

WAVE POWER ANALYSIS FOR REPRESENTATIVE HAWAIIAN ISLAND SITES

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1. Introduction

SWAN version 40.85 was forced with spectral wave parameters hindcasted from WAVEWATCH III (WW3) version 3.14 to produce twenty years (January 1990-December 2009) spectral wave estimates for six sites around the Hawaiian Islands (Figure 1 and Figure 2). The boundary conditions provided by WW3 were obtained by using high resolution winds from the UH Meteorology's mesoscale model, weather and forecasting (WRF). The water depth, latitude, and longitude of each site are presented in Table 1. The annual and monthly averaged wave power fluxes estimated for each of the six sites are presented in Section 2.

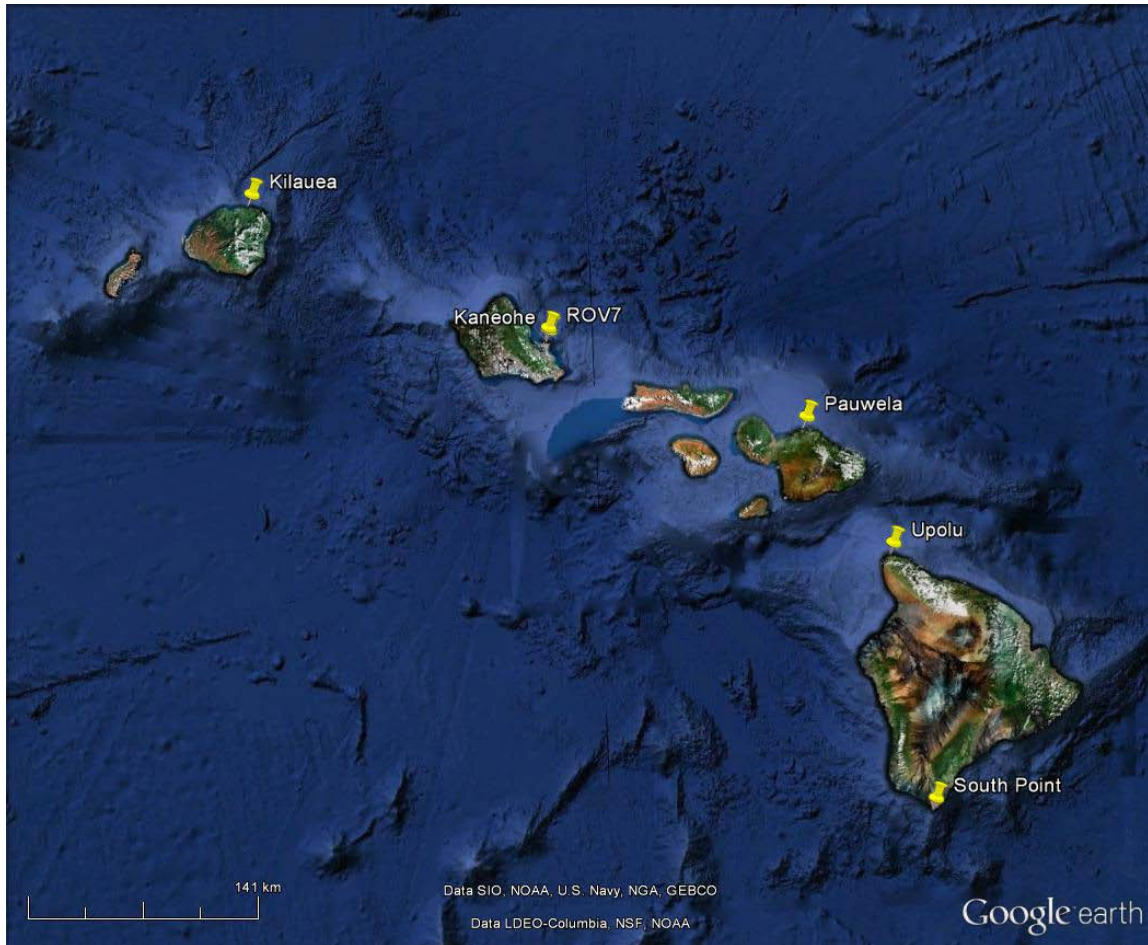


Figure 1 - Locations of Sites Selected by HINMREC

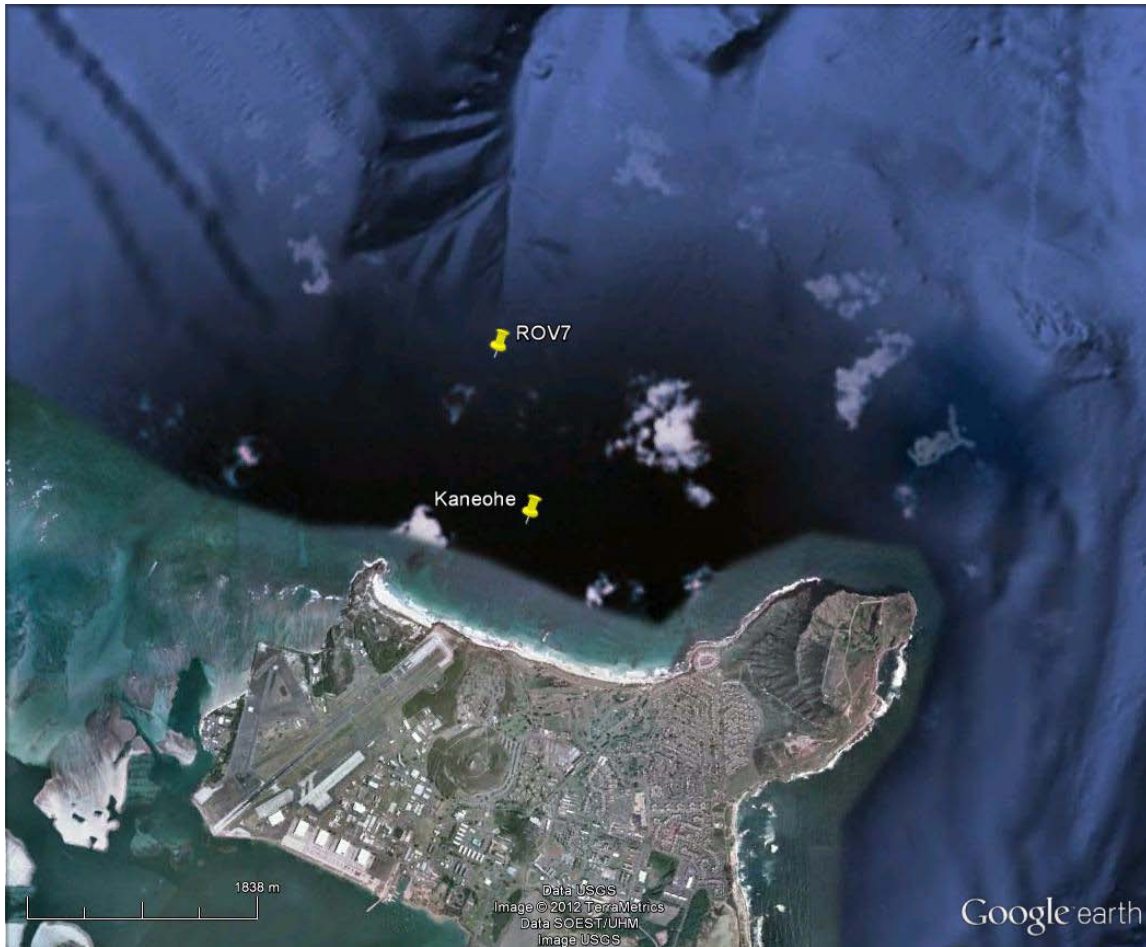


Figure 2 - Locations of Sites Selected by HINMREC at the Wave Energy Test Site (WETS)

Site	Location	Latitude (N)	Longitude (W)	Water Depth (m)
Kaneohe	Kaneohe, Oahu (WETS)	21.465	157.752	27
Kaneohe Rov7	Kaneohe, Oahu (WETS)	21.477	157.750	86
Pauwela	Pauwela, Maui	20.958	156.322	73
Upolu	Upolu, Hawaii	20.275	155.863	47
South Point	South Point, Hawaii	18.910	155.681	40
Kilauea	Kilauea, Kauai	22.236	159.422	53

Table 1 - Locations of Sites Selected by HINMREC for SWAN Analysis

2. Results

The wave power flux was estimated using Equation 1. Table 2 summarizes the average monthly wave power flux for each site indicating the seasonal variation. Table 3 presents the annual average wave flux for each site indicating the highest annual average at the Pauwela site.

The peaks-over-threshold (POT) method was used for estimating the extreme wave heights and periods over a long return period at the sites of interest. These parameters are of particular importance in considering the survival conditions in the design process. The outcomes of the analysis are the 100 years significant wave heights (H_s) and peak periods (T_p) as given in Table 3. It should be noted that the statistics for each variable have been treated independently therefore, the extreme values of H_s and T_p are very likely not related to the same event. The locations exposed to the North Pacific swells (e.g., Kilauea and Pauwela) yield the largest estimates with H_s at 8.2 m and T_p at 16.3 s.

The daily and monthly average, median, 5th and 95th percentile of the wave power is calculated and shown in Figure 3 through Figure 14. The power flux is defined by

$$P = \rho g \int_{\omega=0}^{\omega=\infty} Cg(\omega, h) \left(\int_{\theta=0}^{\theta=2\pi} S(\omega, \theta, h) d\theta \right) d\omega \quad (\text{Watts/m}) \quad (\text{Eq. 1})$$

where,

- $S(\omega, \theta, h)$ = local wave spectrum
- θ = wave direction
- ω = wave frequency
- h = local water depth
- Cg = local group speed
- g = gravitational acceleration, 9.81 m/s²
- ρ = density of sea water, 1025 kg/m³

The wave climate in Hawaii is composed of swells from the North and South Pacific and year-round wind waves from the northeast. Therefore, the majority of the sites are characterized by higher power flux in winter and lower wave power flux in summer. Between May and September, the average monthly wave power flux shows slightly higher value (9.1-10.3 kW/m) at the South Point site, which is mainly driven by the wind seas associated with the trade winds and swells from the south. Between October and April, significantly higher values were observed at the Pauwela site (16.3-48.7 kW/m) and Kilauea site (13.7-49.2 kW/m) due to their exposure to the swells from the North Pacific. The power probability density function in Figure 15 shows a similar feature where the distributions are skewed towards the high values based on their exposure to the largest swells from the North Pacific. This explains why Pauwela and Kilauea have higher occurrence of events with wave power flux above 40 kW/m.

A convenient way to present the occurrence, magnitude, and direction of the wave climate at each site are wave “rose” plots presented in Figures 16-21. The majority of the sites (Kaneohe, Pauwela, and Upolu) show waves from the ENE are most common with typical wave heights in the 1-2.5 m range. The exceptions are Kilauea site, which is dominated by swells from the North Pacific, and South Point site, which is dominated by wind waves from the ESE. Kilauea has a bi-modal sea state with many occurrences of wind waves from the ENE and swells from the NNW. In addition, less pronounced bi-modal sea states are seen at Kaneohe and Pauwela due to their more sheltered positions from the North Pacific swells.

