical waters and having a defined, organized circulation.

b. **Intertropical Convergence Zone (ITCZ).** A zone of convergence between the northeast tradewinds of the Northern Hemisphere and the southeast tradewinds of the Southern Hemisphere. The ITCZ is frequently referred to as a zone of intertropical confluence (ITC) or the Equatorial Trough.

11. **Cyclone Classification.** A defined system of organized and persistent convection (generally 100 to 300 miles in diameter) which originates in the tropics or sub-tropics, having non-frontal migratory characteristics and maintaining its identity for 24 hours or more. It may or may not be associated with a detectable cyclone. It may later, be classified as a tropical depression, tropical storm, typhoon or tropical cyclone (Indian Ocean).

- a. **Tropical Depression.** A tropical cyclone with maximum sustained surface wind (1 minute mean) of 33 knots or less.
- b. **Tropical Storm.** A tropical cyclone with maximum sustained surface wind ( 1 minute mean) of 34 to 63 knots.
- c. **Typhoon/Hurricane/Tropical Cyclone.** A tropical cyclone with maximum sustained surface wind (1 minute mean) of 64 to 129 knots.
- d. **Super Typhoon.** Typhoons with maximum sustained surface wind (1 minute mean) of 130 knots or greater.

12. **Terms Associated with Typhoons**

- a. **Feeder Band.** An intense band of clouds and rain spiraling in a counter-clockwise direction (clockwise in the Southern Hemisphere) towards the center of a tropical cyclone.
- b. **Wall Cloud.** The wall of clouds that forms the periphery of the eye of a tropical cyclone. The wall cloud contains the most severe weather and highest winds.
- c. **Eye.** The relatively calm area that occurs at the center of a tropical cyclone. Size may vary from approximately one mile to greater than fifty miles.

### 13. MODELS

a. **NOGAPS-** Navy Operational Global Atmospheric Prediction System is a complete data assimilation system used for the analysis and forecast for anywhere in the world. NOGAPS reads first guess fields and generates lateral boundary conditions from the Global Atmospheric Model and performs a multivariate optimum interpolation analysis. A nonlinear vertical mode initialization follows, after which the equation for winds, temps, water vapor, and surface pressure are integrated over the forecast period.

b. **NORAPS-** The Navy Operational Regional Atmospheric Prediction System (NORAPS) is a relocatable regional primitive equation numerical weather prediction model. It can be initialized either from its own high-resolution nowcast, or from the coarser resolution NOGAPS nowcast. It uses lateral boundary conditions provided by NOGAPS, and generally provides a more accurate and detailed depiction of mesoscale weather features than NOGAPS, particularly in areas affected by the land surface.

c. **COAMPS-** The Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) is a next generation tactical scale model. COAMPS incorporates non-hydrostatic physics, explicit moisture physics, and improved data assimilation. It comprises control, analysis, initialization, and forecast model components. The system is globally relocatable and supports up to three nested grids down to resolutions of less than 10 kilometers. The model can be run on a stand-alone basis or in a fully coupled mode. The fully coupled oceanographic component of COAMPS will combine the capabilities of OTIS, POM and WAM to provide a fully interactive two-way coupling between ocean and atmosphere.

d. **WAM-** The Third-Generation Wave Model (WAM) contains state-of-the-art nonlinear physics for forecasting the evolution of directional wave energy spectra and derived wave height, period and direction fields. WAM is run in both global coarse-resolution (1.0 deg) and regional high-resolution (0.2-0.25 deg) implementations at Fleet Numerical. The regional implementations generally include shallow water physics to account for refraction and bottom friction effects, although these formulations begin to lose validity at depths shallower than about 30 meters. WAM uses wind stress forcing provided by either NOGAPS or NORAPS.

e. **OTIS-** The Optimum Thermal Interpolation System (OTIS) is the primary ocean thermal nowcast model used at FLENUMMETOCEN and since 1995 version 4.0 has been in use. Both global coarse-resolution and regional high-resolution versions are in use. All of the OTIS implementations use the Optimum Interpolation (OI) technique to assimilate real-time data. Regional OTIS further employs water-mass-based representation of ocean thermal climatology and ocean front and eddy "feature models" to produce

"synthetic" data to supplement the "real" data. This allows a detailed and accurate depiction of subsurface thermal structure associated with fronts and eddies whose surface positions are depicted in operational ocean front and eddy analyses derived primarily from satellite imagery by analysts at the Naval Oceanographic Office.

## B. OCEANOGRAPHIC TERMINOLOGY

### 1. Sea and Swell

- a. **Sea.** A wave generated by friction between wind and a fluid surface. Waves are generated or sustained by wind within their fetch area, as opposed to swell. Wind waves (seas), as opposed to swell, have sharper peaks and an irregular appearance.
- b. **Swell.** A relatively long wind wave, or series of waves, that has traveled out of its generating area. In contrast, the term **Sea** is applied to waves still in the generating area. As these waves travel away from the area in which they were formed, the shorter ones die out. The surviving waves exhibit a more regular and longer period with flatter crests. When these waves reach shoal water, they become more prominent in height and of decreased wave length and are then known as ground swell.
- c. **Combined Seas.** Combined sea and swell condition; given as the significant height (in feet) of the waves when the sea and swell are combined.
- d. **Significant Wave Height.** Average height of the highest one-third of the waves of a given wave group. Forecasts for sea, swell and surf are always recorded as the significant height.
  1. **Slight:** Significant wave height of 2-4 feet.
  2. **Moderate:** Significant wave height of 4-8 feet.
  3. **Rough:** Significant wave height of 8-13 feet.
- e. **Wave Direction.** The direction **from** which the waves are coming.
- f. **Wave Height.** The vertical difference between the wave trough and the wave crest.
- g. **Wave Period.** The time (in seconds) between the passage of two consecutive wave crests (or troughs) past a fixed point.

2. **Surf**

- a. **Surf.** Waves that break along a shore or reef.
- b. **Surf Height.** The height of a breaking wave (surf) measured from the trough to the crest in terms of significant wave height.

3. **ASW Terminology.** See NAVMETOCCOMINST 3140.22.

## APPENDIX B - EXAMPLES OF METOC PRODUCTS

1. OUTLOOK LEGEND (PART I)
2. OUTLOOK LEGEND (PART II)
3. 36-HOUR PROGNOSIS (WPAC)
4. 36-HOUR SIGNIFICANT WAVE HT PROGNOSIS (WPAC)
5. 84-HOUR PROGNOSIS (WPAC)
6. 120-HOUR PROGNOSIS (WPAC)
7. 36-HOUR PROGNOSIS (IO)
8. 36-HOUR SIGNIFICANT WAVE HT PROGNOSIS (IO)
9. 48-HOUR PROGNOSIS (FULL ACCOUNTING)
10. MIXED LAYER DEPTH (WPAC)
11. SEA SURFACE TEMP (WPAC)
12. MIXED LAYER DEPTH (YOKOSUKA)
13. SEA SURFACE TEMP (YOKOSUKA)
14. MIXED LAYER DEPTH (ARABIAN GULF)
15. SEA SURFACE TEMP (ARABIAN GULF)
16. TYPHOON WARNING GRAPHIC
17. GRAPHICAL WEAX

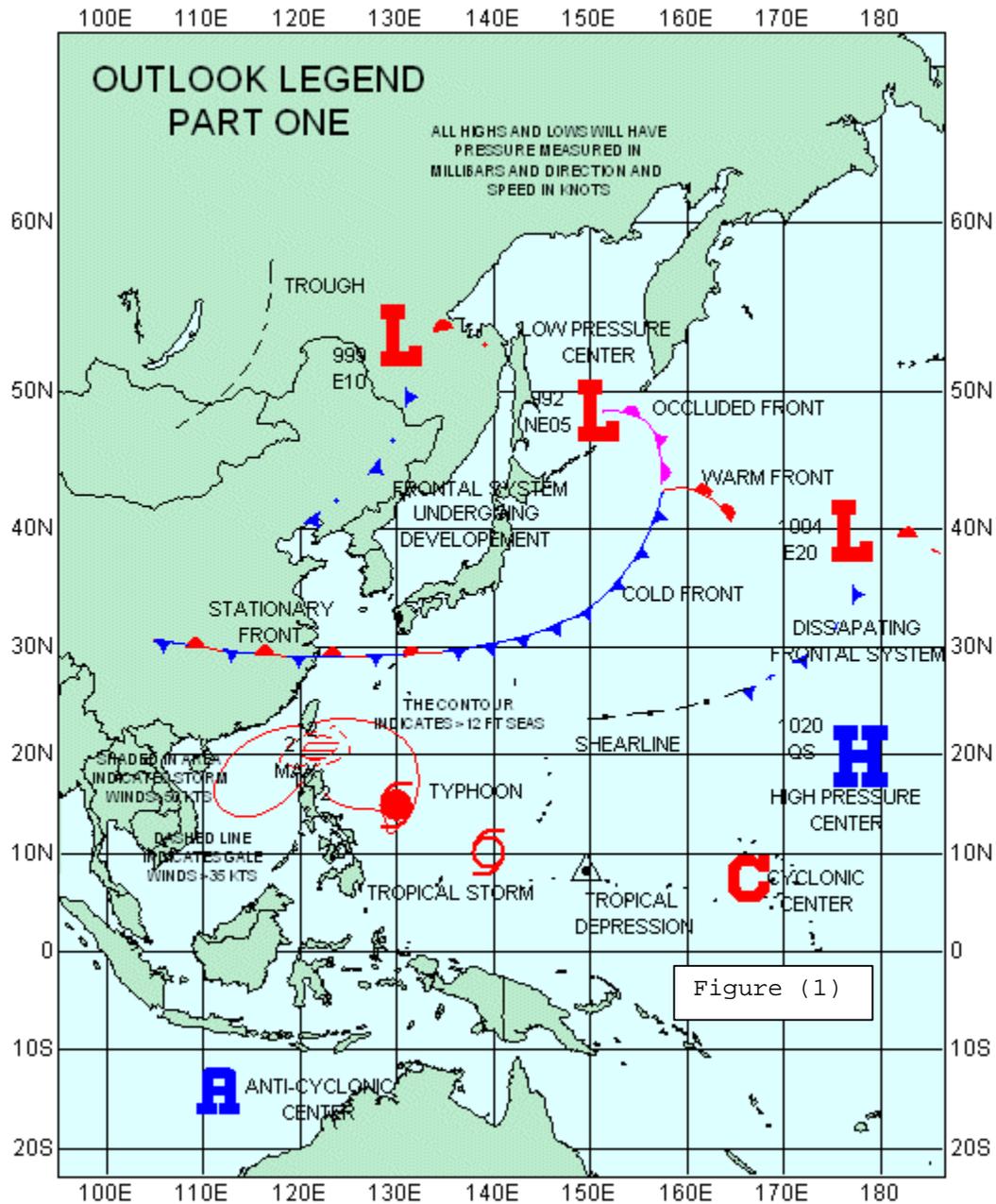


Figure (1)

