Navy SBIR Topic N222-089, Reference 3

Wilbur Marks Wind and Wave Scale (from NSWCCD-80-TR-2017/005 Table 2)

	/ FULLY RISEN SEA										ΞN	SEAS	2	WIND	/
/8	18	TA SO SO SO	The state of the s		VAVE (for	HEIG eet)	нт	/	/_	7	/	WIND ³	-//	APPEARANCE OF THE SEA	
\cap	0	0	0	~	~	~	~	~	~	~	0	CALM	<1	Sea like a mirror.	From a table compiled by Wilbur Marks, David Taylor Model
_	0.05	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.	Basin
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.	Sea states refer only to wind waves. Swells from
	0.6	1.0	1.2	0.8-5.0	3.4	2.4	20	8.5	9.8	1.7	3	GENTLE	7-10	Large wavelets. Crests begin to break. Foam of glassy	distant or old storms are often superimposed on the wind wave pattern.
_	0.88	1.4	1.8	1.0-6.0	4.0	2.9	27	10	10	2.4	٥	BREEZE	7-10	appearance. Perhaps scattered white horses.	² Practical Methods of
2	1.4	2.2	2.8	1.0-7.0	4.8	3.4	40	12	18	3.8	4 MOI	MODERATE BREEZE	11-16	Small waves, becoming longer, fairly frequent white horses.	Observing and Forecasting Ocean Waves, Pierson,
	1.8	2.9	3.7	1.4-7.6	5.4	3.9	52	13.5	24	4.8					Waves, Pierson, Neuman, James, H.O.Pub. 603, 1955. Wind required to create a fully risen sea. To
2	2.0	3.3	4.2	1.5-7.8	5.6	4.0	59	14	28	5.2					
၁	2.9	4.6	5.8	2.0-8.8	6.5	4.6	71	16	40	6.6					attain a fully risen sea for a certain wind speed, th
4	3.8	6.1	7.8	2.5-10.0	7.2	5.1	90	18	55	8.3		FRESH BREEZE	17-21	Moderate waves, taking a more pronounced long form; many white horses are formed. (Chance of some spray.)	wind must blow at that speed over a minimum distance (fetch) for a
4	4.3	6.9	8.7	2.8-10.6	7.7	5.4	99	19	65	9.2					minimum time (duration)
	5.0	8.0	10	3.0-11.1	8.1	5.7	111	20	75	10					⁴ The Beaufort Number is a wind force scale. Whil wind and seas are
5	6.4	10	13	3.4-12.2	8.9	6.3	134	22	100	12	6	STRONG BREEZE	22-27	Large waves begin to form; the white foam crests are more extensive everywhere. (Probably some spray.)	causally related, Beaufort Number and
	7.9	12	16	3.7-13.5	9.7	6.8	160	24	130	14					sea state are not the same. For example, it is common to have force 7 winds, but because of limited fetch or duration,
6	8.2	13	17	3.8-13.6	9.9	7.0	164	24.5	140	15					
	9.6	15	20	4.0-14.5	10.5	7.4	188	26	180	17					a sea state of only 2. Manual of Seamanship,
	11	18	23	4.5-15.5	11.3	7.9	212	28	230	20					Vol. II, Admiralty, H.M. Stationary Office, 1952.
7	14	22	28	4.7-16.7	12.1	8.6	250	30	280	23	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.	⁶ For whole gale, storm, and hurricane winds (50 knots or more) the required durations and
	14	23	29	4.8-17.0	12.4	8.7	258	30.5	290	24					
	16	26	33	5.0-17.5	12.9	9.1	285	32	340	27					fetches are rarely attained. Seas are therefore not fully ariser
	19	30	38	5.5-18.5	13.6	9.7	322	34	420	30		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.	⁷ For such high winds the seas are confused. The
	21	35	44	5.8-19.7	14.5	10.3	363	36	500	34					wave crests are blown off, and the water and a
	23	37	46.7	6.0-20.5				37	530	37					mix.
	25		50	6.2-20.8				38	600	38					
	28		58	6.5-21.7				40	710	42					
8	31		64	7.0-23.0				42	830	47					-
	36	58	73	7.0-24.2				44	960	52	9	STRONG	41-47	High waves. Dense streaks of foam along the direction of the wind. Sea begins to roll. Spray may affect visibility.	
	40	64	81	7.0-24.2				46	1110	57		GALE			
9	44	71	90	7.5-26.0				48	1250	63				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.	-
		+								-	10	WHOLE ⁶ GALE	48-55		
	49	78	99	7.5-27.0				50	1420						
	52	83	106	8.0-28.2					1560				40-00		
	54	87	110	8.0-28.5				52	1610	75					
	59	95	121	8.0-29.5				54	1800	81				Exceptionally high waves. (Small and medium-sized ships might	-
	73	103	130	8.5-31.0 10.0-32.0		16.3		56 59.5	2100 2500		11	STORM ⁶	56-63	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.	
	>80	7 >128	>164	10-(35)	(26)	(18)	~	>64	~	~	12	HURRICANE ⁶	64-71	The air filled with foam and spray. Sea completely white with driving spray; visibility very seriously affected.	