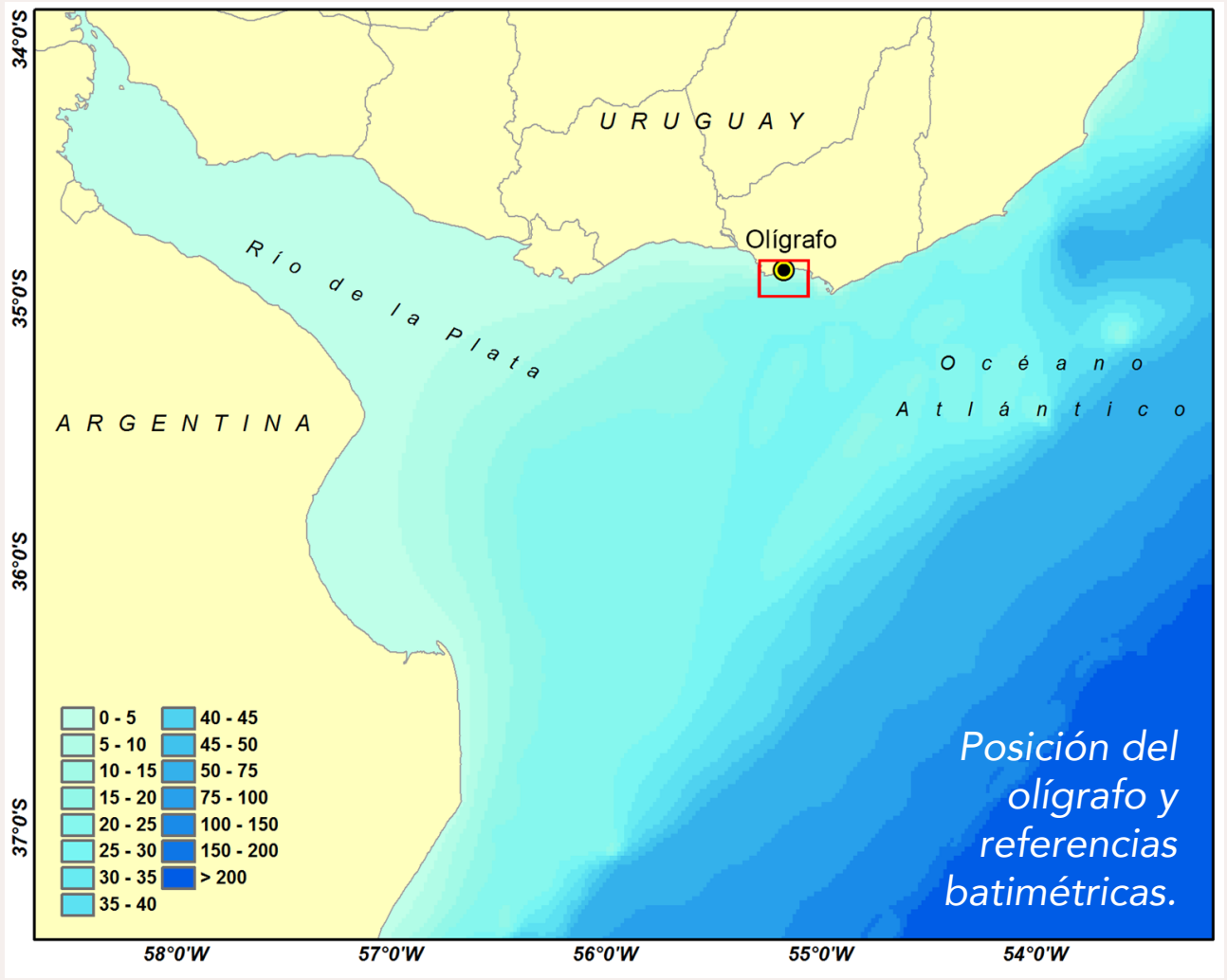
Prácticas de Oceanografía Aplicada
2024

Ejercicio 4.13

Lugar de mediciones



Profundidad al cero: 10.7 m

Ensenada del Potrero

Tiempo: algo más de 1 año

Distancia a la costa: 400 m

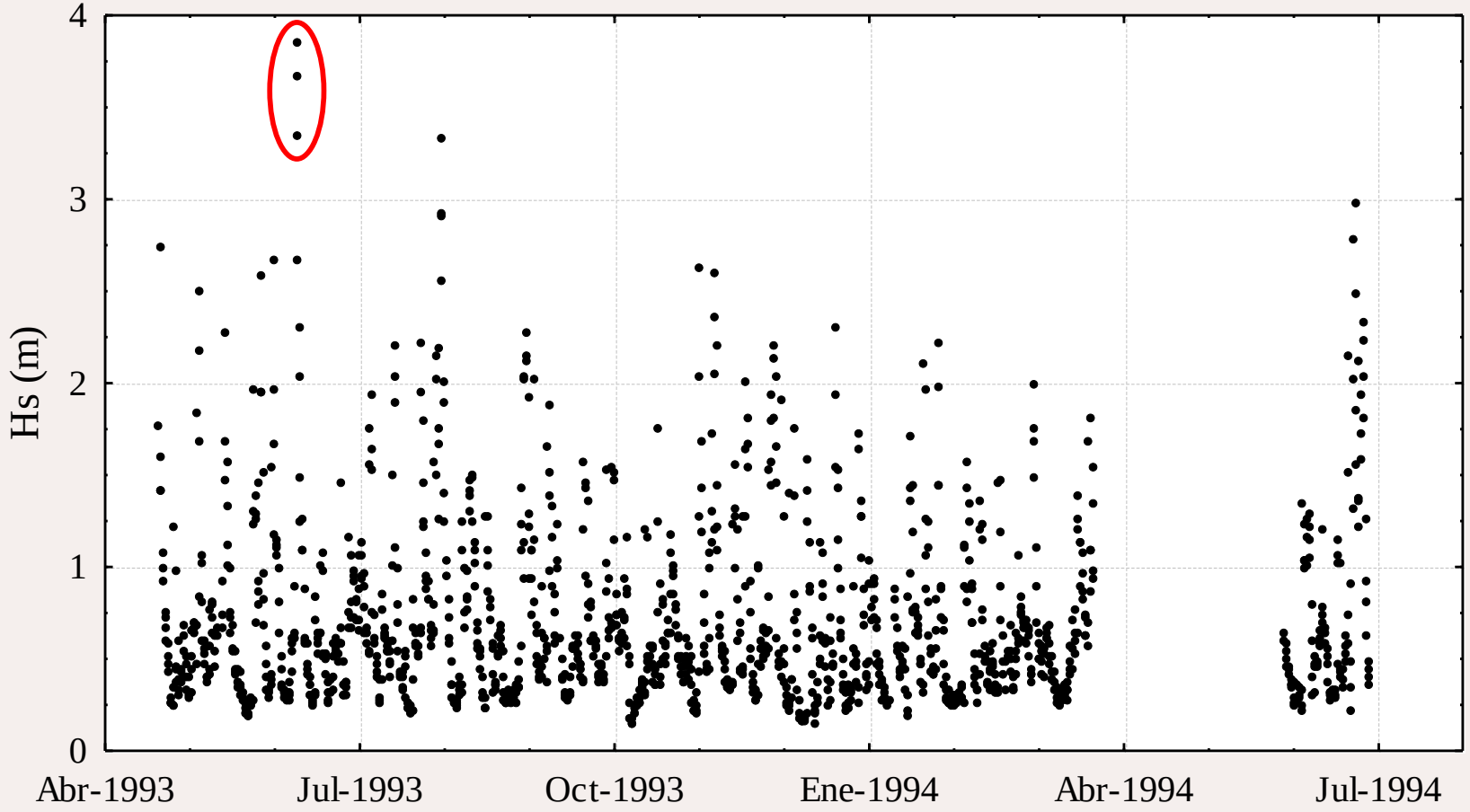
Distancia al fondo: 0.68 m

Latitud (S): $34^{0}54'$

Longitud (W): $55^{0}10'$

Se estudian 3 registros particulares correspondientes al día 9 de junio de 1993 a las 3, 9 y 15 horas.

Serie de tiempo de Hs. Se identifican los registros asociados a la tormenta del 9 de junio de 1993.