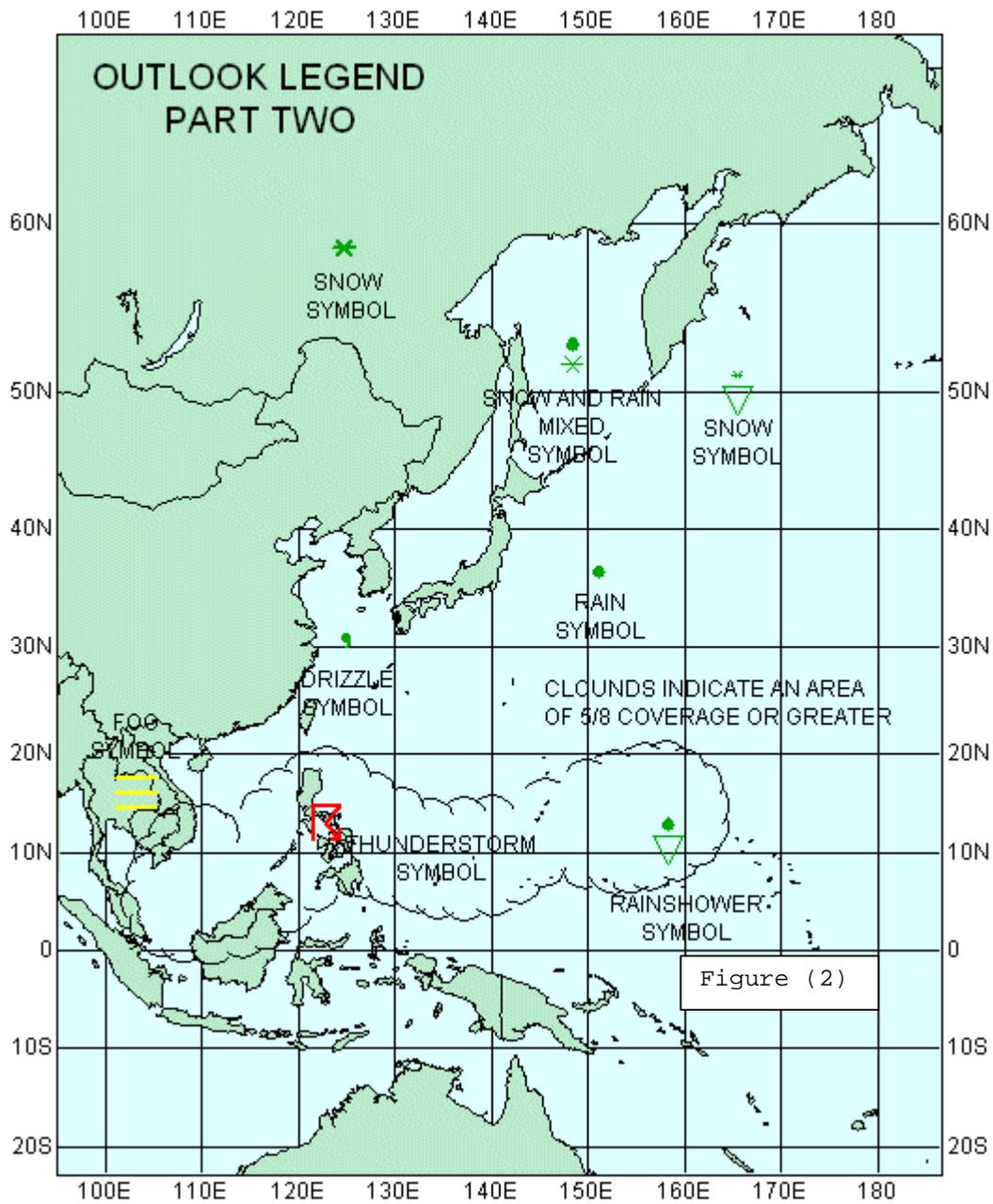
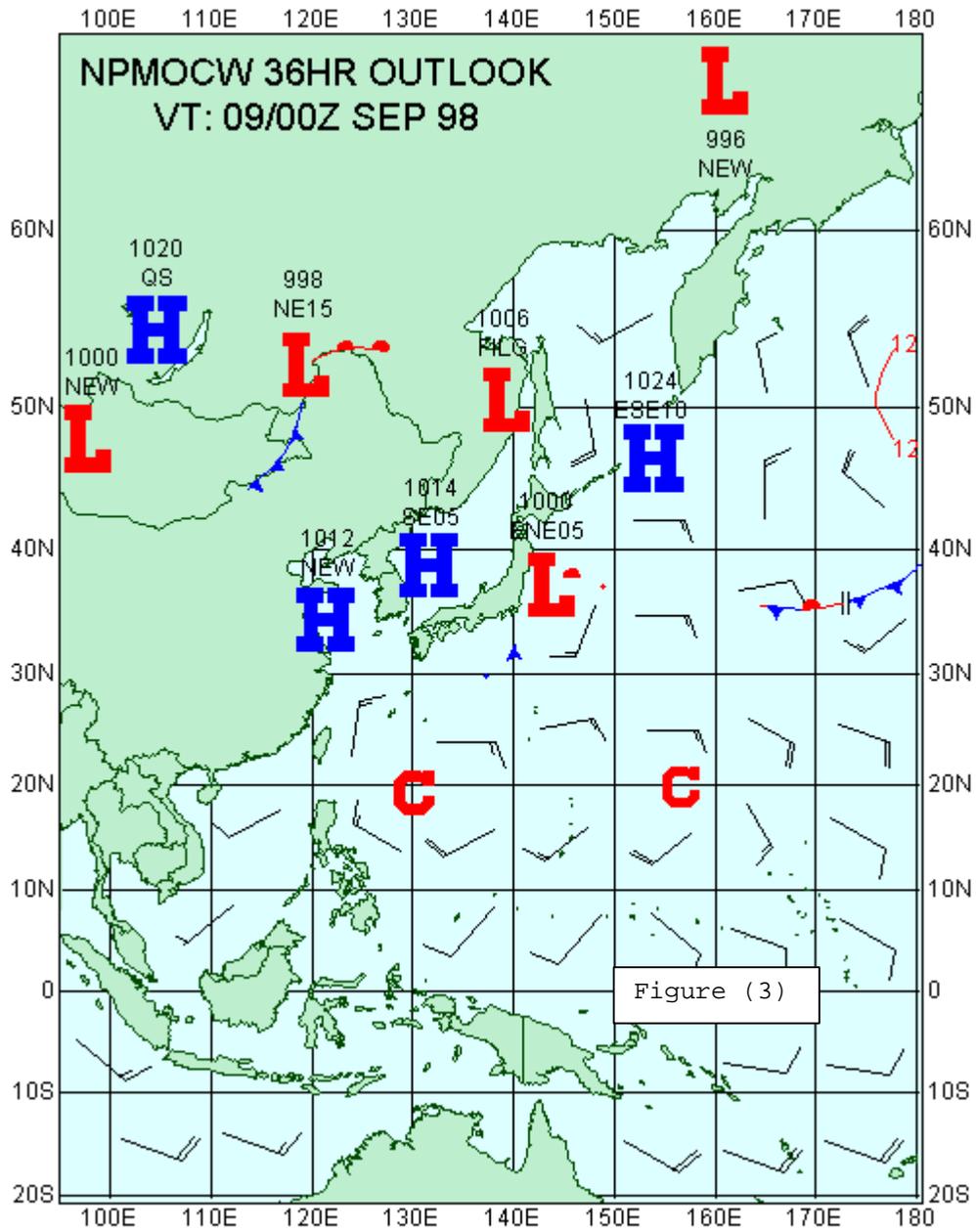
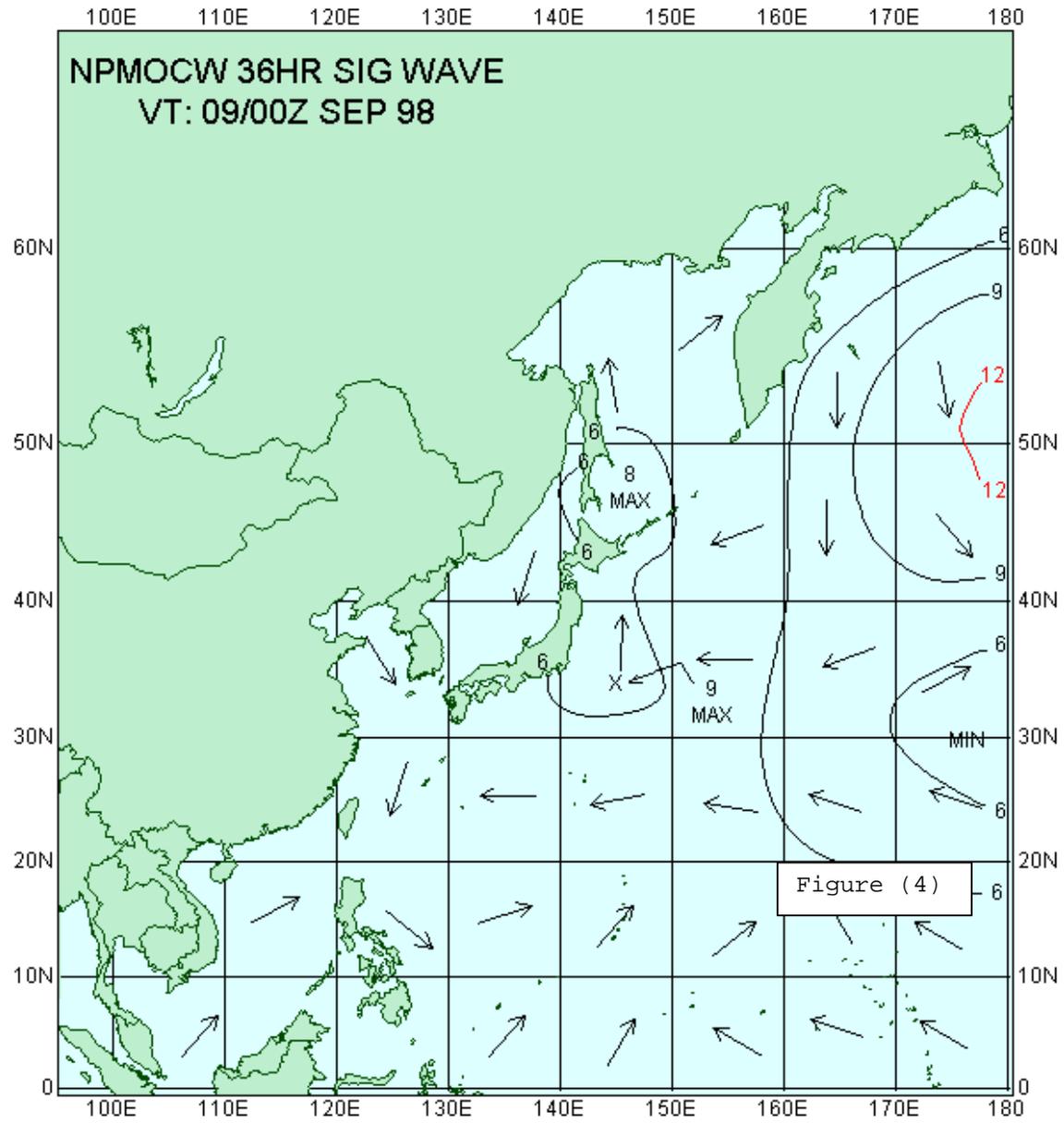