Figure 22 shows the occurrence of events with wave power over the 15 kW/m threshold. The white areas are within the 50 meter contour, where wave energy converters are typically deployed. The shores with open exposure to the swells from the NW are the most energetic. The northern shores of Kauai, Oahu, and Maui have the highest occurrence of events over 15 kW/m for 50-60% of the time. On the other hand, Hawaii Island, has the most consistent wave power near Cape Kumukahi, it is the Eastern point due to its exposure to the swells from the north, swells from the south, and ENE wind waves.

Lastly, the occurrence of events corresponding to binned significant wave height (H_s) and wave periods (T_e or T_{02}) are presented in tables 4-15 utilizing all 20 years estimates. These are useful for the estimation of possible power generated for a particular wave energy converter as represented by their Power Matrix.

Significant wave height H_s is defined by:

$$H_s = 4\sqrt{\int \int S(\omega, \theta) d\omega d\theta} \quad (\text{Eq.2})$$

T_e and T_{02} are defined by

$$T_e = \frac{m_{-1}}{m_0} \quad (\text{Eq.3})$$

$$T_{02} = \sqrt{\frac{m_0}{m_2}} \quad (\text{Eq.4})$$

Where,

m_0, m_1, m_2 are the spectral moments. The nth spectral moment is defined as

$$m_n = \int_0^\infty f^n S(f) df \quad (\text{Eq.5})$$

It must be noted that these definitions do not account for shallow water conditions.

	Power Flux (kW/m)											
Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kaneohe	16.1	16.0	14.1	11.4	6.5	5.0	5.2	5.4	6.1	9.8	17.2	17.1
Kaneohe Rov7	17.8	17.6	15.5	12.9	7.4	5.9	6.1	6.3	6.9	10.9	18.9	19.3
Pauwela	48.7	42.4	31.5	20.8	10.4	7.2	7.0	7.5	9.7	16.3	31.3	44.8
Upolu	15.1	15.6	14.4	12.0	7.2	6.7	7.0	7.6	7.1	9.4	15.9	17.1
South Point	17.6	16.3	13.6	11.7	9.1	9.5	9.8	10.3	9.7	8.8	10.6	15.5
Kilauea	49.2	40.8	28.8	16.5	8.1	4.5	4.4	4.2	7.2	13.7	27.6	39.7

Table 2 - Monthly Average Wave Power Flux (kW/m)

Site	Power Flux (kW/m)	Hs, 100yrs (m)	Tp, 100yrs (s)
Kaneohe	10.8	6.2	14.4
Kaneohe Rov7	12.1	6.5	14.4
Pauwela	23.1	8.2	16.3
Upolu	11.3	6.3	13.0
South Point	11.9	4.1	16.3
Kilauea	20.4	8.2	16.3

Table 3 - Annual Average Wave Power Flux, Hs (100yrs), Tp (100yrs)

