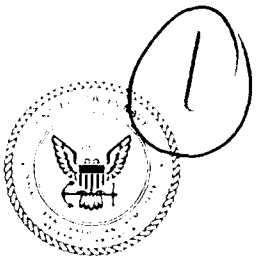


Naval Oceanographic and
Atmospheric Research Laboratory

Technical Note 238
September 1992

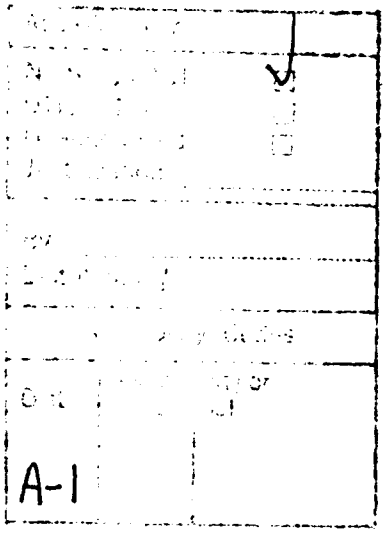
SEVERE WEATHER GUIDE MEDITERRANEAN PORTS

46. KALAMATA

Dan Jacobs

ABSTRACT

This handbook for the port of Kalamata, one in a series of severe weather guides for Mediterranean ports, provides decision-making guidance for ship captains whose vessels are threatened by actual or forecast strong winds, high seas, restricted visibility or thunderstorms in the port vicinity. Causes and effects of such hazardous conditions are discussed. Precautionary or evasive actions are suggested for various vessel situations. The handbook is organized in four sections for ready reference: general guidance on handbook content and use; a quick-look captain's summary; a more detailed review of general information on environmental conditions; and an appendix that provides oceanographic information.



ACKNOWLEDGMENTS

The support of the sponsor, Naval Oceanography Command, Stennis Space Center, MS, LCDR E. Steiner, USN, Program Element O&M,N-1, is gratefully acknowledged.

CONTENTS

FOREWORD

This handbook on Mediterranean Ports was developed as part of an ongoing effort at the Meteorology Division, Naval Research Laboratory (NRL), Monterey, to create products for direct application to Fleet Operations. The research was conducted in response to Commander Naval Oceanography Command (COMNAVOCEANCOM) requirements validated by the Chief of Naval Operations (OP-096).

As mentioned in the preface, the Mediterranean region is unique in that several areas exist where local winds can cause dangerous operating conditions. This handbook will provide the ship's captain with assistance in making decisions regarding the disposition of his ship when heavy winds and seas are encountered or forecast at various port locations.

Readers are urged to submit comments, suggestions for changes, deletions and/or additions to Naval Oceanography Command Center (NAVOCEANCOMCEN), Rota with a copy to the oceanographer, COMSIXTHFLT. They will then be passed on to NRL Monterey for review and incorporation as appropriate. This document will be a dynamic one, changing and improving as more and better information is obtained.

PORT INDEX

The following is a list of Mediterranean Ports that have been evaluated since 1988, with future ports and probable year of distribution also included. Computerized versions of these port guides are currently available for those ports with an asterisk (*). Those without the asterisk will be computerized in the near future. Contact the Naval Research Laboratory (NRL), Monterey or NOCC Rota for IBM compatible floppy disk copies.

NO.	PORT
*1	GAETA, ITALY
*2	NAPLES, ITALY
*3	CATANIA, ITALY
*4	AUGUSTA BAY, ITALY
*5	CAGLIARI, ITALY
*6	LA MADDALENA, ITALY
7	MARSEILLE, FRANCE
8	TOULON, FRANCE
9	VILLEFRANCHE, FRANCE
10	MALAGA, SPAIN
11	NICE, FRANCE
12	CANNES, FRANCE
13	MONACO
14	ASHDOD, ISRAEL
15	HAIFA, ISRAEL
16	BARCELONA, SPAIN
17	PALMA, SPAIN
18	IBIZA, SPAIN
19	POLLENSA BAY, SPAIN
20	LIVORNO, ITALY
21	LA SPEZIA, ITALY
22	VENICE, ITALY
23	TRIESTE, ITALY
*24	CARTAGENA, SPAIN
*25	VALENCIA, SPAIN
*26	SAN REMO, ITALY
*27	GENOA, ITALY
*28	PORTO TORRES, ITALY
*29	PALERMO, ITALY
*30	MESSINA, ITALY
*31	TAORMINA, ITALY
*32	TARANTO, ITALY
*33	TANGIER, MOROCCO
*34	BENIDORM, SPAIN
*35	ROTA, SPAIN
*36	LIMASSOL, CYPRUS
*37	LARNACA, CYPRUS
*38	ALEXANDRIA, EGYPT
*39	PORT SAID, EGYPT
*40	BIZERTE, TUNISIA
*41	TUNIS, TUNISIA
*42	SOUSSE, TUNISIA
*43	SFAX, TUNISIA
*44	SOUDA BAY, CRETE
*45	PIRAEUS, GREECE
*46	KALAMATA, GREECE
*47	KERKIRA (CORFU), GREECE
*48	KITHIRA, GREECE
*49	THESSALONIKI, GREECE

1993	PORT
	VALLETTA, MALTA
	ISKENDERUN, TURKEY
	IZMIR, TURKEY
	ISTANBUL, TURKEY
	ANTALYA, TURKEY

PREFACE

Environmental phenomena such as strong winds, high waves, restrictions to visibility and thunderstorms can be hazardous to critical Fleet operations. The cause and effect of several of these phenomena are unique to the Mediterranean region and some prior knowledge of their characteristics would be helpful to ship's captains. The intent of this publication is to provide guidance to the captains for assistance in decision making.

The Mediterranean Sea region is an area where complicated topographical features influence weather patterns. Katabatic winds will flow through restricted mountain gaps or valleys and, as a result of the venturi effect, strengthen to storm intensity in a short period of time. As these winds exit and flow over port regions and coastal areas, anchored ships with large 'sail areas' may be blown aground. Also, hazardous sea state conditions are created, posing a danger for small boats ferrying personnel to and from port. At the same time, adjacent areas may be relatively calm. A glance at current weather charts may not always reveal the causes for these local effects which vary drastically from point to point.

Because of the irregular coast line and numerous islands in the Mediterranean, swell can be refracted around such barriers and come from directions which vary greatly with the wind. Anchored ships may experience winds and seas from one direction and swell from a different direction. These conditions can be extremely hazardous for tendered vessels. Moderate to heavy swell may also propagate outward in advance of a storm resulting in uncomfortable and sometimes dangerous conditions, especially during tending, refueling and boating operations.

This handbook addresses the various weather conditions, their local cause and effect and suggests some evasive action to be taken if necessary. Most of the major ports in the Mediterranean will be covered in this series of handbooks. A priority list, established by the Sixth Fleet, exists for the port studies conducted and this list will be followed as closely as possible in terms of scheduling publications.

RECORD OF CHANGES

CHANGE NUMBER	DATE OF CHANGE	DATE ENTERED	PAGE NUMBER	ENTERED BY

1. GENERAL GUIDANCE

1.1 DESIGN

This handbook is designed to provide ship captains with a ready reference on hazardous weather and wave conditions in selected Mediterranean harbors. Section 2, the captain's summary, is an abbreviated version of section 3, the general information section intended for staff planners and meteorologists. Once section 3 has been read, it is not necessary to read section 2.

1.1.1 Objectives

The basic objective is to provide ship captains with a concise reference of hazards to ship activities that are caused by environmental conditions in various Mediterranean harbors, and to offer suggestions for precautionary and/or evasive actions. A secondary objective is to provide adequate background information on such hazards so that operational forecasters, or other interested parties, can quickly gain the local knowledge that is necessary to ensure high quality forecasts.

1.1.2 Approach

Information on harbor conditions and hazards was accumulated in the following manner:

A. A literature search for reference material was performed.
B. Cruise reports were reviewed.
C. Navy personnel with current or previous area experience were interviewed.
D. A preliminary report was developed which included questions on variou local conditions in specific harbors.
E. Port/harbor visits were made by NOARL personnel; considerable information was obtained through interviews with local pilots, tug masters, etc; and local reference material was obtained.
F. The cumulative information was reviewed, combined, and condensed for harbor studies.

1.1.3 Organization

The handbook contains two sections for each harbor. The first section summarizes harbor conditions and is intended for use as a quick reference by ship captains, navigators, inport/at sea OOD's, and other interested personnel. This section contains:

A. a brief narrative summary of environmental hazards,
B. a table display of vessel location/situation, potential environmental hazard, effect-precautionary/evasion actions, and advance indicators of potential environmental hazards,
C. local wind wave conditions, and
D. tables depicting the wave conditions resulting from propagation of deep water swell into the harbor.

The swell propagation information includes percent occurrence, average duration, and the period of maximum wave energy within height ranges of greater than 3.3 feet and greater than 6.6 feet. The details on the generation of sea and swell information are provided in Appendix A.

The second section contains additional details and background information on seasonal hazardous conditions. This section is directed to personnel who have a need for additional insights on environmental hazards and related weather events.

1.2 CONTENTS OF SPECIFIC HARBOR STUDIES

This handbook specifically addresses potential wind and wave related hazards to ships operating in various Mediterranean ports utilized by the U.S. Navy. It does not contain general purpose climatology and/or comprehensive forecast rules for weather conditions of a more benign nature.

