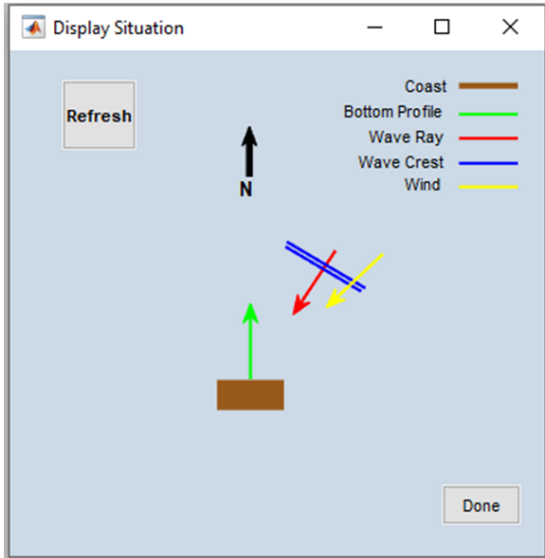1   **Supplementary Materials (SM)**

2

3   **SM1: a) Input parameter features ind SwanOne, b) The bathymetry profile and respective location of the wave sensors.**
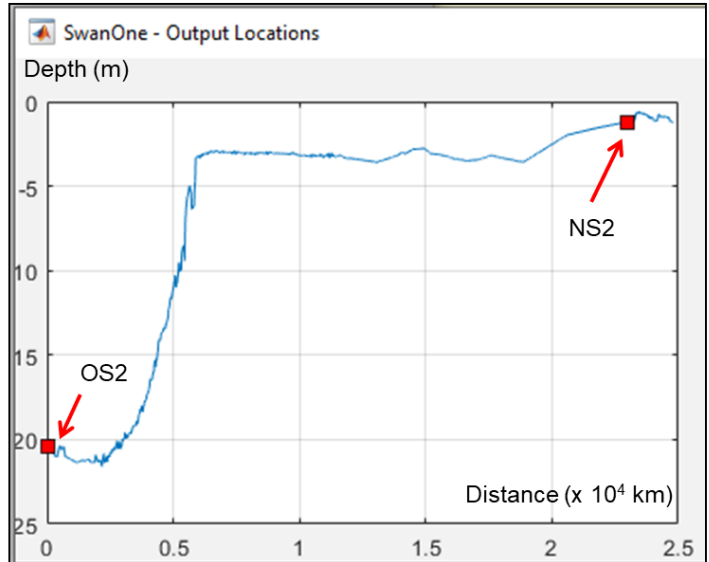4   **Example from transect 2.**

a) Input parameters

b) Bathymetry profile and output locations at Transect 2

5
6

SM2: Iterative increase of 2D model accuracy, list of applies grid refinement and model adaptions to the boundary conditions.

| Iteration	Grid	Resolution	Extend	Adjusting
1	Regular	8 km	200km from coast	New grid