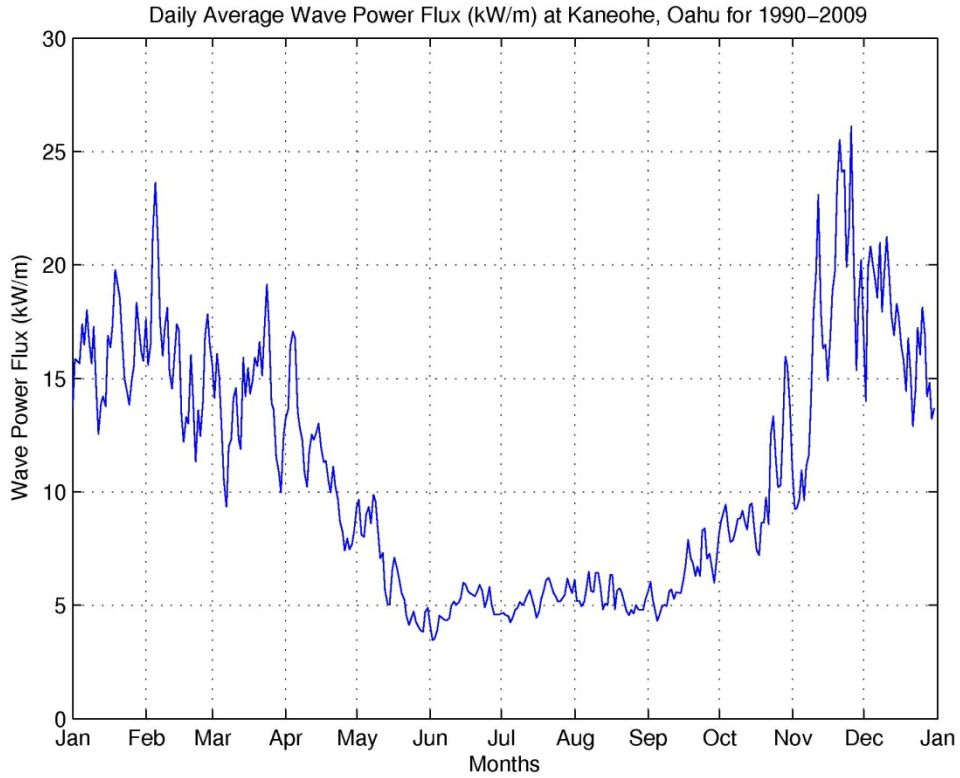


Figure 3 – Daily Average Wave Power Flux for Kaneohe Site

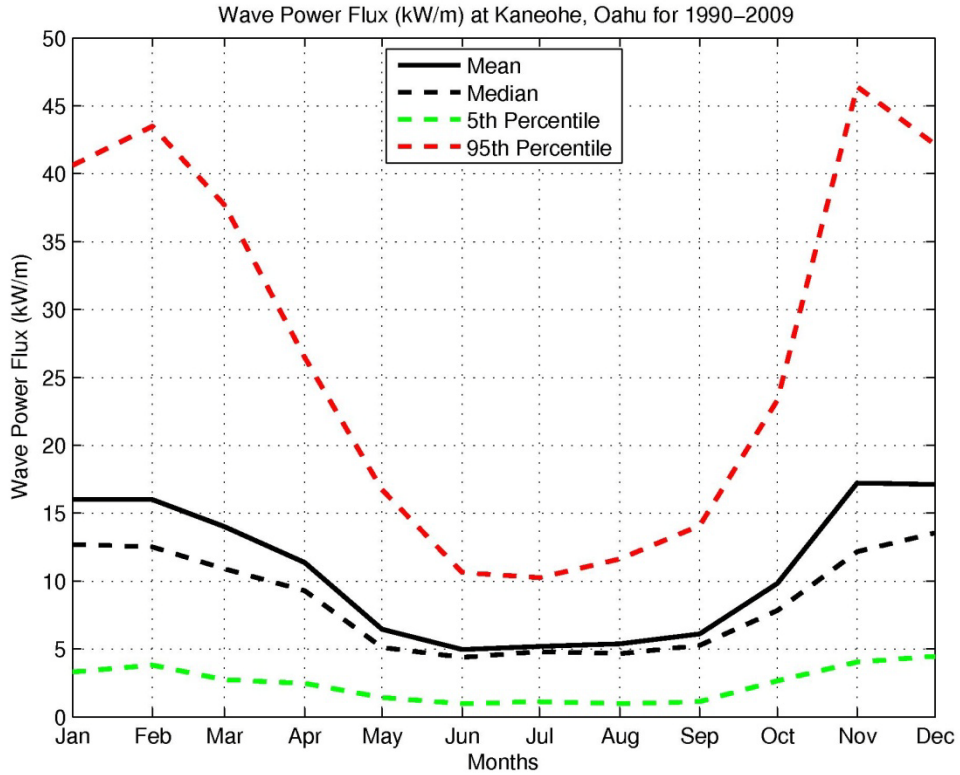


Figure 4 – Monthly Average Wave Power Flux for Kaneohe Site

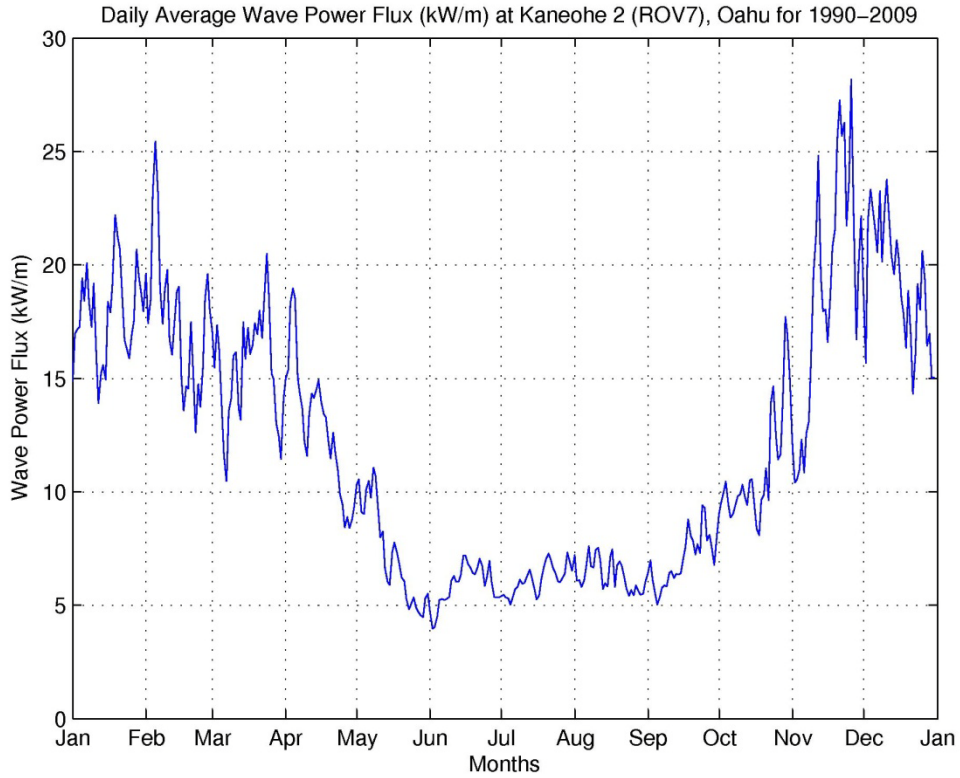


Figure 5 – Daily Average Wave Power Flux for Kaneohe Rov7 Site

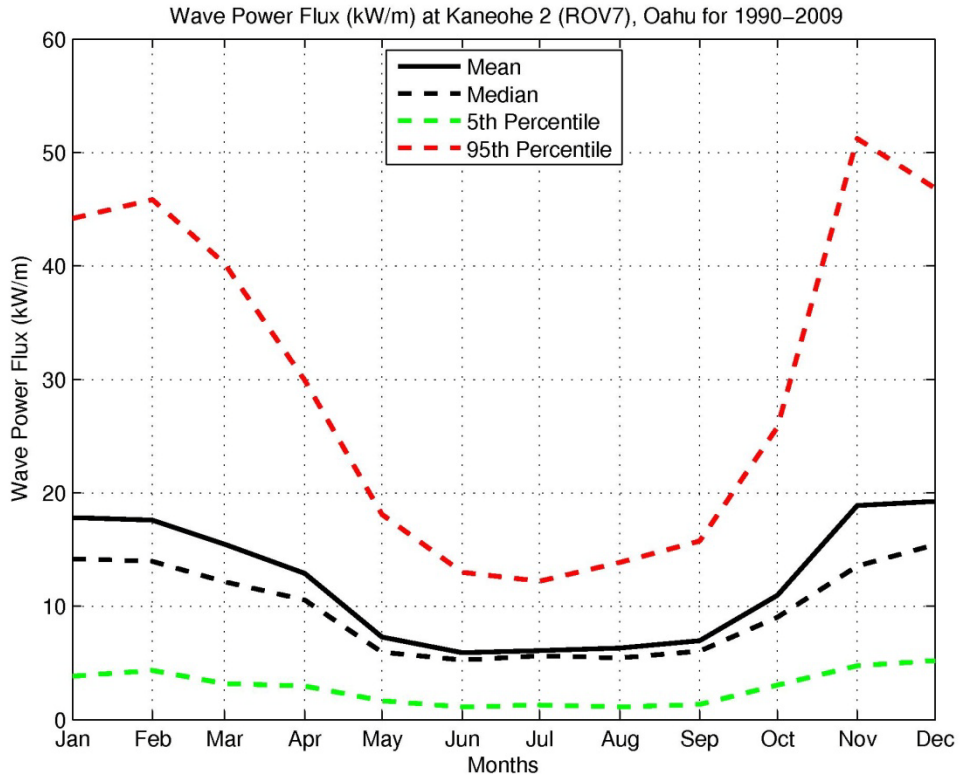


Figure 6 – Monthly Average Wave Power Flux for Kaneohe Rov7 Site

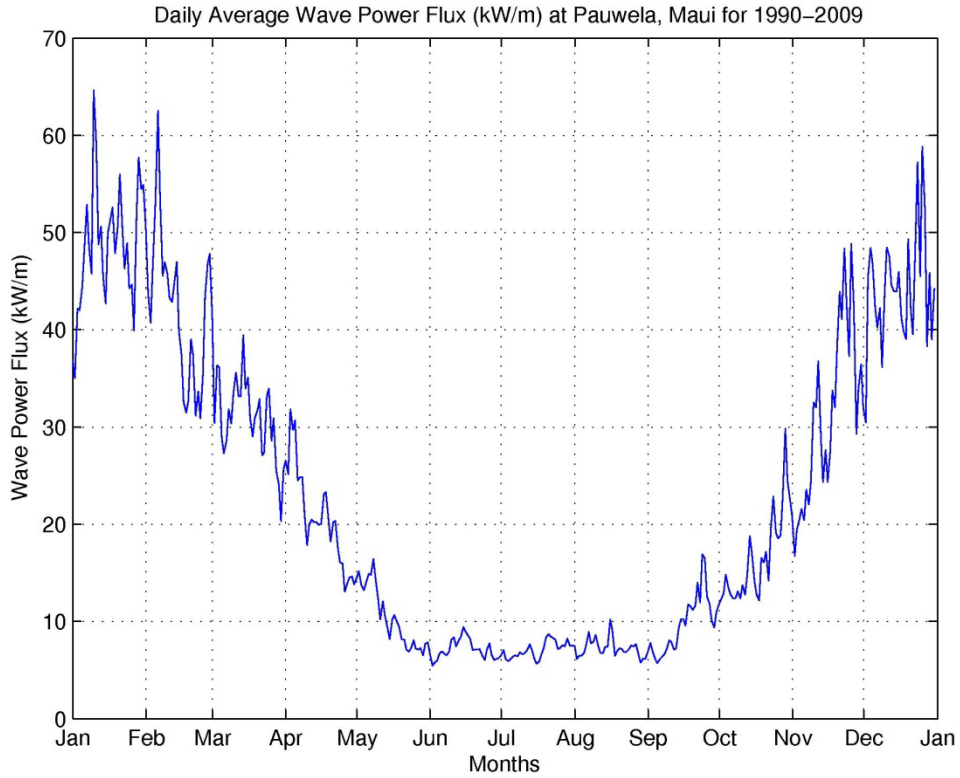


Figure 7 – Daily Average Wave Power Flux for Pauwela Site

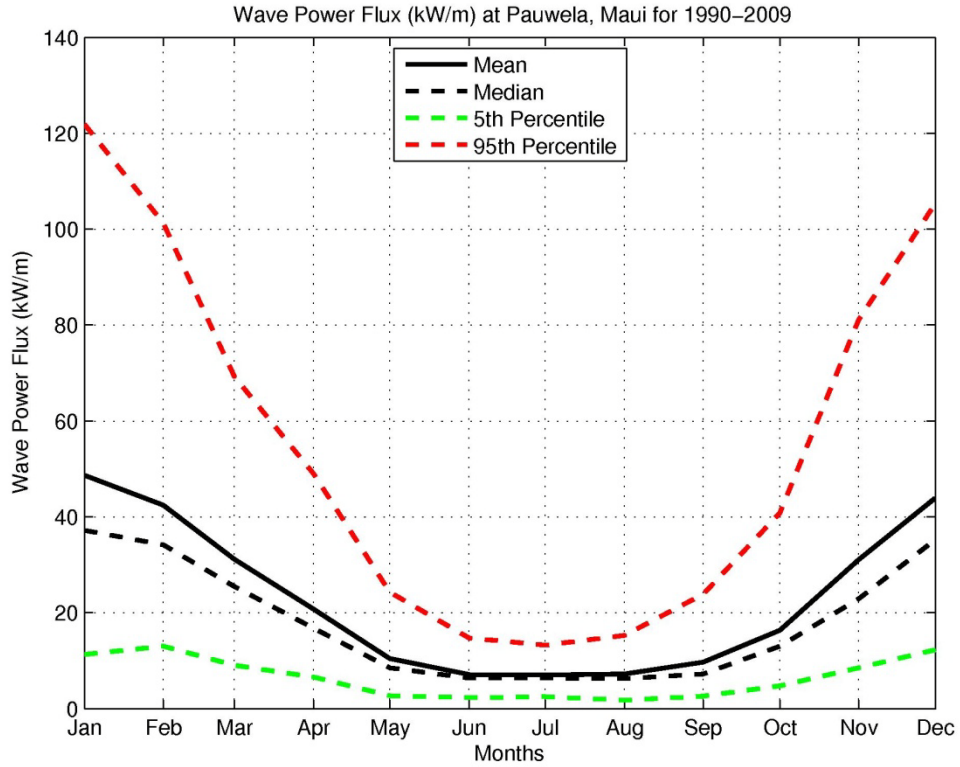


Figure 8 – Monthly Average Wave Power Flux for Pauwela Site

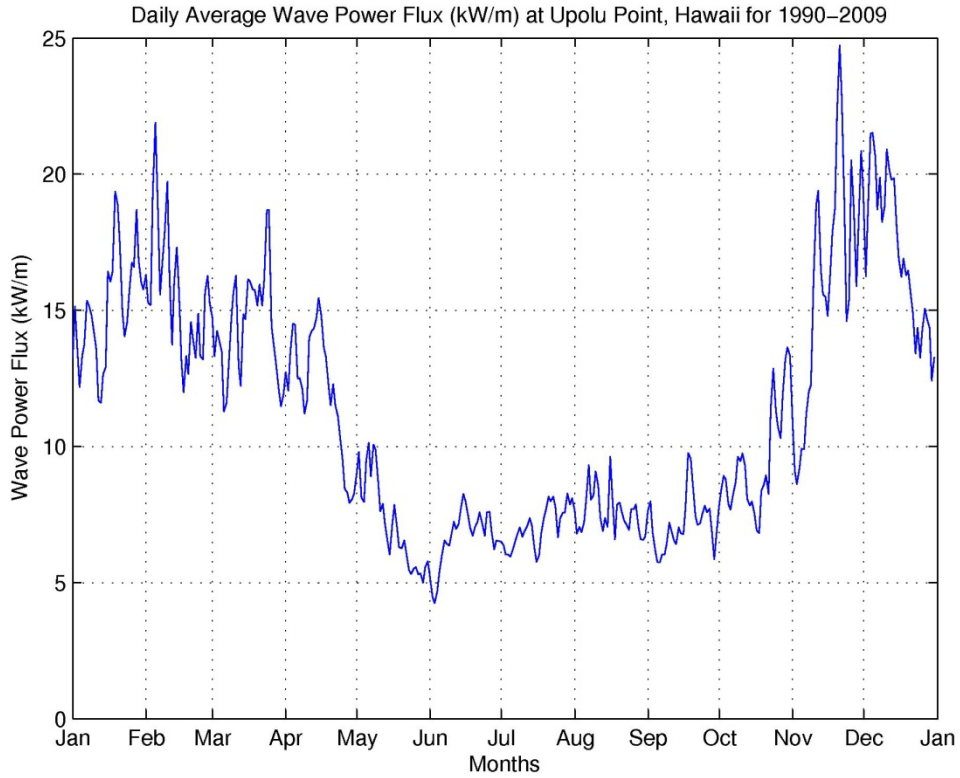


Figure 9 – Daily Average Wave Power Flux for Upolu Site

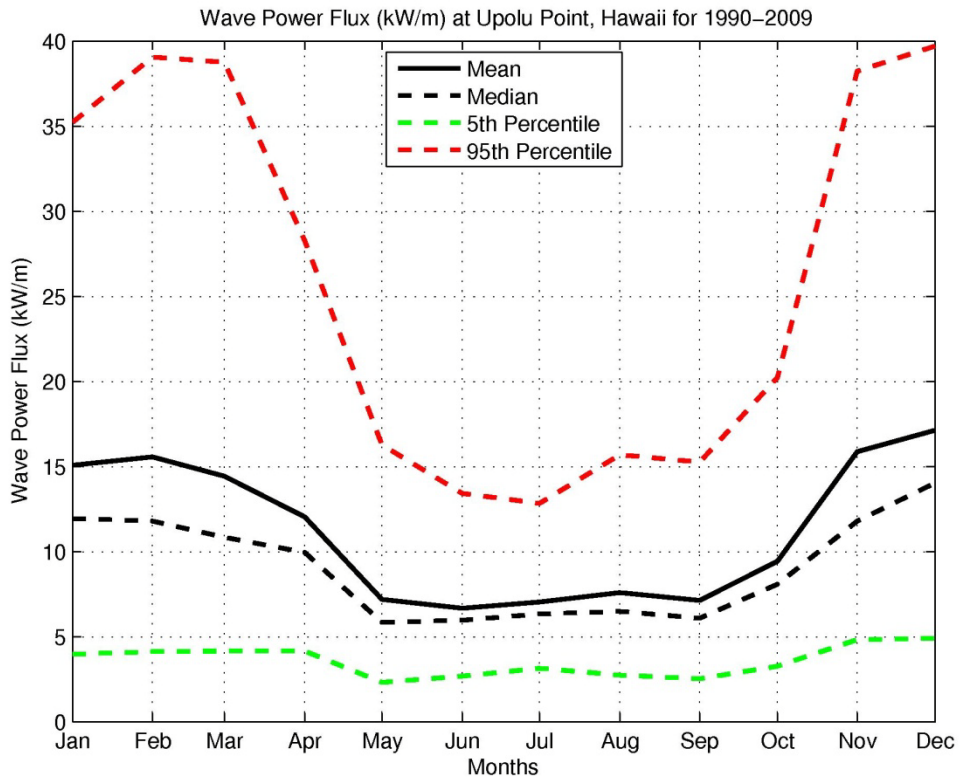


Figure 10 – Monthly Average Wave Power Flux for Upolu Site

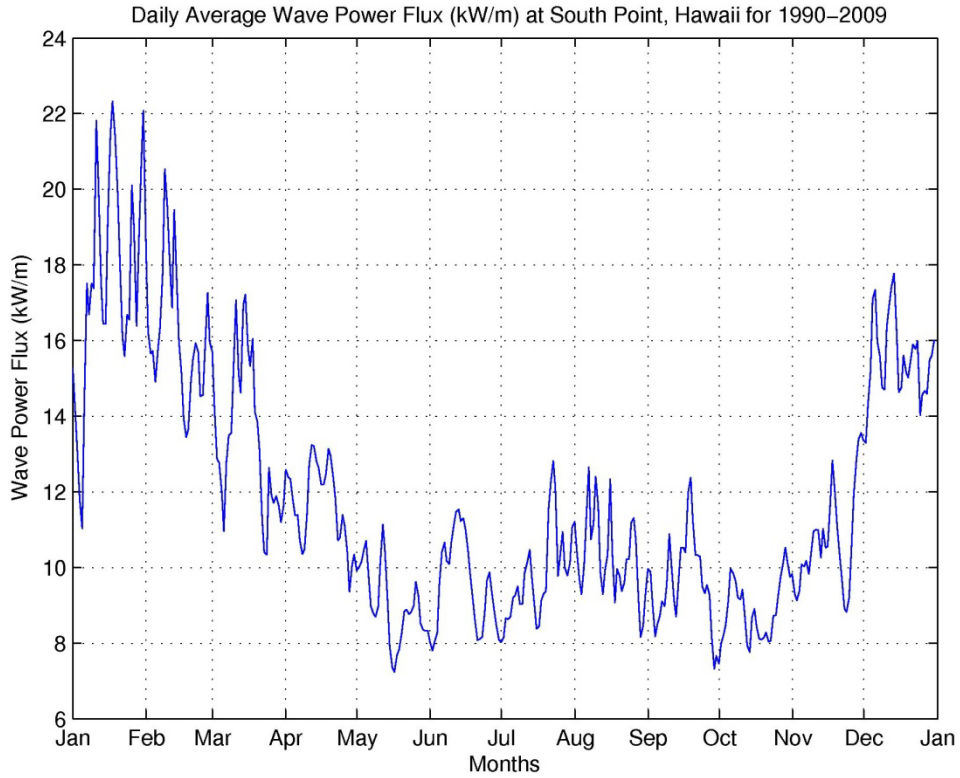


Figure 11 – Daily Average Wave Power Flux for South Point Site