The contents are intended for use in both pre-visit planning and in situ problem solving by either mariners or environmentalists. Potential haz-

ards related to both weather and waves are addressed. The oceanographic information includes some rather unique information relating to deep water swell propagating into harbor shallow water areas.

Emphasis is placed on the hazards related to wind, wind waves, and the propagation of deep water swell into the harbor areas. Various vessel locations/situations are considered, including moored, nesting, anchored, arriving/departing, and small boat operations. The potential problems and suggested precautionary/evasive actions for various combinations of environmental threats and vessel location/situation are provided. Local indicators of environmental hazards and possible evasion techniques are summarized for various scenarios.

CAUTIONARY NOTE: In September 1985 Hurricane Gloria raked the Norfolk, VA area while several US Navy ships were anchored on the muddy bottom of Chesapeake Bay. One important fact was revealed during this incident: Most all ships frigate size and larger dragged anchor, some more than others, in winds of over 50 knots. As winds and waves increased, ships 'fell into' the wave troughs, BROADSIDE TO THE WIND and became difficult or impossible to control.

This was a rare instance in which several ships of recent design were exposed to the same storm and much effort was put into the documentation of lessons learned. Chief among these was the suggestion to evade at sea rather than remain anchored at port whenever winds of such intensity are forecast.

2. CAPTAIN'S SUMMARY

The Port of Kalamata, Greece is located on the southern part of the Greek Peloponnesus in the southeastern Ionian Sea near 37°01'N, 22°07'E (Figure 2-1) (FICEURLANT, 1987).

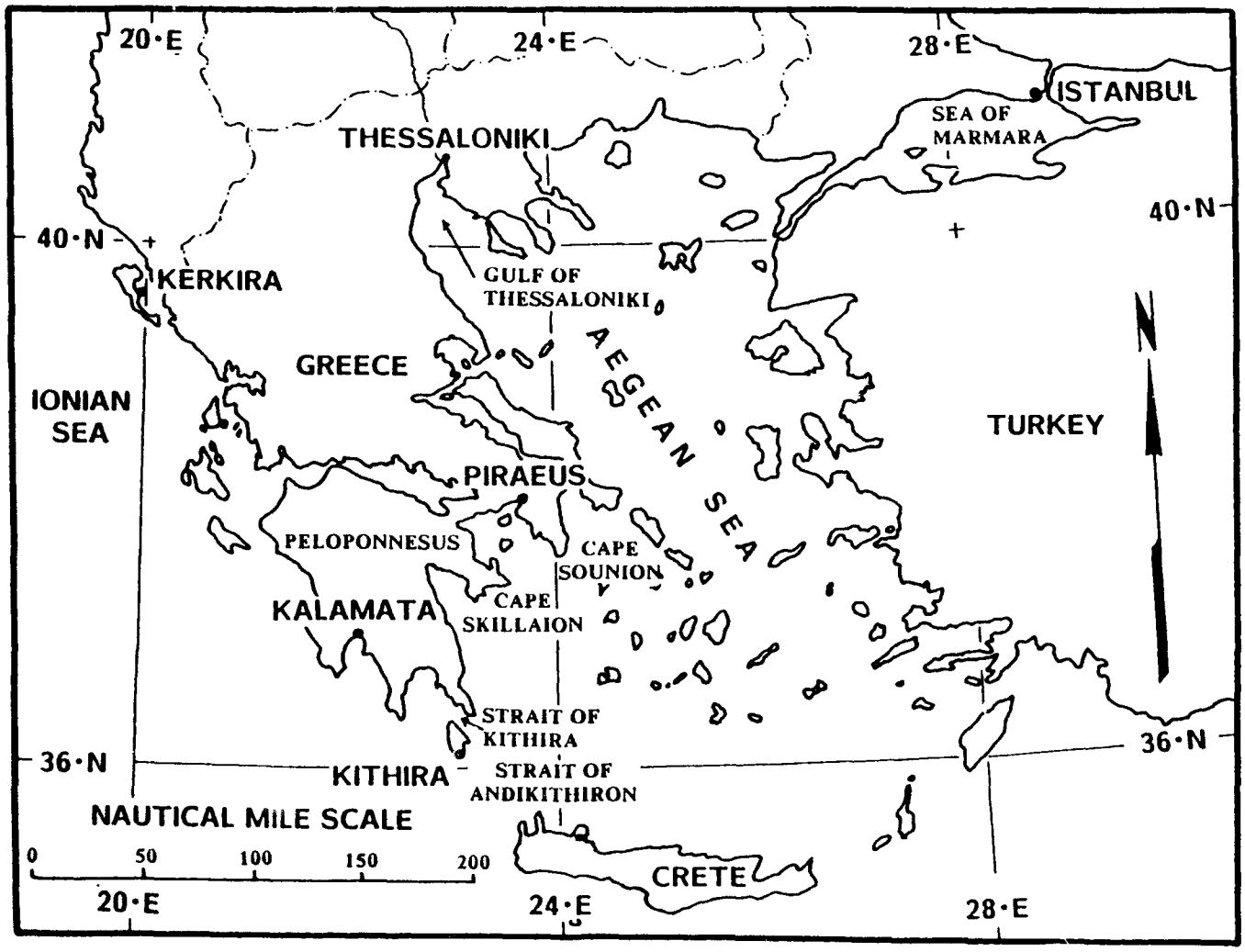


Figure 2-1. Ports of Greece and Surrounding Waters.

The Port is situated near the northeastern corner of the Gulf of Messenia (Figure 2-2) which opens to the south. The entrance between Cape Tainaron on the east and Cape Akritas on the west is about 34 n mi wide. The Port is approximately 40 n mi north-northwest of Cape Tainaron and 20 n mi north-northeast of Cape Akritas. The Gulf waters are deep and free from dangers in the fairway (Hydrographer of the Navy, 1970). The coastal area to the north of the Gulf is part of a low-lying plain. Mountain ranges rim the east and west shores, with maximum elevations near 7900 ft (2406 m) on the east and 3145 ft (958 m) to the west.

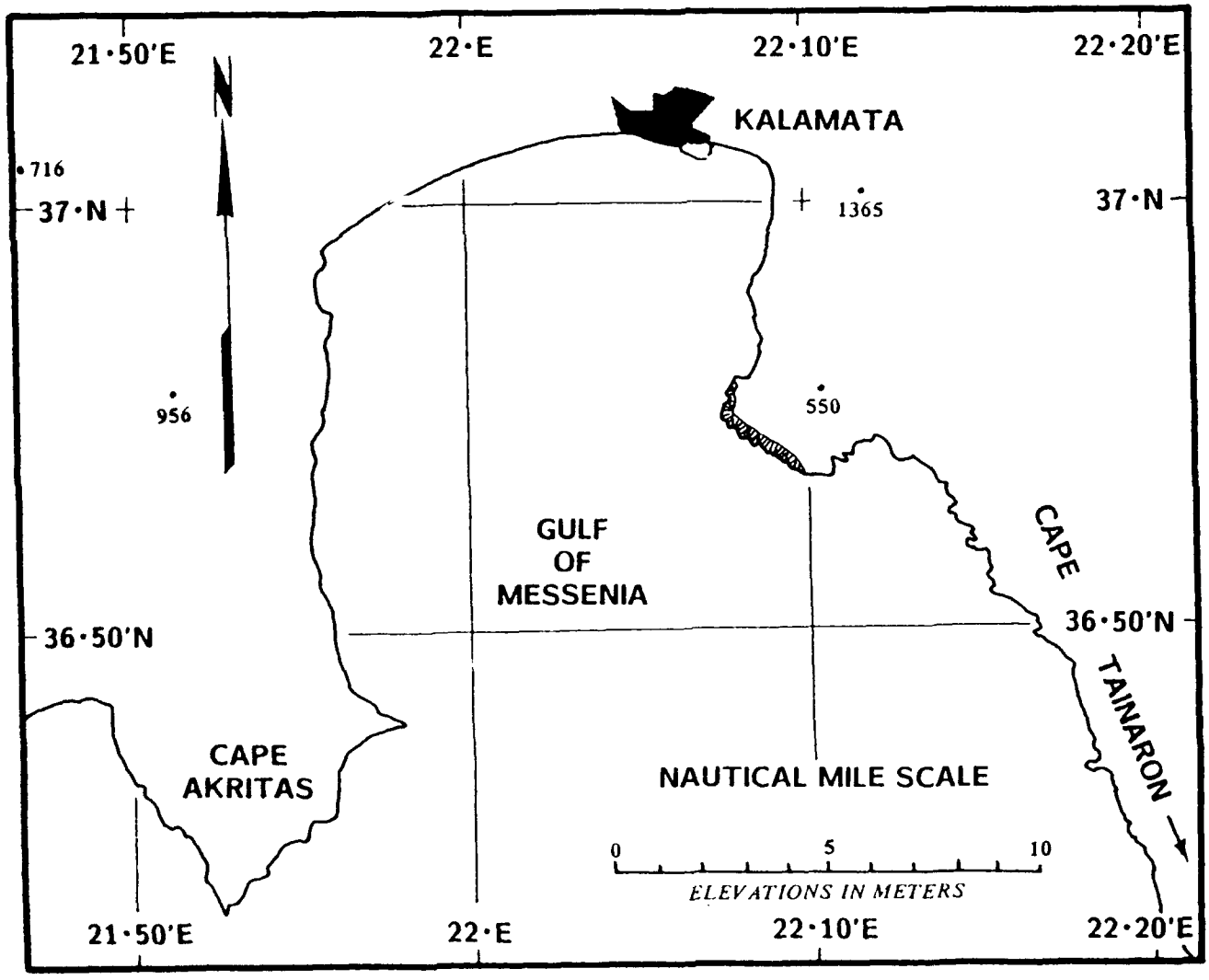


Figure 2-2. Approaches to the Port of Kalamata, Greece.