Ejercicio 4.13

Complete las tablas

Entrega: 12 junio 2024

Fecha	*Hs (m)*	*Tp (s)*	*D (º)*	*d (m)*	*L (m)*	*c (m/s)*	*Ur (HL^2/d^3)*
6/9/93,3:00	*3.85*	*7.3*	*204*	*12.4*	*68*	*9.4*	*9.3*
6/9/93,9:00	*3.67*	*12.6*	*180*	*12.7*	*133*	*10.5*	*31.9*
6/9/93,15:00	*3.35*	*12.5*	*160*	*12.3*	*130*	*10.4*	*30.2*

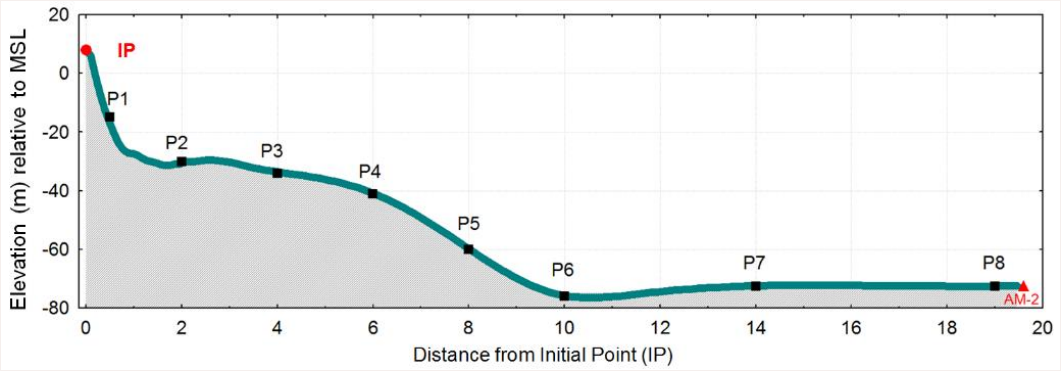
Velocidad (m/s)						
Fecha	*Us*	*U_{TLO}*	*U_{TSSO}*	*U_{TSQO}*	*$U_{fourier}$*	*U_{TCQO}*
6/9/93,3:00	*1.09*					
6/9/93,9:00	*1.41*					
6/9/93,15:00	*1.33*					

