RÉPUBLIQUE FRANÇAISE
Liberté
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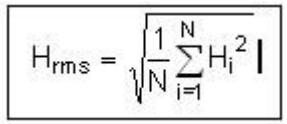
Cerema
CLIMAT & TERRITOIRES DE DEMAIN

Direction technique risques, eaux et mer
Département risques, eaux et littoral

Provision of data extracted from the Candhis database

DETAILS OF SEA STATE PARAMETERS

Field No.	Computer Symbol	Format	Unit	Definition	Calculation method
1	Date Time	YYYY-MM-DD HH:MN	_	Time stamp of the recording	Time given in universal time
2	H13D	FF.FF	m	Significant wave height defined by crossing the mean level by decreasing values (recommended by the AIRH 1986).	Temporal analysis (or wave by wave) : Average value of the upper third of the wave heights.
3	H110D	FF.FF	m	Mean height of the top tenth in wave height defined by crossing the mean level by decreasing values .	Temporal analysis (or wave by wave)
4	HMAXD	FF.FF	m	Maximum height of the waves defined by crossing the average level by decreasing values (rising front).	Temporal analysis (or wave by wave)

Field No.	Computer Symbol	Format	Unit	Definition	Calculation method
5	HSIGMA	FF.FF	m	Significant wave height estimated by Hσ.	Temporal analysis (or wave by wave) : Hσ = 4ση with ση standard deviation of the free surface η(t).
6	HRMSD	FF.FF	m	Mean squared height of waves defined by crossing the mean level by decreasing values .	Temporal analysis (or wave by wave) : 
7	H2%D	FF.FF	m	Wave height exceeded by 2% of all waves defined by crossing the average level by decreasing values .	Temporal analysis (or wave by wave) :
8	TH13D	FF.F	s	Significant period of waves defined by crossing the average level by decreasing values.	Temporal analysis (or wave by wave) : Average of the upper third of the periods of the largest waves.
9	TH110D	FF.F	s	Average of the periods of the top tenth in wave height defined by crossing the average level by decreasing values.	Temporal analysis (or wave by wave) :
10	TAVGD	FF.F	s	Average period of the waves defined by crossing the average level by decreasing values.	Temporal analysis (or wave by wave) :
11	THMAXD	FF.F	s	Period of the wave of maximum height, the waves being defined by crossing the average level by decreasing values.	Temporal analysis (or wave by wave) :

Field No.	Computer Symbol	Format	Unit	Definition	Calculation method
12	TMAXD	FF.F	s	Maximum period of waves defined by crossing the average level by decreasing values.	Temporal analysis (or wave by wave) :
13	ETAMAX	FF.FF	m	Maximum elevation of the free surface in relation to the average level.	Temporal analysis (or wave by wave)
14	ETAMIN	FF.FF	m	Minimum elevation of the free surface in relation to the average level.	Temporal analysis (or wave by wave)
15	SZ13D	0.FFF	_	Significant wave camber.	Temporal analysis (or wave by wave) :The camber of a wave SZ = H/L. The wavelength is calculated from the period T and the water depth d. $L_{i+1}=\frac{gT^2}{2\pi}th\frac{2\pi d}{L_i}$ avec $L_0=1.56T^2$ The significant camber is the average value of the upper third of the wave camber.
16	SZMAXD	0.FFF	_	Maximum wave camber.	Temporal analysis (or wave by wave)
17	TSZMAXD	0.FF	s	Period of maximum camber wave.	Temporal analysis (or wave by wave)

Field No.	Computer Symbol	Format	Unit	Definition	Calculation method
18	NBRE_VAG	FFF	_	Number of waves defined per crossing by decreasing values .	Temporal analysis (or wave by wave) : Quality criteria of the measurement - size of the analyzed sample.
19	SKEW	0.FFF	_	Skewness: Asymmetry of the elevation of the free surface.	Temporal analysis (or wave by wave) Measurement quality criteria. $\sqrt{\beta_1} = \int_{-\infty}^{+\infty} \eta^3 p(\eta) d\eta / \sigma_\eta^3 = \frac{1}{\sigma_\eta^3} \frac{1}{n-1} \sum_{i=1}^{n} (\eta_i - \bar{\eta})^3$ with η : free surface elevation ση standard deviation of the free surface. The skewness of a normal distribution of the elevation of the free surface is equal to 0.
20	KURT	0.FFF	_	Kurtosis of free surface elevation	Temporal analysis (or wave by wave) $\beta_2 = \int_{-\infty}^{+\infty} \eta^4 p(\eta) d\eta / \sigma_\eta^4 = \frac{1}{\sigma_\eta^4} \frac{1}{n-1} \sum_{i=1}^{n} (\eta_i - \bar{\eta})^4$ Quality criterion of the measurement. With η : elevation of the free surface ση standard deviation of the free surface. The kurtosis of a normal distribution of the free surface elevation is equal to 3.