2	Regular	8 km	200km from coast	Adjusting grid
3	Regular	8 km	200km from coast	Adjusting grid, improve near-shore bathymetry interpolation
4	Regular	8 km	200km from coast	Adjusting grid, improve near-shore bathymetry interpolation
5	Regular	3 km	200km from coast	Finer resolution
6	Regular	3 km	200km from coast	Adjusting grid, improve near-shore bathymetry interpolation
7	Regular	3 km	200km from coast	Adjusting grid, improve near-shore bathymetry interpolation
8	Regular	3 km	200km from coast	Improve near-shore bathymetry interpolation
9	Regular	3 km	200km from coast	Adjust bottom roughness
10	Regular	3 km	200km from coast	Adjust bottom roughness
11	Curvilinear	0.8 km – 3 km	120km from coast	New grid
12	Curvilinear	0.8 km – 3 km	120km from coast	Adjusting grid, improve near-shore bathymetry interpolation
13	Curvilinear	0.8 km – 3 km	120km from coast	Adjusting grid, improve near-shore bathymetry interpolation
14	Curvilinear	0.2 km – 2 km	120km from coast	New grid, finer resolution
15	Curvilinear	0.2 km – 2 km	120km from coast	Adjusting grid, improve near-shore bathymetry interpolation
16	Regular	17 km	500-600km from coast	New grid, test swell wave