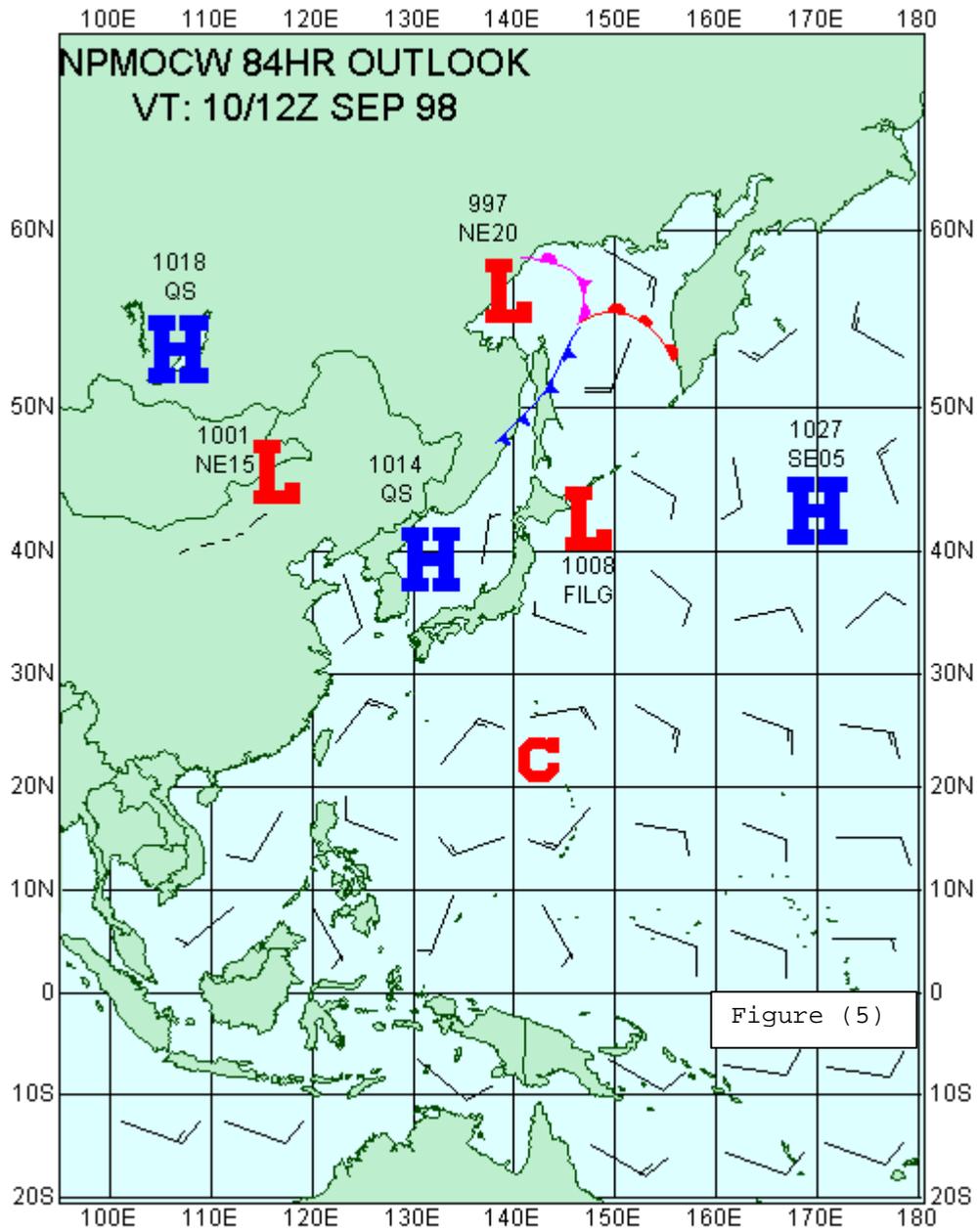
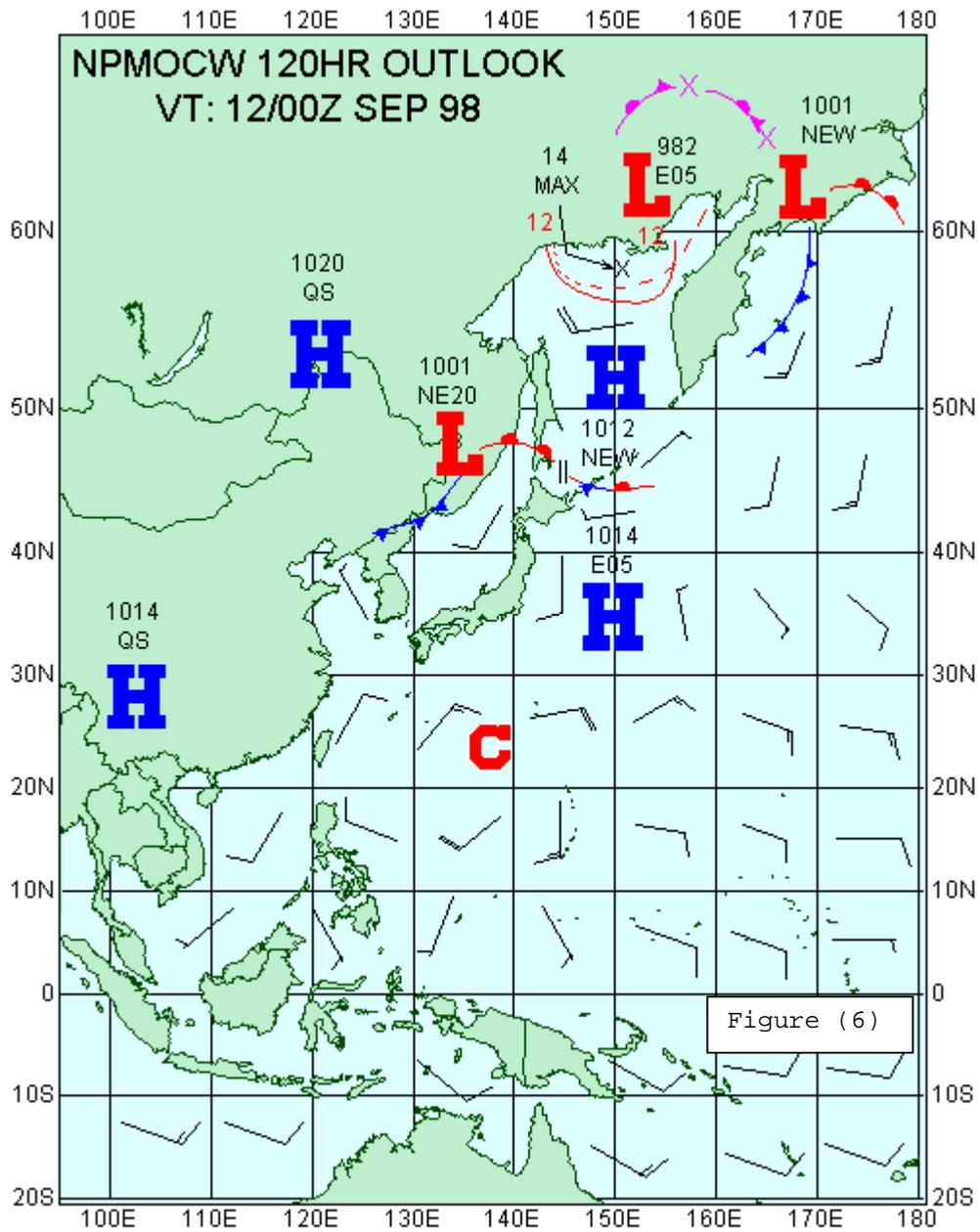