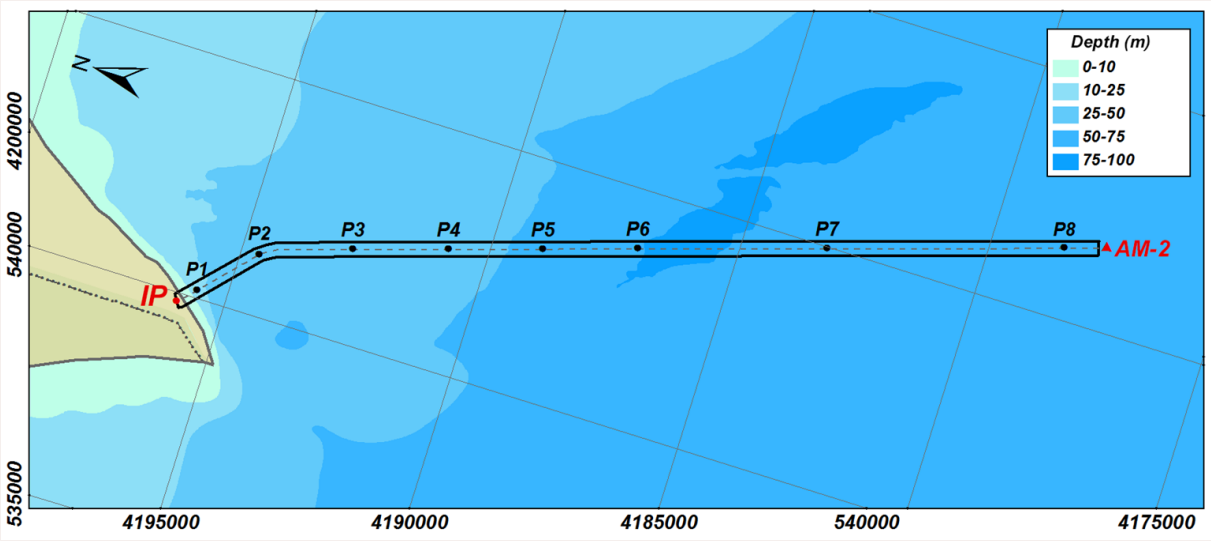
Error porcentual (%)					
Fecha	*U_{TLO}*	*U_{TSSO}*	*U_{TSQO}*	*$U_{Fourier}$*	*U_{TCQO}*
6/9/93,3:00					
6/9/93,9:00					
6/9/93,15:00					

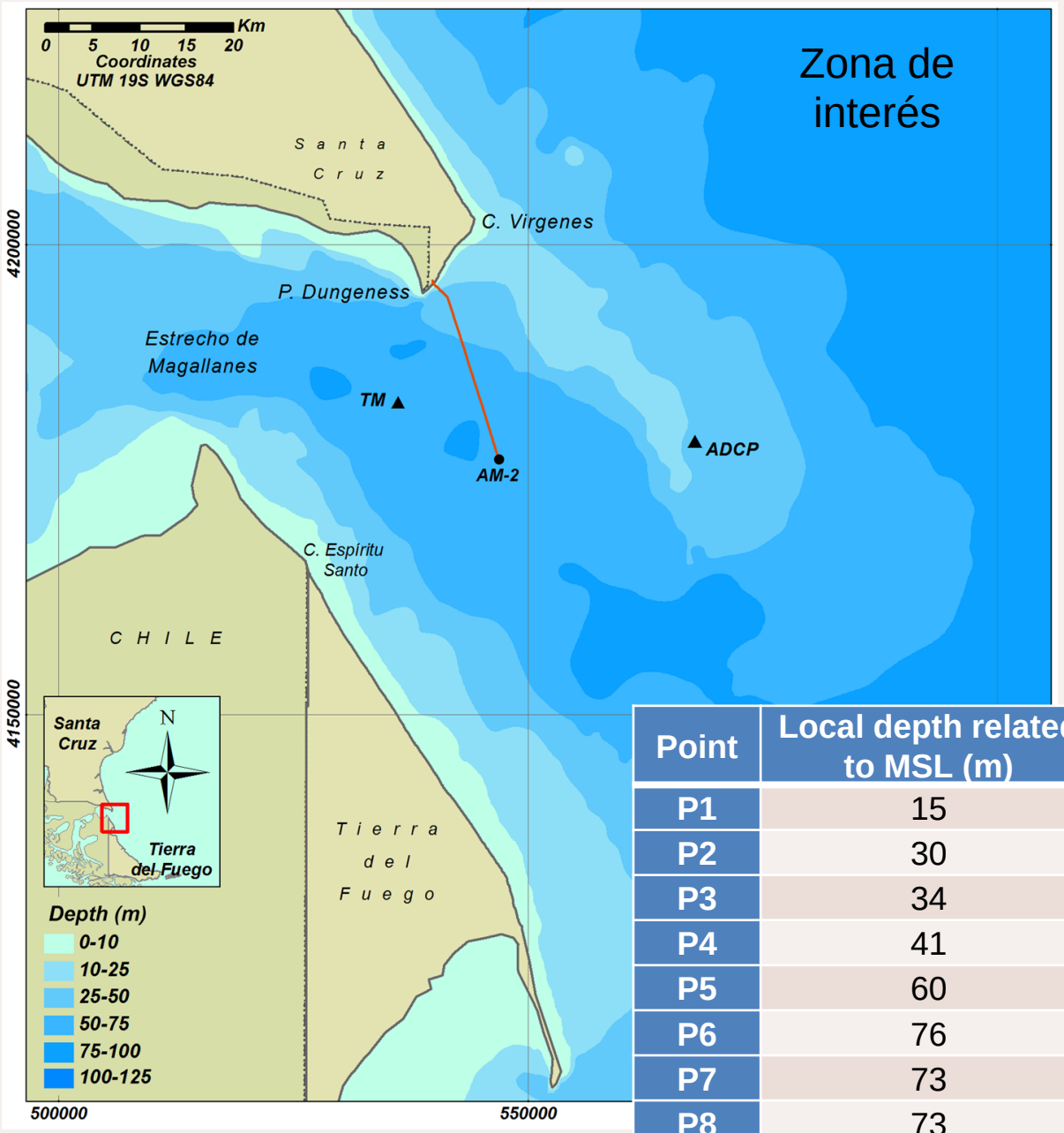
Olas

Ejercicio 4.14 - Series largas

Bathymetric profile and plan view of the area of the pipeline. Locations (P1, P2, P3, P4, P5, P6, P7 and P8) in which the characteristics of the waves and currents were calculated.







Point	Local depth related to MSL (m)
P1	15
P2	30
P3	34
P4	41
P5	60
P6	76
P7	73
P8	73

Ejercicio 4.14

Un cliente instalará un ducto que va desde una plataforma offshore hacia la planta de tratamiento en tierra.

