CODES: WINDS AND WAVES

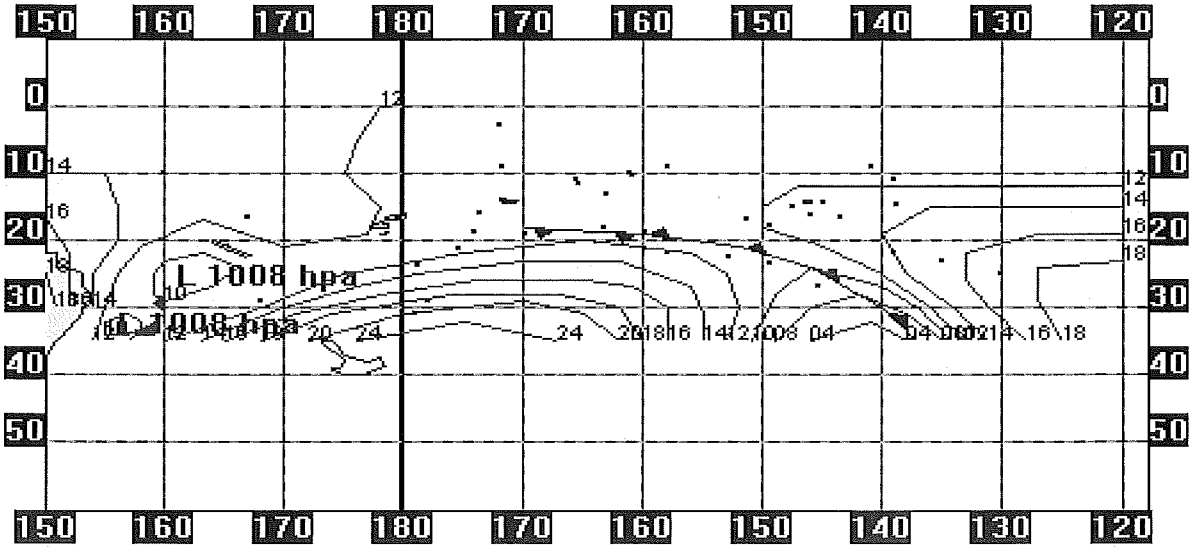
Example of a weather map written in IAC Fleet Code