The Port of Kalamata is a small coastal harbor formed by a 3600 ft (1100 m) long breakwater on the south which parallels the coast, and one of 1300 ft (400 m) to the east that extends seaward from the coast (Figure 2-3). Entrance is made from the east between the ends of the two breakwaters. Entrance width is 591 ft (180 m) with a controlling depth of 30 ft (9 m) (FICEURLANT, 1987). The channel into the inner harbor is narrow. Silting does occur, limiting harbor access to shallow draft vessels. Limited berthing is available with length and depth limits of 660 ft (200 m) and 3C ft (9 m). The Port facilities are located on the shore side of the harbor.

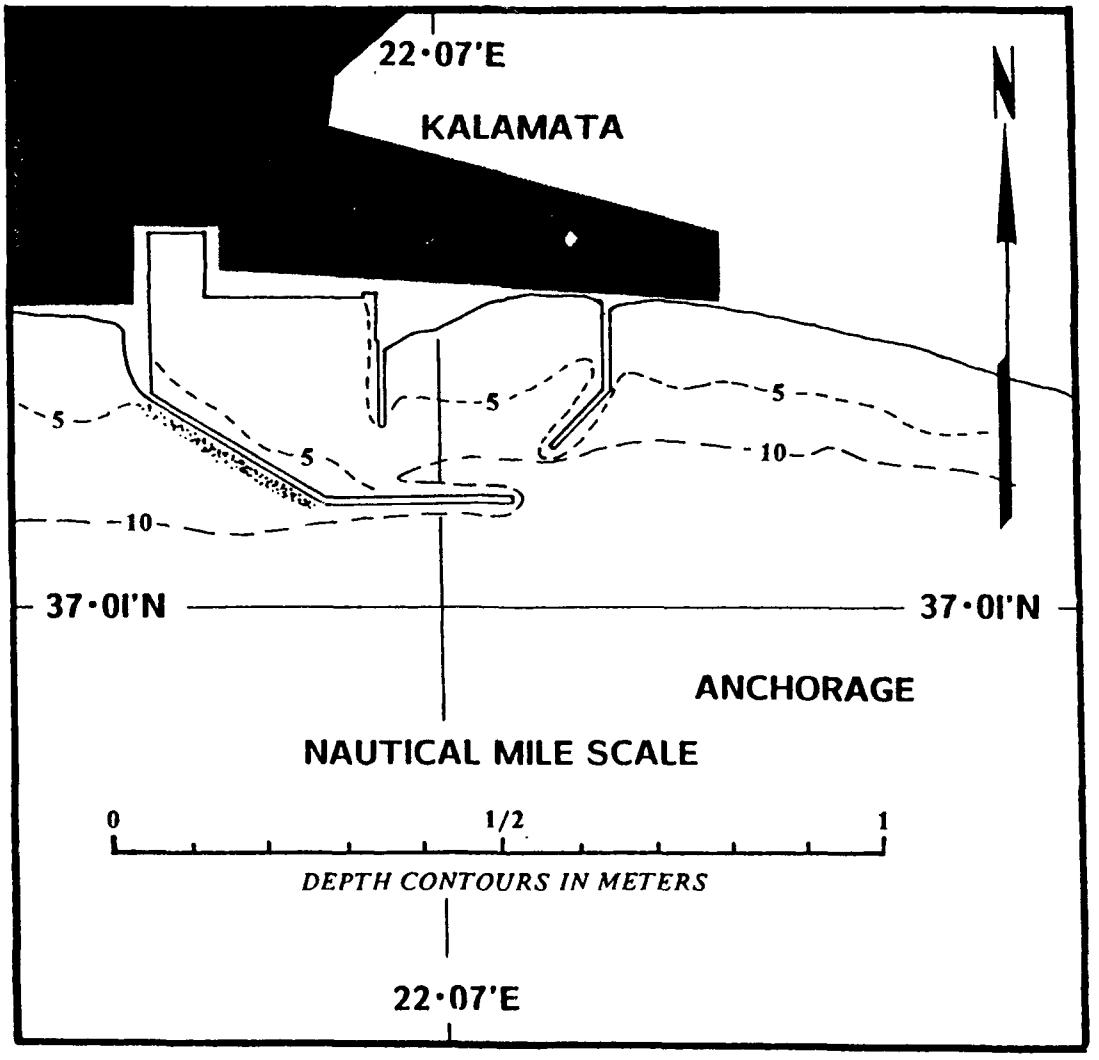


Figure 2-3. The Port of Kalamata, Greece.

The Port has no berthing for large ships. The Fleet Landing is generally established on the wharf in the western portion of the inner harbor but is movable depending on traffic (Port Visit, 1990). The wharf in the western portion of the inner harbor is high above the water's edge and may present difficulty for small boats (FICEURLANT, 1987). Entry to or departure from the harbor during bad weather, especially with high winds, is not recommended.

The best anchorage is located about 875 yds (800 m) to the southeast of the harbor entrance in about 120 ft (37 m) of water. The holding quality is fair to good. The anchorage is protected from southeasterly winds but anchor dragging, towards deeper water, may occur during strong northerly winds. Holding in the area south of the major breakwater has been reported as poor.

Prevailing winds are from the north and generally limited to 17-27 kt (force 5-6), but can reach 41 to 55 kt (force 9-10) during strong winter Bora events. Duration of Bora events ranges from one to five days with two to three being typical. Strong southerly winds up to 34-47 kt (force 8-9) with 4 to 7 ft (1-2 m) waves at the anchorage southwest of the harbor entrance and 10-13 ft (3-4 m) over exposed areas of the Bay typically occur six or seven times a year during the December through February period. Southerly winds of 48 to 55 kt (force 10) have been recorded (Hellenic NMS, 1990). Duration of strong southerly wind events is generally less than two days. During the March through late September period the Gulf tends to be very calm in the morning and late evening with a moderate sea breeze, 7 to 16 kt (force 3-4), developing between noon and 1800 local time.

Freezing temperatures have been recorded from mid-November through mid-April. The coldest months are January and February when average minimums are about 43°F (6°C) and absolute minimums of 23°F (-5°C) and 26°F (-3°C) have been recorded (Hellenic NMS,

1990). Early morning wind chill factors will approach 0°F (-18°C) during strong cold air outbreaks (Boras) from December through March. Snow and hoar frost have been experienced during these same months.

Visibility is generally good but some restriction due to haze is typical during the warm season. Typically, only a few cases of fog occur during winter when visibility may be as low as one n mi. During the Port Visit it was noted that visibility has never been restricted to the degree that one could not see from the anchorage to the harbor.

Specific hazardous environmental conditions, vessel situations, and suggested precautionary/evasive action scenarios for the Port of Kalamata are summarized in Table 2-1.

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Table 2.1. Summary of Hazardous Environmen

HAZARDOUS CONDITIONS	INDICATORS OF POTENTIAL HAZARD
1. Strong S'ly winds/waves - Caused by migratory cyclones. * Most hazardous conditions, occurs winter, spring and autumn. * Winds 34 to 47 kt, extremes of 48-55 kt, waves 10 to 13 ft. * Rapid shift from easterly to southerly. * Local wind waves may be out of phase with swell. * May be followed by strong N'lys and cold outbreak.	1. Advance Warning * Low approaching from west, pressure falling, increasing low clouds, wind shifting out of north to easterly, rapid shift to southerly. Duration * Generally a day, seldom more than 2.
2. S'ly winds/waves - Sciroccos out of North Africa. * Most likely late winter into spring. * Winds gale force or less. * Brings low clouds, rain, reduced visibility, anomalous radar propagation and restricted radio ranges.	2. Advance Warning * Altocumulus cloud deck approaching from south day before onset. * Southerly swell increasing. * Prevailing northerly winds decrease. * Increasing low clouds. Duration * Normally last about 3 days.

ous Environmental Conditions for the Port of Kalmata, Greece.

S OF AZARD	VESSEL LOCATION/ SITUATION AFFECTED	EFFECT-PRECAUTIONARY/EVASIVE ACTIONS
ing from west, ling, ow clouds, g out of north rapid shift .	(1) Anchorage	a. The anchorages are exposed to wind and waves. * Anchorage southeast of harbor entrance most protected from S'lys. * Wave reflection off breakwater causes choppy confused wave conditions at anchorage south of harbor. * There are no tugs available. * Best holding southeast of harbor, anchor dragging may occur elsewhere.
day, seldom	(2) Small Boats	a. The harbor affords good protection from waves, but limited protection from winds. * Small craft runs to/from anchorages curtailed.
cloud deck from south day . ell ortherly winds ow clouds.	(1) Anchorage	a. The anchorages are exposed to wind and waves. * Anchorage southeast of harbor entrance most protected from S'rlys. * Wave reflection off breakwater causes choppy confused wave conditions at anchorage south of harbor. * There are no tugs available. * Best holding southeast of harbor, anchor dragging may occur elsewhere.
about	(2) Small Boats	a. The harbor affords good protection from waves but limited protection from winds. * Small boat operations outside harbor hazardous, use due caution.