Largas series de tiempo

Para las series de tiempo de olas en 2 puntos del mar argentino generar las tablas con la siguiente información:

Table 1. Ocurrencia (%), Hs-dirección

Table 2. Ocurrencia (%), Hs-Mes

Table 3. Ocurrencia (%), Hs-Tp – Calcular recta Tp(Hs)

Table 4. Ocurrencia(%), Tp-dirección

Table 5. Ocurrencia (%), Tp-Tm

Table 6. Ocurrencia (%), Tp-Tz

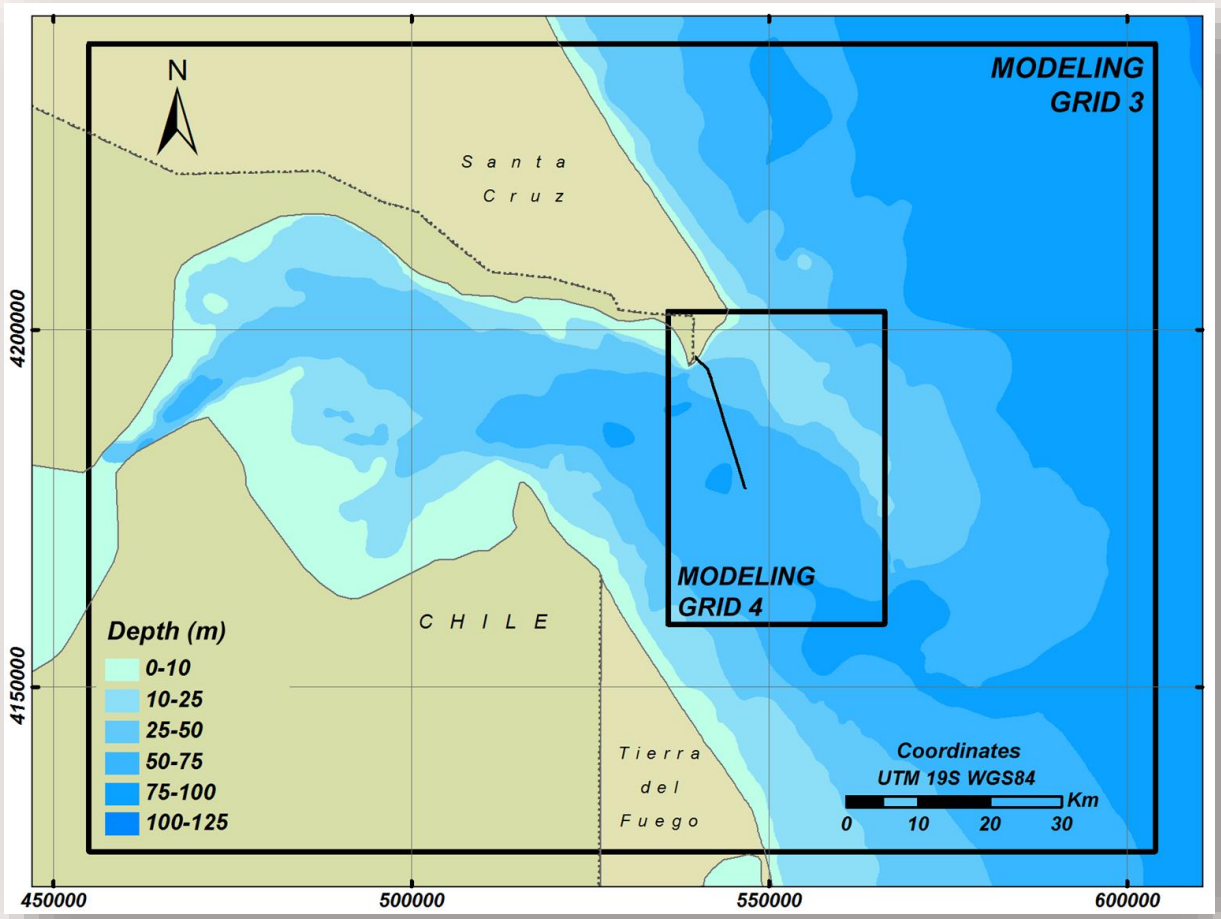
Table 7. Ocurrencia (%), Hmax-Tmax

Calcular recta Hmax(Hs)