17	Regular	17 km	500-600km from coast	Adjusting grid
18	Regular	17 km	500-600km from coast	Adjusting grid
19	Curvilinear	0.2 km – 2 km	120km from coast	Apply the wave boundary from ERA5
20	Curvilinear	0.2 km – 2 km	120km from coast	Bottom roughness, wave breaking coefficient
21	Curvilinear	0.2 km – 2 km	120km from coast	Bottom roughness, wave breaking coefficient

SM3: Iterative increase of 2D model accuracy, application of coarse rectangular grid
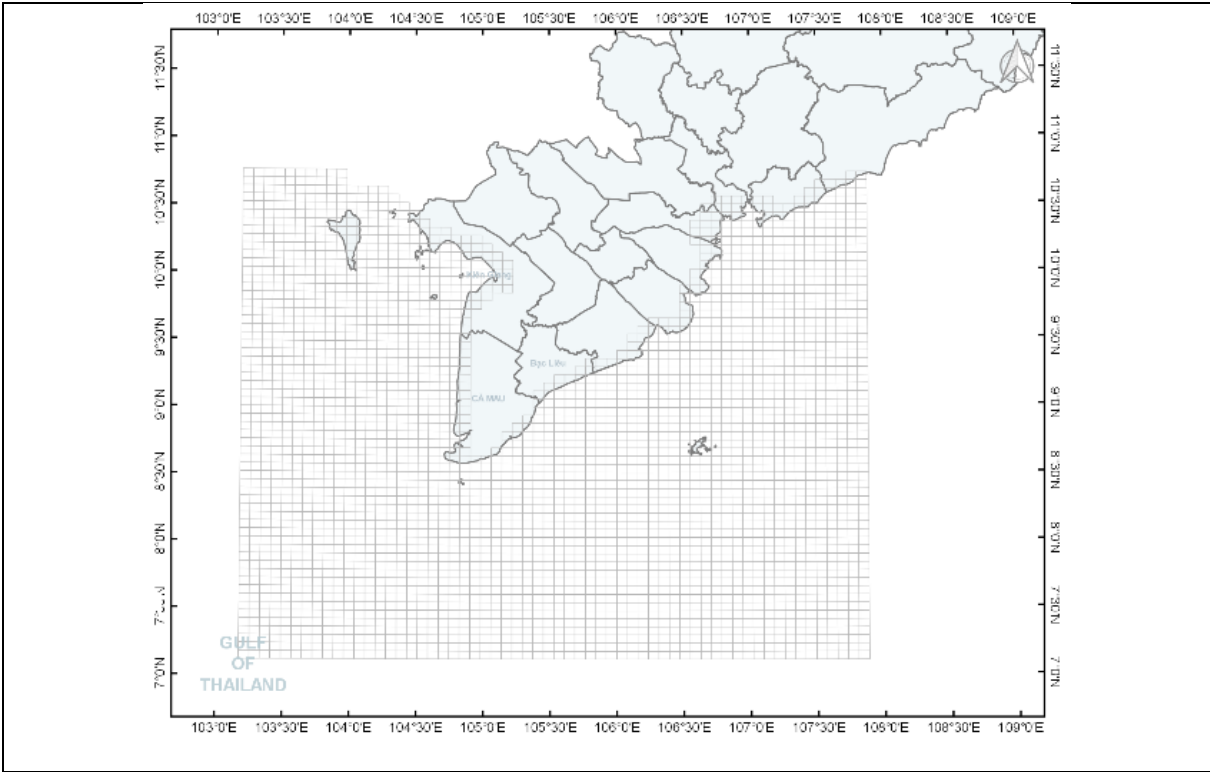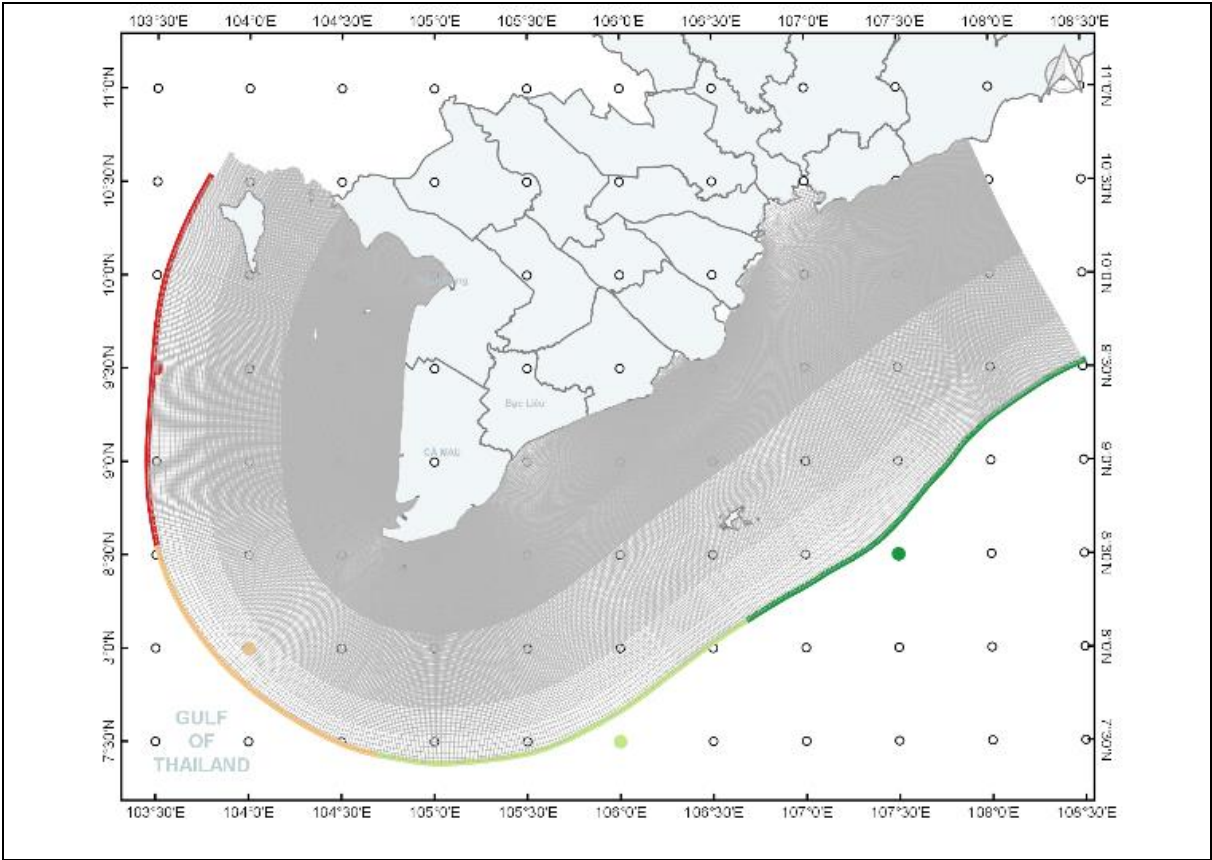