Table 2.1 co

HAZARDOUS CONDITIONS	INDICATORS OF POTENTIAL HAZARD
3. N'ly winds - Winter Boras, Summer Etesians * Rapid onset. * Gusty, squally weather. * Freezing temperatures in winter, wind chill factor to 0°F (-18°C). * Snow showers may occur.	3. Advance Warning Winter Boras * Rising pressure over Balkans, weak cyclone over eastern Mediterranean. * Rapid local onset. Duration * One to five days. Summer Etesians * Increasing cloudiness over Balkans day before onset. Duration * Generally one to five days, but can last for weeks.

Table 2.1 continued

OF ZARD	VESSEL LOCATION/ SITUATION AFFECTED	EFFECT-PRECAUTIONARY/EVASIVE ACTIONS
	(1) Anchorage	a. Terrain provides protection for harbor and anchorages. * Close-in anchoring maximizes terrain protection. * Best holding southeast of harbor entrance. * Anchor dragging possible towards deeper water, adjust scope accordingly. * Freezing temperatures during winter, use cold weather procedures and gear.
	(2) Small Boats	a. Gusty, squally weather. * Boat runs outside harbor curtailed during strong events. * Freezing temperatures during winter, use foul weather procedures and gear.

SEASONAL SUMMARY OF HAZARDOUS CONDITIONS

WINTER (November through February)

* S'ly wind (migratory cyclones) 34 to 47 kt, extremes 48 to 55 kt
  - waves 7 to 10 ft, anchorage SE of entrance, 10-13 ft west of harbor
  - confused seas south of breakwater due to reflection
  - occur 6-7 times a year
  - duration 1-2 days, onset variable, approach variable
* N'ly wind (Boras) 17 to 25 kt, extremes 41 to 55 kt, gusty
  - offshore flow, no significant waves
  - duration several days, onset abrupt
  - duration 1 to 3 days, longer with stronger events

SPRING (March through May)

* S'ly wind (Scirocco) 22 to 33 kt
  - waves 4 to 7 ft, confused seas south of breakwater
  - duration several days, onset gradual

SUMMER (June through September)

* N'ly wind (Etesions) 17 to 27 kt
* S'ly wind (sea breeze) 7 to 16 kt, daily event 1200-1800 LST except during strong Etesians

AUTUMN (October)

* Typical Mediterranean region rapid change to winter weather
  - expect first winter-type cyclone by end of month

Note: For more detailed information on hazardous weather conditions, see previous Table 2-1 in this section and Hazardous Weather Summary in Section 3.

References

FICEURLANT, 1987: Port Directory for Kalamata, Greece. Fleet Intelligence Center Europe and Atlantic, Norfolk, VA.

Hydrographer of the Navy, 1970: Mediterranean Pilot. Volume III. Hydrographer of the Navy, London, England.

Hellenic, NMS, 1990: Hellenic National Meteorological Service, Division II-III/Computer Section, Climatological Data Base, Station 727, Kalamata.

Port Visit Information

May 1990. NOARL Meteorologists R. Fett and R. Miller met with Mr. D. Tsagogeogras, Senior Pilot to obtain much of the information included in this port evaluation.

3. GENERAL INFORMATION

This section is intended for Fleet forecasters/oceanographers and staff planners. Section 3.5 includes a general discussion of hazards and Table 3-2 provides a summary of vessel locations/situations, potential hazards, effect-precautionary/evasive actions, and advance indicators and other information by season.

3.1 Geographic Location

The Port of Kalamata, Greece is located on the southern part of the Greek Peloponnesus in the southeastern Ionian Sea near 37°01'N, 22°07'E (Figure 3-1) (FICEURLANT, 1987).

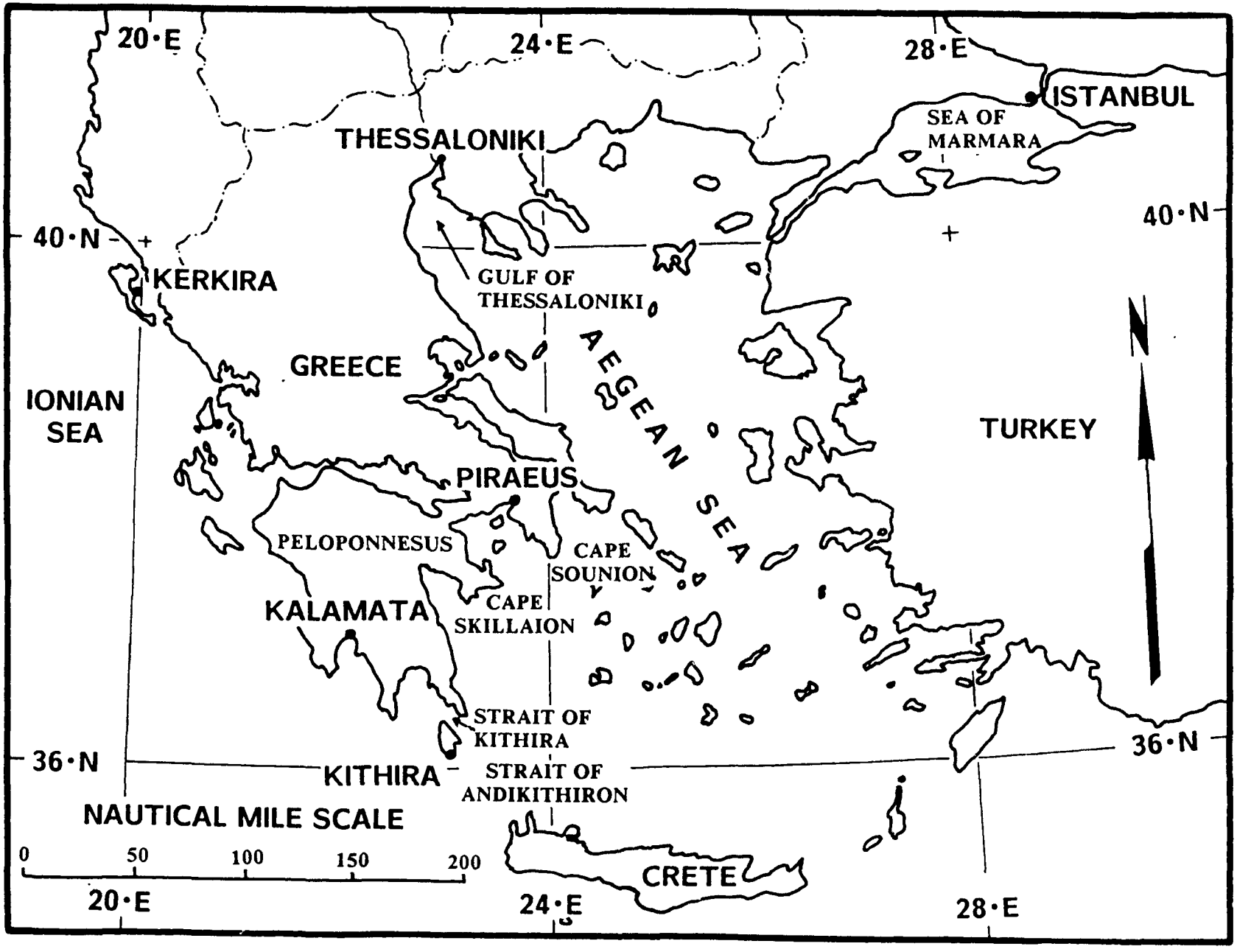
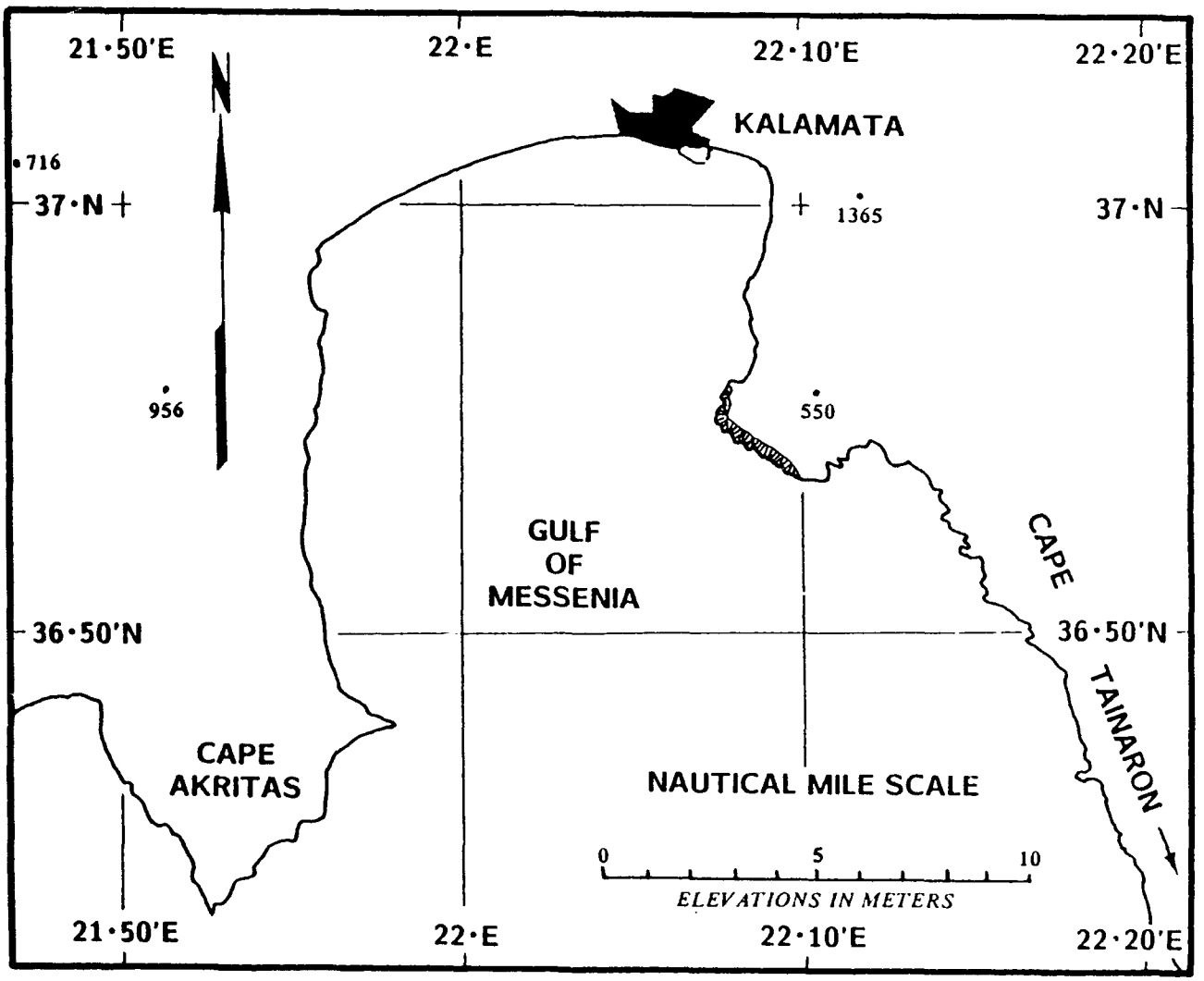