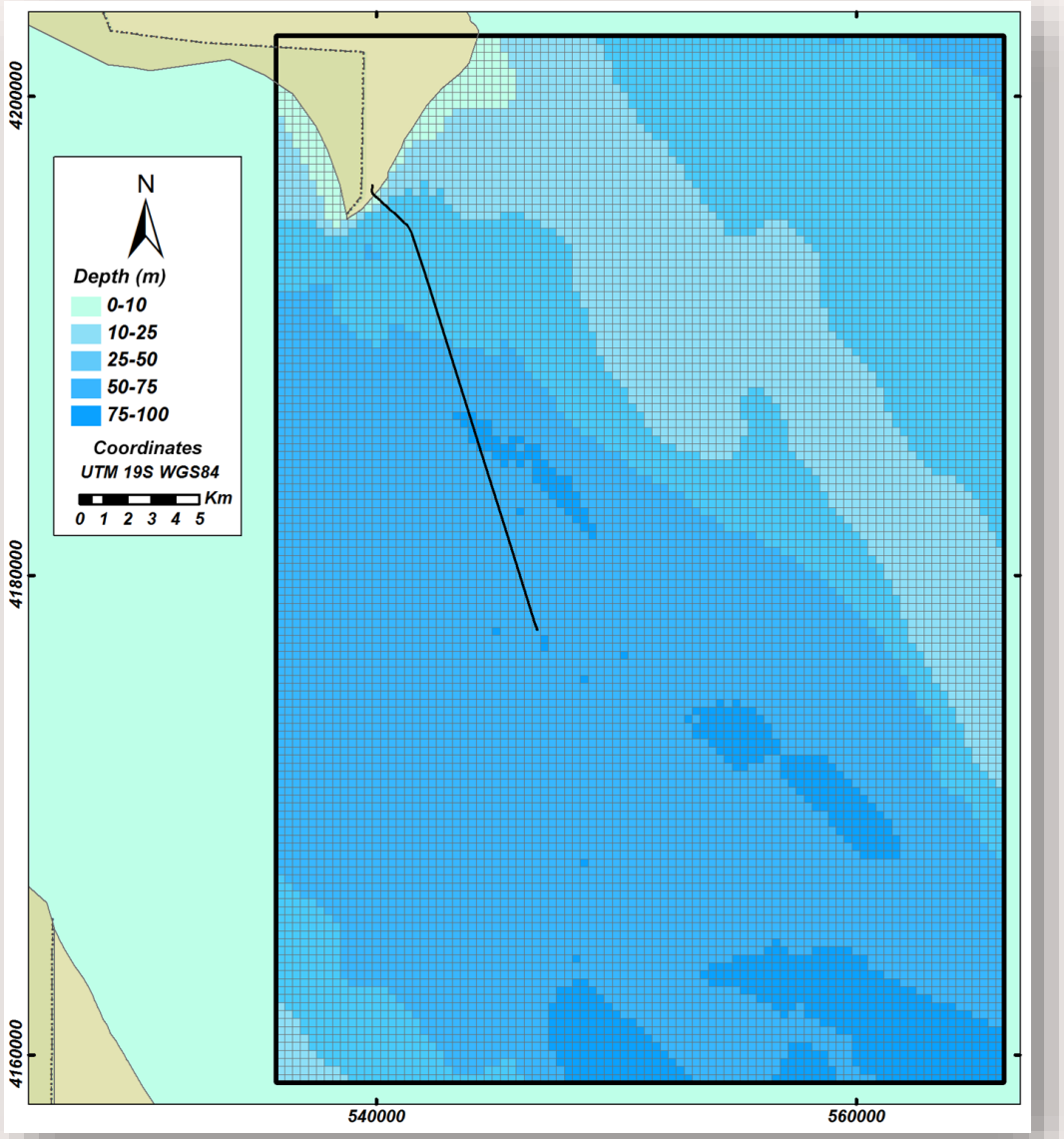
Olas

Series largas

Dominios de modelación de olas. Distancia entre nodos - GRID 3: 1 km y GRID 4: 333 m.

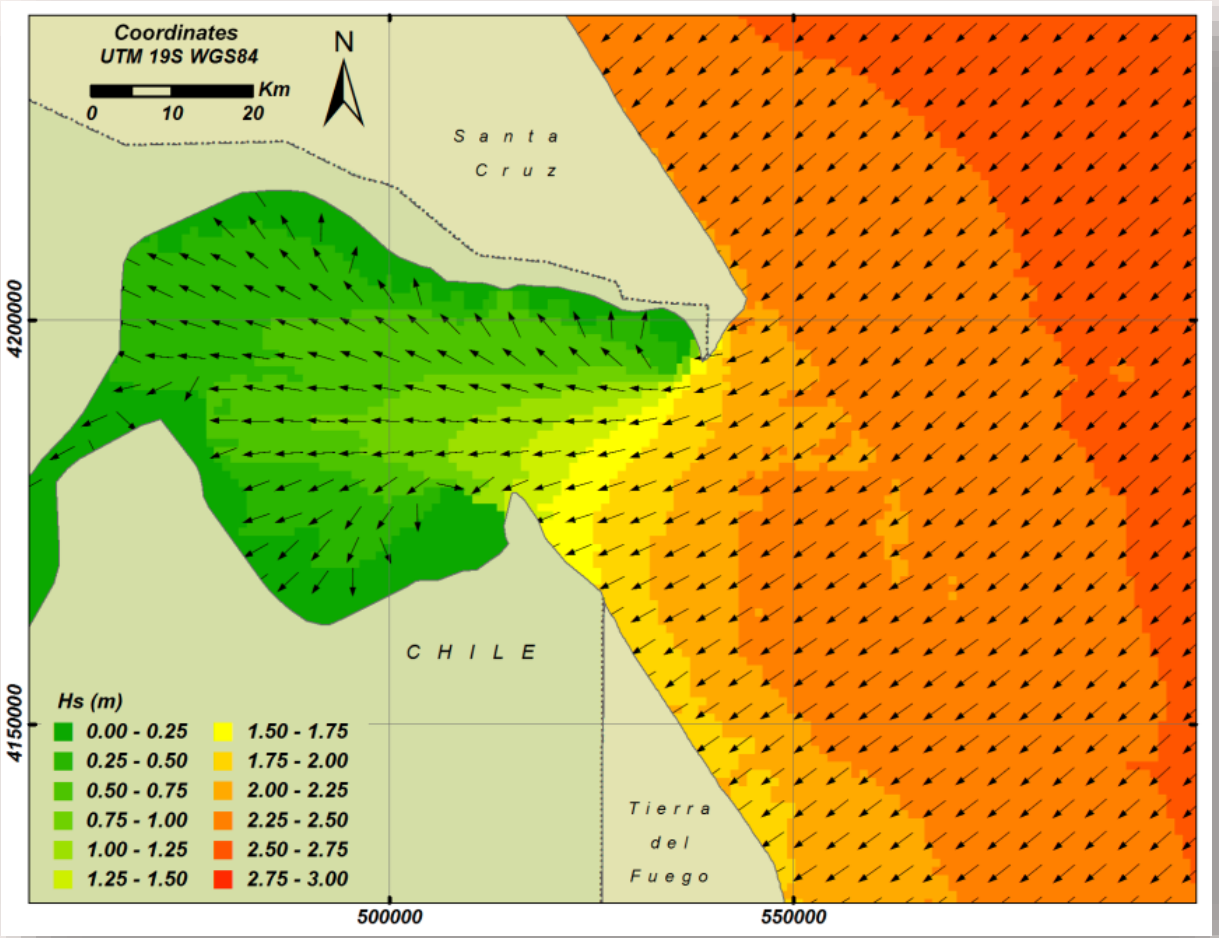


Dominios de modelación de olas. Detalle de GRID 4.