**SM4: Iterative increase of 2D model accuracy, application of fine rectangular grid**
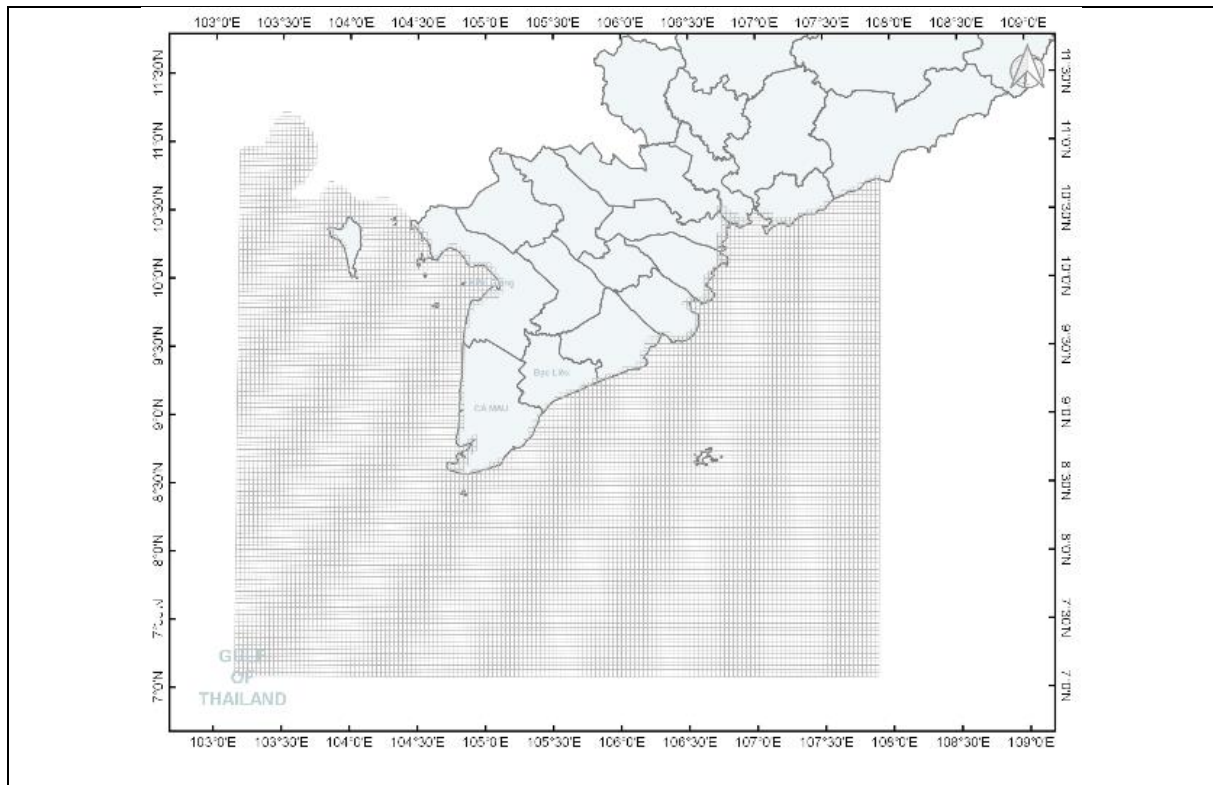
SM5: Iterative increase of 2D model accuracy, application of coarse curvilinear grid including the boundary areas referring to ERA 5 grid cells.
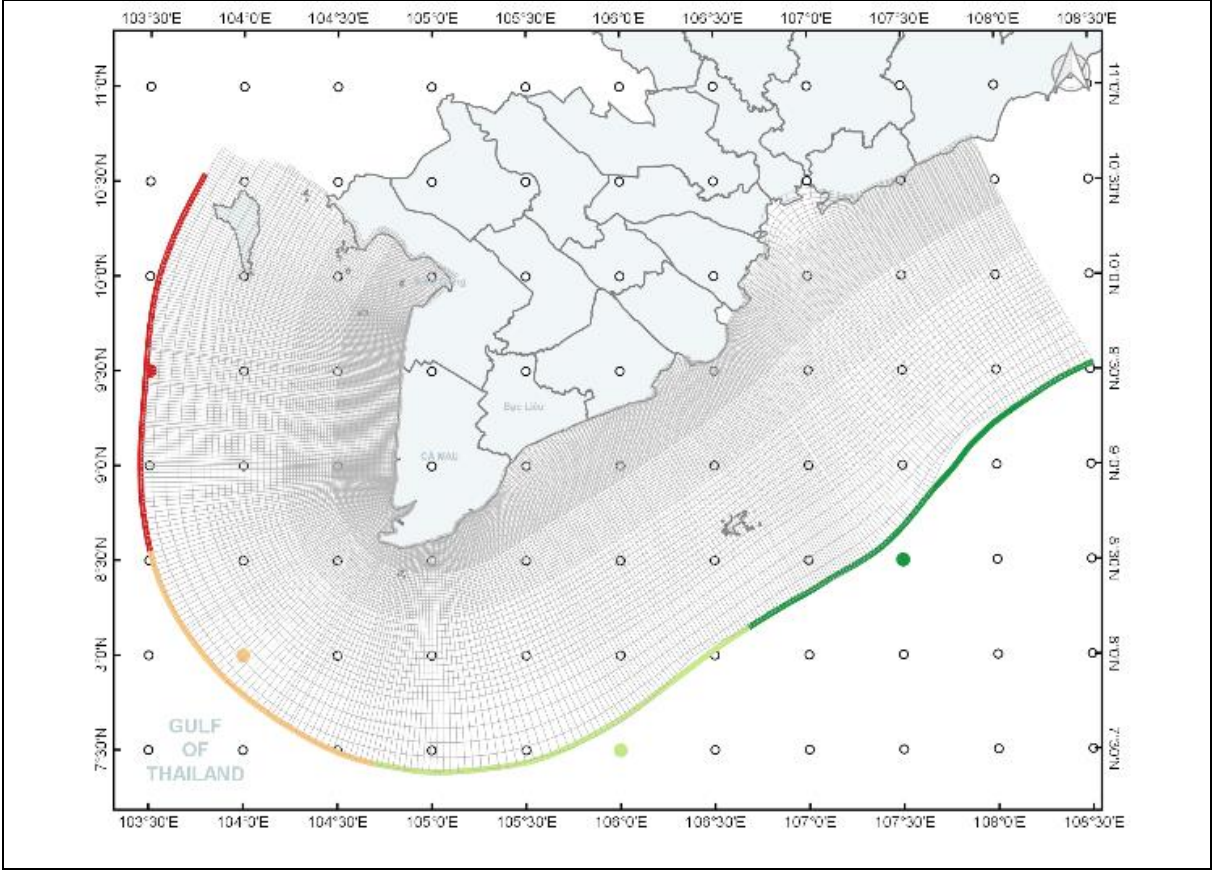
SM6: Iterative increase of 2D model accuracy, application of fine curvilinear grid including the boundary areas referring to ERA 5 grid cells.

SM7: Iterative increase of 2D model accuracy, Improving of RMSE of modelled wave heights within the calibration process