Field No.	Computer Symbol	Format	Unit	Definition	Calculation method
21	RHH	0.FF	_	Coefficient of correlation between successive wave heights defined by crossing the mean level by decreasing values .	Temporal analysis (or wave by wave)
22	HM0	FF.FF	m	Significant spectral wave height.	Spectral analysis : $H_{m0} = 4\sqrt{m_0} = 4\sqrt{\int_{f_{min}}^{f_{max}} E(f)df}$ with f_{min} and f_{max} to be defined.
23	TP	FF.F	s	Barycentric peak period.	Spectral analysis : Calculated by the "Delft" method. $T_p^{D80\%} = \int_{f_1}^{f_2} E(f)df \Big/ \int_{f_1}^{f_2} f\,E(f)df$ où $E(f_1) = E(f_2) = 0.8E_{max}$
24	T02	FF.F	s	Average time period.	Spectral analysis : $T_{m02} = T_{02} = \sqrt{\frac{m_0}{m_2}} = \sqrt{\int_{f_{min}}^{f_{max}} E(f)df \Big/ \int_{f_{min}}^{f_{max}} f^2 E(f)df}$

Field No.	Computer Symbol	Format	Unit	Definition	Calculation method
25	TE	FF.F	s	Average energy period.	Spectral analysis : $T_{m-1,0} = T_{-10} = T_E = \frac{m_{-1}}{m_0} = \frac{\int_{f_{min}}^{f_{max}} \frac{E(f)}{f} df}{\int_{f_{min}}^{f_{max}} E(f) df} = \frac{\int_{f_{min}}^{f_{max}} T.E(f) df}{\int_{f_{min}}^{f_{max}} E(f) df}$
26	EPS2	F.FF	_	Spectral narrowness index.	Spectral analysis : $\varepsilon_2 = \sqrt{\frac{m_0 m_2}{m_1^2} - 1}$
27	KAPA	F.FF	_	Spectral width . κ	Spectral analysis : $\kappa = \frac{\left\| \int_{f_{min}}^{f_{max}} E(f) \exp(i 2\pi f T_{02}) df \right\|}{m_0}$
28	THETAP	FFF.F	degrees	Direction of origin at the peak, measured relative to geographic north, positively clockwise.	Spectral analysis : $\theta_m(f_p) = \arctan\left(\frac{b_1(f_p)}{a_1(f_p)}\right)$ (notation to be confirmed)

Field No.	Computer Symbol	Format	Unit	Definition	Calculation method
29	THETAM	FFF.F	degrees	Spectrum-averaged direction of origin, measured relative to geographic north, positively clockwise.	Spectral analysis : $\overline{\theta}_m = \arctan\left(\frac{\int_{f_{min}}^{f_{max}} \sin(\theta_m(f))\,E(f)\,df}{\int_{f_{min}}^{f_{max}} \cos(\theta_m(f))\,E(f)\,df}\right)$ (notation to be confirmed)
30	SIGMAP	FF.F	degrees	Directional spread at peak.	Spectral analysis : $\sigma(f_p) = \sqrt{2(1-r_1(f_p))}$ où $r_1(f_p) = \sqrt{a_1^2(f_p) + b_1^2(f_p)}$
31	SIGMAM	FF.F	degrees	Average directional spread.	Spectral analysis : $\overline{\sigma} = \int_{f_{min}}^{f_{max}} \sigma(f)E(f)df \Big/ \int_{f_{min}}^{f_{max}} E(f)df$
32	NBSYS	INTEGER	_	Number of wave systems making up the sea state.	Spectral analysis : Limited to 4. Determined by the Hanson and Phillips algorithm included in PADINES. Wave systems will be ranked from 1 to 4 according to decreasing tpic values.
33	HM0_S1	FF.FF	m	Spectral significant height of wave system n°1.	Spectral analysis (see 22).
34	TP_S1	FF.F	s	Barycentric peak period of wave system n°1.	Spectral analysis (see 23).

