

Unit 11

MARINE METEOROLOGY

Basic terms

<i>weather report</i>	<i>fair-weather system</i>
<i>pressure</i>	<i>bad-weather system</i>
<i>barometer</i>	<i>centre of depression</i>
<i>anticyclone</i>	<i>halo</i>
<i>heavy winds / rain</i>	<i>veering wind</i>
<i>haze</i>	<i>backing wind</i>
<i>mist</i>	<i>thunderstorm</i>
<i>depression</i>	<i>heavy seas</i>

Meteorology is the study of weather patterns with the object of predicting change in the weather. It is a complex science, based on current weather reports over a large area, and it is of great importance to navigators (recent units are given in hecto-pascals).

To the navigator the **atmospheric pressure** in the vicinity of his position at sea is the most important guide he has to the likely behaviour of the weather in the immediate future.

Atmospheric pressure is measured by the height of a column of mercury. Another method of measuring atmospheric pressure is with an aneroid barometer. The average atmospheric pressure at sea level in millibars is 1,013 in winter and 1,016 in summer.

There are two main **weather systems** in the general weather patterns, anticyclones and depressions.

In the northern hemisphere an **anticyclone** is a system of wind which circulates spirally in a clockwise direction around an area of high pressure, which can at times cover an area of immense size. In the southern hemisphere the anticyclone wind circulates in an anti-clockwise direction, though still around a high pressure area. The stronger winds are found at the outer limits of the anticyclone, those nearer the centre being very light or at times non-existent. This is always a fair-weather system, with the air dry and the wind strength never more than moderate.

Anticyclones (or highs) are normally slow moving and sometimes stationary for quite long periods. The approach of an anticyclone can usually be predicted by a steadily rising barometer and a clearing sky.

In a **depression** (or a low), basically a bad-weather system, the wind blows in an anti-clockwise direction about a centre of low pressure in the northern hemisphere, and in a clockwise direction in the southern hemisphere. The winds are usually high, sometimes violent, often accompanied by heavy rain, and strongest near the centre of the low pressure area where the barometer gradient is steepest. Depressions usually move swiftly, at an average rate of about 25 miles an hour.

A navigator needs to know where the centre of a depression is in relation to the position of his vessel, in order to avoid the area of highest wind. The approach of a depression can be foretold by a falling barometer, a backing wind, and the appearance in the sky of cirrus clouds. Further evidence of an approaching depression is a halo, or white luminous ring, around the sun or moon, and banking up of low, heavy cloud.

Most **meteorological** or **weather reports** consist of three principal parts:

Part 1 - **Warning** (***gale, storm, hurricane, fog, sand storm***), *nil or no warning*.

Part 2 - **Synopsis** *of surface weather or weather situation or inference (i.e. description of weather systems such as depressions and anti-cyclones).*

Part 3 - Weather **forecast**: *outlook (12 hours) and further outlook (outlook for the next 12 hours).*

LES 102 - MSG 355 - MetWarn/Fore Safety Call to Area: 1 - NoPos
BT CSAT 23423440010402 15-JAN-1999 09:29:08 600998

SECURITE

HIGH SEAS WEATHER BULLETIN FOR METAREA 1 FROM BRACKNELL UNITED
KINGDOM ISSUED AT 0800 UTC FRI 15 JANUARY 1999

Part One: **STORM WARNING**

AT 150000UTC, LOW 58 NORTH 21 WEST 960 EXPECTED 62 NORTH 09 WEST
927 BY 160000UTC.

WINDS WILL REACH STORM FORCE 10 TO HURRICANE
FORCE 12 IN THE SOUTHERN SEMICIRCLE WITHIN 300 MILES OF THE
CENTRE.

WINDS WILL ALSO REACH STORM FORCE 10 IN THE NORTHWESTERN QUADRANT
WITHIN 300 MILES OF THE CENTER.

AT 150000UTC, LOW 63 NORTH 32 WEST 960 EXPECTED 58 NORTH 27 WEST
968 BY 160000UTC. WINDS WILL REACH STORM FORCE 10 IN THE
SOUTHWESTERN QUADRANT BETWEEN 100 MILES AND 350 MILES FROM THE
CENTRE.