Figure 3-1. Ports of Greece and Surrounding Waters.

The Port is situated near the northeastern corner of the Gulf of Messenia (Figure 3-2) which opens to the south. Entrance to the Gulf is made between Cape Tainaron on the east and Cape Akritas which is about 34 n mi to the northwest. The Port is approximately 40 n mi north-northwest of Cape Tainaron and 20 n mi north-northeast of Cape Akritas. The Gulf waters are deep and free from dangers in the fairway (Hydrographer of the Navy, 1970). The coastal area to the north of the Gulf is part of a low-lying plain. Mountain ranges rim the east and west shores, with maximum elevations near 7900 ft (2406 m) on the east and 3145 ft (958 m) to the west.



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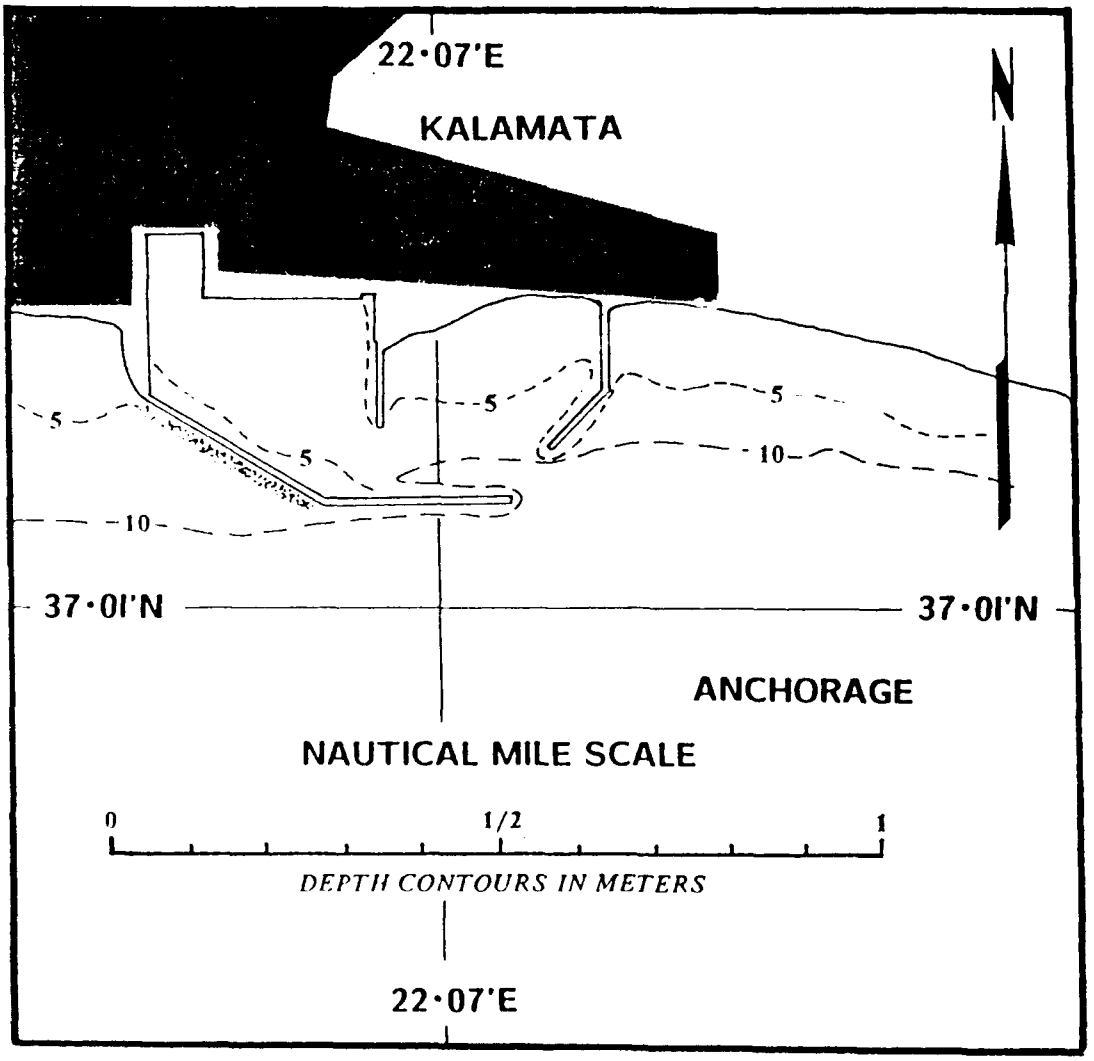

Figure 3-3. Approaches to the Port of Kalamata, Greece.

The Port has no berthing for large ships. The Fleet Landing is generally established on the wharf in the western portion of the inner harbor but is movable depending on traffic (Port Visit Notes, 1990). The wharf in the western portion of the inner harbor is high above the water's edge and may present difficulty for small boats (FICEURLANT, 1987).

The best anchorage is located about 880 yds (800 m) to the southeast of the harbor entrance in about 120 ft (37 m) of water. The holding quality is fair to good. The anchorage is protected from southeasterly winds but anchor dragging, towards deeper water, may occur during strong northerly winds. Holding in the area south of the major breakwater has been reported as poor.

3.2 Qualitative Evaluation of the Port of Kalamata

The harbor provides good protection from all wind and waves but entrance or departure during strong winds is not recommended. There were no reported cases of required sortie, due to weather, mentioned during the Port Visit or noted in references. The recommended anchorage is to the southeast of the harbor entrance.

The anchorage areas are exposed to southerly winds and waves. Wave reflection off the breakwater makes for confused choppy wave conditions in the anchorage area south of the breakwater. During strong northerly winds anchor dragging may occur throughout the anchorage areas due to the soft mud bottom. Note that anchor dragging will be towards deeper water which may further decrease holding.

3.3 Currents and Tides

Tides are limited to 1 to 2 ft (<1 m) during southerly winds and even less during northerly flow. Currents are negligible.

3.4 Visibility

Visibility is normally good. Light-to-moderate haze is generally present during the summer. On a few occasions fog will restrict winter visibilities to about one n mi.

3.5 Seasonal Summary of Hazardous Weather Conditions

The seasonal weather patterns over the eastern Mediterranean are to a significant degree dominated by the monsoonal character of the Eurasian land mass. The following discussion of seasonal patterns is taken from Brody and Nestor (1980).

During the winter season (November through February), the land mass to the north is very cold in comparison to the sea surface of the Mediterranean Sea. With the upper-level westerlies often found over the Mediterranean, cyclonic activity with unsettled weather is common in the area. Because of the proximity of cold air to the north, cold outbreaks are frequent winter events.

During the summer season (June through September), the monsoonal effect leads to the development of an intense heat trough over southern Asia that extends westward over Turkey. With higher pressure over the relatively cooler sea surface of the Mediterranean, dry northerly to northwesterly flow dominates the Crete-Aegean Sea Area.

The transitional seasons, spring and autumn, are of very different length. The relatively long spring season (March through May) is noted for periods of stormy winter-type weather that alternate with a number of false starts of the etesian-type weather of summer. Autumn lasts only about one month (October), and is characterized by an abrupt change to winter-type weather. Cold outbreaks become more

frequent in autumn as the land mass to the north cools, and cyclonic activity increases as the upper-level westerlies move southward over the relatively warm water of the Mediterranean.

Although extremely rare, storms having tropical cyclone characteristics, including apparent "eye" cloud configuration, have been observed on at least three occasions in the Mediterranean Basin. During an event in September 1983 the storm moved from the Gulf of Gabes, through the Straits of Sicily, along the east coast of Sardinia and into the Gulf of Genoa. Winds of 60 kt were reported at Cagliari, Sardinia while winds near the storm's eye were 100 kt.

A seasonal summary of various known environmental hazards that may be encountered in the Port of Kalamata follows.

