

# 有義波などの不規則波浪の統計的特性について

```
> nh <- seq(0,4,by=0.1)
> data.frame(height=nh, excess.prob=exp(- pi/4 *nh^2))
  height excess.prob
1    0.0 1.000000e+00
2    0.1 9.921768e-01
3    0.2 9.690724e-01
4    0.3 9.317546e-01
5    0.4 8.819114e-01
...
> # see, Table 3.1 at TEXT p.44
>
> # H1/3
> sqrt(4/pi*log(3)) # to Inf is the range of sig. wave
[1] 1.182707
>
> xp <- function(x) pi/2*x^2*exp(-pi/4*x^2)
> integrate(xp, sqrt(4/pi*log(3)), Inf)
0.5324952 with absolute error < 4.6e-07
> .last.value$value * 3 # see, eq.(3.3) at TEXT p.45
[1] 1.597486
>
> 1/1.597
[1] 0.6261741
> exp(- pi/4 * 1.597^2)
[1] 0.1349182

> # H1/10
> sqrt(4/pi*log(10))
[1] 1.712233
> integrate(xp, sqrt(4/pi*log(10)), Inf)$value *10
[1] 2.03099
> # see, eq.(3.4) at TEXT p.45
> exp(- pi/4 * 2.031^2)
[1] 0.03917420
>

> # Hmax
> 2*sqrt(log(100)/pi)/1.6
[1] 1.513415
> 2*sqrt(log(200)/pi)/1.6
[1] 1.623320
> 2*sqrt(log(500)/pi)/1.6
[1] 1.758093
>
> 2*sqrt(log(200)/pi)*(1 - digamma(1)/2/log(200))/1.6
[1] 1.711745
> 2*sqrt(log(250)/pi)*(1 - digamma(1)/2/log(250))/1.6
[1] 1.743771
> 2*sqrt(log(300)/pi)*(1 - digamma(1)/2/log(300))/1.6
[1] 1.769513
> 2*sqrt(log(500)/pi)*(1 - digamma(1)/2/log(500))/1.6
[1] 1.839740
> # see, Table 3.2 at TEXT p.46
> sqrt(pi/6/log(100))
[1] 0.3371914
> sqrt(pi/6/log(200))
[1] 0.3143622
> sqrt(pi/6/log(250))
[1] 0.3079444
> sqrt(pi/6/log(300))
[1] 0.3029827
> sqrt(pi/6/log(500))
[1] 0.2902635
>
```

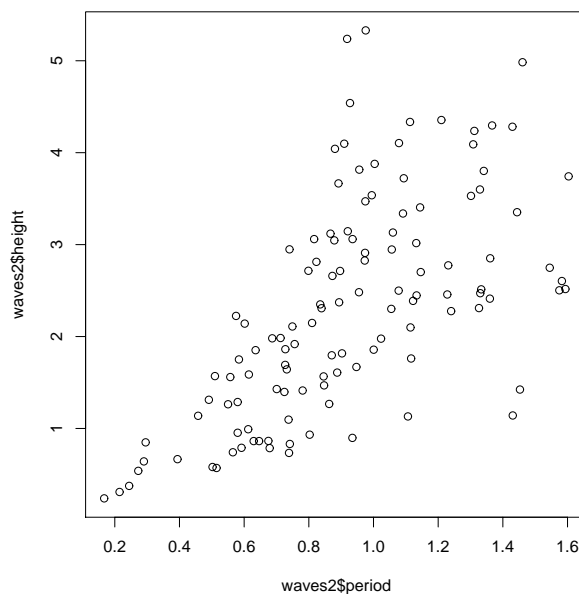


Fig. 1

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```

> dget("waves3.txt") -> waves3
> # The data file will be available at:
> # http://doboku2.ace.nitech.ac.jp/Hydro/Coast_J/member/staff/kitano/home.html

> str(waves3)
'data.frame': 120 obs. of 2 variables:
 $ height: num 1.982 0.952 2.851 2.827 2.372 ...
 $ period: num 0.687 0.580 1.361 0.973 0.894 ...
> waves3
  height period
1  1.9819673 0.6866453
2  0.9523565 0.5796386
3  2.8513894 1.3611331
4  2.8268573 0.9731845
5  2.3724831 0.8937316
...
> mean(waves3) # for mean wave
  height period
2.309486 0.917264
> waves3[order(waves3$height),]
  height period
25 0.2381146 0.1671570
55 0.3089061 0.2147177
24 0.3765886 0.2444060
9  0.5399374 0.2726629
84 0.5694928 0.5149591
110 0.5807655 0.5021924
...
> waves3[order(waves3$height),][81:120,]
  height period
66 2.775459 1.2312712
...
45 4.294945 1.3664920
11 4.335807 1.1129445
71 4.356775 1.2099419
57 4.541078 0.9277524
46 4.983645 1.4606083
97 5.238052 0.9182946
61 5.328860 0.9756951
> mean(waves3[order(waves3$height),][81:120,])
  height period
3.661079 1.095765