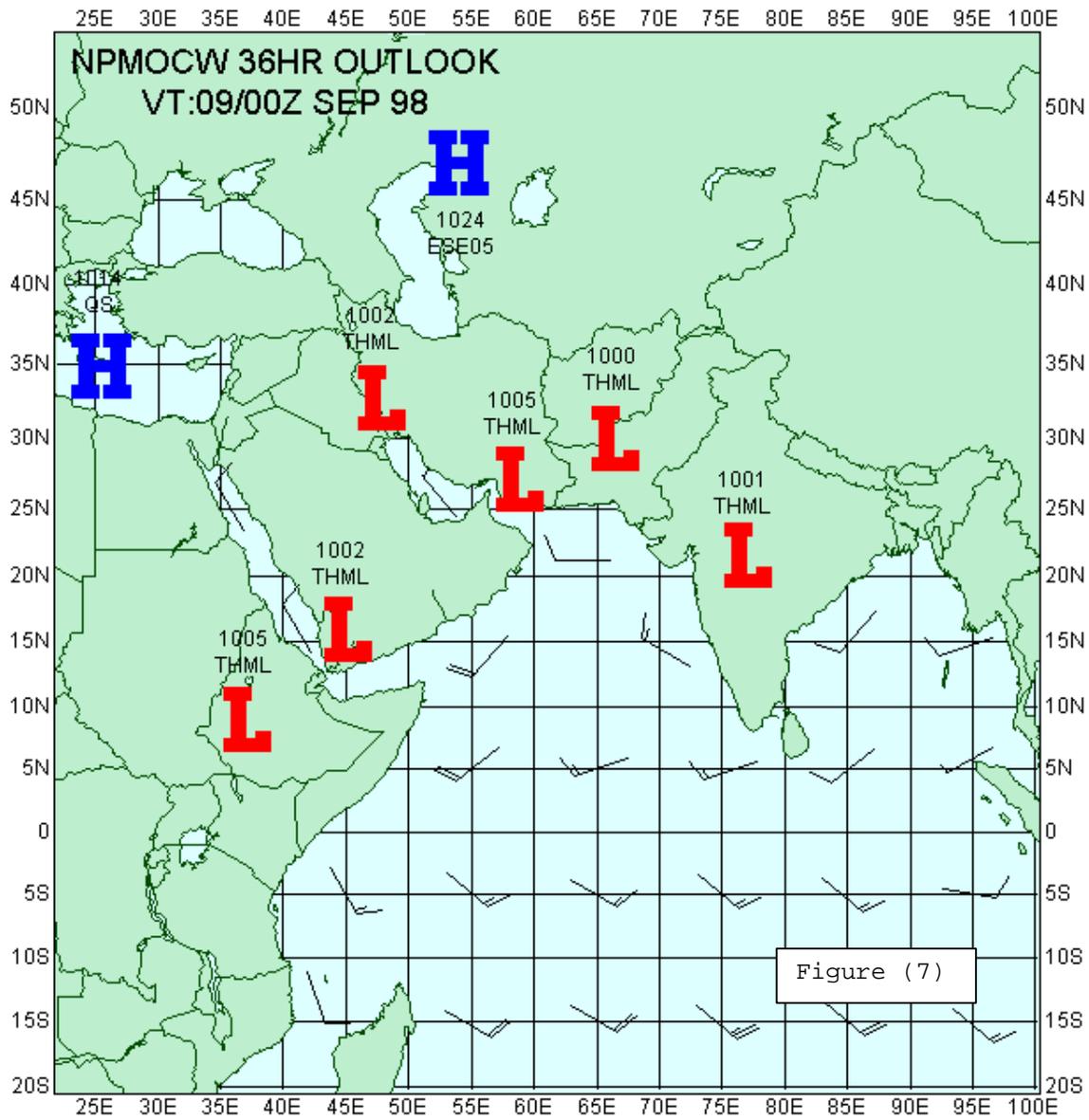
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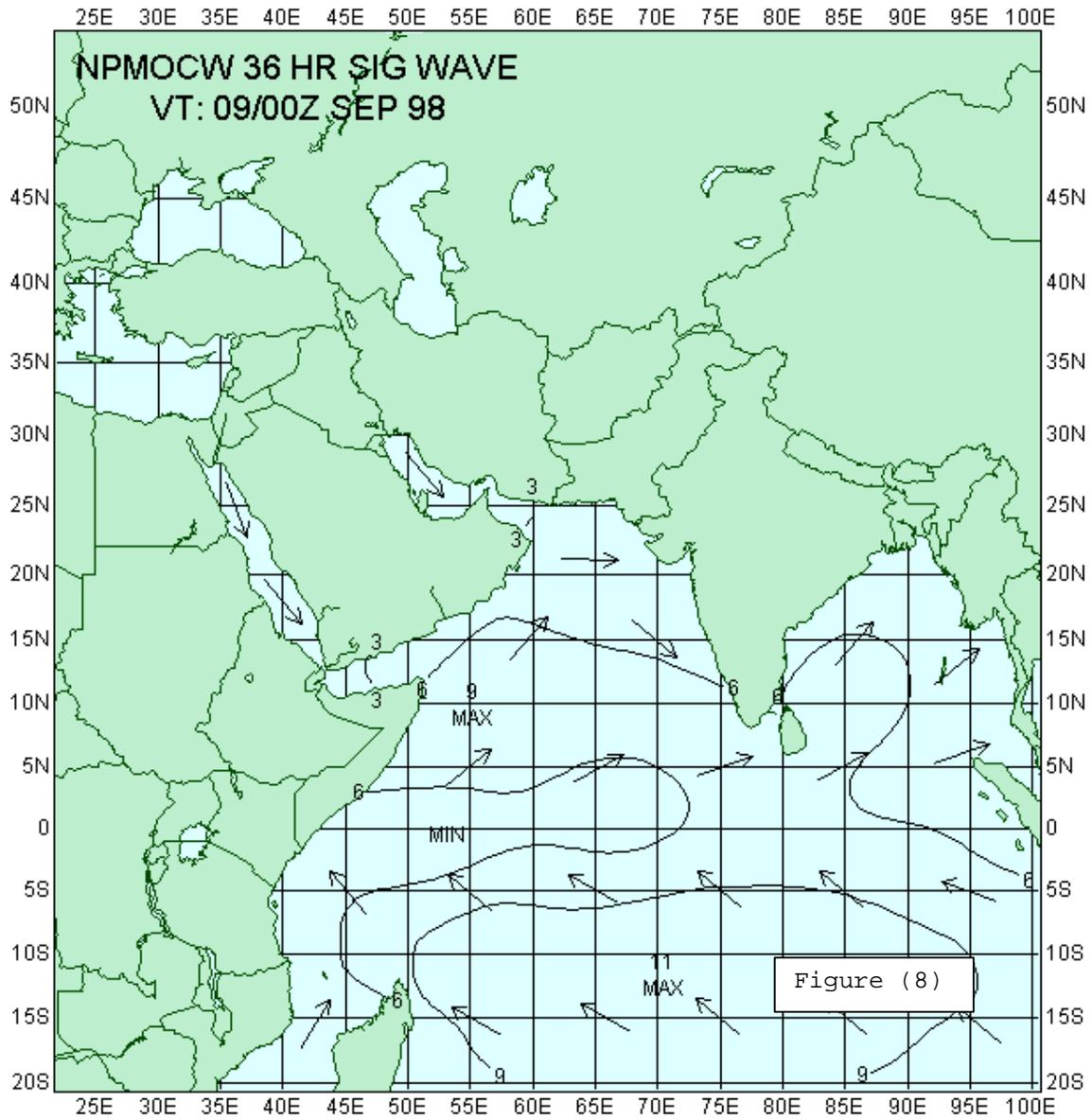