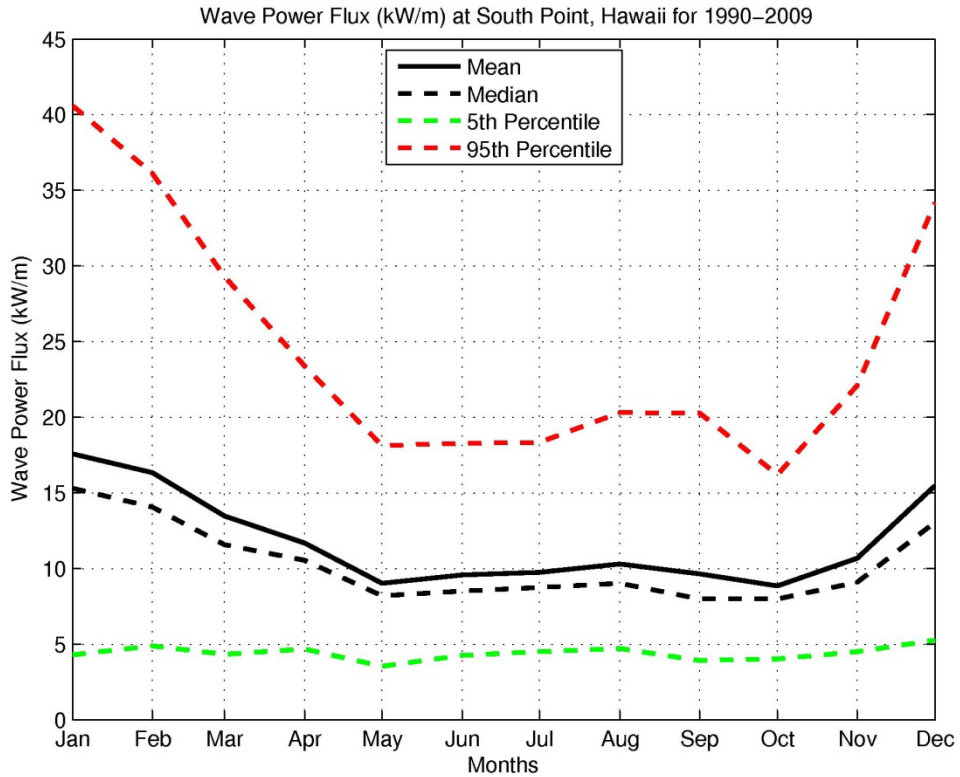


Figure 12 – Monthly Average Wave Power Flux for South Point Site

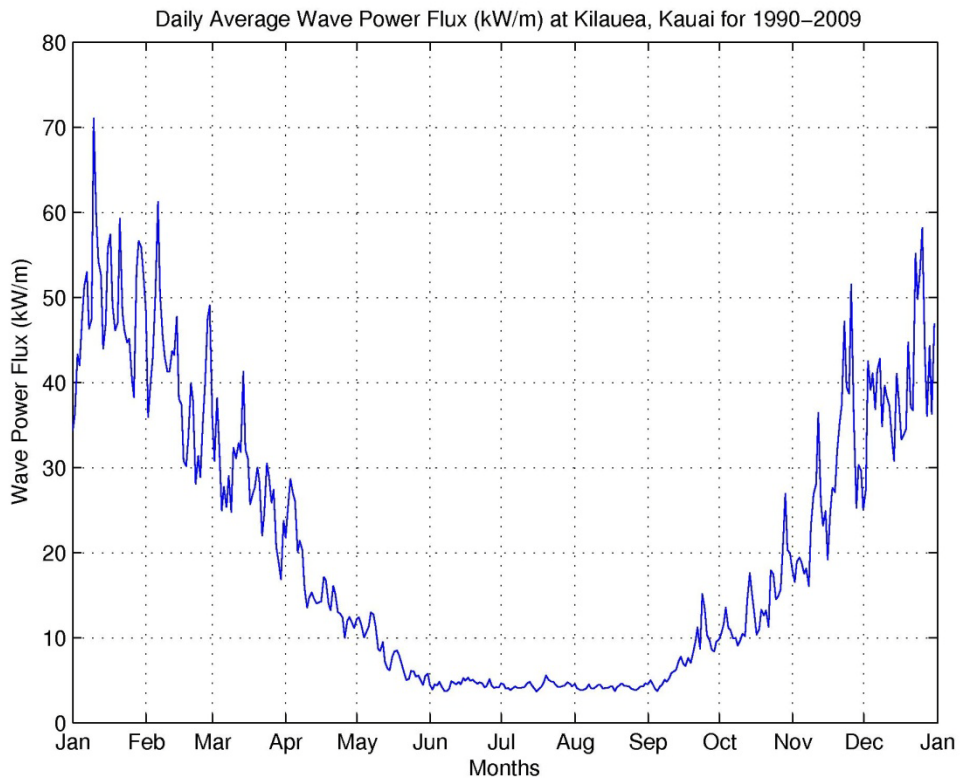


Figure 13 – Daily Average Wave Power Flux for Kilauea Site

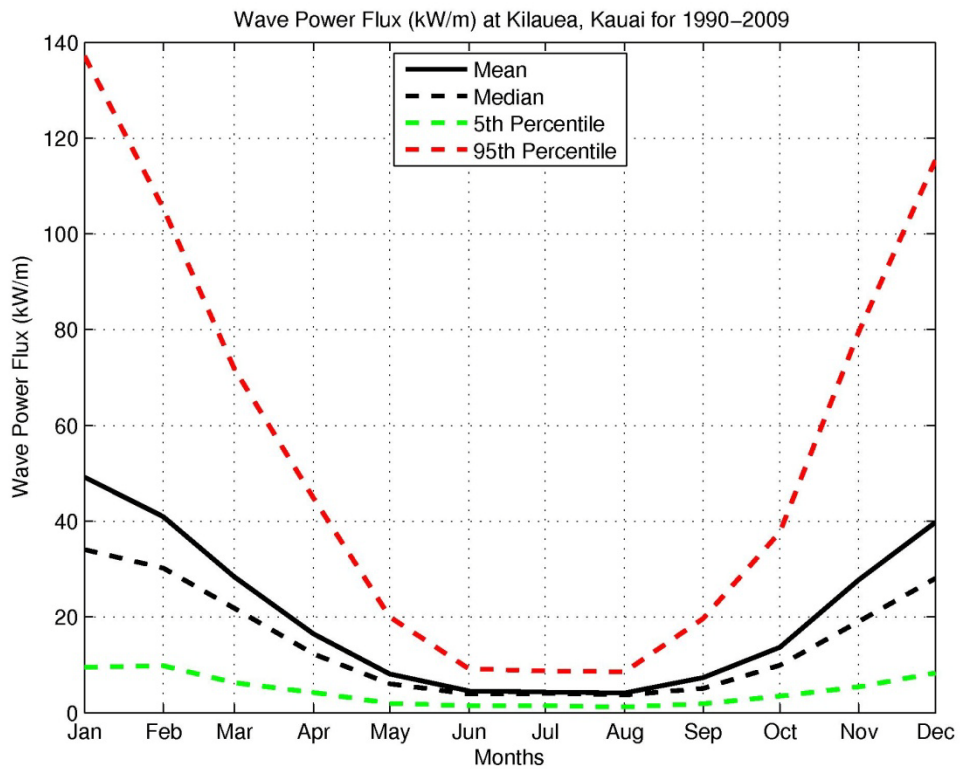


Figure 14 – Monthly Average Wave Power Flux for Kilauea Site

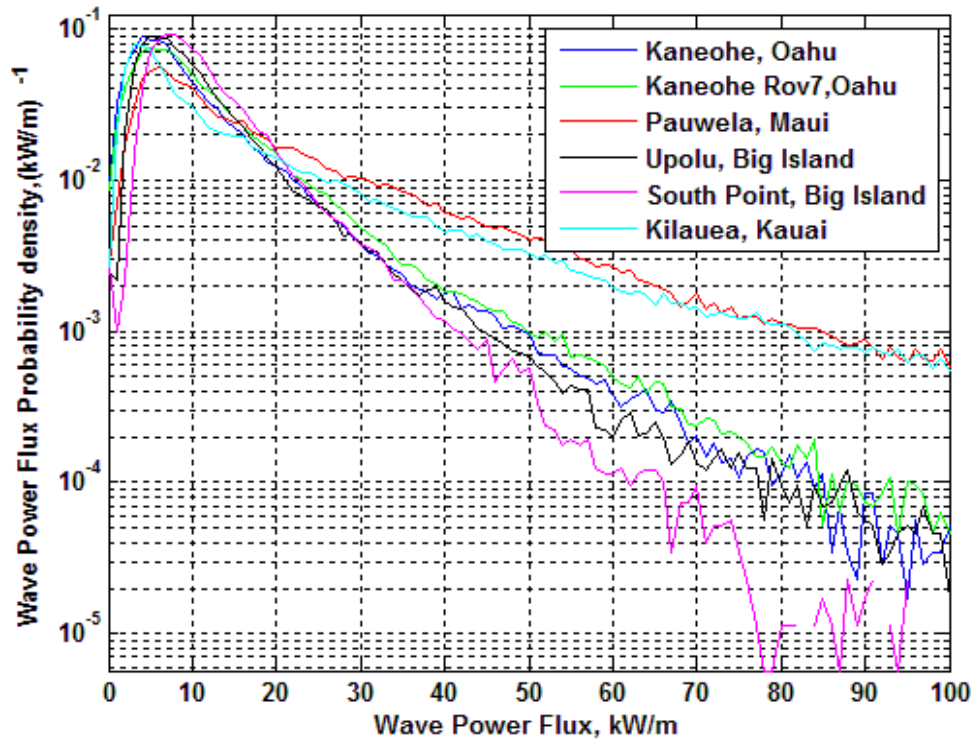


Figure 15 – Wave Power Flux Probability Density Function

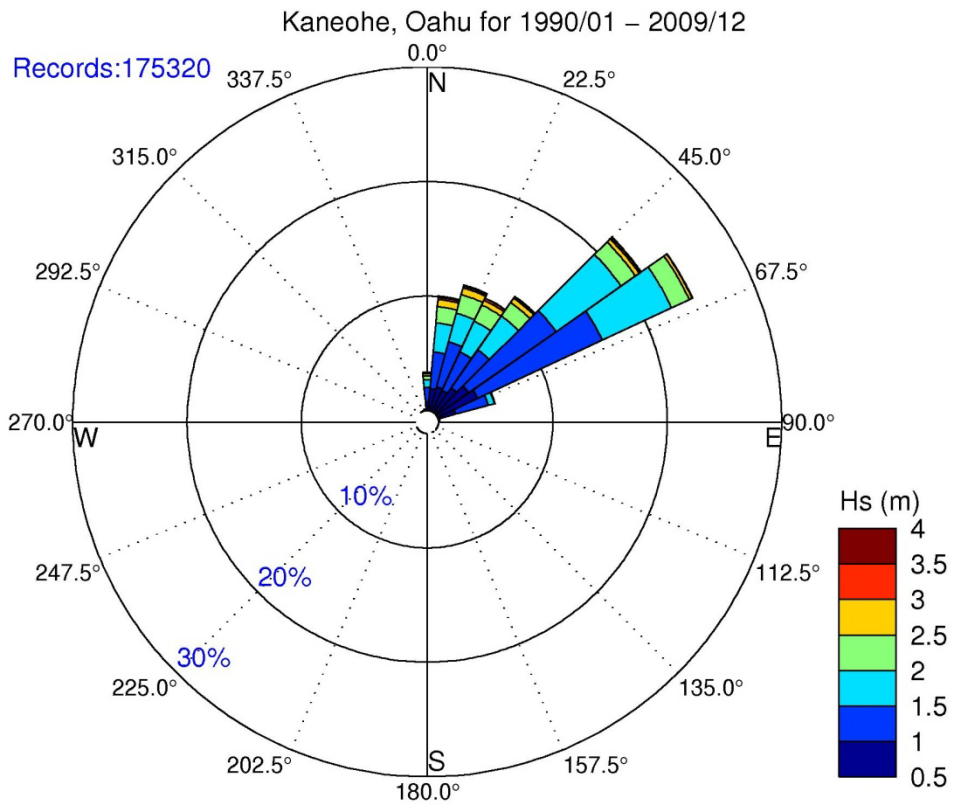


Figure 16 – The Rose map of Significant Wave Height for Kaneohe Site

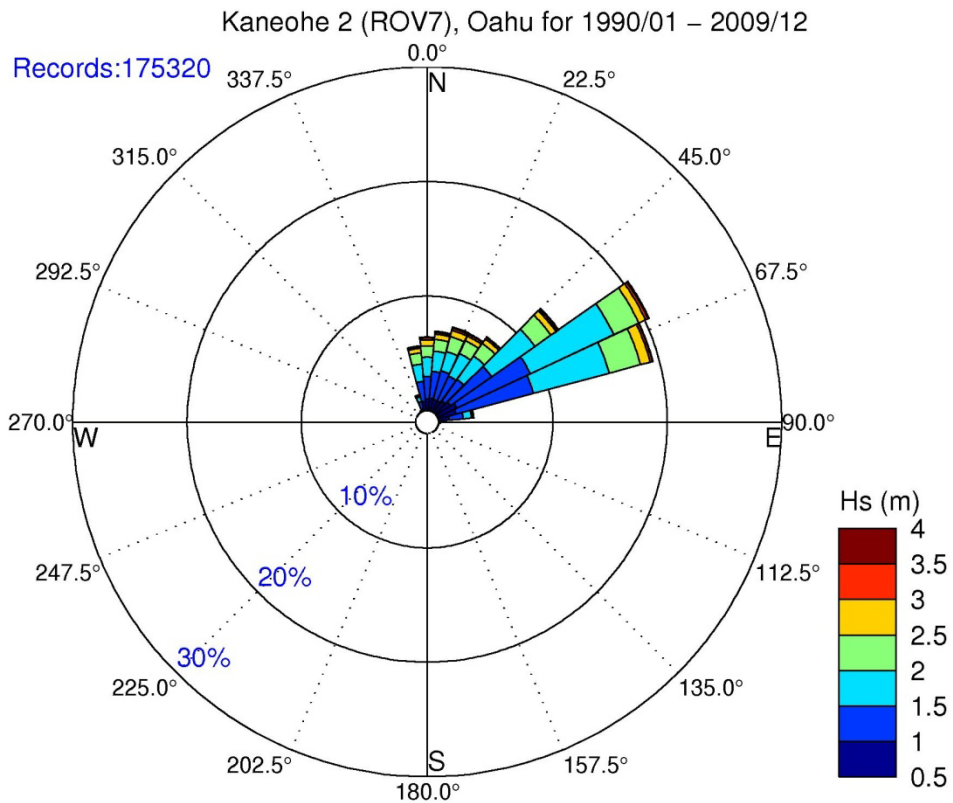


Figure 17 – The Rose map of Significant Wave Height for Kaneohe Rov7 Site

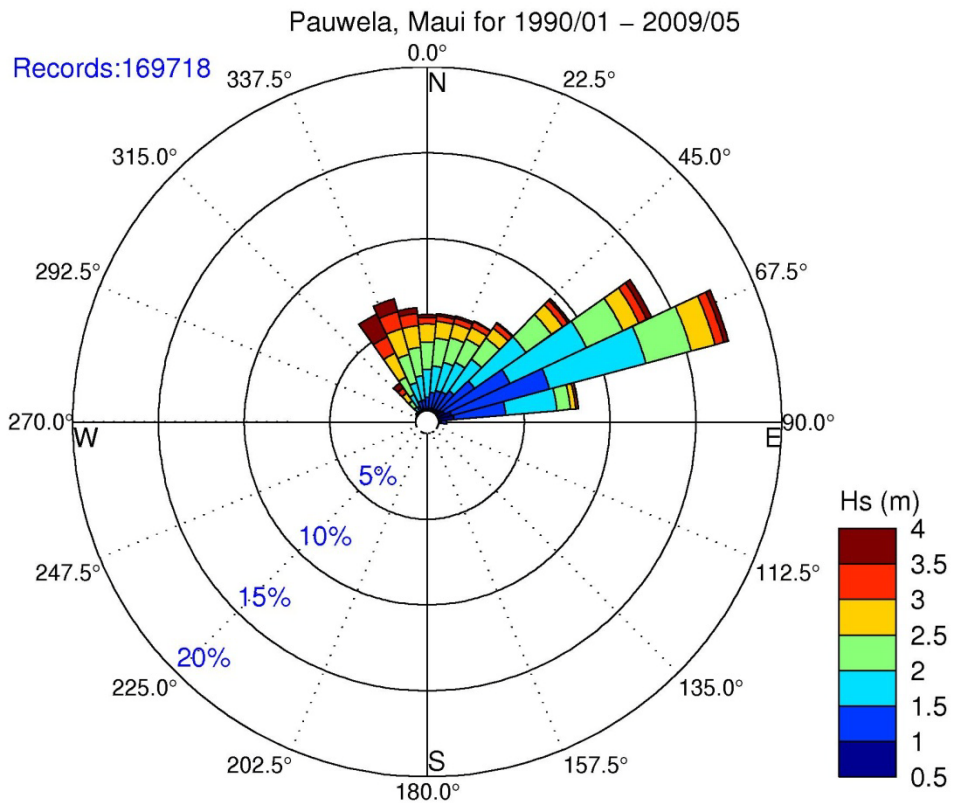


Figure 18 – The Rose map of Significant Wave Height for Pauwela Site

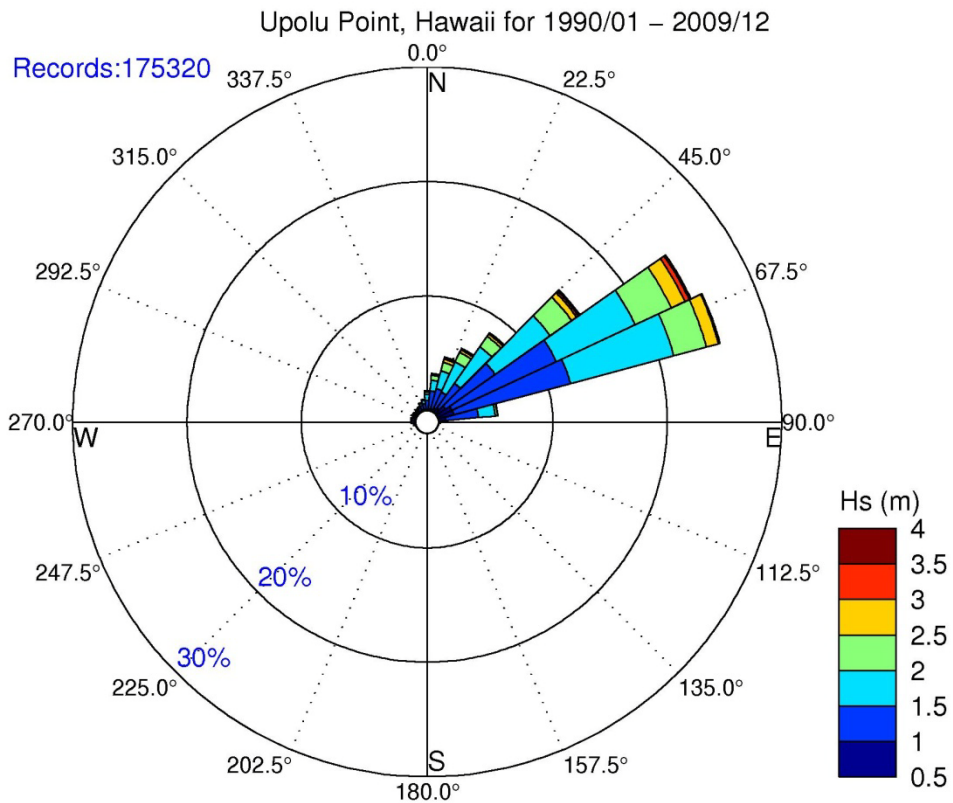


Figure 19 – The Rose map of Significant Wave Height for Upolu Site

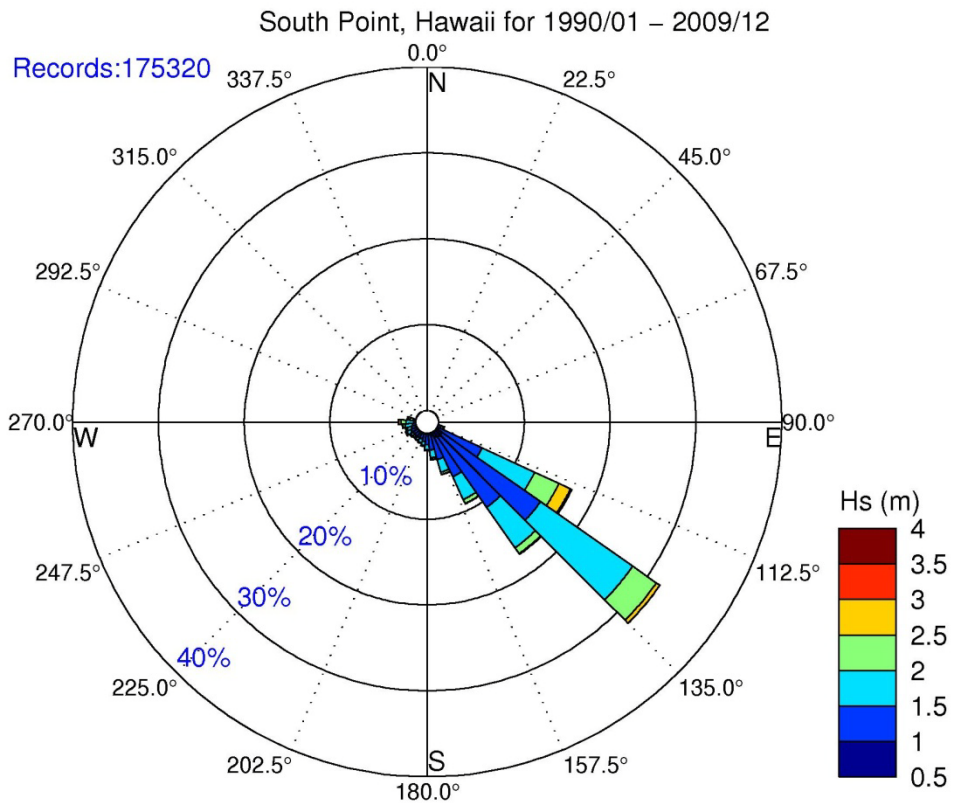