WINDS WILL ALSO INCREASE TO STORM FORCE 10 IN THE DENMARK STRAIT

Part Two: **GENERAL SYNOPSIS**

AT 150000UTC, LOW 58 NORTH 21 WEST 960 EXPECTED 62 NORTH 09 WEST
927 BY 160000UTC.

LOW 63 NORTH 32 WEST 968 EXPECTED 58 NORTH 27
WEST 968 BY SAME TIME. HIGH 35 NORTH 30 WEST 1034 MOVING STEADILY
SOUTHWEST AND DECLINING, LOSING ITS IDENTITY BY THAT TIME

Part Three: **AREA FORECASTS** FOR NEXT 24 HOURS

SOUTHEAST ICELAND

EAST 6 OR 7 BACKING NORTHEAST GALE 8 TO STORM 10. SHOWERS THEN
RAIN. MODERATE OR POOR

EAST NORTHERN SECTION

IN NORTH, CYCLONIC IN EAST AT FIRST, OTHERWISE NORTH OR NORTHEAST
7 TO SEVERE GALE 9, OCCASIONALLY STORM 10 IN EAST AT FIRST.

SQUALLY WINTRY SHOWERS. MODERATE.

IN SOUTH, WESTERLY GALE 8 TO STORM 10, OCCASIONALLY VIOLENT STORM
11 TO HURRICANE FORCE 12 IN THE EAST AT FIRST, DECREASING 6 TO
GALE 8. WINTRY SHOWERS. MODERATE OR POOR

WEST CENTRAL SECTION

IN NORTH, WESTERLY GALE 8 TO STORM 10. SQUALLY WINTRY SHOWERS.
MODERATE OR GOOD. LIGHT ICING IN SOUTH, NORTHWESTERLY 7 TO SEVERE
GALE 9. SQUALLY WINTRY SHOWERS.

MODERATE OR GOOD

NORWEGIAN SEA AND DENMARK STRAIT

EAST OF 00 DEGS WEST, SOUTHEASTERLY 6 TO GALE 8 INCREASING SEVERE
GALE 9. WINTRY SHOWERS THEN RAIN. GOOD BECOMING MODERATE OR POOR.
FROM 10 DEGS WEST TO 00 DEGS WEST, SOUTHEASTERLY BACKING
NORTHEASTERLY 6 TO GALE 8 INCREASING SEVERE GALE 9. SNOW SHOWERS
THEN RAIN. MODERATE OR POOR.

WEST OF 10 DEGS WEST, NORTHEASTERLY 7 TO SEVERE GALE 9 ,
OCCASIONALLY STORM 10 IN THE DENMARK STRAIT AND FOR A TIME NEAR
NORTHEASTERN ICELAND. SNOW SHOWERS MODERATE OR POOR. TEMPERATURES
MS02 TO MS06 WITH MODERATE OR SEVERE ICING

IMO STANDARD MARINE COMMUNICATION PHRASES
(SMCP 2001)

**III/3.1 - WARNINGS INVOLVING
METEOROLOGICAL AND HYDRO LOGICAL
CONDITIONS**

3.1.1 - Winds, storms, tropical storms, sea state

What is wind direction and force in your position/in position... ?

- Wind direction ... (compass points), force Beaufort ... in my position/in position...

Is wind backing/veering?

- Wind backing/veering.

Is wind expected to increase/decrease?

- Wind expected to increase/decrease.

What is latest gale warning?

- Latest gale warning is as follows: Gale warning. Winds at... UTC in area ... (metarea) from direction ... (compass points) and force Beaufort ... backing/veering to ...

What is atmospheric pressure in your position/in position... ?

- Atmospheric pressure... millibars.

What maximum winds are expected in storm area?

- Maximum winds of... knots expected in storm area.

What is sea state in your position/in position... ?

- Sea/swell in my position/in position metres from ... (compass points).

Is sea state expected to change (within next hours)?

- No, sea state not expected to change (within next hours).
- Yes, sea/swell of... metres from ... (compass points) expected (within next hours).

3.1.2 - Restricted visibility (due to mist/fog, precipitation)

What is visibility in your position/in position... ?