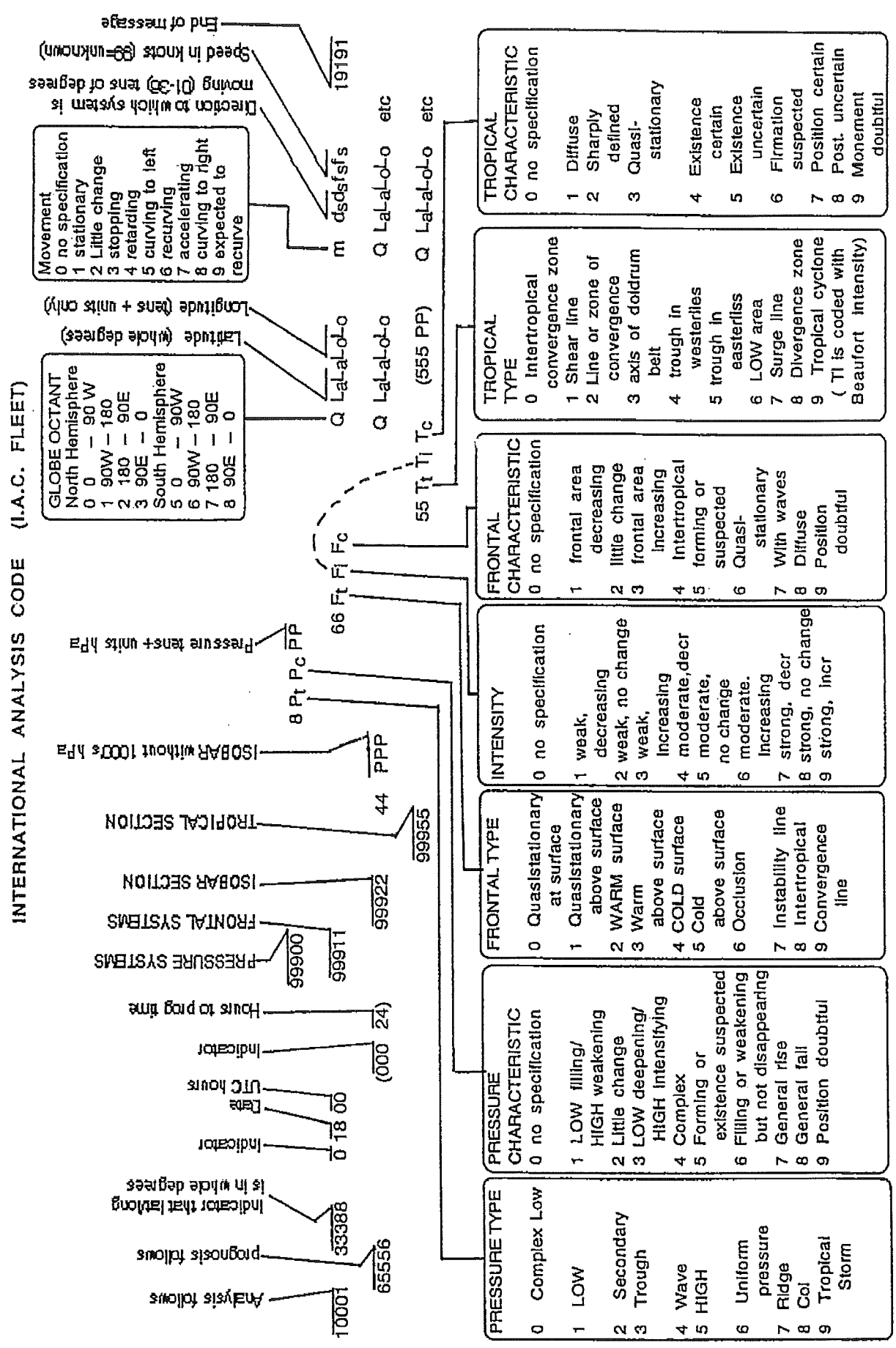
In the South Pacific, an abridged version of the International Analysis Code (IAC Fleet) is used to transmit a coded analysis covering the tropics. This used to be sent in Morse code as a series of five-figured groups, and is now being made available by email which can be sent by HF (contact mcdavitt@met.co.nz). Some computer enthusiasts have written their own programs that will turn the raw IAC fleet code into a corresponding weather map. One of these shareware programs is freely available from the Met Society of New Zealand web page: http://metsoc.rsnz.govt.nz . This program will look after all the decoding for you, but (for those interested) a decode chart for IAC Fleet is shown on the next page.

In the tropics the pressure gradient is weaker than that in the mid-latitudes, so a spacing of 2hPa is usually chosen. Near the equator the component of earth-spinning force about the local vertical becomes small, and so wind tends to blow with its on inertia rather than along the isobars. This makes it difficult to anticipate wind flow purely from the isobars.

Here is an example of a typical IAC Fleet code analysis:

ASPS20 NFFN 200000~
DCC PASS NAVY
10001 33388 02000
99900 81208 73456 73456 10000 81208 72761 72761 01810
99911 66627 72760 73160 73557 01610 66450 61870 61960 62152 62446
63040 63537 01025 99922 44010 72960 72764 72466 72263 72360 72559
72859 72960 44010 73455 73457 73358 73258 73157 73255 73455 44012
70078 70576 71075 71578 71977 72170 71763 72158 72556 73055 73554
44012 73560 73068 72575 62275 62065 62256 62553 63052 63553 44014
71050 71055 71556 72056 72554 73054 44014 73563 73070 72776 62579
62370 62362 62756 63155 63555 44016 71750 72252 72652 73052 44016
73565 73171 72878 62674 62665 62761 63058 63558 44018 72550 73051
44018 73568 73174 62876 62867 63062 63560 44020 73572 73180 62970
63165 63562 44024 73576 63275 63567 44010 63551 62849 62446 62740
63037 63534 44008 63549 63046 62842 63138 63535 44004 63546 63241
63538 44012 61220 61230 61240 61247 61550 61850 62145 62540 63036
63533 44014 61520 61530 61536 61940 62538 63034 63531 44016 61920
61927 62233 62633 63031 63528 44018 62320 62427 62927 63525 19191=