A. <u>WINTER (November through February)</u>

The prevailing winds of the region are northerly. During Bora events the local winds may reach 41 to 47 kt (force 9) but the Port is protected by the terrain to the north. During strong Bora events early morning temperatures may be near zero with only limited warming during the day. Freezing temperatures have been recorded from mid-November through mid-April. The coldest months are January and February when average minimums are about 43°F (6°C), and absolute minimums of 23°F (-5°C) and 16°F (-3°C) have been recorded (Hellenic NMS, 1990). Wind chill factors will approach 0°F (-18°C) during strong cold air outbreaks (Boras) in December through March. See Table 3-1 for wind chill values under various wind speed/temperature conditions. Snow and hoar frost have also been experienced during those months. See NTAG Vol. III (1980) for a case study description of Bora events.

The worst conditions at the Port occur when migratory cyclones approach from the west, resulting in southerly flow over the region. Winds frequently reach 34 to 47 kt (force 8-9) and waves 7 to 10 ft (2-3 m) at the preferred anchorage southeast of the harbor entrance, increasing to 10-13 ft (3-4 m) over fully exposed areas of the Bay. Southerly winds of 48-55 kt (force 10) have been recorded (Hellenic NMS, 1990). While the harbor is protected, the anchorages are fully exposed.

A second cause of southerly winds are Sciroccos that approach from the south or southwest after forming over North Africa. Due to the dust carried by these systems "Red Rain" may be experienced. Sciroccos tend to persist for several days with intensity and duration increasing from late winter into early spring.

Occasional thunderstorms are experienced with passing frontal systems which are generally associated with migratory lows. Restrictions to visibility are limited to precipitation and low cloud effects.

Table 3-1. Wind Chill. The cooling power of the wind expressed as "Equivalent Chill Temperature" (adapted from Kotsch, 1983).

Wind Speed		Cooling Power of Wind expressed as "Equivalent Chill Temperature"								
Knots	MPH	Temperature (°F)								
Calm	Calm	40	35	30	25	20	15	10	5	0
		Equivalent Chill Temperature								
3-6	5	35	30	25	20	15	10	5	0	-5
7-10	10	30	20	15	10	5	0	-10	-15	-20
11-15	15	25	15	10	0	-5	-10	-20	-25	-30
16-19	20	20	10	5	0	-10	-15	-25	-30	-35
20-23	25	15	10	0	-5	-15	-20	-30	-35	-45
24-28	30	10	5	0	-10	-20	-25	-30	-40	-50
29-32	35	10	5	-5	-10	-20	-30	-35	-40	-50
33-36	40	10	0	-5	-15	-20	-30	-35	-45	-55

B. SPRING (March through May)

The spring transition is prolonged with alternating periods of winter- and summer-like conditions. Migratory winter-like cyclones can be experienced well into May. The regional prevailing winds during non-storm periods remain northerly. Locally, the Gulf tends to be very calm in the morning and late evening with a moderate sea breeze of 7 to 16 kt (force 3-4) developing between noon and 1800 local time.

The frequency, intensity, and extent of Scirocco conditions are at a maximum during spring. Sciroccos tend to develop slowly over a day or two, but they may persist for several days. Over Greece, Sciroccos generally bring cloudy conditions and light rain mixed with dust (Red Rains). At the Port winds of 22 to 33 kt and waves of 4 to 7 ft (1-2 m) are typical for Scirocco events.

C. SUMMER (June through September)

Typical mediterranean climate conditions, nearly cloud and precipitation free with mild temperatures (daily highs in upper 80's, nightly lows in mid 60's), dominate. There are no truly hazardous weather conditions during summer. The prevailing regional winds remain northerly in response to the development of the thermal low over southwestern Asia with relatively high pressure over the Mediterranean. A low pressure trough extends westward, from the thermal low, along the southern coast of Turkey. Except during periods of enhanced northerly flow, discussed in the following paragraph, the Gulf tends to be very calm in the morning and early evening with a moderate sea breeze of 7 to 16 kt (force 3-4) developing between noon and 1800 local time.

The intensity and position of the thermal trough determines the regional wind/weather conditions. Enhanced northerly flow of 17 to 27 kt (force 5-6) develops over the local area when the thermal trough is most intense and/or shifted to its western most position off southwest Turkey. These events are called Meltemi in Greece and are part of the regional Etesian wind pattern which influences the Aegean Sea, Balkan Peninsula, and Asia Minor during summer. The Etesian is, in turn, a regional aspect of the continental scale monsoonal flow of Asia. Etesian events, and therefore Meltemi events, tend to persist for several days. During these events the southerly local sea breeze along southward-facing coasts will counter the northerly gradient flow resulting in decreased wind speeds during the afternoon.

While no local indicators were identified during the 1990 Port visit to Kalamata, the tendency for an increase in clouds the day before and first day of Etesian events was noted in Reiter (1971), is a well-known fact by Aegean Sea fishermen. Thunderstorm activity tends to occur over Greece on the day before and the first day of an Etesian during May-June and

September-October periods. During July and August the clouds are typically limited to scattered altocumulus on the day preceding the Etesian.

D. AUTUMN (October)

The most hazardous aspect of weather in autumn, as elsewhere in the Mediterranean, is the rapidity with which the winter-type pattern is established. On average, over the northern Mediterranean, the winter pattern is established around the end of the third week of October. While the first storms are not likely to be as intense as some later in the winter, the marked change from the summer Mediterranean weather can catch people unaware and unprepared. A migratory cyclone approaching from the west is the most likely early season event. Conditions for migratory lows are addressed in the Winter Section and described in detail in Brody and Nestor (1980).

3.6 Harbor and Anchorage Protection

To some degree the harbor and anchorage are protected from the prevailing northerly winds by the terrain of the Island. The harbor, defined by a long east-west breakwater and a shorter north-south one on its eastern end, provides protection from all high-wave conditions. Entrance is made from the east between the ends of the two breakwaters. The entrance and channel to the inner harbor are both narrow and are aligned east-west. Entrance and departure in bad weather is not recommended, especially if there is significant wind (FICEURLANT, 1987). During strong wind events the wind direction is generally either northerly or southerly, both resulting in cross-wind conditions for entry or departure of the harbor.

The anchorages are exposed to southerly wind and waves. The preferred anchorage area, located southeast of the harbor en-

trance, provides the best protection from wind and waves regardless of direction and also the shortest run to the harbor. Under strong winds anchor dragging may occur in areas south and west of the harbor.

3.6.1 Wind and Weather

The weather of the region is generally good. Northerly winds prevail except under the warm season afternoon southerly sea breeze regime. Winter migratory cyclones bring occasional periods of strong southerly wind and waves with low overcast and light rain/drizzle. Also during winter, Boras result in strong northerly winds and cold temperatures. Wind chill factors to near 0°F (-18°C) occur from December through March. During late winter and early spring Sciroccos, moving out of North Africa, can result in gale force southerly winds, moderate waves/swell, widespread low clouds and light rain/drizzle. The strongest summer Etesian events, on occasion, bring storm force northerly winds to the area. During all strong wind events, but particularly during northerly flow, squally gusty conditions are likely over coastal waters of the Bay due to the surrounding steep terrain. The coastal waters west of the headland of Cape Tainaron has been noted as an area of intense squalls during strong northerly wind events (Hydrographer of the Navy, 1970).

3.6.2 Waves and Swell

Only during the periods of strong southerly winds do any significant waves/swell reach the local area. During the approach and passage of the most intense eastward moving cyclones swell of 10 to 13 ft (3-4 m) will be experienced. Reflection off the south-facing breakwater can compound the wave hazards for small boat operations. The squally nature of near-shore conditions may result in local winds being out of phase with deep

water generated waves/swell. Most of the time the Bay is very calm, particularly during the early morning periods.

3.7 Protective and Mitigating Measures

3.7.1 Moving to a New Anchorage

During the Port Visit, no indication was given of past conditions that had required vessels to sortie. The Port Directory (FICEURLANT, 1987' states that although the harbor affords good shelter year-around, entrance or departure in bad weather is not recommended, especially if there is significant wind.

During strong northerly winds the harbor area provides as good protection as other regional locations. Under strong southerly flow better protection can be found in a number of regional locations including Kerkira (Corfu) harbor and anchorage, and the anchorage northeast of Kithira Island.

3.7.2 Scheduling

During the summer the southerly sea breeze may cancel out or at least locally decrease the regional northerly gradient winds. Lightest day-time wind conditions will then occur during the afternoon. More typically, light winds and near calm seas occur during early morning.

The wind shift from prevailing northerly flow to easterly and then southeasterly, as migratory cyclones approach, can be quite rapid. The area protection by terrain is lost when the wind shifts to southeast, resulting in rapid deterioration of conditions over the entire Bay. Scheduling of wind- and wave-sensitive events such as entry/departure of the harbor should be accelerated when southerly wind conditions are anticipated.

3.7.3 Small Boat Operations

The most protected and fastest run from the harbor to anchored vessels is to/from southeast of the harbor entrance. While small boat operations outside the harbor are likely to be curtailed during gale force or stronger winds, the runs to/from the southeast will be the least affected. Under southerly winds, wave reflection off the south-facing breakwater will cause additional hazards to small boats during runs and alongside operations. When winter Bora conditions develop cold-weather procedures should be followed.