- **Visibility in my position/in position metres/nautical miles.**
- **Visibility reduced by mist/fog/snow/dust/rain.**
- **Visibility increasing/decreasing/variable.**

Is visibility expected to change in my position/in position... (within next hours)?

- **Yes, visibility expected to increase/decrease to ... metres/nautical miles in your position/in position ... (within next hours).**

What is latest ice information?

- **Ice warning. Ice/iceberg(s) located in position... /reported in area around**

A. Comprehension & vocabulary

A.1 Decide whether the following statements are true or false:

1. Meteorology is an exact science today.
2. A sudden change of pressure is an important guide for the navigator.
3. In an anticyclone the winds are usually moderate.
4. A depression is basically a fair-weather system.
5. A depression has low air pressure in the centre.
6. Anticyclones are accompanied by heavy rain.
7. Anticyclones are predicted by a steadily rising barometer.
8. Cyclonic weather is predicted by a clearing sky.

A.2 Supply the missing terms

• *tropical storm* • *hectopascals* • *average* • *wind* • *heavy*
• *hectopascals* • *depression* • *falling* • *settled* • *weather*
• *moderate* • *pressure*

1. Every rise in the _____ does not foretell an anticyclone and every fall does not foretell a _____.
2. Variations of three to four _____ except in the tropics, are fairly normal.
3. Five hp above and steady or still rising barometer indicates _____ weather with light to _____ winds.
4. A barometer reading of five hectopascals, below normal, with the barometer still _____, is an indication of a period of unsettled _____.
5. In the tropics a fall of three mb below the _____ needs to be treated with caution.
6. If it lasts for two or three days, it is a sure predication of a _____.
7. In other areas the pressure of less than 1000 _____, and the barometer falling rapidly at one hp per hour, indicates strong _____ and _____ rain.

A.3 Insert the following missing meteorological terms:

• *heavy* • *visibility* • *veer* • *drizzle* • *front* • *direction*
• *warm* • *speed* • *cold* • *sky* • *rain* • *wind* • *approach*
• *speed* • *haze* • *sleet* • *cold front*

1. In modern meteorological language wind-shift lines are called _____ ; three types of fronts are recognized: _____ fronts, _____ fronts, and occluded fronts.
2. The meteorological elements of special interest to the navigator are wind _____, wind _____, appearance of the _____ and frontal _____.
3. The _____ of a well-defined warm front is indicated in middle and high latitudes by solidly overcast skies with more or less steady _____ and diminishing _____. When the warm front arrives, the _____ veers rather suddenly, the rain stops or diminishes to a fine _____.
4. The conditions following the passage of a warm front are succeeded, sooner or later, by passage of a _____.
5. When this occurs, _____ rain begins and the wind _____ suddenly.
6. Precipitation of rain and snow or snow and hail is called _____.
7. In _____ the visibility is reduced to about one mile.

A.4 Answer the following questions:

1. What does meteorology study?
2. What is it based on?
3. How can the navigator best predict the change in weather?
4. What is the atmospheric pressure measured with? Where?
5. What are the two main weather systems?
6. Describe an anticyclone: circulation of wind, pressure at its centre, strength of winds, air, moving, forecasting anticyclones.
7. Describe a depression: circulation of wind, pressure, wind strength, air, moving, forecasting depressions.

A.5 Match the English terms of the Beaufort Wind Scale with the Italian or your language equivalent (see Beaufort Wind Scale, p. 84):

A.6 Working in pairs describe the two weather systems

	ANTI-CYCLONE	DEPRESSION
denotation on weather maps		
Pressure in the centre		
Wind change		
Wind force		
Type of Weather		
Appearance of ther sky		
Precipitations		
Prediction		

B. Grammar

B.1 Put the verbs in brackets into the Simple Present (active or passive):

Tropical storms

Tropical storms (*occur*) _____ in tropical and sub-tropical latitudes in all oceans. They (*have*) _____ different names in different oceans. In the western North Atlantic, eastern North Pacific and western South Pacific they (*know*) _____ as hurricanes. They (*call*) _____ cyclones in the Arabian Sea, Bay of Bengal, South Indian Ocean and the vicinity of North-West Australia. In the western North Pacific they (*refer*) _____ to as typhoons. A monsoon (*not be*) _____ a tropical storm because it (*be*) _____ a seasonal wind which (*occur*) _____ in the Indian and western Pacific Oceans. In the Arabian Sea and in the China Sea a monsoon wind (*reach*) _____ gale force.