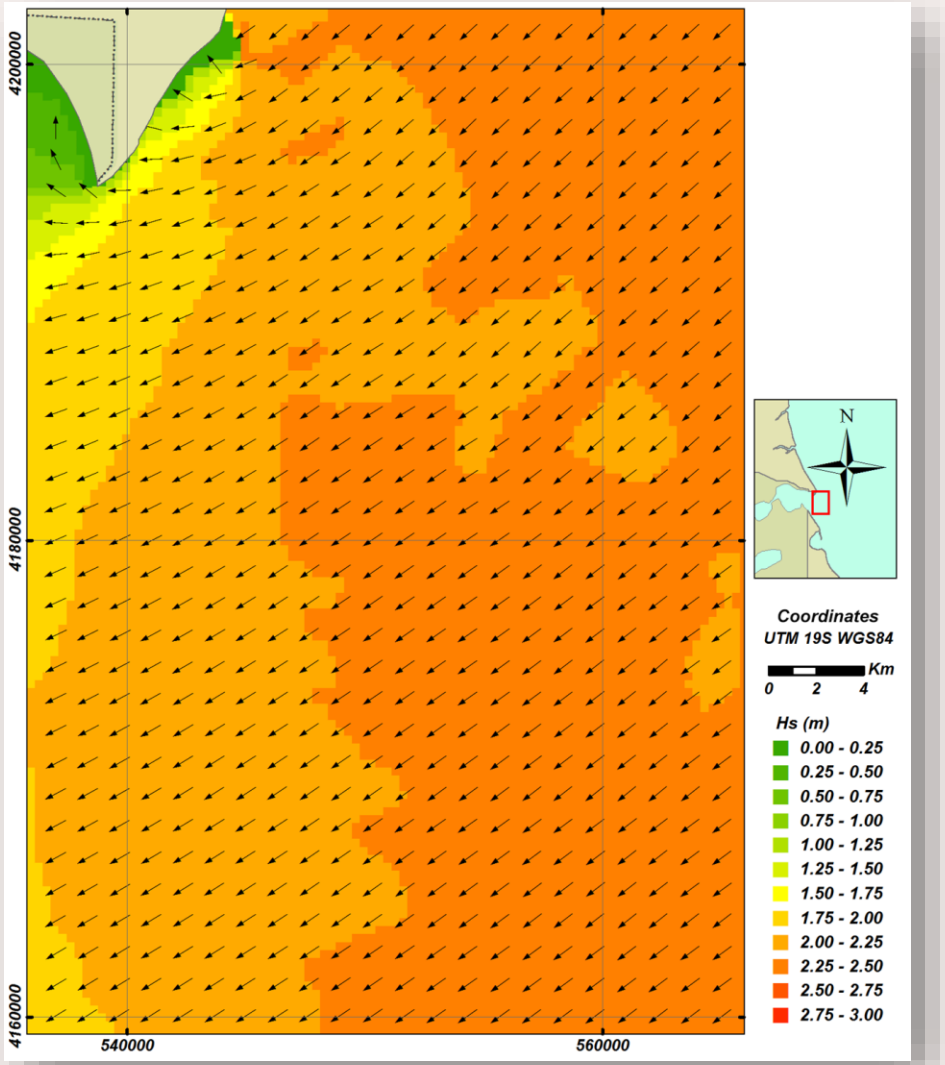


Olas

Distribution of significant wave heights, Hs, for a grid with element size of 1 km



Distribution of significant wave heights, Hs, for a grid with element size of 333 m



Olas. Ejemplo.

Series largas

Ejemplo. Table 3. Occurrence (%) Hs-Tp. N=51137

Hs(m)		Tp (s)								Sum
		0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	
0	0.5		1.254	1.853	1.107	0.393	0.080	0.008		4.695
0.5	1		7.383	10.654	8.215	3.294	0.763	0.045	0.010	30.364
1	1.5		0.072	18.515	7.902	5.220	1.802	0.119	0.020	33.649
1.5	2			11.024	3.924	2.835	1.328	0.203	0.016	19.331
2	2.5			2.565	3.298	1.099	0.577	0.121	0.010	7.671
2.5	3			0.560	1.450	0.458	0.270	0.055	0.012	2.803
3	3.5			0.125	0.325	0.331	0.106	0.018	0.002	0.906
3.5	4			0.010	0.063	0.196	0.059	0.006		0.333
4	4.5				0.012	0.094	0.031	0.002		0.139
4.5	5				0.002	0.057	0.025			0.084
5	5.5					0.006	0.014			0.020
5.5	6					0.004	0.012			0.016
6	6.5					0.002	0.016			0.018
6.5	7						0.006			0.006
Sum			8.710	45.305	26.297	13.988	5.088	0.577	0.068	100

Notes:
Hs: significant wave height
Tp: spectral peak period
Fitting: Tp = 5.1 + 0.93*Hs (correlation, r = 0.9927)

Olas

Ejercicio 4.15 - **Valores Extremos de Olas**

Con las instrucciones vistas en clase calcular los valores extremos para 50 y 100 años de período de retorno para las alturas significativas del P6 analizadas en el Ejercicio 4.14.

Realizar el cálculo considerando Block Maxima y POT, verificar mejor ajuste. Para POT verificar diferentes umbrales de la altura de ola 4 m, 4.5 m y 5 m.