INTERNATIONAL ANALYSIS CODE (I.A.C. FLEET)
Analysis follows
10001
prognosis follows
65556
Indicator that latlong is in whole degrees
33388
Indicator
0 18 00
Date
UTC hours
Indicator
(000 24)
Hours to prog time
PRESSURE SYSTEMS
99000
FRONTAL SYSTEMS
99911
ISOBAR SECTION
99922
TROPICAL SECTION
99955
44 PPP
ISOBAR without 1000's hPa
8 Pt Pc PP
Pressure tens+ units hPa
66 Ft Fi Fc
55 Tt Ti Tc
Q LaLaLoLo (555 PP)
Q LaLaLoLo
Q LaLaLoLo etc
m dsdsfsfs
Q LaLaLoLo etc
19191
End of message
Speed in knots (99=unknown)
Direction to which system is moving (01-36) tens of degrees
Movement
0 no specification
1 stationary
2 Little change
3 stopping
4 retarding
5 curving to left
6 recurving
7 accelerating
8 curving to right
9 expected to recurve
Latitude (whole degrees)
Longitude (tens + units only)
GLOBE OCTANT
North Hemisphere
0 0 – 90 W
1 90W – 180
2 180 – 90E
3 90E – 0
South Hemisphere
5 0 – 90W
6 90W – 180
7 180 – 90E
8 90E – 0
PRESSURE TYPE
0 Complex Low
1 LOW
2 Secondary Trough
3 Trough
4 Wave
5 HIGH
6 Uniform pressure
7 Ridge
8 Col
9 Tropical Storm
PRESSURE CHARACTERISTIC
0 no specification
1 LOW filling/ HIGH weakening
2 Little change
3 LOW deepening/ HIGH intensifying
4 Complex
5 Forming or existence suspected
6 Filling or weakening but not disappearing
7 General rise
8 General fall
9 Position doubtful
FRONTAL TYPE
0 Quasistationary at surface
1 Quasistationary above surface
2 WARM surface
3 Warm above surface
4 COLD surface
5 Cold above surface
6 Occlusion
7 Instability line
8 Intertropical
9 Convergence line
INTENSITY
0 no specification
1 weak, decreasing
2 weak, no change
3 weak, Increasing
4 moderate,decr
5 moderate, no change
6 moderate. Increasing
7 strong, decr
8 strong, no change
9 strong, incr
FRONTAL CHARACTERISTIC
0 no specification
1 frontal area decreasing
2 little change
3 frontal area increasing
4 Intertropical forming or suspected
5 Quasi-stationary
6 With waves
7 Diffuse
8 Position doubtful
TROPICAL TYPE
0 Intertropical convergence zone
1 Shear line
2 Line or zone of convergence
3 axis of doldrum belt
4 trough in westerlies
5 trough in easterliss
6 LOW area
7 Surge line
8 Divergence zone
9 Tropical cyclone (TI is coded with Beaufort intensity)
TROPICAL CHARACTERISTIC
0 no specification
1 Diffuse
2 Sharply defined
3 Quasi-stationary
4 Existence certain
5 Existence uncertain
6 Firmation suspected
7 Position certain
8 Post. uncertain
9 Monement doubtful

BEAUFORT SCALE OF WIND FORCE

Beaufort Number	Descriptive Term	Open Sea Criterion	Mean† wind speed in knots	Coastal Criterion (to be applied to well found yachts and fishing boats under sail)	Probable Wave Height* in Metres	Beaufort Number
0	Calm	Sea like a mirror	<1	Calm		0
1	Light air	Ripples with the appearance of scales are formed, but without foam crests	1–3	Steerage way	0.1 (0.1)	1
2	Light breeze	Small wavelets, still short but more pronounced; crests have a glassy appearance and do not break	4–6	Sails filled	0.2 (0.3)	2
3	Gentle breeze	Large wavelets; crests begin to break; foam of glassy appearance; perhaps scattered white horses	7–10	Yachts heel over	0.6 (1)	3
4	Moderate breeze	Small waves, becoming longer; fairly frequent white horses	11–16	Good working breeze, yachts carry all canvas	1 (1.5)	4
5	Fresh breeze	Moderate waves, taking a more pronounced long form; many white horses are formed (chance of some spray)	17–21	Yachts shorten sail	2 (2.5)	5
6	Strong breeze	Large waves begin to form; the white foam crests are more extensive everywhere (probably some spray)	22–27	Double reef mainsails	3 (4)	6
7	Near gale	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind	28–33	Remain in harbour, if at sea heave to	4 (5.5)	7
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	34–40	Heave to or seek shelter	5.5 (7.5)	8
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	41–47		7 (10)	9
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	48–55	Note: Only experienced sailers should proceed to sea in winds over force 4, and no small sailing vessel should leave harbour in winds over Force 6.	9 (12.5)	10
11	Violent storm	Exceptionally high waves (small and medium-sized ships might be for a time lost to view 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	56–63		11.5 (16)	11
12	Hurricane	The air is filled with foam and spray; sea completely white with driving spray; visibility very seriously affected	64 and over		14 (—)	12

*This table is intended as a rough guide for the open sea. Figures in brackets indicate the probable maximum wave heights. In coastal areas greater heights will be experienced.