3.8 Local Indicators of Hazardous Weather Conditions

No local indicators were noted during the Port Visit of 1990. Reiter (1971) reported that increasing cloudiness over the Balkan Peninsula and Aegean Sea on the day preceding the establishment of an Etesian wind event was a well-known fact by local fishermen. During the periods of May-June and September-October, thunderstorms and lightning frequently occur on the day preceding the outbreak of the Etesian as well as on the first day of the Etesian. During July and August, when the most stable atmospheric conditions exist over the Mediterranean, altocumulus are typically noted on the day preceding the onset of the Etesian. Another regional indicator is a deck of altocumulus approaching from the southwest in advance of a Scirocco. The occurrence of southerly swell over the Bay, while local winds remain northerly or have shifted to easterly, is a strong indicator of an approaching southerly wind event. Brody and Nestor (1980) summarize various regional indicators for the Aegean Sea area.

3.9 Summary of Problems, Actions, and Indicators

Table 3-2 is intended to provide easy-to-use seasonal references for forecasters on ships using the Port of Kalamata.

Table 2-1 (Section 2) summarizes Table 3-2 and is intended primarily for use by ship captains.

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Table 3.2. Potential Problem Situations a

VESSEL LOCATION/ SITUATION AFFECTED	POTENTIAL HAZARD	EFFECT - PRECAUTI(
1. Anchored Late autumn, winter and spring - most intense in winter	a. S'ly winds and waves - Migratory Cyclones: Most hazardous conditions. Typically 34 to 47 kt, extremes of 48-55 kt, waves 10-13 ft in exposed areas. Duration generally less than two days. May be followed by strong N'lys and cold outbreak.	a. Exposed to open sea age to southeast of har tected and has best hol breakwater fully expose poor, and wave reflecti choppy confused wave co tugs available.
Most likely late winter into spring - most intense in early spring	b. S'ly wind and waves - Scirocco: winds 22-33 kt, waves 4 to 7 ft. Low clouds, light rain and drizzle, may contain dust. Anomalous radar propagation, radio ranges restricted.	b. Exposed to open sea age to southeast of har tected and has best hol breakwater fully expose poor, and wave reflecti choppy confused wave co tugs available. Condit ardous than during pass clones.
Most frequent in summer, occurs all seasons.	c. N'ly winds - Boras in winter, Etesians in summer. Winter: Strongest events reach 41 to 55 kt. Gusty, squally weather, rapid onset. Cold outbreaks, snow showers may occur. Summer: Winds 17 to 27 kt. Stronger winds at sea, particularly to the east over Aegean Sea.	c. Gusty, squally condit at anchor. Anchor drag er water, adjust scope a squalls wind directions quently and rapidly impe alongside/well deck oper anchoring maneuvering. be minimized during thes tugs available. Cold wo may be necessary during

Table 3.2. Potential Problem Situations at the Port of Kalamata, Greece -- All Seasons

NTIAL HAZARD	EFFECT - PRECAUTIONARY/EVASIVE ACTION	ADVANCE INDI INFORMATION AI
ds and waves - Mi- lones: Most hazard- ons. Typically 34 to emes of 48-55 kt, ft in exposed areas. nerally less than two be followed by strong old outbreak.	a. Exposed to open sea wind and waves. Anchorage to southeast of harbor entrance most protected and has best holding. Anchorage south of breakwater fully exposed, holding only fair to poor, and wave reflection off breakwater causes choppy confused wave conditions. There are no tugs available.	a. Strong southerly by cyclones and frc west, generally fol with intensificatic the Ionian Sea. Mc events will occur w the west intensify they are associated Adriatic Sea, syste most intense. If a area to the north, travel eastward, if northeastward.
id and waves - Sci- ids 22-33 kt, waves 4 ow clouds, light rain , may contain dust. adar propagation, es restricted.	b. Exposed to open sea wind and waves. Anchorage to southeast of harbor entrance most protected and has best holding. Anchorage south of breakwater fully exposed, holding only fair to poor, and wave reflection off breakwater causes choppy confused wave conditions. There are no tugs available. Conditions generally less hazardous than during passage of migratory cyclones.	b. Sciroccos occur sions move northeas Sea. To reach the oped 500 mb trough Europe across the M ca is necessary. S fog and drizzle, re sional heavy rain. likely over exposed
ids - Boras in winter, summer. Strongest events to 55 kt. Gusty, weather, rapid onset. breaks, snow showers ir. Winds 17 to 27 kt. winds at sea, par- ly to the east over ea.	c. Gusty, squally conditions may cause swinging at anchor. Anchor dragging will be toward deeper water, adjust scope accordingly. During squalls wind directions and speeds change frequently and rapidly impeding boat handling, alongside/well deck operations, and berthing/ anchoring maneuvering. Vessel movements should be minimized during these events. There are no tugs available. Cold weather gear/operations may be necessary during winter events.	c. Boras and Etesia ents between high p Europe and low pres terranean. A cold panies Boras and sp basic synoptic patt ridge and deepening eastward from weste winter the primary high moving southea two days before ons the Balkans on day the Mediterranean n the onset. During located over Greece with ridging buildi Etesians develop wh ing westward from A coast of Turkey bec ing cloudiness deve la the day before c during July and Aug May-June and Septem

mata, Greece -- All Seasons

ACTION	ADVANCE INDICATORS AND OTHER INFORMATION ABOUT POTENTIAL HAZARDS
Anchor- pro- south of air to causes are no	a. Strong southerly winds are most often caused by cyclones and fronts approaching from the west, generally follow Genoa low development with intensification or secondary development in the Ionian Sea. Most rapid onset and strongest events will occur when systems approaching from the west intensify over the Ionian Sea. When they are associated with a strong Bora over the Adriatic Sea, systems over the Ionian Sea become most intense. If a cold surge dominates the area to the north, Ionian Sea cyclones will travel eastward, if not, cyclones will move northeastward.
Anchor- pro- south of air to causes are no ss haz- cy-	b. Sciroccos occur when North African depressions move northeastward over the Mediterranean Sea. To reach the Aegean Sea area a well developed 500 mb trough that extends from southern Europe across the Mediterranean into North Africa is necessary. Sciroccos bring low stratus, fog and drizzle, reduced visibility and occasional heavy rain. Gale force wind speeds are likely over exposed marine areas.
winging rd deep- ing e fre- ng, hing/ should are no tions	c. Boras and Etesians are caused by steep gradients between high pressure over southeastern Europe and low pressure over the eastern Mediterranean. A cold air outbreak typically accompanies Boras and spring/autumn Etesians. The basic synoptic pattern at 500 mb is a migratory ridge and deepening trough in advance moving eastward from western Europe. During autumn and winter the primary surface feature is a strong high moving southeastward from near Scotland, two days before onset over the Aegean, to over the Balkans on day of onset. A weak low over the Mediterranean moves eastward in advance of the onset. During the spring an intense low is located over Greece two days before the onset with ridging building behind the low. Summer Etesians develop when the thermal trough extending westward from Asia Minor along the southern coast of Turkey becomes most intense. Increasing cloudiness develops over the Balkan Peninsula the day before onset, generally altocumulus during July and August and thunderstorms during May-June and September-October.

VESSEL LOCATION/ SITUATION AFFECTED	POTENTIAL HAZARD	EFFECT - PRECAUTION
2. Small Boat Operations Late autumn, winter and spring - most intense in winter	a. S'ly winds and waves - Migratory Cyclones: Most hazardous conditions. Typically 34 to 47 kt, extremes of 48-55 kt, waves 10-13 ft in exposed areas. Duration generally less than two days. May be followed by strong N'lys and cold outbreak.	a. Small boat operations tailed. Alongside and we additionally hazardous di periods due to variations swell directions and peri off breakwater causes cha ditions in areas south o ous and shortest runs are of harbor entrance.
Most likely late winter into spring - most intense in early spring	b. S'ly wind and waves - Scirocco: winds 22-33 kt, waves 4 to 7 ft. Low clouds, light rain and drizzle, may contain dust. Anomalous radar propagation, radio ranges restricted.	b. Small boat operations ous, use due caution.
Most frequent in summer, occurs all seasons.	c. N'ly winds - Boras in winter, Etesians in summer. Winter: Strongest events reach 41 to 55 kt. Gusty, squally weather, rapid onset. Cold outbreaks, snow showers may occur. Summer: Winds 17 to 27 kt. Stronger winds at sea, particularly to the east over Aegean Sea.	c. Small boat operations tailed. Rapidly changin tions will cause handlin tion problems. Large ve swinging at anchor.