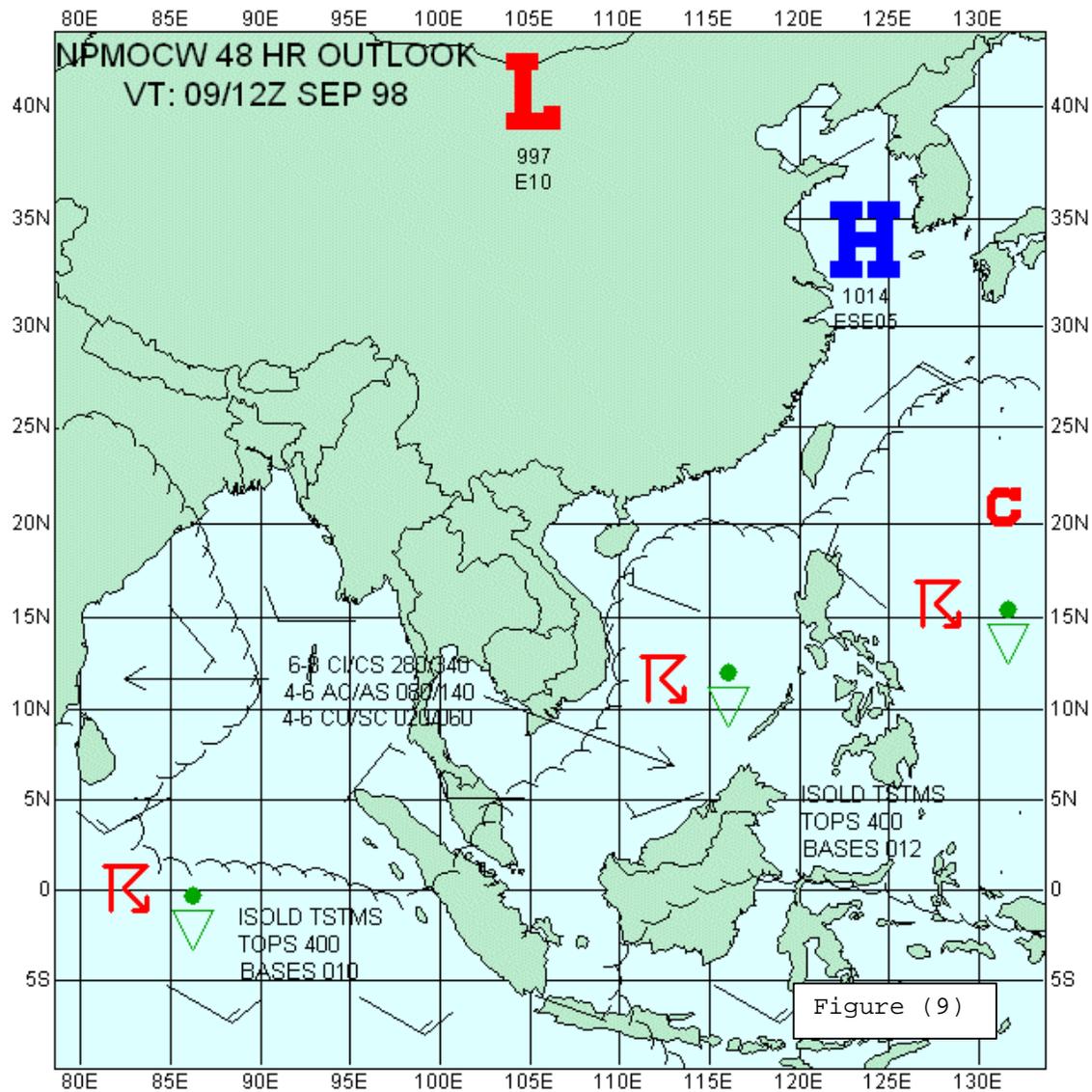




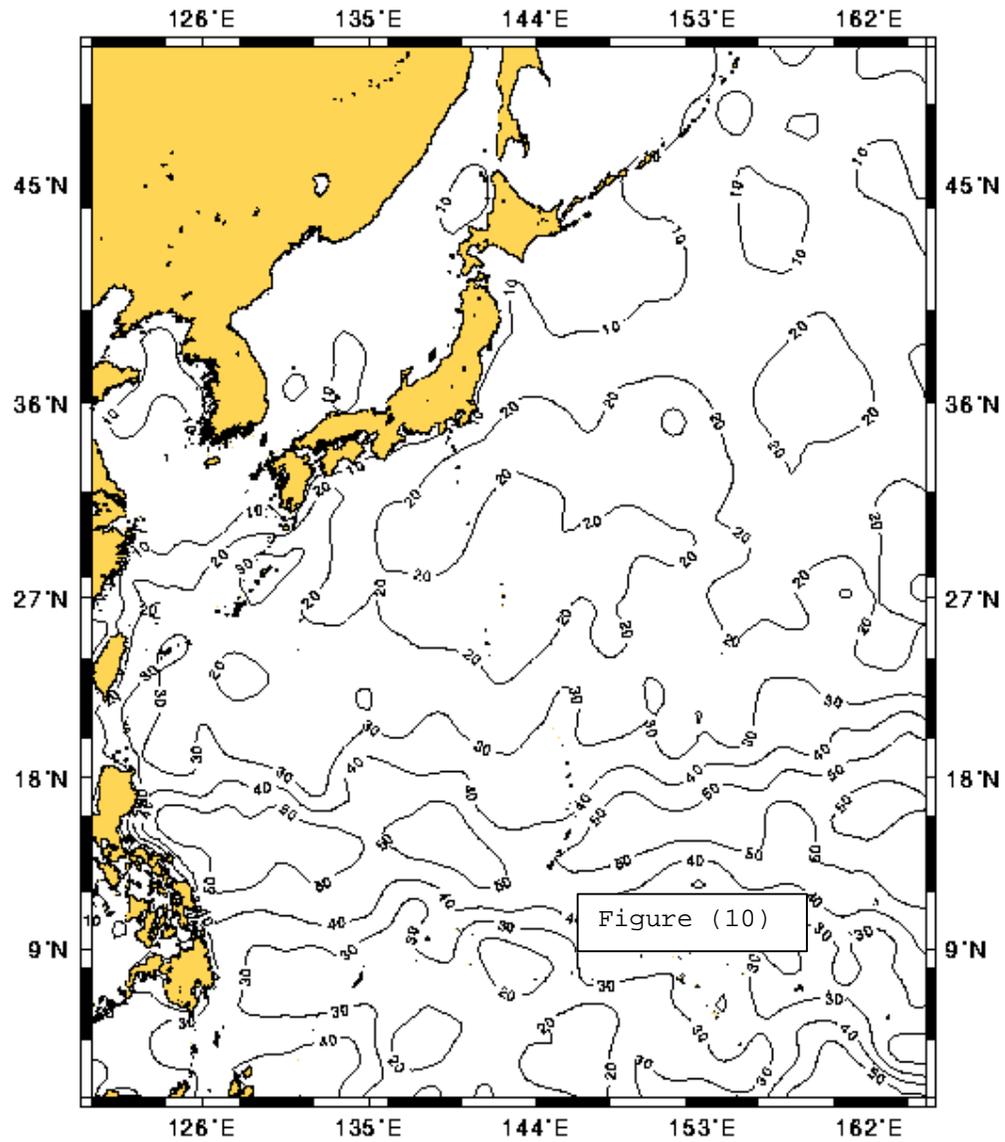




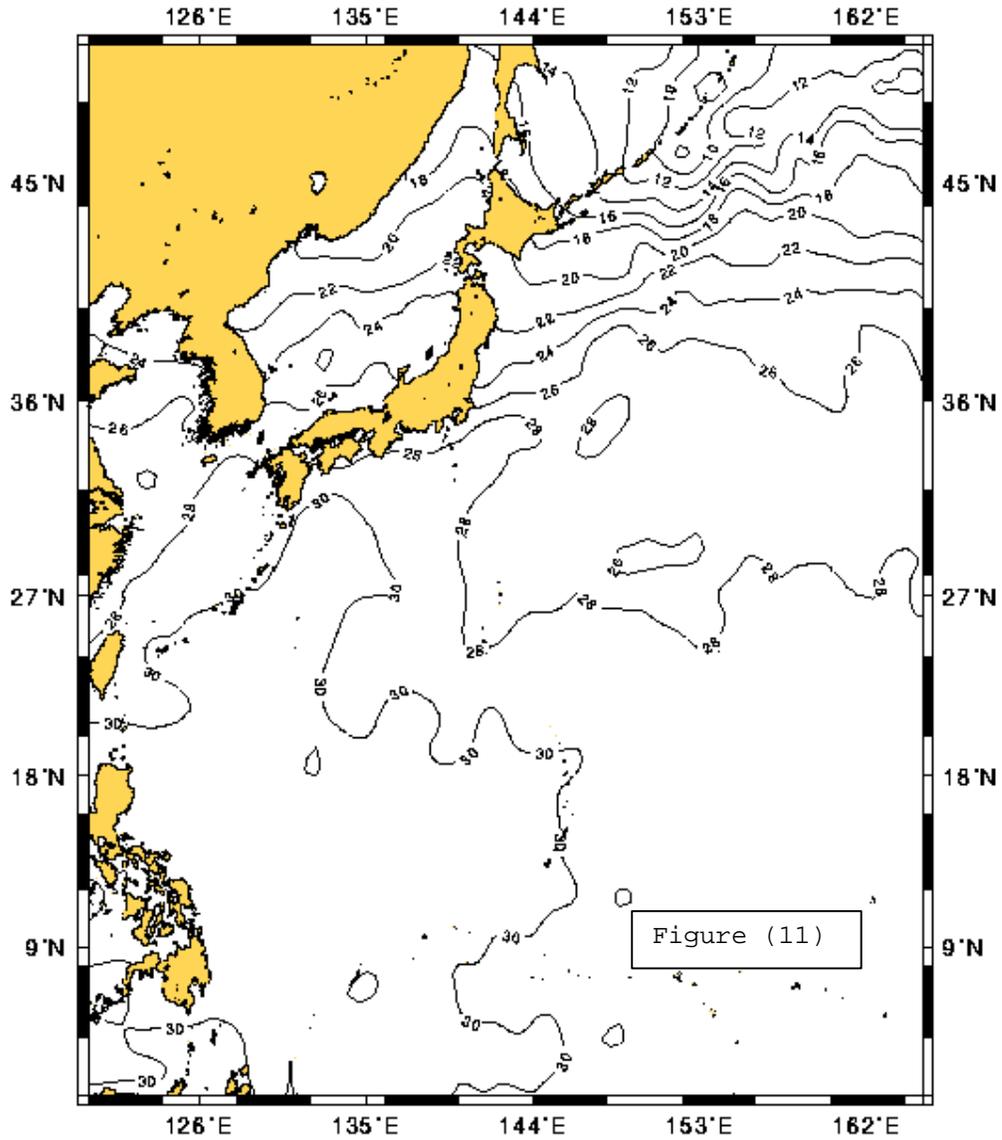




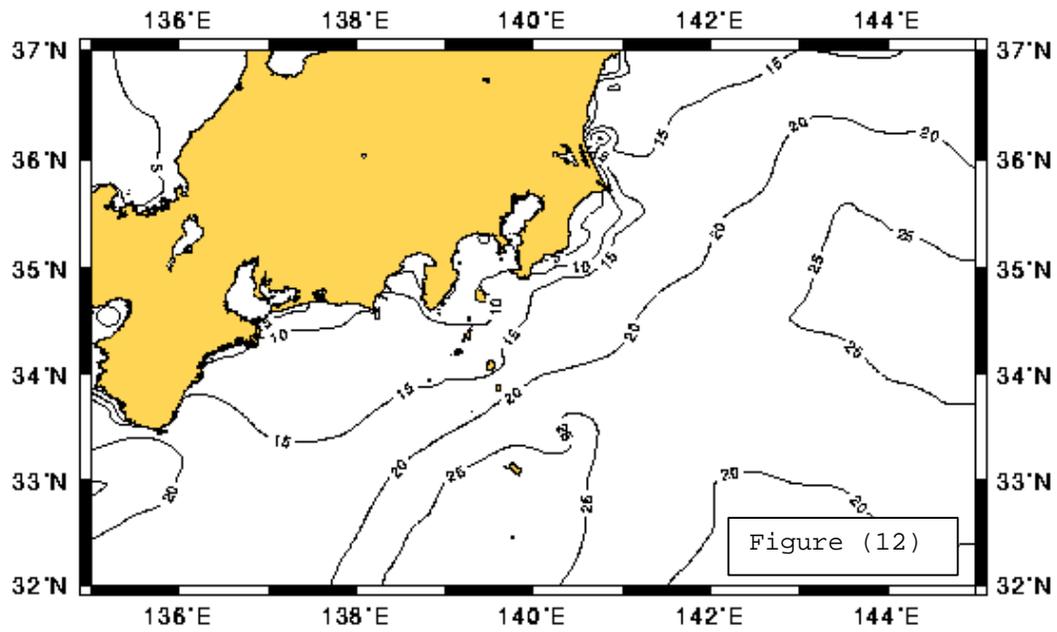
**MODAS Analysis**  
**WESTPAC 980907**  
**MIXED LAYER DEPTH (M)**



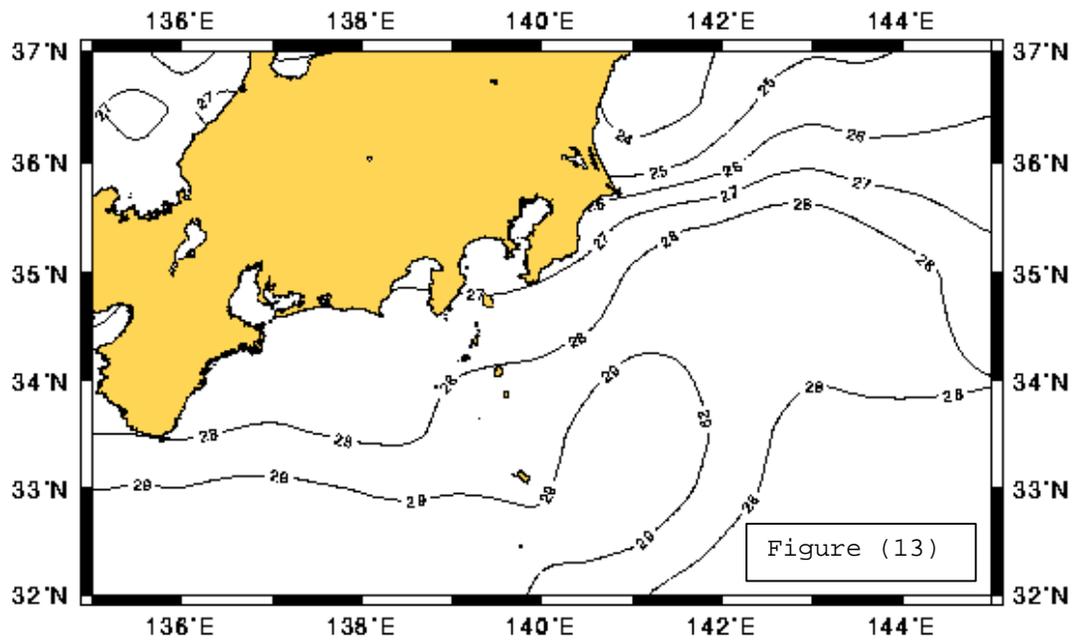
**MODAS Analysis**  
**WESTPAC 980907 0.0 m**  
**(deg c)**