†The equivalent speeds are mean speeds (over several minutes) at a height of 10 metres; they may be considerably exceeded in gusts, especially close to land

SEA STATE

The following descriptive terms are applied to the state of the sea surface. The heights refer to the average from trough to crest of the larger, well-formed waves, i.e., to the average of about the highest one-third of the waves present.

Occasional waves may reach much higher; about one in a hundred is likely to reach half as high again; and one in a thousand almost twice the quoted averages.

Descriptive Term	Average Height of Larger Well-formed Waves in Metres	
Calm (glassy)	0	
Calm (rippled)		up to 0.1
Smooth (wavelets)	Over 0.1	up to 0.5
Slight	Over 0.5	up to 1.25
Moderate	Over 1.25	up to 2.5
Rough	Over 2.5	up to 4
Very Rough	Over 4	up to 6
High	Over 6	up to 9
Very High	Over 9	up to 14
Phenomenal	Over 14	

Although many swells are generated a considerable distance away and may be from another storm there is a fairly direct relationship between the wind speeds and the heights of the locally generated waves. This relationship is shown in the Beaufort scale (see page 8).

The following descriptive terms are applied specifically to swell, i.e., to waves that have left the wind which generated them:

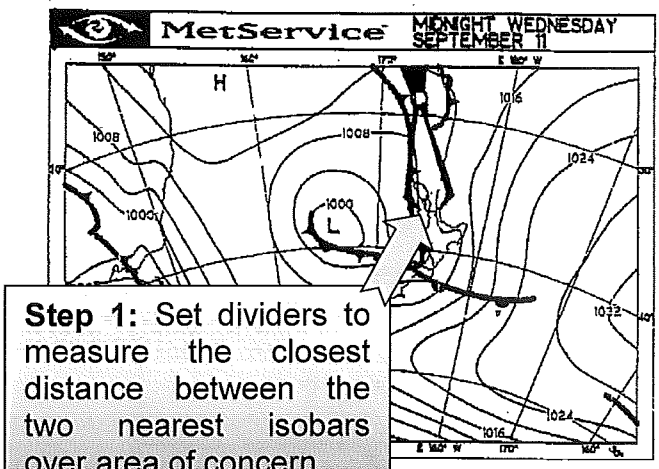
Descriptive Term	Distance from Crest to Crest in Metres
Short swell	0–100
Average swell	100–200
Long swell	Over 200

Descriptive Term	Average Height from Trough to Crest of Well-formed Swell Waves in Metres
Low swell	0–2
Moderate swell	2–4
Heavy swell	Over 4

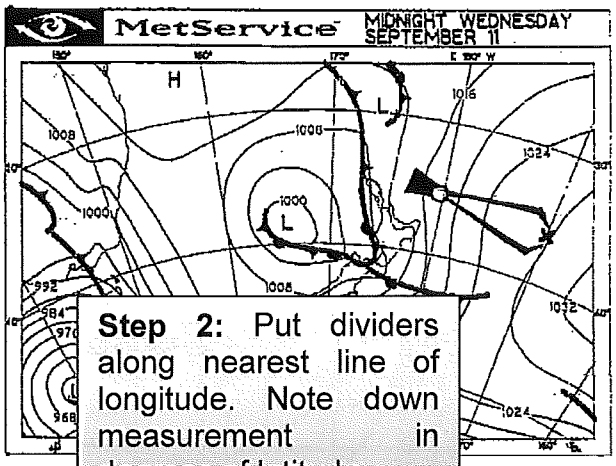
METSERVICE
A world of valuable information

METSERVICE Wind scale

- Use this table to estimate wind speed from a weather map.
- It assumes isobars are 4 hectoPascals (millibars) apart.
- It gives the expected steady state airspeed in knots averaged over ten minutes at a height of ten metres over the open sea.