Figure 20 – The Rose map of Significant Wave Height for South Point Site

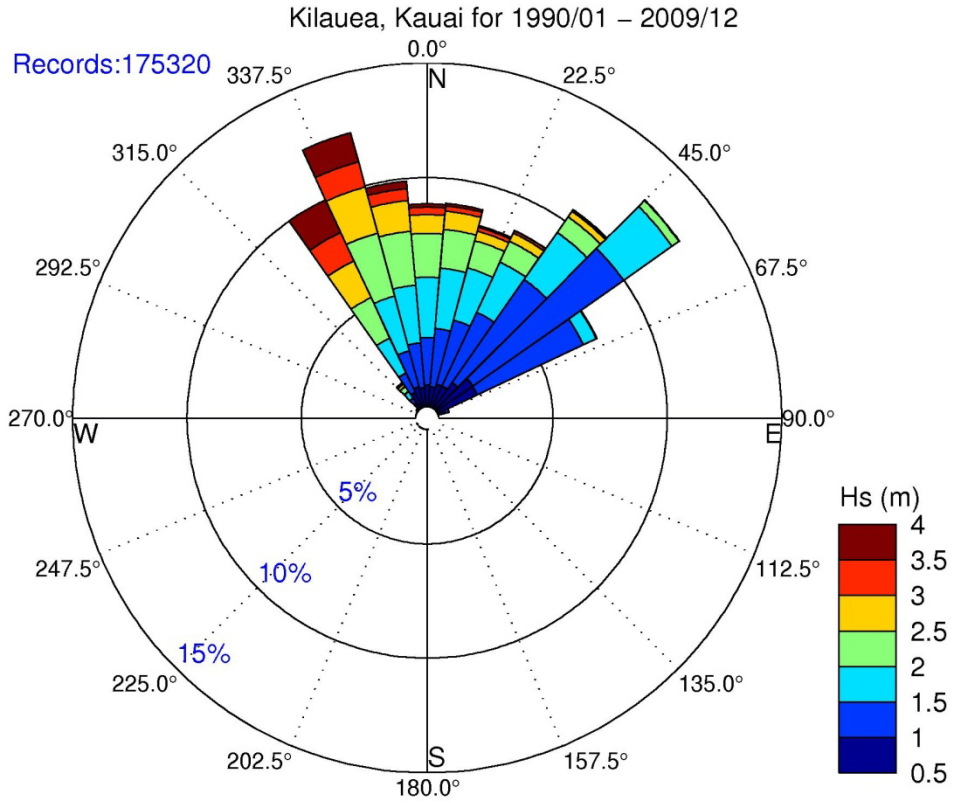


Figure 21 – The Rose map of Significant Wave Height for Kilauea Site

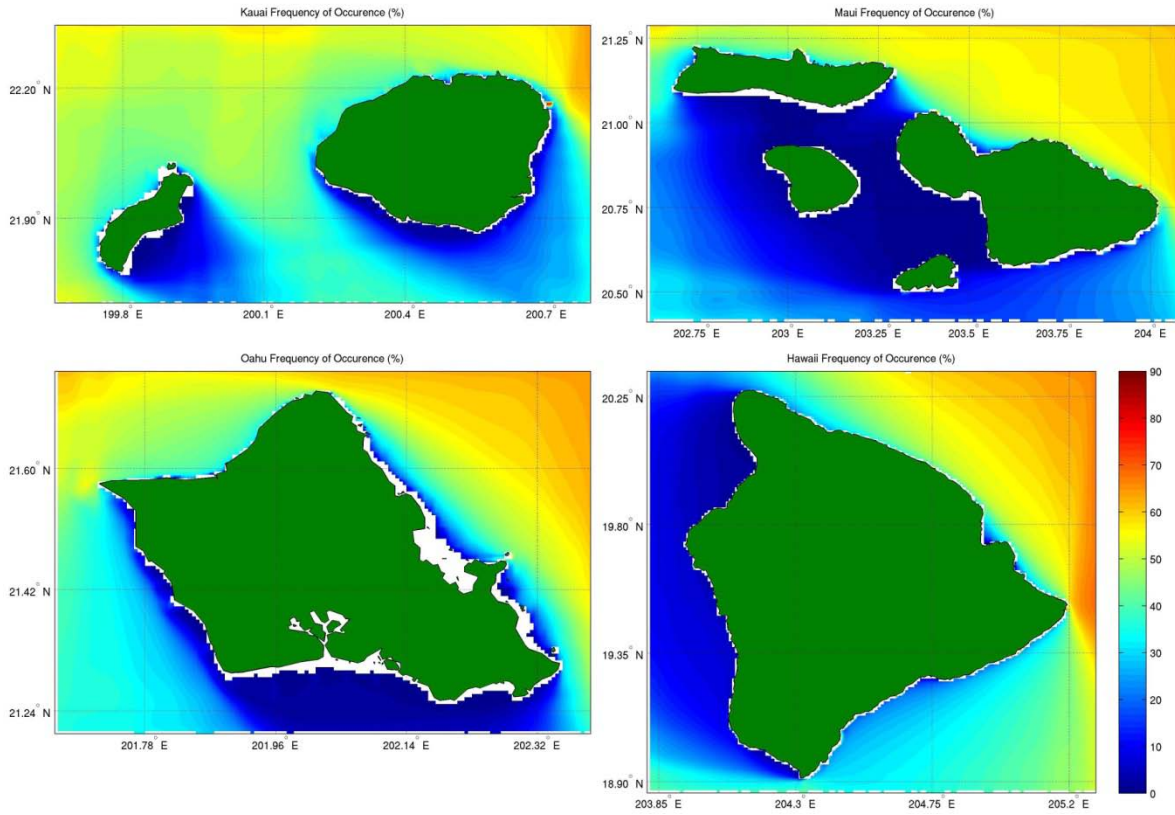


Figure 22 – Wave Power Occurrence of events larger than 15 kW/m

		Te (s)																			
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0.0	8.5	9.0	9.5	
Hs (m)	0.5	0	0	0	30	3	3	11	118	123	155	154	154	229	301	224	271	311	234	170	
	1.0	0	0	0	0	0	16	30	125	108	326	1512	3122	3907	4394	3712	3485	2744	1980	1347	
	1.5	0	0	0	0	0	0	0	8	9	178	1907	10427	15621	10169	7496	6378	4482	3771	2912	
	2.0	0	0	0	0	0	0	0	0	0	0	135	1279	5238	7801	8228	6108	4767	3584	2528	
	2.5	0	0	0	0	0	0	0	0	0	0	10	24	322	1013	2060	3040	2389	2180	1550	
	3.0	0	0	0	0	0	0	0	0	0	0	0	0	4	165	425	643	581	581	622	
	3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71	94	196	222	202	
	4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8	17	36	84	
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	24
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

		Te (s)																
		10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	>17.0	
Hs (m)	0.5	127	113	91	31	17	4	3	3	0	0	0	0	0	0	0	0	2880
	1.0	920	619	551	362	232	124	92	58	45	16	5	1	0	0	0	0	29833
	1.5	2241	1729	1330	844	609	465	218	202	140	68	15	4	3	1	0	1	71228
	2.0	1999	1638	1167	761	526	322	204	110	71	43	25	20	4	1	0	2	46561
	2.5	1205	1020	784	510	326	189	177	138	93	69	17	3	2	5	0	4	17130
	3.0	500	385	364	337	280	173	132	73	48	21	12	3	2	1	2	0	5354
	3.5	213	156	97	96	101	67	49	33	37	32	19	3	5	0	0	0	1693
	4.0	44	49	41	49	33	17	7	14	17	4	10	0	0	0	0	0	434
	4.5	0	2	8	27	22	29	3	3	41	4	0	0	0	0	0	0	165
	5.0	0	0	0	0	18	5	0	0	0	0	0	0	0	0	0	0	23
	5.5	0	0	0	0	0	5	7	0	0	0	0	0	0	0	0	0	12
	6.0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	7
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