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Table 3.2 continued

AZARD	EFFECT - PRECAUTIONARY/EVASIVE ACTION	ADVANCE INDICATORS INFORMATION ABOUT PO
aves - Mi- Most hazard- pically 34 to 48-55 kt, xposed areas. less than two wed by strong reak.	a. Small boat operations outside harbor curtailed. Alongside and well deck operations additionally hazardous during frontal passage periods due to variations of local wind wave and swell directions and periods. Wave reflection off breakwater causes choppy confused wave conditions in areas south of harbor. Least hazardous and shortest runs are to anchorage southeast of harbor entrance.	a. Strong southerly winds a by cyclones and fronts appr west, generally follow Geno with intensification or sec the Ionian Sea. Most rapid events will occur when syst the west intensify over the they are associated with a Adriatic Sea, systems over most intense. If a cold su area to the north, Ionian S travel eastward, if not, cy northeastward.
ves - Sci- kt, waves 4 s, light rain ntain dust. pagation, cted.	b. Small boat operations outside harbor hazardous, use due caution.	b. Sciroccos occur when Nor sions move northeastward ov Sea. To reach the Aegean S oped 500 mb trough that ext Europe across the Mediterra ca is necessary. Sciroccos fog and drizzle, reduced vi sional heavy rain. Gale fo likely over exposed marine
as in winter, t events t. Gusty, rapid onset. snow showers 7 to 27 kt. t sea, par- east over	c. Small boat operations outside harbor curtailed. Rapidly changing wind speeds and directions will cause handling and alongside operation problems. Large vessels likely to be swinging at anchor.	c. Boras and Etesians are c ents between high pressure Europe and low pressure ove terranean. A cold air outb panies Boras and spring/aut basic synoptic pattern at 5 ridge and deepening trough eastward from western Europ winter the primary surface high moving southeastward f two days before onset over the Balkans on day of onset the Mediterranean moves eas the onset. During the spri located over Greece two day with ridging building behin Etesians develop when the t ing westward from Asia Minc coast of Turkey becomes mos ing cloudiness develops ove la the day before onset, ge during July and August and May-June and September-Octc

'EVASIVE ACTION	ADVANCE INDICATORS AND OTHER INFORMATION ABOUT POTENTIAL HAZARDS
de harbor cur- ck operations frontal passage ocal wind wave and Wave reflection onfused wave con- or. Least hazard- nchorage southeast	a. Strong southerly winds are most often caused by cyclones and fronts approaching from the west, generally follow Genoa low development with intensification or secondary development in the Ionian Sea. Most rapid onset and strongest events will occur when systems approaching from the west intensify over the Ionian Sea. When they are associated with a strong Bora over the Adriatic Sea, systems over the Ionian Sea become most intense. If a cold surge dominates the area to the north, Ionian Sea cyclones will travel eastward, if not, cyclones will move northeastward.
de harbor hazard-	b. Sciroccos occur when North African depressions move northeastward over the Mediterranean Sea. To reach the Aegean Sea area a well developed 500 mb trough that extends from southern Europe across the Mediterranean into North Africa is necessary. Sciroccos bring low stratus, fog and drizzle, reduced visibility and occasional heavy rain. Gale force wind speeds are likely over exposed marine areas.
de harbor cur- speeds and direc- alongside opera- likely to be	c. Boras and Etesians are caused by steep gradients between high pressure over southeastern Europe and low pressure over the eastern Mediterranean. A cold air outbreak typically accompanies Boras and spring/autumn Etesians. The basic synoptic pattern at 500 mb is a migratory ridge and deepening trough in advance moving eastward from western Europe. During autumn and winter the primary surface feature is a strong high moving southeastward from near Scotland, two days before onset over the Aegean, to over the Balkans on day of onset. A weak low over the Mediterranean moves eastward in advance of the onset. During the spring an intense low is located over Greece two days before the onset with ridging building behind the low. Summer Etesians develop when the thermal trough extending westward from Asia Minor along the southern coast of Turkey becomes most intense. Increasing cloudiness develops over the Balkan Peninsula the day before onset, generally altocumulus during July and August and thunderstorms during May-June and September-October.

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*Now Naval Research Laboratory, Monterey, CA 93943-5006.

Port Visit Information

May 1990. NOARL Meteorologists R. Fett and R. Miller met with Mr. D. Tsagogeogras, Senior Pilot to obtain much of the information included in this port evaluation.

APPENDIX A

General Purpose Oceanographic Information

This section provides some general definitions regarding waves and is extracted from H.O. Pub. No. 603, Practical Methods for Observing and Forecasting Ocean Waves (Pierson, Neumann, and James, 1955).

Definitions

Waves that are being generated by local winds are called "SEA". WAVES that have traveled out of the generating area are known as "SWELL". Seas are chaotic in period, height and direction while swell approaches a simple sine wave pattern as its distance from the generating area increases. An in-between state exists for a few hundred miles outside the generating area and is a condition that reflects parts of both of the above definitions. In the Mediterranean area, because its fetches and open sea expanses are limited, SEA or IN-BETWEEN conditions will prevail. The "SIGNIFICANT WAVE HEIGHT" is defined as the average value of the heights of the one-third highest waves. PERIOD and WAVE LENGTH refer to the time between passage of, and distances between, two successive crests on the sea surface. The FREQUENCY is the reciprocal of the period ($f = 1/T$); therefore as the period increases the frequency decreases. Waves result from the transfer of energy from the wind to the sea surface. The area over which the wind blows is known as the FETCH, and the length of time that the wind has blown is the DURATION. The characteristics of waves (height, length, and period) depend on the duration, fetch, and velocity of the wind. There is a continuous generation of small short waves from the time the wind starts until it stops. With continual transfer of energy from the wind to the sea surface the waves grow with the older waves leading the growth and spreading the energy over a greater range of frequencies. Throughout the growth cycle a SPECTRUM of ocean waves is being developed.

A Beaufort Scale table with related wave effects is shown on the following page.

BEAUFORT SCALE

Beaufort Number	Wind Speed Knots	Wind Speed MPH	Seaman's term	Effects observed at sea	Term and height of Waves in meters
0	Under 1	Under 1	Calm	Sea like mirror.	Calm, glassy, 0
1	1-3	1-3	Light air	Ripples with appearance of scales; no foam crests.	Rippled, less than 0.5
2	4-6	4-7	Light breeze	Small wavelets; crests of glassy appearance, not breaking	Smooth, 0.5
3	7-10	8-12	Gentle breeze	Large wavelets; crests begin to break; scattered whitecaps.	Slight, 1.0
4	11-16	13-18	Moderate breeze	Small waves, becoming longer; numerous whitecaps.	Moderate, 1.0-2.5
5	17-21	19-24	Fresh breeze	Moderate waves, taking longer form; many whitecaps; some spray.	Rough, 2.5-4.0
6	22-27	25-31	Strong breeze	Larger waves forming; whitecaps everywhere; more spray.	Very rough, 4.0-6.0
7	28-33	32-38	Moderate gale	Sea heaps up; white foam from breaking waves begins to be blown up in streaks.	
8	34-40	39-46	Fresh gale	Moderate high waves; edges of crests begin to break; foam is blown in steaks.	
9	41-47	47-54	Strong gale	High waves; sea begins to roll; dense streaks of foam; spray may reduce visibility.	
10	48-55	55-63	Whole gale	Very high waves with overhanging crests; sea takes white appearance as foam is blown in very dense streaks; rolling is heavy and visibility reduced.	High, 6.0-9.0
11	56-63	64-72	Storm	Exceptionally high waves; sea covered with white foam patches; visibility still more reduced.	Very high, 9.0-13.5
12 13 14 15 16 17	64-71 72-80 81-89 90-99 100-108 109-118	73-82 83-92 93-103 104-114 115-125 126-136	Hurricane	Air filled with foam; sea completely white with driving spray; visibility greatly reduced. Winds of force 12 and above very rarely experienced on land; usually accompanied by widespread damage.	Phenomenal, greater than 13.5

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24A1	Naval Air Force Commander LANT
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24E	Mine Warfare Command
24G1	Submarine Force Commander LANT
26QQ1	Special Warfare Group LANT
28A1	Carrier Group LANT (2)
28B1	Cruiser-Destroyer Group LANT (2)
28D1	Destroyer Squadron LANT (2)
28J1	Service Group and Squadron LANT (2)
28K1	Submarine Group and Squadron LANT
28L1	Amphibious Squadron LANT (2)
29A1	Guided Missile Cruiser LANT
29B1	Aircraft Carrier LANT
29D1	Destroyer LANT (DO 931/945 Class)
29E1	Destroyer LANT (DO 963 Class)
29F1	Guided Missile Destroyer LANT
29G1	Guided Missile Frigate (LANT)
29I1	Frigate LANT (FF 1098)
29J1	Frigate LANT (FF 1040/1051 Class)
29K1	Frigate LANT (FF 1052/1077 Class)
29L1	Frigate LANT (FF 1078/1097 Class)
29N1	Submarine LANT (SSN)
29Q	Submarine LANT SSBN
29R1	Battleship Lant (2)
29AA1	Guided Missile Frigate LANT (FFG 7)
29BB1	Guided Missile Destroyer (DDG 993)
31A1	Amphibious Command Ship LANT (2)
31B1	Amphibious Cargo Ship LANT
31G1	Amphibious Transport Ship LANT
31H1	Amphibious Assault Ship LANT (2)
31I1	Dock Landing Ship LANT
31J1	Dock Landing Ship LANT
31M1	Tank Landing Ship LANT
32A1	Destroyer Tender LANT
32C1	Ammunition Ship LANT
32G1	Combat Store Ship LANT
32H1	Fast Combat Support Ship LANT
32N1	Oiler LANT
32Q1	Replenishment Oiler LANT
32S1	Repair Ship LANT
32X1	Salvage Ship LANT

32DD1	Submarine Tender LANT
32EE1	Submarine Rescue Ship LANT
32KK	Miscellaneous Command Ship
32QQ1	Salvage and Rescue Ship LANT
32TT	Auxiliary Aircraft Landing Training Ship
42N1	Air Anti-Submarine Squadron VS LANT
42P1	Patrol Wing and Squadron LANT
42BB1	Helicopter Anti-Submarine Squadron HS LANT
42CC1	Helicopter Anti-Submarine Squadron Light HSL LANT
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This handbook for the port of Kalamata, one in a series of severe weather guides for Mediterranean ports, provides decision-making guidance for ship captains whose vessels are threatened by actual or forecast strong winds, high seas, restricted visibility or thunderstorms in the port vicinity. Causes and effects of such hazardous conditions are discussed. Precautionary or evasive actions are suggested for various vessel situations. The handbook is organized in four sections for ready reference: general guidance on handbook content and use; a quick-look captain's summary; a more detailed review of general information on environmental conditions; and an appendix that provides oceanographic information.

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