Step 1: Set dividers to measure the closest distance between the two nearest isobars over area of concern.



Step 2: Put dividers along nearest line of longitude. Note down measurement in degrees of latitude.

Step 3: Allow for latitude: Use the following table to interpolate wind speed in knots.

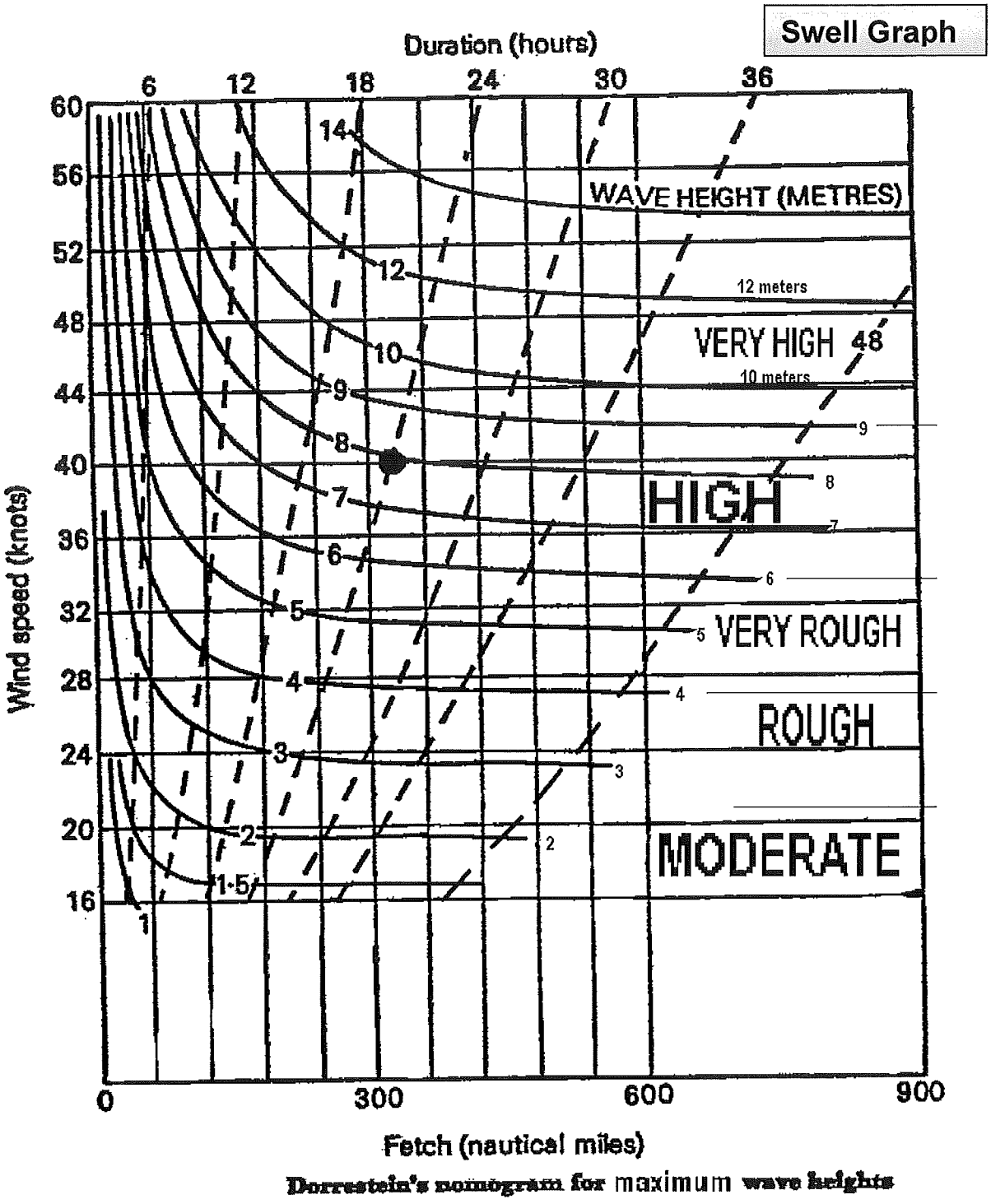
X DEG LAT	20 DEG NEAR FIJI	30 DEG NEAR NORFOLK ISL.	40 DEG NEAR TARANAKI,	50 DEG NEA CAMPBELL
1	78 gust 117	54 gust 80	42 gust 62	35 gust 52
2	39 gust 58	**27** gust 40	**21** gust 31	17 gust 26
3	26 gust 39	18 gust 27	14 gust 21	12 gust 17
4	20 gust 29	13 gust 20	10 gust 16	9 gust 13
5	16 gust 23	11 gust 16	8 gust 12	7 gust 10
6	13 gust 19	9 gust 13	7 gust 10	6 gust 9

Step 4: Allow for isobar curvature: Around a High, corrected wind speed is higher by as much as 20%. Around a Low, it is lower by as much as 20-40%.

