**Supplementary Material**

**Table A.** Mortality models adopted in this research

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Type | Name | Year of publishing | Function | Number of events based on | Number of data points |
| F1 | Waarts | 1992 | $$F\_{D}=0.665×10^{-3}e^{1.16h}$$ | 1 | 91 |
|  | Waarts | 1992 | $$F\_{D}=0.4×10^{-3}exp⁡(1.27h)$$ | 1 | 91 |
|  | Isewan | 1985 | $$F\_{D}=10^{\frac{2h}{3}-\frac{11}{3}}$$ | 1 | 30 |
|  | Jane | 1985 | $$F\_{D}=10^{h-5.5}$$ | 1 | 10 |
|  | Boyd | 2010 | $$F\_{D}=0.002h+0.005$$ | 1 | 534 |
| F2 | Jonkman | 2009 | $F\_{D}=Φ\left[\frac{In\left(h\right)-μ}{σ}\right]$\* | 1 | Unknown |
| F3 | Jonkman | 2007 | $F\_{D}=Φ\left[\frac{In\left(h\right)-μ}{σ}\right]$\* | 6 | 158 |
| F4 | Zhang | 2020 | $$F\_{D}=\frac{exp⁡(-7.148+1.168V\_{v})}{1+exp⁡(-7.148+1.168V\_{v})}$$ | 1 | 3545 |

$F\_{D}$ is probability of mortality, h is the water depth in m and $V\_{v}$ is the rate at which water rise in m/hr.

\* μ and σ are categorized based on water depth, rise rate and velocity. Detailed equations can be found in Appendix A.

The equations of the mortality model in Jonkman et al. (2009):

$F\_{D}=0.$053 when $wv\geq 5(m^{2}/s)$

$F\_{D}=Φ\left[\frac{In\left(h\right)-μ}{σ}\right], $(μ=5.20 and σ=2.00) when $wv<5(m^{2}/s)$

Equations of the model in Jonkman (2007):

$F\_{D}=1$ when $hv\geq 7 m^{2}/s$ and $v\geq 2 m/s$

$F\_{D}=Φ\left[\frac{In\left(h\right)-μ}{σ}\right], $(μ=1.46 and σ=0.28)

when $h\geq 2.1m$ and $w\geq 0.5m/hr$ and $hv\geq 7 m^{2}/s$ or $v\leq 2 m/s$

$F\_{D}=Φ\left[\frac{In\left(h\right)-μ}{σ}\right], $(μ=7.60 and σ=2.75)

when $h\geq 2.1m$ or ($w\geq 0.5m/hr$ and $h\leq 2.1 m$), and $hv<7m^{2}/s$ or $v<2 m/s$

**Fig. A**

RFR in regions with different storm climates in CLaNs with different aspect ratios. Colored lines denote three different storm climates. Only F3 and F4 model results are presented here as the same reason explained in section 3.1.1.