B.2 Put the verbs in brackets into the Simple Past, the Past Continuous or the Past Perfect Tense:

Hurricane «Gladys» (1975)

«Gladys» (*follow*) _____ the disturbance from which the hurricane «Faye» (*form*) _____ four days before. «Faye» (*take*) _____ a more northerly track while «Gladys» (*follow*) _____ the south-east along latitude 11°11' N. It (*reach*) _____ tropical depression status near long. 35°00' W and tropical storm strength near long. 40°00' W.

It (*reach*) _____ hurricane intensity before «Faye». As the hurricane (*turn*) _____ to a northerly track the MS «Marconi Trader» (*report*) _____ hurricane-force winds of 70 knots on October 1st. Twenty-four hours later at 18.00 hrs southerly winds of 60 knots (*report*) _____ and a reconnaissance aircraft (*measure*) _____ a central pressure of 939 mb and 120-knot wind. On the 2nd October the «Gladys» (*accelerate*) _____ as it (*pass*) _____ about 70 miles off Cape race. Widespread gales (*cover*) _____ the western Atlantic as «Gladys» (*merge*) _____ with a strong cold front.

A ship which (*run*) _____ into a tropical storm three months earlier (*report*) _____ 44-knot winds early that day.

B.3 Classify the words according to the pronunciation of the stressed vowel:

• *meteorology* • *weather* • *passage* • *atmosphere* •
atmospheric • *mercury* • *barometer* • *barometric* •
anticyclone • *depression* • *hemisphere* • *anticyclonic* •
gradient • *halo* • *hurricane* • *typhoon* • *monsoon* • *gale*
• *facsimile*

/i/	fac <i>si</i> mile
/e/	wea <i>th</i> er
/æ/	
/ɔ/	
/u:/	
/ʌ/	
/ə:/	
/ai/	
/ei/	

B.4 Form adjectives from the following nouns (note the shifting of stress):

NOUN	ADJECTIVE
meteorology	
barometer	
atmosphere	
anticyclone	
climate	
tropics	

C. Translation

C.1 Translate the following dialogue into English:

MV MISTRAL - Messina Radio. Messina Radio. Qui MV Mistral. Quali sono le

condizioni del mare nella tua zona?

- MESSINA RADIO - Mistral. Mistral. Qui Messina Radio. La direzione prevista delle onde è 40 gradi.

MV MISTRAL - Quali condizioni del mare sono previste nella zona 15 gradi Nord e 12 gradi Ovest?

- MESSINA RADIO - Ci sono indicazioni di una forte depressione in formazione in posizione 15 gradi Nord e 12 gradi Ovest. Ci si aspetta che la temperatura dell'aria scenda sotto zero. È prevista una onda lunga e debole. È prevista una riduzione di visibilità.

MV MISTRAL - Come cambia l'intensità e la forza del vento?

- MESSINA RADIO - Il vento è in aumento. Dovreste cambiare rotta finché le condizioni migliorano.

MV MISTRAL - Ricevuto. Aspetterò finché il tempo migliora.

LES 114 - MSG 405 - MetWarn/Fore Safety Call to Area: 5 - NoPos
VIA EMBRATEL 114 TANGUA 2131220MMAR BR 29-JAN-1999 07:53:39 077869

weather and sea bulletin nr 059/99
brazilian navy marine meteorological service
hydrographic office
issued at 0000 gmt fri 01/29/99

weather and sea bulletin 0000 gmt 29 january of 1999

part one warning nil st

part two analysis at 290000 gmt st low 1006 hpa 35sO3lw st trough at 32sO47w 31sO49w and 28sO53w st i t c z at OOnO2Ow 03nO3Ow 05nO4Ow and 03nO5Ow with 3/4 degrees wide with light/moderate showers in whole band st

part three weather forecast valid till 300000 gmt st

area alfa

light/moderate isolated showers and thunderstorms wind se/e 11/16 kts with gusts waves from se/e 0.5/ 1.0 m visib 10/20 km stable temp max 28.Oc min 20.Oc st