**MODAS Analysis**  
**YOKO 980907**  
**MIXED LAYER DEPTH ( M )**



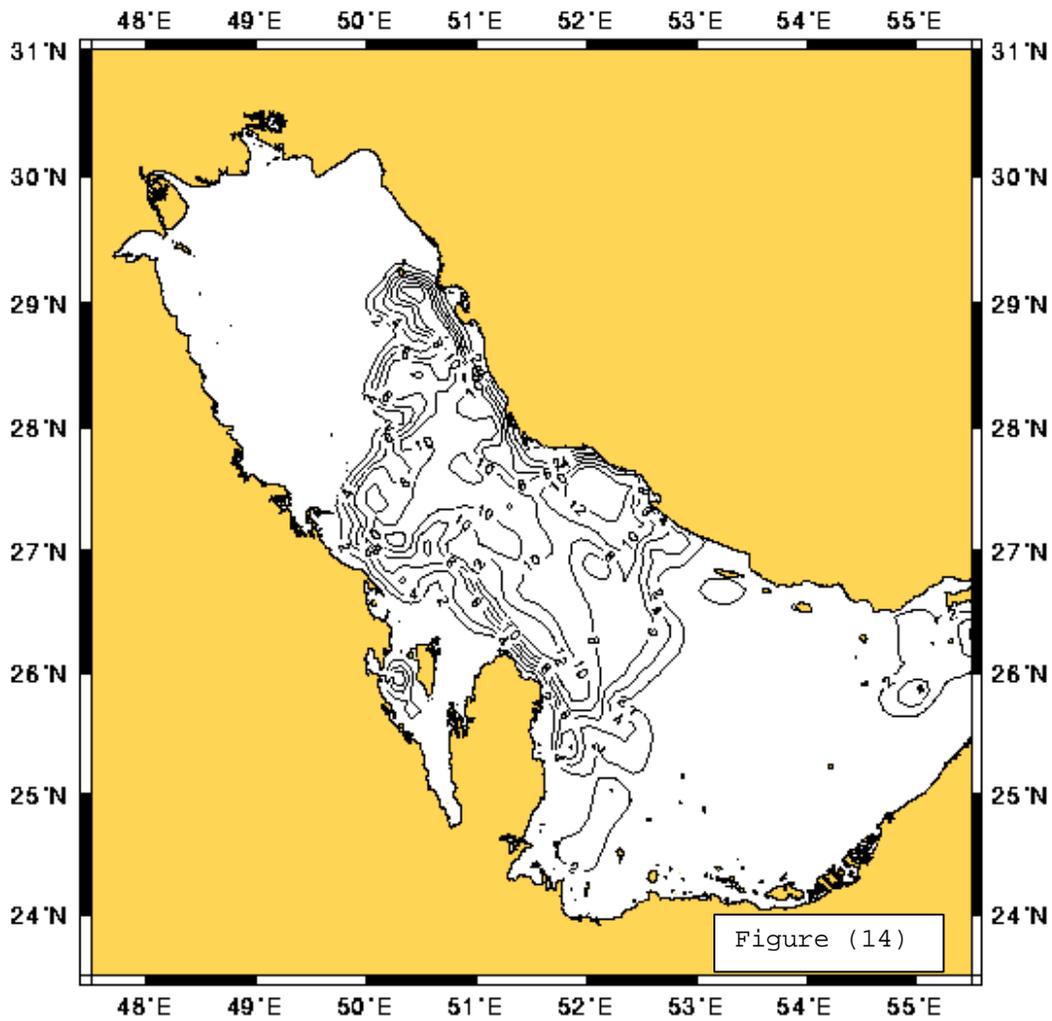
**MODAS Analysis**  
**YOKO 980907 0.0 m**  
**(deg c)**



# MODAS Analysis

pg 980908

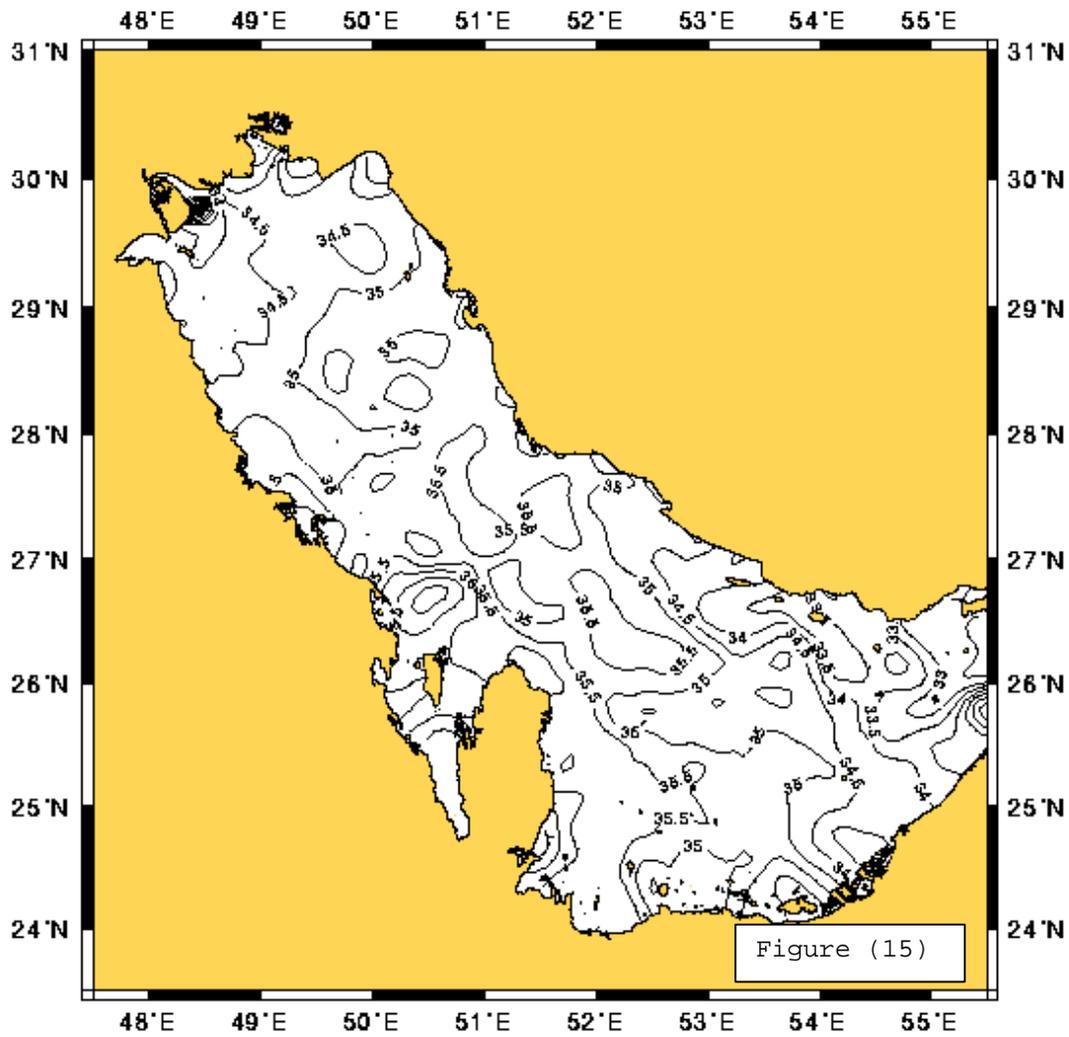
## MIXED LAYER DEPTH (M)



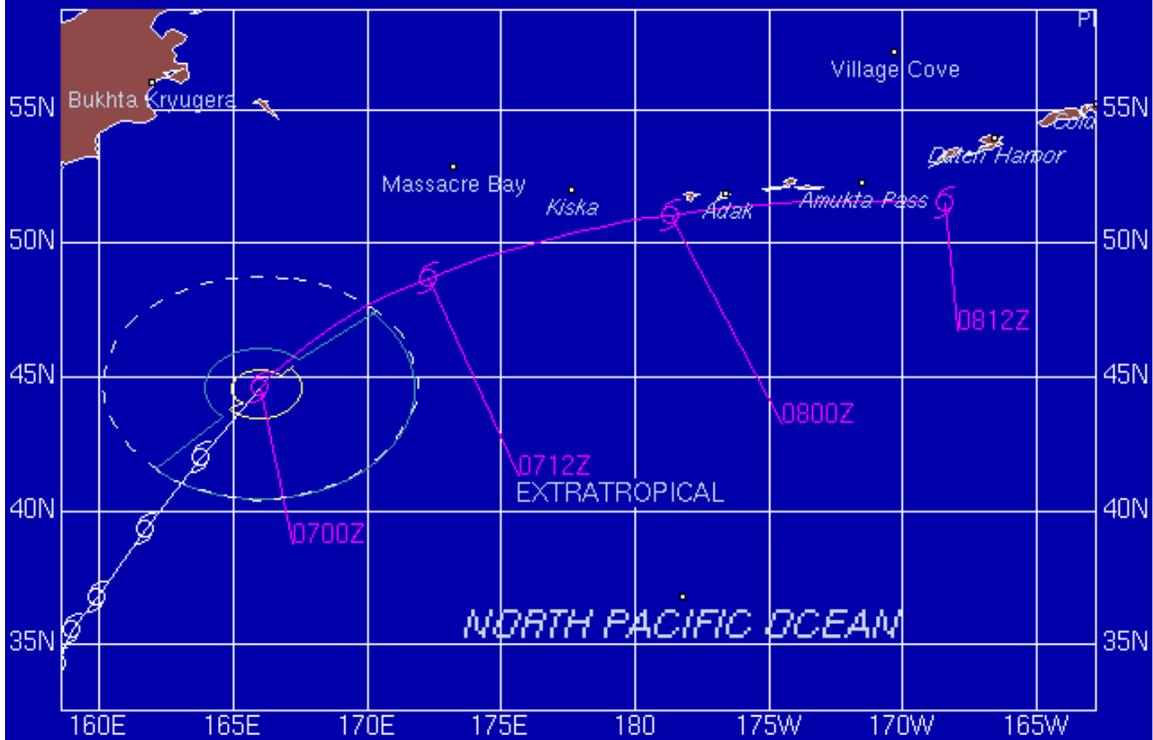
# MODAS Analysis

pg 980908 0.0 m

(deg c)



FINAL WARNING



TROPICAL STORM REX (06W) WARNING #57  
 WTPN31 PGTW 070300  
 MSGDTG: NPMOCW GU 070151 Z SEP 98  
 070000Z POSIT: 44.6N 166.0E  
 MOVING 030 DEGREES TRUE AT 31 KNOTS  
 DASHED LINE INDICATES 24-HOUR DANGER AREA  
 MAXIMUM SEAS: 15 FEET  
 0700Z, WINDS 055KTS, GUSTS TO 070KTS  
 0712Z, WINDS 050KTS, GUSTS TO 065KTS  
 0800Z, WINDS 045KTS, GUSTS TO 055KTS  
 0812Z, WINDS 040KTS, GUSTS TO 050KTS

Figure (16)

