

FULLY RISEN SEAS ²											WIND		APPEARANCE OF THE SEA ⁵		
SEA STATE ¹	AVERAGE	SIGNIFICANT (avg. of 1/10 HIGHEST)	AVE. OF 1/10 HIGHEST	SIGNIFICANT RANGE OF PERIODS	T _{max.} (based on max. energy of spectra, sec.)	L (average period, sec.)	WIND SPEED (avg. wave length, ft.)	MINIMUM FETCH (knots)	MINIMUM DURATION (hrs)	BEAUFORT NUMBER ⁴	WIND DESCRIPTION	WIND SPEED (knots)			
														WAVE HEIGHT (feet)	WIND ³
0	0	0	0	-	-	-	-	-	-	0	CALM	<1	Sea like a mirror.	From a table compiled by Wilbur Marks, David Taylor Model Basin	
	0.06	0.08	0.10	up to 1.2 sec.	0.7	0.5	0.83	2	5	0.3	1	LIGHT AIRS	1-3		Ripples with the appearance of scales are formed, but without foam crests.
1	0.18	0.29	0.37	0.4-2.8	2.0	1.4	6.7	5	8	0.7	2	LIGHT BREEZE	4-6	Small wavelets, still short but more pronounced; crests have glassy appearance and do not break.	1Sea states refer only to wind waves. Swells from distant or old storms are often superimposed on the wind wave pattern.
	0.6	1.0	1.2	0.8-5.0	3.4	2.4	20	8.5	9.8	1.7	3	GENTLE BREEZE	7-10	Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered white horses.	
2	0.88	1.4	1.8	1.0-6.0	4.0	2.9	27	10	10	2.4	4	MODERATE BREEZE	11-16	Small waves, becoming longer; fairly frequent white horses.	2Practical Methods of Observing and Forecasting Ocean Waves, Pierson, Neuman, James, H.O.Pub. 603, 1955.
	1.4	2.2	2.8	1.0-7.0	4.8	3.4	40	12	18	3.8					
3	2.0	3.3	4.2	1.5-7.8	5.6	4.0	59	14	28	5.2	5	FRESH BREEZE	17-21	Moderate waves, taking a more pronounced long form; many white horses are formed. (Chance of some spray.)	3Wind required to create a fully risen sea. To attain a fully risen sea for a certain wind speed, the wind must blow at that speed over a minimum distance (fetch) for a minimum time (duration).
	2.9	4.6	5.8	2.0-8.8	6.5	4.6	71	16	40	6.6					
4	3.8	6.1	7.8	2.5-10.0	7.2	5.1	90	18	55	8.3	6	STRONG BREEZE	22-27	Large waves begin to form; the white foam crests are more extensive everywhere. (Probably some spray.)	4The Beaufort Number is a wind force scale. While wind and seas are causally related, Beaufort Number and sea state are not the same. For example, it is common to have force 7 winds, but because of limited fetch or duration, a sea state of only 2.
	4.3	6.9	8.7	2.8-10.6	7.7	5.4	99	19	65	9.2					
5	5.0	8.0	10	3.0-11.1	8.1	5.7	111	20	75	10	7	MODERATE GALE	28-33	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind. Spindrift begins.	5Manual of Seamanship, Vol. II, Admiralty, H.M. Stationary Office, 1952.
	6.4	10	13	3.4-12.2	8.9	6.3	134	22	100	12					
6	7.9	12	16	3.7-13.5	9.7	6.8	160	24	130	14	8	FRESH GALE	34-40	Moderately high waves of greater length; edges of crests break into spindrift. The foam is blown in well-marked streaks along the direction of the wind.	6For whole gale, storm, and hurricane winds (50 knots or more) the required durations and fetches are rarely attained. Seas are therefore not fully arisen.
	8.2	13	17	3.8-13.6	9.9	7.0	164	24.5	140	15					
7	9.6	15	20	4.0-14.5	10.5	7.4	188	26	180	17	9	STRONG GALE	41-47	High waves. Dense streaks of foam along the direction of the wind. Sea begins to roll. Spray may affect visibility.	7For such high winds the seas are confused. The wave crests are blown off, and the water and air mix.
	11	18	23	4.5-15.5	11.3	7.9	212	28	230	20					
8	14	22	28	4.7-16.7	12.1	8.6	250	30	280	23	10	WHOLE GALE	48-55	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 rolling of the sea becomes heavy and shock like. Visibility is affected.	
	14	23	29	4.8-17.0	12.4	8.7	258	30.5	290	24					
9	16	26	33	5.0-17.5	12.9	9.1	285	32	340	27	11	STORM	56-63	Exceptionally high waves. (Small and medium-sized ships might for a long time be 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.	
	19	30	38	5.5-18.5	13.6	9.7	322	34	420	30					
10	21	35	44	5.8-19.7	14.5	10.3	363	36	500	34	12	HURRICANE	64-71	The air filled with foam and spray. Sea completely white with driving spray; visibility very seriously affected.	
	23	37	46.7	6.0-20.5	14.9	10.5	376	37	530	37					
11	25	40	50	6.2-20.8	15.4	10.7	392	38	600	38					
	28	45	58	6.5-21.7	16.1	11.4	444	40	710	42					
12	31	50	64	7.0-23.0	17.0	12.0	492	42	830	47					
	36	58	73	7.0-24.2	17.7	12.5	534	44	960	52					
13	40	64	81	7.0-25.0	18.6	13.1	590	46	1110	57					
	44	71	90	7.5-26.0	19.4	13.8	650	48	1250	63					
14	49	78	99	7.5-27.0	20.2	14.3	700	50	1420	68					
	52	83	106	8.0-28.2	20.8	14.7	736	51.5	1560	73					
15	54	87	110	8.0-28.5	21.0	14.8	750	52	1610	75					
	59	95	121	8.0-29.5	21.8	15.4	810	54	1800	81					
16	64	103	130	8.5-31.0	22.6	16.3	910	56	2100	88					
	73	116	148	10.0-32.0	24	17.0	985	59.5	2500	101					
17	>80	>128	>164	10-(35)	7	(26)	7	(18)	-	>64	-	-	-		

Figure 1. Sea states