F151ow13z[001-008]: Eastern Wadden Sea 2013

Purpose

The aim is to assess the SWAN model performance in stationary mode for the Sinterklaasstorm (December 5/6, 2013) which is one of the most severe storms (in terms of water levels and wind velocities) for which proper wave observations are available in the Wadden Sea. Hereto the starting point is the model set up as applied in WTI. Furthermore, the sensitivity of various model settings is assessed. The areas to be considered are the 'tidal inlet of Ameland' (cases f105am13z) and the 'eastern Wadden Sea' (cases 151ow13z). The focus will be on wave penetration of North Sea waves into the Wadden Sea.

Case selection

For the eastern Wadden Sea, the HW situation at UHW is included in the selection as t3. The water level observed at UHW is NAP+4 m. It coincides almost with the maximum wave height at BRKN and it is the moment with maximum wave heights at UHW (before the signal stops). To see the influence of the water level, another moment was chosen with similar off shore waves, but a lower water level, being t2. Moment t1 is the beginning of the storm with lower off shore waves, but it is chosen because of the strong flood velocities. Moment t4 shows maximum ebb velocities in the Westereems Channel near Ranzelgat Noord. The fifth moment was chosen because it represents LW at UHW. The flow in the Westereems Channel is moderate ebb at this moment. With t6, another flood situation is selected, with stronger currents than t2 but lower off shore boundary conditions. Although the observed low frequency wave height H_{E10} is very small at UHW, there is a maximum providing a reason to select t7. This is again more or less a HW situation for UHW. T8 is again an ebb case with considerable currents in the channel so that the influence of the current can be studied. Also – since this moment is quite like t4 - it can be interesting to see whether the model performance is similar for quite similar conditions, or not.

	time on 5/6 Dec 2013 [GMT]		current speed (D3d) [m/s]	current dir (D3d) [from°N]	obs wind speed [m/s]	observed wind dir [from °N]	observed sign. wave height H_{m0} [m]	observed wave period T_p [s]	observed water level [m+NAP]
			RZGN	RZGN	AWG platform	AWG platform	BRKN	BRKN	Huibert gat
t1	20:00	FLOOD	1.0	300	19.3	295	6.53	11.0	1.89
t2	22:00	flood	0.5	304	22.9	322	8.10	11.8	2.86
t3	00:00	HW slack	0.3	140	24.6	303	9.17	12.7	3.48
t4	04:00	EBB	1.6	125	21.3	296	8.33	13.1	1.62
t5	07:00	LW ebb	0.5	125	18.9	307	6.70	11.8	1.56
t6	09:00	flood	0.9	304	20.7	298	7.02	11.5	2.63
t7	12:00	HW slack	0.5	128	20.3	301	6.96	12.3	2.37
t8	14:00	ebb	1.3	125	17.0	318	6.45	12.4	1.41

Cases t1, …, t8 correspond to f151ow13z001, …, f151ow13z008.

Model setup

The following model settings are employed for this case. Note that they are different from the setting used in Deltares (2014).

```
GEN3 KOMEN
WCAP KOMEN cds2=2.36e-05   stpm=3.02e-03  powst=2.   delta=1.
QUAD       iquad=2         lambda=0.25    Cnl4=3.0e+07
LIMITER    ursell=10.0     qb=1.0
FRIC JONSWAP               cfjon=0.038
BREA CON   alpha=1         gamma=0.73
TRIAD      trfac=0.10      cutfr=2.5
```

References

Deltares (2014). SWAN hindcasts Wadden Sea, December 2013. Tidal inlet of Ameland and eastern Wadden Sea. Deltares report 1209433-007-HYE-0005, Version 2, date 23 October 2014.