Notas:

1. Para POT considerar el máximo de olas por semana (esto genera eventos independientes).

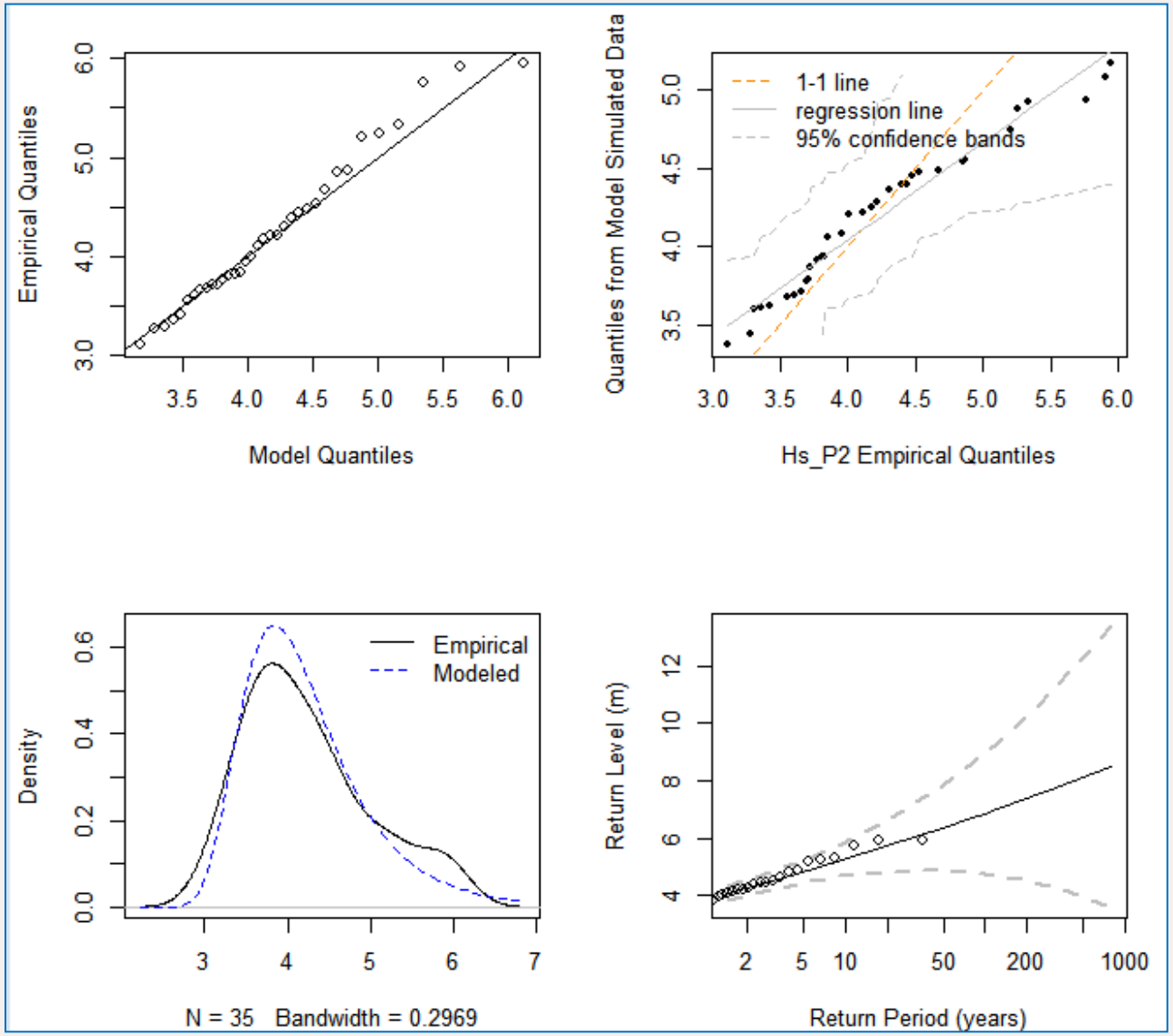
1. Criterio de mejor ajuste: *Both the AIC and BIC attempt to counteract the problem of over fitting a model from adding more parameters by incorporating a penalty based on the number of parameters. The BIC is more restrictive than the AIC. Between two models, the one with a lower AIC and BIC is preferred*.

Olas

Ejercicio 4.15 - **Ejemplo de resultados GEV**

```
fevd(x = Hs_P2, data = xdat, location.fun = ~1, scale.fun = ~1,
    shape.fun = ~1, use.phi = FALSE, type = "GEV", units = "m",
    na.action = na.fail)

[1] "Estimation Method used: MLE"


 Negative Log-Likelihood Value:  36.74376


 Estimated parameters:
  location      scale      shape
3.87309273 0.56719870 0.05841112

 Standard Error Estimates:
  location      scale      shape
0.11242190 0.08551864 0.16350550

 Estimated parameter covariance matrix.
             location        scale        shape
location  0.012638682  0.004723175 -0.007814116
scale     0.004723175  0.007313438 -0.005038349
shape    -0.007814116 -0.005038349  0.026734050

 AIC = 79.48753

 BIC = 84.15357
```