areas bravo/charlie

light/moderate isolated showers in extreme north of areas wind ne/n 17/21 kts in bravo area in the north of 27s and se 11/16 kts in the remainder of the areas with gusts during showers waves from ne 2.0/ 3.0 in the area bravo in the north of 27s and 1.0/1.5 m in the remainder of areas visib 04/10 km stable temp max 28.Oc min 24.Oc st

area delta

light/moderate showers and isolated thunderstorms wind ne/n 17/21 kts with gusts during showers waves from ne 2.5/3.0 m in the south of 21s and 1.0/1.5 m in the remainder of the area visib 04/10 km stable temp max 30.Oc min 24.Oc st

area echo

light isolated showers wind ne/n 11/16 kts waves from e 1.0/1.5 m visib 10/20 km stable temp max 30.Oc min 24.oc st

area foxtrot

light/moderate isolated showers wind se/e 11/16 kts waves from e 0.5/ 1.0 m visib 10/20 km stable temp max 32.Oc min 26.Oc st

area golf

light/moderate isolated showers wind e/ne 11/16 kts with gusts during the showers waves from se/e 0.5/ 1.0 m visib 10/20 km stable temp max 32.Oc min 26.Oc st wind e/ne 11/16 kts waves from e/ne 0.5/1.0 m visib 10/20 km stable temp max 28.Oc min 24.Oc st

BEAUFORT WIND SCALE AND SEA DISTURBANCE TABLE

			Equivalent speed at 10 m above sea level				Description in forecasts	State of sea	Probable height of waves* metres
Force	Description	Specification for use at sea*	Mean		Limits				
			knots	metres per second	knots	metres per second			
0	Calm	Sea like a mirror.	0	0.0	<1	0.0-0.2	Calm	Calm	0.0
1	Light air	Ripples with the appearance of scales are formed, but without foam crests.	2	0.8	1-3	0.3-1.5	Light	Calm	0.1 (0.1)
2	Light breeze	Small wavelets, still short but more pronounced. Crests have a glassy appearance and do not break.	5	2.4	4-6	1.6-3.3	Light	Smooth	0.2 (0.3)
3	Gentle breeze	Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered white horses.	9	4.3	7-10	3.4-5.4	Light	Smooth	0.6 (1.0)
4	Moderate breeze	Small waves, becoming longer, fairly frequent white horses.	13	6.7	11-16	5.5-7.9	Moderate	Slight	1.0 (1.5)
5	Fresh breeze	Moderate waves, taking a more pronounced long form; many white horses are formed. Chance of some spray	19	9.3	17-21	8.0-10.7	Fresh	Moderate	2.0 (2.5)
6	Strong breeze	Large waves begin to form; the white foam crests are more extensive everywhere. Probably some spray.	24	12.3	22-27	10.8-13.8	Strong	Rough	3.0 (4.0)
7	Near gale	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind.	30	15.5	28-33	13.9-17.1	Strong	Very rough	4.0 (5.5)
8	Gale	Moderately high waves of greater length; edges of crests begin to break into spindrift. The foam is blown in well-marked streaks along the direction of the wind.	37	18.9	34-40	17.2-20.7	Gale	High	5.5 (7.5)
9	Strong gale	High waves. Dense streaks of foam along the direction of the wind. Crests of waves begin to topple, tumble and roll over. Spray may affect visibility.	44	22.6	41-47	20.8-24.4	Severe gale	Very high	7.0 (10.0)
10	Storm	Very high waves with long overhanging crests. The resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On the whole, the surface of the sea takes a white appearance. The 'tumbling' of the sea becomes heavy and shock-like. Visibility affected.	52	26.4	48-55	24.5-28.4	Storm	Very high	9.0 (12.5)
11	Violent storm	Exceptionally high waves (small and medium-sized ships might be lost to	60	30.5	56-63	28.5-32.6	Violent storm	Pheno- menal	11.5 (16.0)

		view for a time behind the waves). The sea is completely covered with long white patches of foam lying along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility affected.							
12	Hurricane	The air is filled with foam and spray. Sea completely white with driving spray; visibility seriously affected.	-	-	64 and over	32.7 and over	Hurricane force	Phenomenal	14.0 (-)

* These columns are a guide to show roughly what may be expected in the open sea, remote from land. Figures in brackets indicate the probable maximum height of waves. In enclosed waters, or when near land with an offshore wind, wave heights will be smaller and the waves steeper.