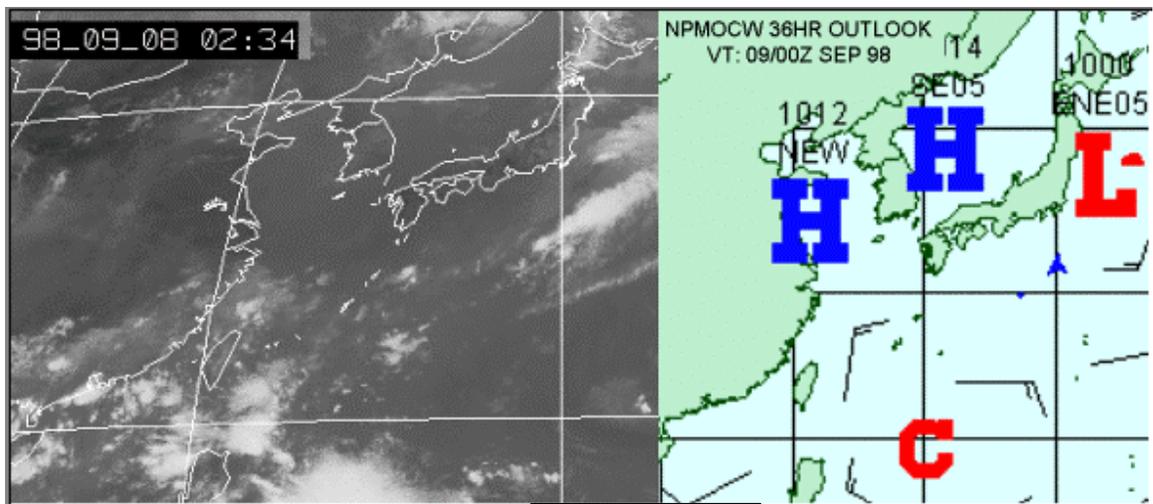


Figure (17)

## APPENDIX C - COMMON CONTRACTIONS

### A. SUFFIXES

In writing WEAX, NAVPACMETOCEN West/JTWC Guam uses meteorological contractions as listed in the Department of Transportation FAA Contractions Handbook 7340.1. Furthermore, these contractions may be modified by the addition of suffixes as follows:

|     |   |       |     |   |       |        |
|-----|---|-------|-----|---|-------|--------|
| -D  | = | -ED   | -N  | = | -EN   |        |
| -G  | = | -ING  | -NS | = | -NES, | -INESS |
| -L  | = | -AL   | -R  | = | -ER,  | -IER   |
| -MT | = | -MENT | -S  | = | -ES   |        |

NAVPACMETOCEN West/JTWC Guam uses both contractions (N, SE, W-SW, etc...) and full spellings for compass directions.

### B. Partial Listing of DPT 7340.1 Contractions

|       |       |              |            |       |                           |
|-------|-------|--------------|------------|-------|---------------------------|
| ABT   | ..... | ABOUT        | CLR        | ..... | CLEAR                     |
| ABTG  | ....  | ABATING      | CNTR       | ..... | CENTER                    |
| ABV   | ..... | ABOVE        | COND       | ..... | CONDITION                 |
| ACPY  | ....  | ACCOMPANY    | CONT       | ..... | CONTINUE,<br>CONTINUOUSLY |
| ACRS  | ....  | ACROSS       | DCR        | ..... | DECREASE                  |
| ACTV  | ....  | ACTIVE       | DEG        | ..... | DEGREE                    |
| ADVCN | ...   | ADVECTION    | DPNG       | ..... | DEEPENING                 |
| AFCT  | ....  | AFFECT       | DRZL       | ..... | DRIZZLE                   |
| AFT   | ..... | AFTER        | DSIPT      | ....  | DISSIPATE                 |
| AHD   | ..... | AHEAD        | DSNT       | ..... | DISTANT                   |
| ALF   | ..... | ALOFT        | DURG       | ..... | DURING                    |
| ALG   | ..... | ALONG        | DVLP       | ..... | DEVELOP                   |
| AMT   | ..... | AMOUNT       | EASTPAC... |       | EASTERN PACIFIC           |
| APCH  | ....  | APPROACH     | ELSW       | ..... | ELSEWHERE                 |
| AVG   | ..... | AVERAGE      | ENDG       | ..... | ENDING                    |
| BCKG  | ....  | BACKING      | ENTR       | ..... | ENTIRE                    |
| BCM   | ..... | BECOME       | ERY        | ..... | EARLY                     |
| BGN   | ..... | BEGIN, BEGAN | EST        | ..... | EST                       |
| BHND  | ....  | BEHIND       | XCP        | ..... | EXCEPT                    |
| BKN   | ..... | BROKEN       | XPC        | ..... | EXPECT                    |
| BLD   | ..... | BUILD        | XTND       | ..... | EXTEND                    |
| BLO   | ..... | BELOW        | EXTRM      | ....  | EXTREME                   |
| BRK   | ..... | BREAK        | EXTSV      | ....  | EXTENSIVE                 |
| BTWN  | ....  | BETWEEN      | FCST       | ..... | FORECAST                  |
| CDFNT | ...   | COLD FRONT   | FILG       | ..... | FILLING                   |
| CHG   | ..... | CHANGE       | FLW        | ..... | FOLLOW                    |
| CIG   | ..... | CEILING      | FM         | ..... | FROM                      |
| CLD   | ..... | CLOUD        |            |       |                           |

|        |                |        |                  |
|--------|----------------|--------|------------------|
| FNT    | FRONT          | MXD    | MIXED            |
| FNTL   | FRONTAL        | NML    | NORMAL           |
| FQT    | FREQUENT       | NO     | NUMBER           |
| FRMG   | FORMING        | NMBRS  | NUMEROUS         |
| FRZ    | FREEZING       | NR     | NEAR             |
| FRZLVL | FREEZING LEVEL | NXT    | NEXT             |
| FRZN   | FROZEN         | OB     | OBSERVATION      |
| FT     | FEET, FOOT     | OBSC   | OBSCURATION      |
| FTHR   | FURTHER        | OCNL   | OCCASIONAL, -LY  |
| FWD    | FORWARD        | OFSHR  | OFFSHORE         |
| GNDFG  | GROUND FOG     | ONSHR  | ONSHORE          |
| GRAD   | GRADIENT       | OTLK   | OUTLOOK          |
| GRDL   | GRADUAL, -LY   | OTRW   | OTHERWISE        |
| GSTS   | GUSTS          | OVC    | OVERCAST         |
| GTR    | GREATER        | OVR    | OVER             |
| HGT    | HEIGHT         | OVRN   | OVERRUN          |
| HI     | HIGH           | PBL    | PROBABLE         |
| HVY    | HEAVY          | PCPN   | PRECIPITATION    |
| ICG    | ICING          | PD     | PERIOD           |
| IN     | INCHES         | PRES   | PRESSURE         |
| INCR   | INCREASE       | PRTCD  | PROTECTED        |
| INSTBY | INSTABILITY    | PRST   | PERSIST          |
| INTMD  | INTERMEDIATE   | PSBL   | POSSIBLE         |
| INTMT  | INTERMITTENT   | PSG    | PASSING/PASSAGE  |
| INTS   | INTENSE        | PTCHY  | PATCHY           |
| INTSFY | INTENSIFY      | PTLY   | PARTLY           |
| ISOLD  | ISOLATED       | PTN    | PORTION          |
| KT     | KNOTS          | PVL    | PREVAIL          |
| LCL    | LOCAL          | QSTNRY | QUASI-STATIONARY |
| LGT    | LIGHT          | QUAD   | QUADRANT         |
| LO     | LOW            | RAFL   | RAINFALL         |
| LRG    | LARGE          | RDCG   | REDUCING         |
| LTLCHG | LITTLE CHANGE  | RDG    | RIDGE            |
| LTNG   | LIGHTNING      | RGD    | RAGGED           |
| LVL    | LEVEL          | RGN    | REGION           |
| LWR    | LOWER          | RLTV   | RELATIVE         |
| LYR    | LAYER          | RMN    | REMAIN           |
| MAX    | MAXIMUM        | RN     | RAIN             |
| MB     | MILLIBAR       | RPD    | RAPID            |
| MDT    | MODERATE       | RPT    | REPORT           |
| MET    | METEOROLOGICAL | RSG    | RISING           |
| MI     | MILE(S)        | RSHWR  | RAINSHOWER       |
| MID    | MIDDLE         | RUF    | ROUGH            |
| MIN    | MINIMUM        | SCT    | SCATTERED        |
| MISG   | MISSING        | SEC    | SECOND           |
| MOV    | MOVE           | SFC    | SURFACE          |
| MRGL   | MARGINAL       | SGFNT  | SIGNIFICANT      |
| MSL    | MEAN SEA LEVEL | SHFT   | SHIFT            |
| MSTLY  | MOSTLY         | SHLW   | SHALLOW          |

|        |       |              |         |       |                 |
|--------|-------|--------------|---------|-------|-----------------|
| SHRT   | ..... | SHORT        | WRM     | ..... | WARM            |
| SHWR   | ..... | SHOWER       | WND     | ..... | WIND            |
| SLGT   | ..... | SLIGHT       | WK      | ..... | WEAK            |
| SLO    | ..... | SLOW         | WESTPAC | ..    | WESTERN PACIFIC |
| SMK    | ..... | SMOKE        | WEAX    | ..... | WX FORECAST     |
| SN     | ..... | SNOW         | WDSPD   | ....  | WIDESPREAD      |
| SPD    | ..... | SPEED        | WDLY    | ..... | WIDELY          |
| SQLN   | ..... | SQUALL LINE  |         |       |                 |
| STBL   | ..... | STABLE       |         |       |                 |
| STG    | ..... | STRONG       |         |       |                 |
| STM    | ..... | STORM        |         |       |                 |
| SVR    | ..... | SEVERE       |         |       |                 |
| SYNOP  | ....  | SYNOPTIC     |         |       |                 |
| SYS    | ..... | SYSTEM       |         |       |                 |
| TEMP   | ..... | TEMPERATURE  |         |       |                 |
| THK    | ..... | THICK        |         |       |                 |
| THN    | ..... | THIN         |         |       |                 |
| THRU   | ..... | THROUGH      |         |       |                 |
| THRUT  | ....  | THROUGHOUT   |         |       |                 |
| TMPRY  | ....  | TEMPORARY    |         |       |                 |
| TROF   | ..... | TROUGH       |         |       |                 |
| TSTM   | ..... | THUNDERSTORM |         |       |                 |
| TWD    | ..... | TOWARD       |         |       |                 |
| UNKN   | ..... | UNKNOWN      |         |       |                 |
| UNL    | ..... | UNLIMITED    |         |       |                 |
| UNR    | ..... | UNRESTRICTED |         |       |                 |
| UNSTBL | ...   | UNSTABLE     |         |       |                 |
| UPR    | ..... | UPPER        |         |       |                 |
| VCNTY  | ....  | VICINITY     |         |       |                 |
| VRG    | ..... | VEERING      |         |       |                 |
| VRBL   | ..... | VARIABLE     |         |       |                 |
| VSBY   | ..... | VISIBILITY   |         |       |                 |
| WRMFNT | ...   | WARM FRONT   |         |       |                 |
| WSHFT  | ....  | WIND SHIFT   |         |       |                 |
| WX     | ..... | WEATHER      |         |       |                 |