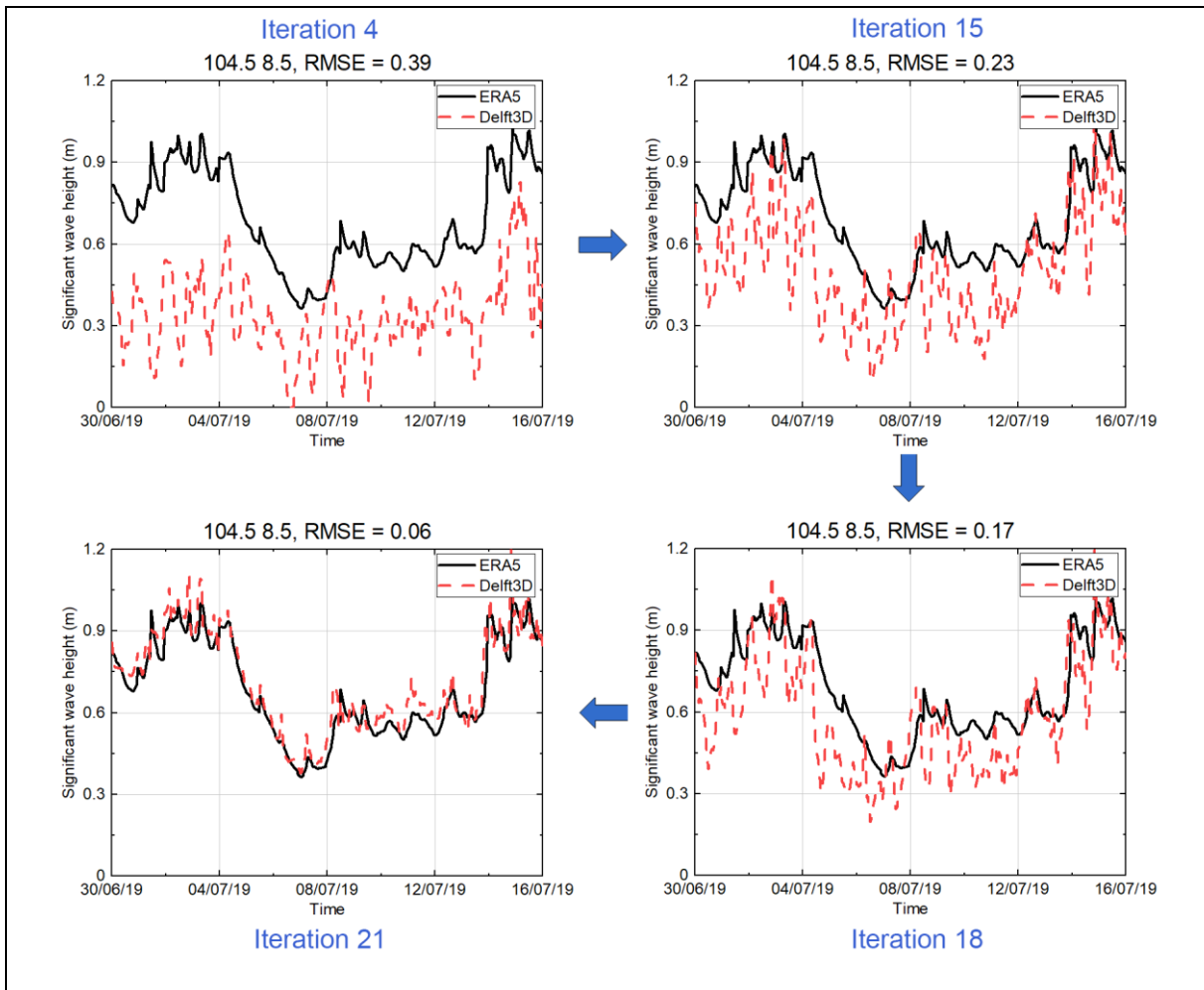
SM8: Comparison of water depths used for 1D and 2D model extracted at the same location during the storm event (16.8.2000 – 24.08.2000).
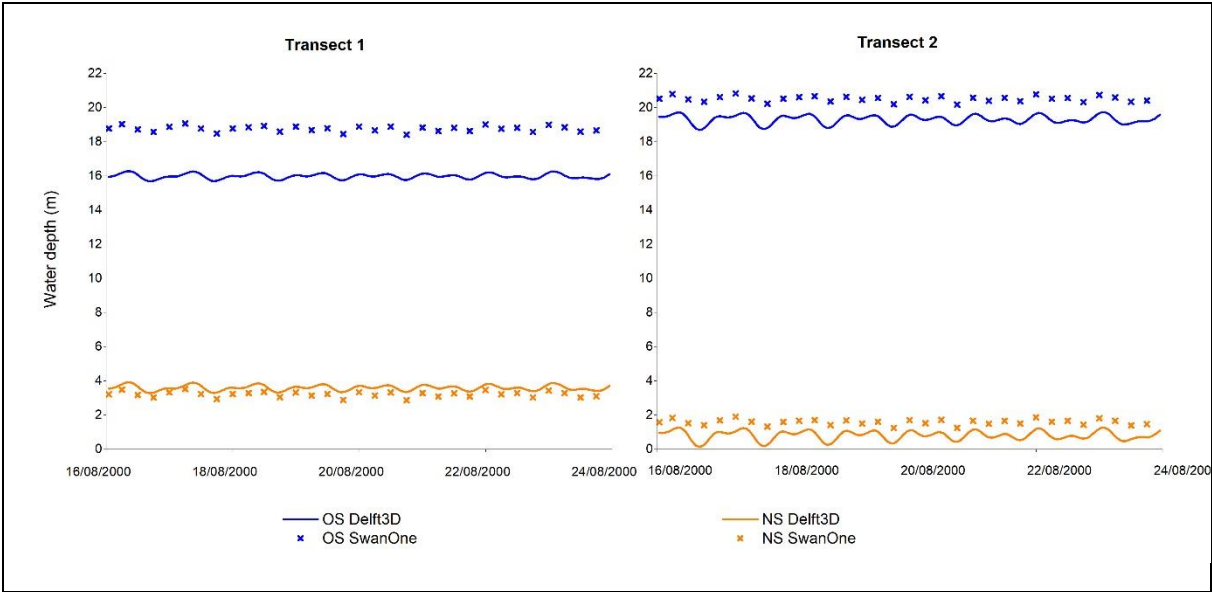
SM9: Wind surge generated water depth increase at the coastline (point 113 and 118, see Fehler! Verweisquelle konnte nicht gefunden werden.**) based on Beaufort scale wind speed input to the spatial model.**

Beaufort wind scale	12	11	10	9	8	7
Wind descriptive	Hurricane	Violent storm	Storm	Strong gale	Gale	Near gale
Wind speed (m/s)	>32	29-32	25-28	21-24	17-21	14-17