Pomorski meteorološki centar Split

VREMENSKO IZVJEŠĆE, dan 12.10.2006 u 19:00 sati

UPOZORENJE

Sutra se u Velebitskom kanalu očekuju mjestimični udari NE vjetra 30-40 čvorova.

SITUACIJA

Nad Jadranom se zadržava polje povišenog atmosferskog tlaka, kao dio prostrane anticiklone s europskog kopna.

VREMENSKA PROGNOZA ZA JADRAN ZA 24 SATI

Vjetar uglavnom NW, tijekom noći i jutra uz obalu NE, 6-14 čvorova. Sutra na sjevernom Jadranu NE vjetar 6-16, u Velebitskom kanalu u pojačanju tijekom dana do 22 čvora. More 1-2, na otvorenom južnog Jadrana i sutra na sjevernom Jadranu ponegdje 3. Vidljivost 10-20 km, na otvorenom moru sjevernog i dijela srednjeg Jadrana ponegdje oko 4 km zbog sumaglice. Pretežno vedro.

WEATHER REPORT ISSUED BY THE MARINE METEOROLOGICAL CENTER SPLIT ON 12.10.2006 AT 1200 HOURS

WARNING

Tomorrow by midday gusts of NE 30-40 knots are possible in the Velebit Channel.

SYNOPSIS

The ridge of high is stationary over the Adriatic.

WEATHER FORECAST FOR THE ADRIATIC FOR THE FIRST 12 HOURS

NW, also SW 4-10 along the coast while up to 15 knots in the open of the Central and South Adriatic. In the course of the night calm along the coast or NE 4-10 knots. The sea 1-2 while 2-3 in the open of the South and Central Adriatic. Visibility 10-20 km, possible to be reduced to 1-4 km due to mist in the open of the North Adriatic. Mostly clear.

WEATHER FORECAST FOR THE NEXT 12 HOURS

Mostly clear while moderate cloud increase in the North Adriatic. Light NW in the open while moderate in places of the Central and South Adriatic. Calm or with light NE along the coast of the Central and South Adriatic. Light to moderate NE along the coast of the North Adriatic, by midday onwards at times strong at the foot of Velebit. The sea smooth to slight. No significant change in air temperature.

Marine forecasts glossary

Marine forecasts contain a number of terms which are used to convey specific meanings.

Gale warnings

Gale	Winds of at least Beaufort force 8 (34-40 knots) or gusts reaching 43-51 knots
Severe gale	Winds of force 9 (41-47 knots) or gusts reaching 52-60 knots
Storm	Winds of force 10 (48-55 knots) or gusts reaching 61-68 knots
Violent storm	Winds of force 11 (56-63 knots) or gusts of 69 knots or more
Hurricane force	Winds of force 12 (64 knots or more)

Note: The term used is 'hurricane force'; the term 'hurricane' on its own means a true tropical cyclone, not experienced in British waters.

Imminent	Expected within six hours of time of issue
Soon	Expected within six to 12 hours of time of issue
Later	Expected more than 12 hours from time of issue

Visibility

Fog	Visibility less than 1,000 metres
Poor	Visibility between 1,000 metres and 2 nautical miles
Moderate	Visibility between 2 and 5 nautical miles
Good	Visibility more than 5 nautical miles

Movement of pressure systems

Slowly	Moving at less than 15 knots
Steadily	Moving at 15 to 25 knots
Rather quickly	Moving at 25 to 35 knots
Rapidly	Moving at 35 to 45 knots
Very rapidly	Moving at more than 45 knots

Note: For those more familiar with the millibar, 1 hPa = 1 mb

Wind

Wind direction	Indicates the direction from which the wind is blowing
Becoming cyclonic	Indicates that there will be considerable change in wind direction across the path of a depression within the forecast area
Veering	The changing of the wind direction clockwise, e.g. SW to W
Backing	The changing of the wind in the opposite direction to veering (anticlockwise), e.g. SE to NE