## APPENDIX D

### WESTERN PACIFIC GFAQ BROADCAST SCHEDULE UPDATED OCT 1997

| <u>Start (Z)</u> | <u>Base Time (Z)</u> | <u>Product Description</u> |
|------------------|----------------------|----------------------------|
| 0001/1200        |                      | *WPAC BROADCAST SCHEDULE   |
| 0015/1215        |                      | *KUROSHIO CURRENT          |
| 0030/1230        | 12/00                | SIG WAVE HGT 48HR PROG     |
| 0045/1245        | 12/00                | SFC 48HR PROG              |
| 0100/1300        | 12/00                | 850 MB 48HR PROG           |
| 0115/1315        | 12/00                | 700 MB 48HR PROG           |
| 0130/1330        | 12/00                | 500 MB 48HR PROG           |
| 0145/1345        | 12/00                | SFC 60HR PROG              |
| 0200/1400        | 12/00                | 500 MB 60HR PROG           |
| 0215/1415        | 12/00                | (OPEN PERIOD)              |
| 0230/1430        |                      | *TROPICAL CYCLONE WRNGS    |
| 0245/1445        |                      | (OPEN PERIOD)              |
| 0300/1500        | 12/00                | (OPEN PERIOD)              |
| 0315/1515        | 12/00                | SFC 72HR PROG              |
| 0330/1530        | 12/00                | 500 MB 72HR PROG           |
| 0345/1545        | 12/00                | *SFC 84HR PROG             |
| 0400/1600        | 12/00                | SFC 96HR PROG              |
| 0415/1615        | 12/00                | 500 MB 96HR PROG           |
| 0430/1630        | 12/00                | SFC 108HR PROG             |
| 0445/1645        | 12/00                | 500 MB 108HR PROG          |
| 0500/1700        | 12/00                | SFC 120HR PROG             |
| 0515/1715        | 12/00                | 500 MB 120HR PROG          |
| 0530/1730        |                      | *SFC 120 HR PROG           |
| 0545/1745        |                      | (OPEN PERIOD)              |
| 0600/1800        |                      | (OPEN PERIOD)              |
| 0615/1815        |                      | (OPEN PERIOD)              |
| 0630/1830        | 00/12                | SFC ANAL                   |
| 0645/1845        | 00/12                | 850 MB ANAL                |
| 0700/1900        | 00/12                | 700 MB ANAL                |
| 0715/1915        | 00/12                | 500 MB ANAL                |
| 0730/1930        | 00/12                | 300 MB ANAL                |
| 0745/1945        | 00/12                | SFC 24HR PROG              |
| 0800/2000        | 00/12                | 850 MB 24HR PROG           |
| 0815/2015        | 00/12                | 700 MB 24HR PROG           |
| 0830/2030        | 00/12                | 500 MB 24HR PROG           |
| 0845/2045        |                      | *TROPICAL CYCLONE WARNING  |
| 0900/2100        |                      | (OPEN PERIOD)              |
| 0915/2115        |                      | (OPEN PERIOD)              |
| 0930/2130        |                      | (OPEN PERIOD)              |
| 0945/2145        |                      | (OPEN PERIOD)              |
| 1000/2200        | 00/12                | SFC 36HR PROG              |
| 1015/2215        | 00/12                | 850 MB 36HR PROG           |

**WESTERN PACIFIC GFAX BROADCAST SCHEDULE (Continued)**

|           |       |                     |
|-----------|-------|---------------------|
| 1030/2230 | 00/12 | 700 MB 36HR PROG    |
| 1045/2245 | 00/12 | 500 MB 36HR PROG    |
| 1100/2300 | 00/12 | 300 MB 36HR PROG    |
| 1115/2315 |       | SIG WAVE ANAL       |
| 1130/2330 | 00/12 | *SIG WAVE 36HR PROG |
| 1145/2345 | 00/12 | *SFC 36HR PROG      |

\*\* INDICATES LOCALLY PRODUCED/VALUE-ADDED PRODUCT

**INDIAN OCEAN GFAX BROADCAST SCHEDULE**  
**UPDATED OCT 1997**

| <u>Start (Z)</u> | <u>Base Time (Z)</u> | <u>Product Description</u> |
|------------------|----------------------|----------------------------|
| 0000/1200        |                      | *IO BROADCAST SCHEDULE     |
| 0015/1215        |                      | (OPEN PERIOD)              |
| 0030/1230        |                      | (OPEN PERIOD)              |
| 0045/----        | 00                   | SFC 24HR PROG (IO)         |
| ----/1245        |                      | (OPEN PERIOD)              |
| 0100/1300        | 12/00                | *SIG WAVE 36HR PROG        |
| 0115/1315        | 12/00                | *SFC 36HR PROG             |
| 0130/----        | 00                   | SFC 48HR PROG (IO)         |
| ----/1330        |                      | (OPEN PERIOD)              |
| 0145/1345        | 12/00                | 850 MB 36HR PROG (IO)      |
| 0200/1400        | 12/00                | 700 MB 36HR PROG (IO)      |
| 0215/1415        | 12/00                | 500 MB 36HR PROG (IO)      |
| 0230/1430        | 12/00                | 300 MB 36HR PROG (IO)      |
| 0245/1445        | 12/00                | SFC 36HR PROG (AG/RS)      |
| 0300/1500        | 12/00                | 850 MB 36HR PROG (AG/RS)   |
| 0315/1515        | 12/00                | 500 MB 36HR PROG (AG/RS)   |
| 0330/1530        | 12/00                | SFC 48HR PROG (IO)         |
| 0345/1545        | 12/00                | 850 MB 48HR PROG (IO)      |
| 0400/1600        | 12/00                | 700 MB 48HR PROG (IO)      |
| 0415/1615        | 12/00                | 500 MB 48HR PROG (IO)      |
| 0430/1630        | 12/00                | SFC 48HR PROG (AG/RS)      |
| 0445/1645        | 12/00                | 500 MB 48HR PROG (AG/RS)   |
| 0500/1700        | 12/00                | SFC 72HR PROG (IO)         |
| 0515/1715        |                      | (OPEN PERIOD)              |
| 0530/1730        |                      | (OPEN PERIOD)              |
| 0545/1745        |                      | (OPEN PERIOD)              |
| 0600/1800        |                      | (OPEN PERIOD)              |
| 0615/1815        |                      | (OPEN PERIOD)              |
| 0630/1830        |                      | (OPEN PERIOD)              |
| 0645/1845        | 00/12                | SFC ANAL (IO)              |
| 0700/1900        | 00/12                | 850 MB ANAL (IO)           |
| 0715/1915        | 00/12                | 700 MB ANAL (IO)           |
| 0730/1930        | 00/12                | 500 MB ANAL (IO)           |
| 0745/1945        | 00/12                | 300 MB ANAL (IO)           |
| 0800/2000        | 00/12                | SFC ANAL (AG/RS)           |
| 0815/2015        | 00/12                | 850 MB ANAL (AG/RS)        |
| 0830/2030        | 00/12                | 500 MB ANAL (AG/RS)        |
| 0845/2045        |                      | *TROPICAL CYCLONE WARNINGS |
| 0900/2100        |                      | (OPEN PERIOD)              |
| 0915/2115        |                      | (OPEN PERIOD)              |
| 0930/2130        | 00/12                | SFC 24HR PROG (IO)         |
| 0945/----        | 00                   | SFC 36HR PROG (IO)         |
| ----/2145        |                      | (OPEN PERIOD)              |

## INDIAN OCEAN GFAX BROADCAST SCHEDULE (CONTINUED)

|           |       |                          |
|-----------|-------|--------------------------|
| 1000/---- | 00    | SFC 48HR PROG (IO)       |
| ----/2200 |       | (OPEN PERIOD)            |
| 1015/2215 | 00/12 | 850 MB 24HR PROG (IO)    |
| 1030/2230 | 00/12 | 700 MB 24HR PROG (IO)    |
| 1045/2245 | 00/12 | 500 MB 24HR PROG (IO)    |
| 1100/2300 | 00/12 | 300 MB 24HR PROG (IO)    |
| 1115/2315 | 00/12 | SFC 24HR PROG (AG/RS)    |
| 1130/2330 | 00/12 | 850 MB 24HR PROG (AG/RS) |
| 1145/2345 | 00/12 | 500 MB 24HR PROG (AG/RS) |

\* INDICATES LOCALLY PRODUCED/VALUE-ADDED PRODUCT

IO - INDIAN OCEAN

AG/RS - ARABIAN GULF/RED SEA

**APPENDIX E - SELECTED PACIFIC AND INDIAN OCEAN  
FACSIMILE BROADCASTS**

Pearl Harbor, Hawaii

Freq: 4855 (LSB/ISB) (06-16Z)  
6453 (USB/ISB) Continuous  
8494 (LSB) Continuous  
9090 (USB/ISB) Continuous  
21735 (LSB/ISB) (16-06Z)

Darwin, Australia

Freq: 5755 (1110-2300Z)  
7535 (1110-2300Z)  
10555 Continuous  
15615 (2300-1110Z)  
18060 (2300-1110Z)

Honolulu, Hawaii

Freq: 9982.5 Continuous  
11090 Continuous  
16135 Continuous  
23331.5 Continuous

Melbourne, Australia

Freq: 2628 Continuous  
5100 Continuous  
11030 Continuous  
13920 Continuous  
20469 Continuous

Tokyo, Japan

Freq: 3622.5 Continuous  
7305 Continuous  
9970 Continuous  
13597 Continuous  
18220 Continuous  
23522.9 Continuous

Nairobi, Kenya

Freq: 9043 Continuous  
12315 Continuous  
15525 Continuous  
16315 Continuous  
17365 Continuous  
22867 Continuous

Khabarovsk, Russia

Freq: 4516.7 Continuous  
7475 Continuous  
9230 Continuous  
19275 Continuous

Cairo, Egypt

Freq: 11015 (1900-0700Z)  
17635 (0700-1900Z)  
14737 Continuous

Bangkok, Thailand

Freq: 7395 Unknown  
17520 Unknown

New Delhi, India

Freq: 4993.5 (1430-0230Z)  
7403 Continuous  
14842 Continuous  
18227 (0230-1430Z)

Diego Garcia, BIOT

Freq: 7580 (USB) Continuous  
12804 (USB) (00-12Z)  
20300 (USB) (12-00Z)

Wellington, New Zealand

Freq: 5807 Continuous  
9459 Continuous  
13550 Continuous  
16340.1 Continuous