175320

Table 4 Te-Hs Occurrence (hours) in Kaneohe Site over the year 1990-2009

		Te (s)																		
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0.0	8.5	9.0	9.5
Hs (m)	0.5	0	0	0	27	6	3	16	103	108	154	134	169	201	204	180	218	215	136	113
	1.0	0	0	0	0	0	16	35	129	121	229	902	1674	2591	3136	2804	2453	1902	1169	775
	1.5	0	0	0	0	0	0	0	8	11	166	1823	8677	10918	8510	6587	5680	4326	3759	2645
	2.0	0	0	0	0	0	0	0	0	0	0	156	1861	10005	10798	9051	6680	4916	3378	2678
	2.5	0	0	0	0	0	0	0	0	0	0	1	71	547	2166	4559	4300	3756	2913	1918
	3.0	0	0	0	0	0	0	0	0	0	0	0	0	12	184	820	1839	1461	952	749
	3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	91	309	385	395	435
	4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	141	135	164
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	7	12	40
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	26
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

		Te (s)																
		10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	>17.0	
Hs (m)	0.5	90	52	8	7	3	0	0	0	0	0	0	0	0	0	0	0	2147
	1.0	565	442	339	205	107	77	37	28	21	1	0	0	0	0	0	0	19758
	1.5	1839	1345	1052	714	501	315	185	123	95	33	10	3	2	1	0	0	59328
	2.0	2105	1733	1124	767	474	230	169	75	56	18	29	7	2	0	0	3	56315
	2.5	1319	1066	757	582	315	177	151	116	77	25	9	4	2	0	0	3	24834
	3.0	681	560	414	384	279	171	126	64	54	11	3	2	2	2	1	0	8771
	3.5	338	190	161	154	122	102	45	48	35	33	6	0	0	0	0	0	2850
	4.0	128	95	55	47	59	18	20	24	24	10	3	0	0	0	0	0	950
	4.5	47	15	25	37	29	11	2	11	29	0	0	0	0	0	0	0	271
	5.0	6	0	0	4	29	8	0	0	0	0	0	0	0	0	0	0	74
	5.5	0	0	0	0	1	11	1	0	0	0	0	0	0	0	0	0	13
	6.0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	9
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

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Table 5 Te-Hs Occurrence (hours) in Kaneohe Rov7 Site over the year 1990-2009

		Te (s)																		
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0.0	8.5	9.0	9.5
Hs (m)	0.5	0	0	0	14	21	7	6	25	31	11	0	1	0	0	1	0	5	23	15
	1.0	0	0	0	0	0	7	10	167	401	762	917	854	770	765	510	367	272	227	167
	1.5	0	0	0	0	0	0	0	0	195	1033	4480	9339	7796	5164	3612	2607	1791	1199	758
	2.0	0	0	0	0	0	0	0	0	0	0	494	4693	9686	8955	6933	5597	4675	3546	2741
	2.5	0	0	0	0	0	0	0	0	0	0	0	13	761	2922	4122	4171	4069	4445	3925
	3.0	0	0	0	0	0	0	0	0	0	0	0	0	1	178	950	1896	2191	2140	2335
	3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	4	80	479	855	855	911
	4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	43	130	281	264
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	29	138
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

		Te (s)																
		10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	>17.0	
Hs (m)	0.5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	165
	1.0	188	84	47	15	7	5	3	1	1	0	0	0	0	0	0	0	6547
	1.5	510	367	214	111	59	22	29	7	5	4	0	1	0	0	0	0	39303
	2.0	1951	1337	888	560	331	150	107	82	59	12	7	1	0	0	1	1	52807
	2.5	3326	2765	1914	1457	876	480	238	112	82	40	40	9	6	1	0	2	35776
	3.0	2162	2240	2420	1990	1487	950	652	374	154	89	62	26	15	11	1	1	22325
	3.5	900	972	1152	1162	1082	848	620	441	269	165	104	39	18	13	6	4	10979
	4.0	241	233	276	365	498	485	601	449	299	192	124	73	22	12	11	7	4607
	4.5	88	34	43	107	151	218	195	223	214	127	90	72	17	13	3	3	1789
	5.0	76	3	0	4	31	53	56	63	96	113	110	42	21	4	1	2	711
	5.5	3	0	0	0	0	16	7	42	50	25	32	14	8	2	3	1	203
	6.0	0	0	0	0	0	0	6	8	10	8	8	9	10	0	0	1	60
	6.5	0	0	0	0	0	0	0	0	0	9	5	10	5	0	0	1	30
7.0	0	0	0	0	0	0	0	0	0	0	0	2	3	3	0	2	10	
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	4	8	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

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Table 6 Te-Hs Occurrence (hours) in Pauwela Site over the year 1990-2009

		Te (s)																		
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0.0	8.5	9.0	9.5
Hs (m)	0.5	0	0	0	4	6	34	13	3	10	4	5	0	2	0	1	0	0	0	0
	1.0	0	0	0	0	0	3	20	16	16	120	900	1865	2039	2174	1903	1240	600	421	149
	1.5	0	0	0	0	0	0	0	0	0	217	3201	13273	15797	12284	8431	6228	4270	2630	1702
	2.0	0	0	0	0	0	0	0	0	0	0	95	3637	14433	14490	10668	6743	4249	2707	1611
	2.5	0	0	0	0	0	0	0	0	0	0	0	40	1030	4187	5441	3923	3010	1871	979
	3.0	0	0	0	0	0	0	0	0	0	0	0	0	7	134	1195	2000	1455	636	563
	3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	103	276	619	361	273
	4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	87	115	181
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	14	83
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

		Te (s)																
		10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0		>17.0
Hs (m)	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	82
	1.0	76	16	7	13	4	1	0	0	0	0	0	0	0	0	0	0	11583
	1.5	851	499	259	143	101	50	25	13	7	0	0	0	0	0	0	0	69981
	2.0	1116	704	480	309	123	76	56	21	19	7	5	0	0	0	0	0	61549
	2.5	583	368	294	233	172	50	36	44	24	15	6	0	0	0	0	0	22306
	3.0	310	260	134	77	57	56	20	17	10	6	0	0	0	0	0	0	6937
	3.5	148	117	30	20	52	16	10	5	8	3	0	0	0	0	0	0	2042
	4.0	37	19	28	34	24	13	0	4	10	21	10	0	0	0	0	0	586
	4.5	28	17	7	4	9	10	0	0	2	18	0	0	0	0	0	0	194
	5.0	17	0	0	0	0	13	2	0	0	0	0	0	0	0	0	0	41
	5.5	0	0	0	0	0	0	9	4	0	0	0	0	0	0	0	0	13
	6.0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	6
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Table 7 Te-Hs Occurrence (hours) in Upolu Site over the year 1990-2009

		Te (s)																		
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0.0	8.5	9.0	9.5
Hs (m)	0.5	0	0	3	4	11	13	61	3	4	14	3	0	0	0	0	0	0	0	0
	1.0	0	0	0	0	0	7	14	45	23	26	66	98	364	644	1122	1143	949	795	363
	1.5	0	0	0	0	0	0	0	2	6	20	61	567	2957	8886	14886	17263	13803	8946	5571
	2.0	0	0	0	0	0	0	0	0	0	0	0	122	1129	4390	9519	13790	12053	7994	5638
	2.5	0	0	0	0	0	0	0	0	0	0	0	1	114	779	1906	4078	3262	2428	1644
	3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	189	709	1388	737	452
	3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	76	115
	4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

		Te (s)																		
		10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	>17.0			
Hs (m)	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	116
	1.0	180	72	41	21	2	4	1	0	0	0	0	0	0	0	0	0	0	0	5980
	1.5	3542	2116	1138	579	356	181	58	13	12	4	1	0	0	0	0	0	0	0	80968
	2.0	3851	2337	1559	1007	493	366	195	106	48	10	3	4	0	0	0	0	0	0	64614
	2.5	1074	1005	684	410	330	172	130	44	25	16	8	1	2	0	0	0	0	0	18113
	3.0	318	236	170	194	203	144	73	48	27	8	0	0	3	0	0	0	0	0	4936
	3.5	70	57	55	12	53	44	24	24	17	4	4	4	4	0	0	0	0	0	582
	4.0	0	0	0	0	0	0	2	9	0	0	0	0	0	0	0	0	0	0	11
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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Table 8 Te-Hs Occurrence (hours) in South Point Site over the year 1990-2009

		Te (s)																		
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0.0	8.5	9.0	9.5
Hs (m)	0.5	0	0	0	5	11	5	2	17	27	44	54	22	12	6	0	0	0	0	0
	1.0	0	0	0	0	0	4	7	162	532	1439	3581	4341	3854	2735	1968	1274	732	393	194
	1.5	0	0	0	0	0	0	0	1	13	408	4678	11971	11544	8175	6404	5028	3874	3096	2359
	2.0	0	0	0	0	0	0	0	0	0	0	40	544	1900	3315	4239	4695	4734	4837	4308
	2.5	0	0	0	0	0	0	0	0	0	0	3	1	71	274	935	1265	1957	2714	2962
	3.0	0	0	0	0	0	0	0	0	0	0	0	0	2	20	108	337	621	800	1155
	3.5	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	53	97	250	355
	4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	36	86
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	8
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

		Te (s)																
		10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	>17.0	
Hs (m)	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	205
	1.0	89	32	18	7	0	0	0	0	0	0	0	0	0	0	0	0	21362
	1.5	1542	885	441	190	119	50	25	6	1	0	1	0	1	0	0	0	60812
	2.0	3937	2748	2157	1209	665	348	180	89	33	23	13	6	3	1	1	0	40025
	2.5	3074	3131	2685	2240	1638	1007	620	389	176	123	46	30	21	10	7	1	25380
	3.0	1460	1691	1686	1503	1417	1279	813	561	352	168	111	34	51	24	11	8	14212
	3.5	479	595	769	686	825	764	666	430	336	296	171	85	59	34	16	13	6983
	4.0	94	200	238	344	346	444	445	353	255	206	127	96	62	27	21	8	3391
	4.5	5	18	94	175	187	192	246	215	160	147	155	68	37	23	15	13	1763
	5.0	0	0	12	32	69	82	74	88	88	77	95	60	30	11	8	2	728
	5.5	0	0	0	4	4	35	34	66	64	43	41	31	20	0	2	2	346
	6.0	0	0	0	0	0	0	1	9	21	5	14	16	1	3	1	1	72
6.5	0	0	0	0	0	0	0	0	2	2	5	7	2	0	0	1	19	

	7.0	0	0	0	0	0	0	0	0	0	0	0	1	6	1	3	0	2	13
	7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6	9
	>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Table 9 Te-Hs Occurrence (hours) in Kilauea Site over the year 1990-2009

		T02 (s)																			
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0.0	8.5	9.0	9.5	
Hs (m)	0.5	0	0	19	26	647	587	439	325	192	161	158	110	60	79	50	24	1	1	1	
	1.0	0	0	0	0	88	569	1593	3509	5989	6042	4127	2696	1971	1356	961	451	212	130	81	
	1.5	0	0	0	0	0	0	71	1708	10154	21194	17427	7774	4698	2877	1908	1275	935	610	265	
	2.0	0	0	0	0	0	0	0	26	1717	7319	13454	11103	5752	2837	1607	1158	737	392	243	
	2.5	0	0	0	0	0	0	0	0	22	1101	3184	3932	3481	2275	1372	753	382	257	150	
	3.0	0	0	0	0	0	0	0	0	0	14	654	1159	882	757	761	501	302	105	115	
	3.5	0	0	0	0	0	0	0	0	0	0	3	257	354	330	196	163	147	90	42	
	4.0	0	0	0	0	0	0	0	0	0	0	0	15	65	98	72	79	26	24	15	
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	2	24	9	17	15	10	22	
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	11	9
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