Step 5: Allow for friction and terrain. Table allows for friction and gives expected surface wind speed over open sea, but over land the wind speed can as much as halved or doubled by friction and terrain effects.

Direction: Wind leaks across isobars to low pressure so **ADD** (in Southern Hemisphere) 15 to 20 degrees to isobar direction over open sea, and 30 to 90 degrees about coast.

Example: Auckland ahead of a front, isobar spacing (from divider) around 2-degrees latitude. Using table, wind at 35S is 24 knots (halfway between 27 knots at 30S and 21 knots at 40S). Isobars curve round a High, so add (say) 15% (4 knots) to get 28 gust 40 knots.



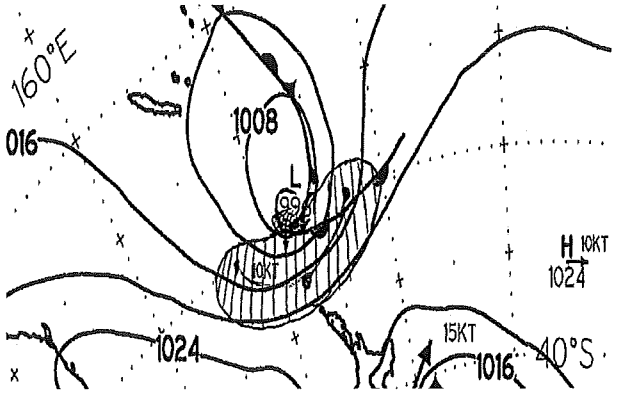
Dorrestein's nomogram for maximum wave heights

Use this graph to estimate "probable maximum" wave heights.

For example, the dot above computes "probable maximum" wave heights that you can expect after a 40 knot gale blows for 24 hours over the open sea — 8 metres (HIGH). If the fetch (area over which the wind blows) is limited (as is the case on a lake or when you are only a few miles offshore), you can still use this graph. A fetch of 60 miles (or one degree of latitude) of 40-knot winds should produce maximum wave heights of 5 metres (VERY ROUGH).

WIND WARNINGS

WEATHER MAP WITH SHADED AREA OF GALES



Corresponding warning

Storm Warning
064

At 061200Z/
070000 NZST TUESDAY

LOW 996HPA, FORMERLY TROPICAL CYCLONE ZUMAN,

29 SOUTH 172 EAST

MOVING SOUTH-SOUTHWEST 10 KNOTS

1. WITHIN 60 MILES OF LOW IN SOUTHERN SEMICIRCLE: EASTERLY 50 KNOTS

2. OUTSIDE AREA 1, IN A BELT 240 MILES WIDE CENTRED ON A LINE FROM 30 SOUTH 177 EAST SOUTH 172 EAST 30 SOUTH 167 EAST, EASTERLY 40 KNOTS.

THIS WARNING CANCELS AND REPLACES WARNING 061

Warning type
Gale = 34 to 47 knots
Storm = 48 knots or more
Hurricane = 64 knots or more from tropical cyclone

NUMBER used to identify the warning. Starts each month on 001

REFERENCE TIME = time of map and observations on which warning is based. Given in UTC in the international format of a six figure date / time group. Maybe followed by a local time group.

TYPE of disturbance (LOW or FRONT) with estimate of central pressure in hectoPascals.

LOCATION of disturbance at reference time in terms of degrees latitude and longitude.

MOVEMENT of disturbance Direction (to) and speed (in knots). Sometimes an indication of degree of certainty of location and movement is also given.

WIND. Direction (true compass point from) and sustained average speed (in knots over ten minutes at ten metres above sea level). Note that gusts may be considerably stronger, especially near land.

CHANGES: Expected changes in character and effects of disturbance AFTER reference time are added LAST. (sometimes).