> 3.66/2.309
[1] 1.585102
>
> which(rank(waves3$height) == 81)
[1] 66
> waves3[[66,]]
  height period
66 2.775459 1.231271
> which(rank(waves3$height) == 80)
[1] 6
> waves3[[6,]]
  height period
6 2.74844 1.544953

> waves4 <- waves3
> waves4[waves4$height < 2.77545,] <- c(NA, NA)
> waves4
  height period
1      NA      NA
2      NA      NA
3  2.851389 1.3611331
4  2.826857 0.9731845
5      NA      NA
...
> plot(1:120, waves3$height, type="h", ylim=c(-1.8, 5.5))
> abline(h = 2.775459, lty=2)
> points(1:120, -1 * waves3$period)
> points(1:120, waves4$height, pch=19)
> points(1:120, -1 * waves4$period, pch=8)
> dev.copy2eps(file="fig3.eps")
Macintosh
3
> plot(waves3$period, waves3$height) # fig.2

```

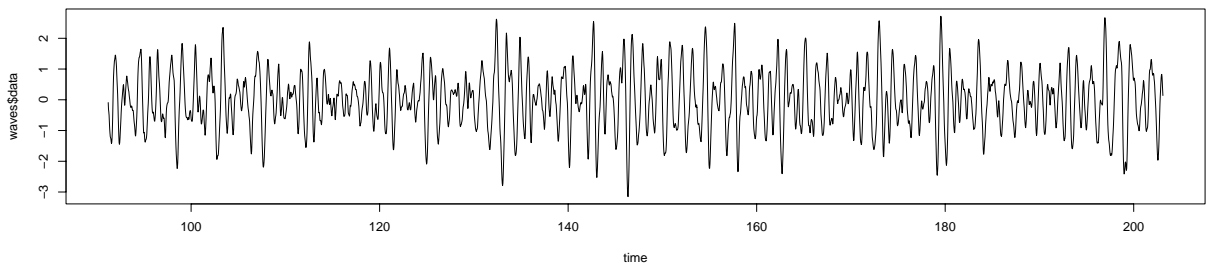


Fig. 2

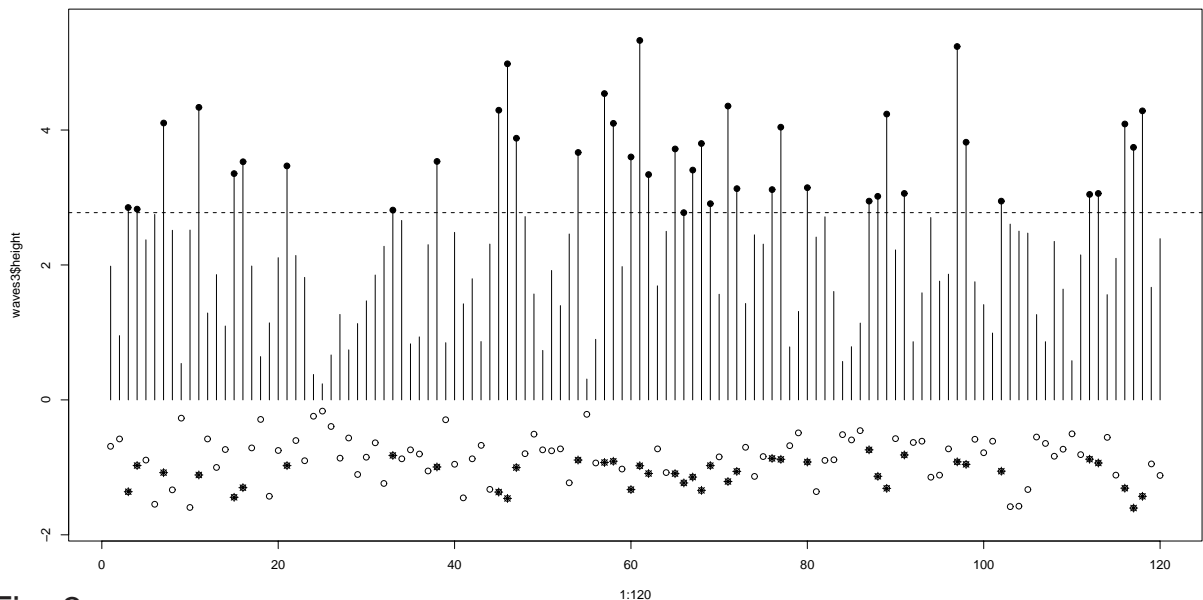


Fig. 3