Acknowledgements

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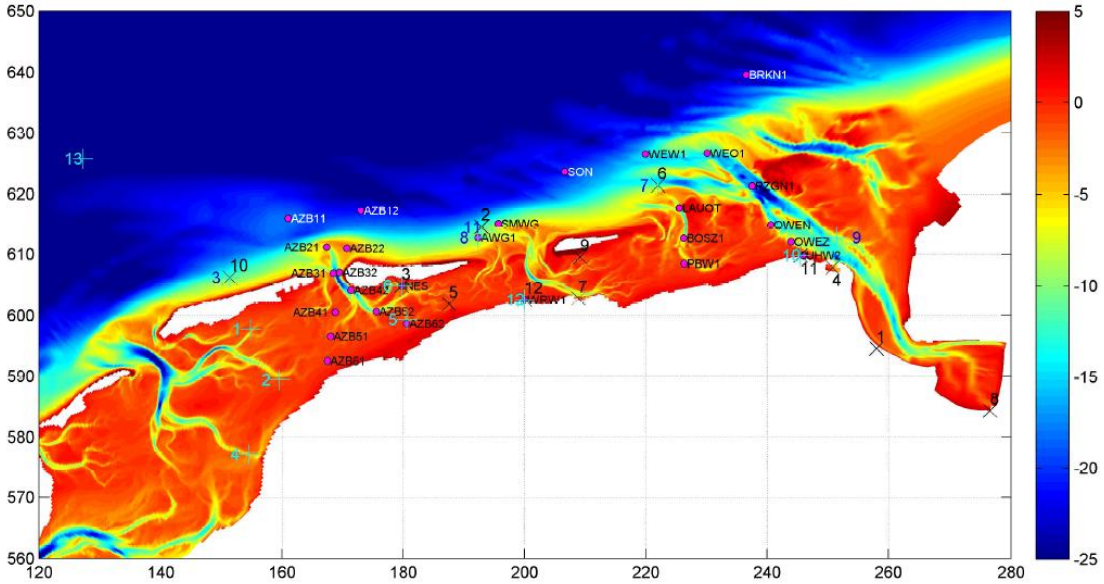
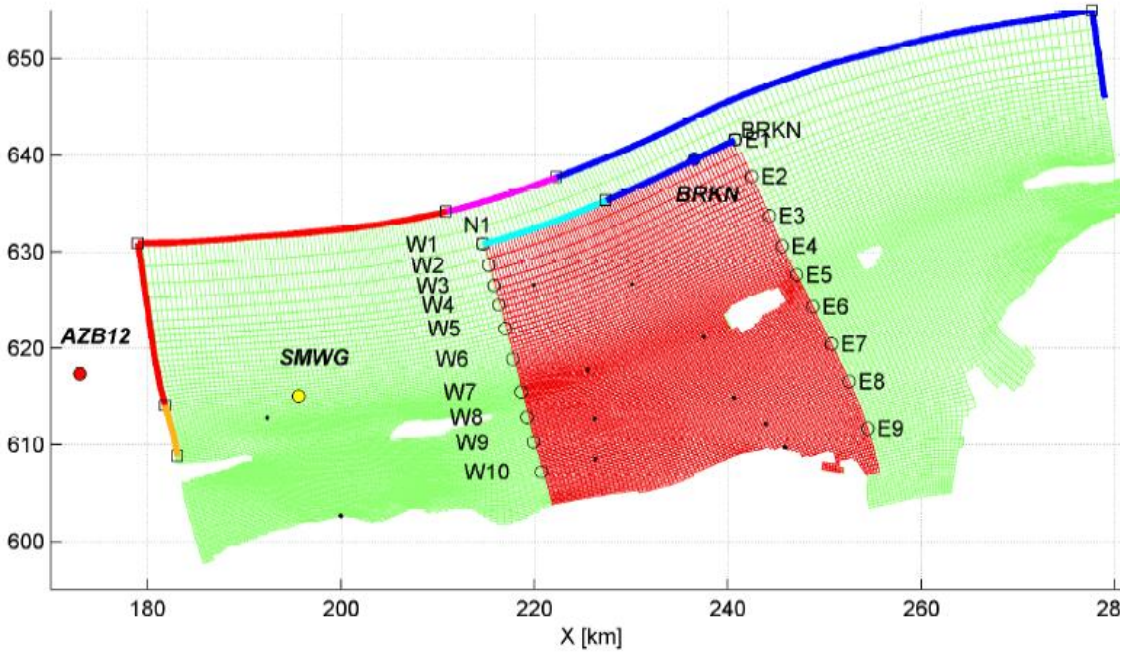
Figure



WIND (+)			WATERLEVEL (X)	
1 Noorderbalgen	7 Huibertgat		1 Delfzijl	7 Lauwersoog
2 Kimstergat	8 Amelander Westgat		2 Wierumergronden	8 Nieuwe Statenzijl
3 Terschelling NZ	9 Emshorn		3 Nes	9 Schiermonnikoog
4 Harlingen	10 Uithuizerwad		4 Eemshaven	10 Terschelling NZ
5 Dantziggat	11 Wierumergronden		5 Holwerd	11 Uithuizerwad
6 Nes	12 Wierumerwad	13 L9 Platform	6 Huibertgat	12 Wierumerwad



coloured circles indicate buoy locations (red, yellow, blue)

on blue and red lines, observed spectra are applied

on orange and pink lines, interpolated observed spectra are applied

on cyan line, interpolated spectra based on observations at BRKN and computations at the north western corner are applied

W1= (214669.66 630804.83)
W2= (215245.51 628622.67)
W3= (215795.86 626537.14)
W4= (216334.74 624494.19)
W5= (216961.24 622061.06)
W6= (217748.97 618933.68)
W7= (218602.36 615511.20)
W8= (219226.93 612882.22)
W9= (219866.10 610300.03)
W10=(220738.85 607213.13)

E1=(240763.96 641597.83)
E2=(242460.07 637803.97)
E3=(244251.44 633732.21)
E4=(245599.24 630573.01)
E5=(247090.12 627587.60)
E6=(248758.71 624333.93)
E7=(250689.63 620452.61)
E8=(252541.92 616557.49)
E9=(254435.38 611728.36)