		T02 (s)																
		10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	>17.0	
Hs (m)	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2880
	1.0	44	13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	29833
	1.5	159	106	38	18	7	4	0	0	0	0	0	0	0	0	0	0	71228
	2.0	116	52	21	16	7	1	2	0	1	0	0	0	0	0	0	0	46561
	2.5	76	52	51	22	9	1	2	5	1	2	0	0	0	0	0	0	17130
	3.0	34	18	26	10	1	5	8	2	0	0	0	0	0	0	0	0	5354
	3.5	38	37	27	8	1	0	0	0	0	0	0	0	0	0	0	0	1693
	4.0	12	17	5	0	6	0	0	0	0	0	0	0	0	0	0	0	434
	4.5	27	22	10	2	5	0	0	0	0	0	0	0	0	0	0	0	165
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
	5.5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
	6.0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Table 10 T₀₂-Hs Occurrence (hours) in Kaneohe Site over the year 1990-2009

		T02 (s)																		
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5
Hs (m)	0.5	0	0	3	35	465	556	371	222	153	104	89	61	53	33	2	0	0	0	0
	1.0	0	0	0	0	100	479	1248	2556	3812	3608	2873	1954	1364	858	435	285	108	42	26
	1.5	0	0	0	0	0	0	61	1384	8325	17936	13311	6632	4031	2853	1896	1138	776	450	254
	2.0	0	0	0	0	0	0	0	13	1589	9043	18734	12654	6098	3384	1735	1283	874	460	227
	2.5	0	0	0	0	0	0	0	0	24	1104	4817	6969	5403	2892	1566	863	471	297	220
	3.0	0	0	0	0	0	0	0	0	0	15	848	1988	2212	1333	1009	591	347	171	108
	3.5	0	0	0	0	0	0	0	0	0	0	15	367	670	607	382	347	176	112	57
	4.0	0	0	0	0	0	0	0	0	0	0	0	6	172	260	187	106	92	43	22
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	12	51	56	47	17	15	17
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	30	0	4	4	19
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

		T02 (s)															
		10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	>17.0
Hs (m)	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2147
	1.0	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	19758
	1.5	147	71	40	12	11	0	0	0	0	0	0	0	0	0	0	59328
	2.0	117	68	17	10	6	1	0	1	0	1	0	0	0	0	0	56315
	2.5	82	44	43	21	8	7	0	1	1	1	0	0	0	0	0	24834
	3.0	52	32	33	14	1	3	9	5	0	0	0	0	0	0	0	8771
	3.5	52	33	21	8	3	0	0	0	0	0	0	0	0	0	0	2850
	4.0	16	26	9	2	1	8	0	0	0	0	0	0	0	0	0	950
	4.5	28	14	9	3	2	0	0	0	0	0	0	0	0	0	0	271
	5.0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74
	5.5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
	6.0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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175320

Table 11 T₀₂-Hs Occurrence (hours) in Kaneohe Rov7 Site over the year 1990-2009

		T02 (s)																		
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0.0	8.5	9.0	9.5
Hs (m)	0.5	0	0	2	25	47	26	16	4	4	10	8	11	5	7	0	0	0	0	0
	1.0	0	0	0	0	17	578	1977	1572	1028	483	297	227	142	79	70	35	26	16	0
	1.5	0	0	0	0	0	0	717	6980	16155	7874	3119	1743	1045	751	401	200	116	70	66
	2.0	0	0	0	0	0	0	0	76	8114	18262	10942	5782	3286	2251	1430	1081	649	351	253
	2.5	0	0	0	0	0	0	0	0	6	2751	9571	7267	5045	3680	2600	1608	1145	867	596
	3.0	0	0	0	0	0	0	0	0	0	0	1442	4794	3851	2849	2790	2113	1514	1070	716
	3.5	0	0	0	0	0	0	0	0	0	0	12	1115	1900	1375	1254	1249	1325	939	618
	4.0	0	0	0	0	0	0	0	0	0	0	0	33	432	501	314	438	464	582	498
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	40	175	98	77	145	178	237
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	91	0	9	19	52
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

		T02 (s)																
		10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	>17.0	
Hs (m)	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	165
	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6547
	1.5	56	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39303
	2.0	140	104	58	18	8	2	0	0	0	0	0	0	0	0	0	0	52807
	2.5	325	141	92	62	12	5	2	1	0	0	0	0	0	0	0	0	35776
	3.0	461	276	262	86	58	23	10	8	2	0	0	0	0	0	0	0	22325
	3.5	418	231	167	169	101	47	33	16	10	0	0	0	0	0	0	0	10979
	4.0	496	333	161	108	91	75	40	27	14	0	0	0	0	0	0	0	4607
	4.5	206	221	147	75	61	71	32	11	13	2	0	0	0	0	0	0	1789
	5.0	77	85	117	109	31	42	36	15	2	2	0	0	0	0	0	0	711
	5.5	5	51	55	30	15	16	16	2	4	5	0	0	0	0	0	0	203
6.0	0	17	9	9	6	6	7	6	0	0	0	0	0	0	0	0	60	
6.5	0	0	4	7	9	9	0	1	0	0	0	0	0	0	0	0	30	

	7.0	0	0	0	0	0	0	4	4	0	2	0	0	0	0	0	0	0	0	0
	7.5	0	0	0	0	0	0	0	2	4	2	0	0	0	0	0	0	0	0	0
	>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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8
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175320

Table 12 T₀₂-Hs Occurrence (hours) in Pauwela Site over the year 1990-2009

		T02 (s)																		
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0.0	8.5	9.0	9.5
Hs (m)	0.5	0	0	0	10	45	14	8	4	1	0	0	0	0	0	0	0	0	0	0
	1.0	0	0	0	0	2	41	472	3531	3012	1716	1094	830	516	270	64	32	1	1	1
	1.5	0	0	0	0	0	0	15	6204	29211	17409	7556	4143	2653	1688	752	203	100	42	5
	2.0	0	0	0	0	0	0	0	24	5784	27284	16481	6093	2644	1534	979	406	205	80	21
	2.5	0	0	0	0	0	0	0	0	14	2379	9934	5615	2334	934	552	246	120	95	31
	3.0	0	0	0	0	0	0	0	0	0	7	915	3546	1219	634	305	180	77	27	15
	3.5	0	0	0	0	0	0	0	0	0	0	6	518	904	357	102	42	31	30	43
	4.0	0	0	0	0	0	0	0	0	0	0	0	0	171	224	62	42	29	10	8
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	2	94	48	7	0	9	11
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	24	0	0	0	6
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

		T02 (s)															
		10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	>17.0
Hs (m)	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2.0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2.5	31	19	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	3.0	5	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3.5	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4.0	6	7	12	2	4	6	3	0	0	0	0	0	0	0	0	0
	4.5	3	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.5	7	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

82
11583
69981
61549
22306
6937
2042
586
194
41
13
6
0

	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Table 13 T₀₂-Hs Occurrence (hours) in Upolu Site over the year 1990-2009

		T02 (s)																		
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5
Hs (m)	0.5	0	0	3	13	27	52	5	11	5	0	0	0	0	0	0	0	0	0	0
	1.0	0	0	0	0	7	53	93	478	1290	1648	1197	603	346	130	107	26	2	0	0
	1.5	0	0	0	0	0	0	14	670	10231	28181	22847	10290	5150	2661	613	222	65	24	0
	2.0	0	0	0	0	0	0	0	8	837	11398	25167	15461	6693	3170	1174	408	224	67	7
	2.5	0	0	0	0	0	0	0	0	29	869	5827	5941	2824	1420	663	262	185	69	24
	3.0	0	0	0	0	0	0	0	0	0	8	432	2227	996	446	360	298	122	31	14
	3.5	0	0	0	0	0	0	0	0	0	0	0	19	194	79	48	98	55	15	36
	4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

		T02 (s)															
		10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	>17.0
Hs (m)	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	116
	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5980
	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80968
	2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64614
	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18113
	3.0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4936
	3.5	19	8	11	0	0	0	0	0	0	0	0	0	0	0	0	582
	4.0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

0
0
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Table 14 T₀₂-Hs Occurrence (hours) in South Point Site over the year 1990-2009

		T02 (s)																		
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0.0	8.5	9.0	9.5
Hs (m)	0.5	0	0	2	8	15	67	56	35	21	1	0	0	0	0	0	0	0	0	0
	1.0	0	0	0	0	4	644	2490	6573	5882	3072	1435	611	399	165	76	10	1	0	0
	1.5	0	0	0	0	0	0	48	4105	18987	18163	8830	4684	2658	1601	928	499	230	61	15
	2.0	0	0	0	0	0	0	0	9	989	5759	8664	7994	6258	4323	2709	1472	866	515	278
	2.5	0	0	0	0	0	0	0	0	5	358	2049	3482	4077	4420	3712	2747	1828	1195	769
	3.0	0	0	0	0	0	0	0	0	0	3	181	903	1660	1750	1900	2247	1897	1524	896
	3.5	0	0	0	0	0	0	0	0	0	1	3	72	421	659	663	761	908	1040	792
	4.0	0	0	0	0	0	0	0	0	0	0	0	0	16	153	195	306	354	453	469
	4.5	0	0	0	0	0	0	0	0	0	0	0	0	5	4	13	133	185	187	211
	5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	41	66	82
	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	42
	6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

		T02 (s)															
		10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	>17.0
Hs (m)	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	205
	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21362
	1.5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	60812
	2.0	137	42	10	0	0	0	0	0	0	0	0	0	0	0	0	40025
	2.5	399	245	72	17	4	1	0	0	0	0	0	0	0	0	0	25380
	3.0	565	314	210	106	41	6	7	1	1	0	0	0	0	0	0	14212
	3.5	531	372	318	253	89	55	27	15	0	3	0	0	0	0	0	6983
	4.0	513	297	167	179	133	84	43	16	6	7	0	0	0	0	0	3391
	4.5	238	256	166	94	113	91	46	15	4	2	0	0	0	0	0	1763
	5.0	113	82	88	83	62	65	30	11	0	0	1	0	0	0	0	728
	5.5	48	62	60	42	29	25	17	6	1	0	3	0	0	0	0	346

	6.0	19	11	4	4	14	14	1	0	1	4	0	0	0	0	0	0	72
	6.5	0	2	1	6	6	3	0	1	0	0	0	0	0	0	0	0	19
	7.0	0	0	0	0	3	5	3	0	2	0	0	0	0	0	0	0	13
	7.5	0	0	0	0	0	0	0	4	5	0	0	0	0	0	0	0	9
	>7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

175320

Table 15 T₀₂-Hs Occurrence (hours) in Kilauea Site over the year 1990-2009

3.0 Reference

SWAN Team, 2011: SWAN User Manual: SWAN Cycle III version 40.85, Delft University of Technology, 121 pgs.