Field No.	Computer Symbol	Format	Unit	Definition	Calculation method
35	T02_S1	FF.F	s	Average period of the wave system n°1.	Spectral analysis (see 24).
36	TE_S1	FF.F	s	Average energy period of the wave system n°1.	Spectral analysis (see 25).
37	EPS2_S1	F.FF	_	Spectral narrowness index of the wave system n°1.	Spectral analysis (see 26).
38	KAPA_S1	F,FF	_	Spectral width κ of wave system n°1.	Spectral analysis (see 27).
39	THETAP_S1	FFF.F	degrees	Direction of origin at the peak of wave system n°1.	Spectral analysis (see 28).
40	THETAM_S1	FFF.F	degrees	Averaged direction of origin for wave system n°1.	Spectral analysis (see 29).
41	SIGMAP_S1	FF.F	degrees	Directional spread at the peak of wave system n°1.	Spectral analysis (see 30).
42	SIGMAM_S1	FF.F	degrees	Average directional spread of wave system n°1.	Spectral analysis (see 31).
43	HM0_S2	FF.FF	m	Spectral significant height wave system n°2.	Spectral analysis (see 22).
44	TP_S2	FF.F	s	Barycentric peak period of the wave system n°2.	Spectral analysis (see 23).
45	T02_S2	FF.F	s	Average period of the wave system n°2.	Spectral analysis (see 24).
46	TE_S2	FF.F	s	Average energy period of the wave system n°2.	Spectral analysis (see 25).
47	EPS2_S2	F.FF	_	Spectral narrowness index of the wave system n°2.	Spectral analysis (see 26).
48	KAPA_S2	F,FF	_	Spectral width κ of the wave system n°2.	Spectral analysis (see 27).
49	THETAP_S2	FFF.F	degrees	Direction of origin at the peak of the wave system n°2.	Spectral analysis (see 28).

Field No.	Computer Symbol	Format	Unit	Definition	Calculation method
50	THETAM_S2	FFF.F	degrees	Averaged direction of origin for wave system n°2.	Spectral analysis (see 29).
51	SIGMAP_S2	FF.F	degrees	Directional spread at the peak of wave system n°2.	Spectral analysis (see 30).
52	SIGMAM_S2	FF.F	degrees	Average directional spread of wave system n°2.	Spectral analysis (see 31).
53	HM0_S3	FF.FF	m	Spectral significant height of the wave system n°3.	Spectral analysis (see 22).
54	TP_S3	FF.F	s	Barycentric peak period of wave system n°3.	Spectral analysis (see 23).
55	T02_S3	FF.F	s	Average period of the wave system n°3.	Spectral analysis (see 24).
56	TE_S3	FF.F	s	Average energy period of the wave system n°3.	Spectral analysis (see 25).
57	EPS2_S3	F.FF	_	Spectral narrowness index of the wave system n°3.	Spectral analysis (see 26).
58	KAPA_S3	F,FF	_	Spectral width κ of wave system n°3.	Spectral analysis (see 27).
59	THETAP_S3	FFF.F	degrees	Direction of origin at the peak of the wave system n°3.	Spectral analysis (see 28).
60	THETAM_S3	FFF.F	degrees	Averaged direction of origin for wave system n°3.	Spectral analysis (see 29).
61	SIGMAP_S3	FF.F	degrees	Directional spread at the peak of wave system n°3.	Spectral analysis (see 30).
62	SIGMAM_S3	FF.F	degrees	Average directional width of wave system n°3.	Spectral analysis (see 31).
63	HM0_S4	FF.FF	m	Spectral significant height of wave system n°4.	Spectral analysis (see 22).

Field No.	Computer Symbol	Format	Unit	Definition	Calculation method
64	TP_S4	FF.F	s	Barycentric peak period of wave system n°4.	Spectral analysis (see 23).
65	T02_S4	FF.F	s	Average period of wave system n°4.	Spectral analysis (see 24).
66	TE_S4	FF.F	s	Average energy period of wave system n°4.	Spectral analysis (see 25).
67	EPS2_S4	F.FF	_	Spectral narrowness index of the wave system n°4.	Spectral analysis (see 26).
68	KAPA_S4	F,FF	_	Spectral width κ of wave system n°4.	Spectral analysis (see 27).
69	THETAP_S4	FFF.F	degrees	Direction of origin at the peak of wave system n°4.	Spectral analysis (see 28).
70	THETAM_S4	FFF.F	degrees	Averaged direction of origin for wave system n°4.	Spectral analysis (see 29).
71	SIGMAP_S4	FF.F	degrees	Directional spread at the peak of wave system n°4.	Spectral analysis (see 30).
72	SIGMAM_S4	FF.F	degrees	Average directional width of wave system n°4.	Spectral analysis (see 31).