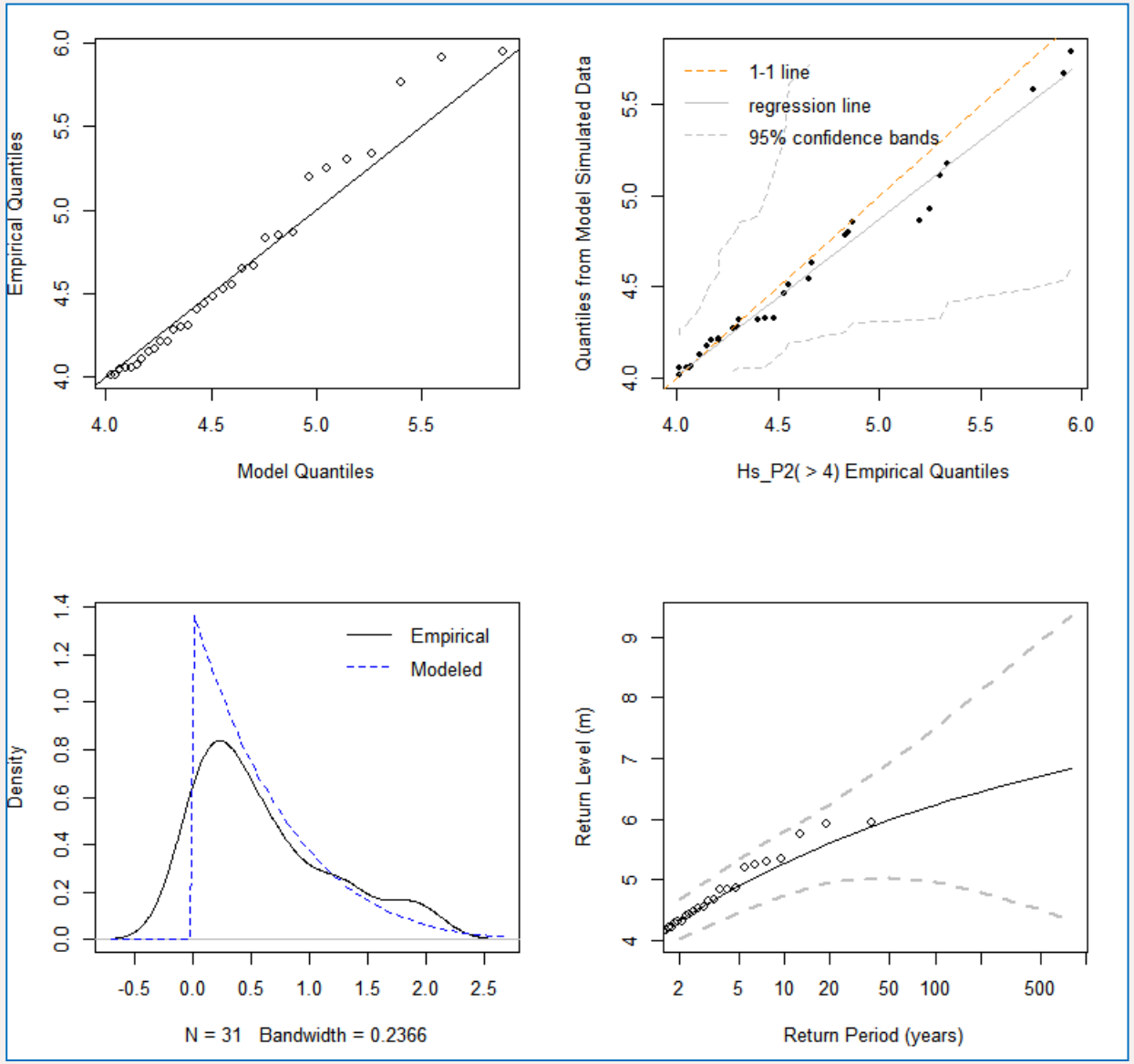
```
[1] "Normal Approx."

[1] "100-year return level: 6.866"

[1] "95% Confidence Interval: (4.7606, 8.9723)"
```



Ejercicio 4.15 - **Ejemplo de resultados GP**

```
fevd(x = Hs_P2, data = xdat, threshold = threshold.val, threshold.fun = ~1,
    location.fun = ~1, scale.fun = ~1, shape.fun = ~1, use.phi = FALSE,
    type = "GP", units = "m", time.units = "4/month", na.action = na.fail)

[1] "Estimation Method used: MLE"


 Negative Log-Likelihood Value:  15.60082


 Estimated parameters:
     scale      shape
 0.7207705 -0.1693435

 Standard Error Estimates:
    scale     shape
0.2245812 0.2564625

 Estimated parameter covariance matrix.
            scale       shape
scale  0.05043673 -0.05067102
shape -0.05067102  0.06577300

 AIC = 35.20163

 BIC = 38.06961
```

```
[1] "Normal Approx."

[1] "100-year return level: 6.236"

[1] "95% Confidence Interval: (4.9563, 7.5155)"
```



Olas

Table 5.2.59 **Point P2**. Omnidirectional wave extreme values. Best fit: GP2 (Generalized Pareto)

Return period (year)	Hs (m)	Tp (s)	Tz (s)	Tm (s)	Hmax (m)	Tmax (s)
100	6.3	11.6	5.9	7.5	11.4	12.1
50	6.1	11.4	5.8	7.4	11.0	11.8
20	5.8	11.0	5.6	7.1	10.4	11.4
10	5.4	10.6	5.4	6.9	9.7	11.0
5	4.9	10.1	5.2	6.6	8.9	10.5
2	4.1	9.2	4.9	6.1	7.4	9.6
1	3.2	8.4	4.5	5.6	5.9	8.7
95%	1.8	-	-	-	-	-

Notes:

Hs: significant wave height

Tp: spectral peak period, computed from Hs (best fit)

Tz: zero crossing period, computed from Tp (best fit)

Tm: mean period, computed from Tp (best fit)

Hmax: maximum wave height (largest wave in a record), computed from Hs

Tmax: period associated to Hmax, computed from Tp

Hs (95%) computed from Hs cumulative frequency distribution

Olas

Ejercicio 4.16

Calcular, con los resultados de los Ejercicios 4.14 y 4.15, el Tp y Hmax para 50 y 100 años de período de retorno.

Utilizar la librería de olas no lineales de Fourier para calcular el nivel de cresta de asociados a Hs y Hmax para 50 y 100 años de período de retorno.

Entrega 4.14, 4.15 y 4.16: 17 junio 2024