F062westr[001-030]: Western Scheldt

Purpose

The Western Scheldt (Figure 3.1, top) is an estuary in Zeeland, in the southwest of the Netherlands, and is one of the downstream branches of the Scheldt River from France and Belgium. The outer region is exposed to energetic waves from the North Sea, that refract and largely dissipate on the broad ebb tidal shoals in the estuary mouth. The interior of the estuary features a system of channels and shoals, where local wind sea is generated under the influence of respectively ambient current and the finite water depths. The focus of the present study is on the central region of the Western Scheldt, where the predominantly young waves at the observation stations WCT1, HFPL, HFP1 and PVT1 are under the strong influence of the current (Figure 3.1, bottom).

Case selection

Information on the selected storm moments is given in the table below (taken from Deltares (2010)).

Run code	Hindcast time	WL WIEL [m NAP]	H_{m0} WIEL [m]	θ_w DELO [°N]	H_{m0} WCT1 [m]	U_{10} inside [m/s]	U_{dir} inside [°N]
f062westr001	26/10/02 02:00	1.55	2.09	267	1.34	15	250
f062westr002	27/10/02 18:00	2.42	3.43	296	2.01	21	285
f062westr003	27/10/02 19:30	1.92	3.00	301	1.50	19	289
f062westr004	20/12/03 21:30	1.27	1.48	256	0.94	14	236
f062westr005	21/12/03 06:30	-0.52	1.87	281	1.11	13	237
f062westr006	21/12/03 08:00	0.16	2.21	287	1.47	18	256
f062westr007	21/12/03 15:00	1.57	2.12	323	0.83	12	302
f062westr008	07/02/04 01:00	1.36	1.60	253	1.25	14	244
f062westr009	07/02/04 10:00	-1.00	1.74	281	0.92	15	258
f062westr010	08/02/04 06:00	1.07	2.45	289	1.72	18	266
f062westr011	08/02/04 07:00	0.36	2.16	296	1.41	19	271
f062westr012	08/02/04 16:30	2.87	3.30	326	1.22	18	317
f062westr013	08/02/04 18:00	1.96	2.69	327	1.14	17	306
f062westr014	12/02/05 08:30	-0.93	1.66	268	0.79	15	238
f062westr015	12/02/05 10:30	-2.08	1.83	269	1.05	18	248
f062westr016	13/02/05 06:00	2.58	2.78	308	1.05	14	281
f062westr017	13/02/05 08:30	0.33	2.19	305	0.90	15	288
f062westr018	14/02/05 00:00	-0.47	1.87	335	0.47	14	331
f062westr019	14/02/05 08:30	0.56	1.76	330	0.31	10	342
f062westr020	14/02/05 13:30	-0.88	1.79	328	0.60	15	322
f062westr021	09/11/07 01:30	3.45	3.08	318	1.00	16	314
f062westr022	09/11/07 04:30	1.96	2.36	327	0.86	16	316
f062westr023	09/11/07 07:30	0.73	2.39	323	1.09	14	315
f062westr024	09/11/07 10:00	1.21	2.48	318	0.89	14	314
f062westr025	09/11/07 14:00	2.97	2.87	334	0.83	13	311
f062westr026	09/11/07 17:00	0.56	2.04	324	0.45	13	311
f062westr027	29/02/08 22:30	-0.19	1.99	267	1.17	17	234
f062westr028	29/02/08 23:30	-0.67	1.87	268	1.17	17	239
f062westr029	01/03/08 03:30	0.06	1.97	258	1.24	19	248
f062westr030	01/03/08 06:00	2.01	2.58	276	1.45	19	283

Table 3.1: Stationary cases selected for the WB10 hindcast study (extract from WB10, Table 4.2). 'U_{10} inside' and 'U_{dir} inside' are the average values of HFPL and HAWI.

Model setup

The original model is described in Witteveen & Bos (2010), and is improved in Deltares (2010). In SWIVT, the improved model setup is used.

Default settings

The physical settings applied are:

```
GEN3 WESTH
WCAP WESTH cds2=5.0E-5 br=1.75E-3 p0=4. cds3=0.800
QUAD iquad=2 lambda=0.25 Cnl4=3.00e+07
BREA WESTH alpha=0.96 pown=2.5 bref=-1.39630 shfac=500.
TRIAD trfac=0.080 cutfr=2.500
FRIC JONSWAP cfjon=0.020
```

In order to have sufficient converged results, accuracy settings are applied. The following convergence criteria are applied:

```
NUM STOPC 0.001 0.01 0.001 99 0.001 STAT mxitst=80 alfa=0.001
```

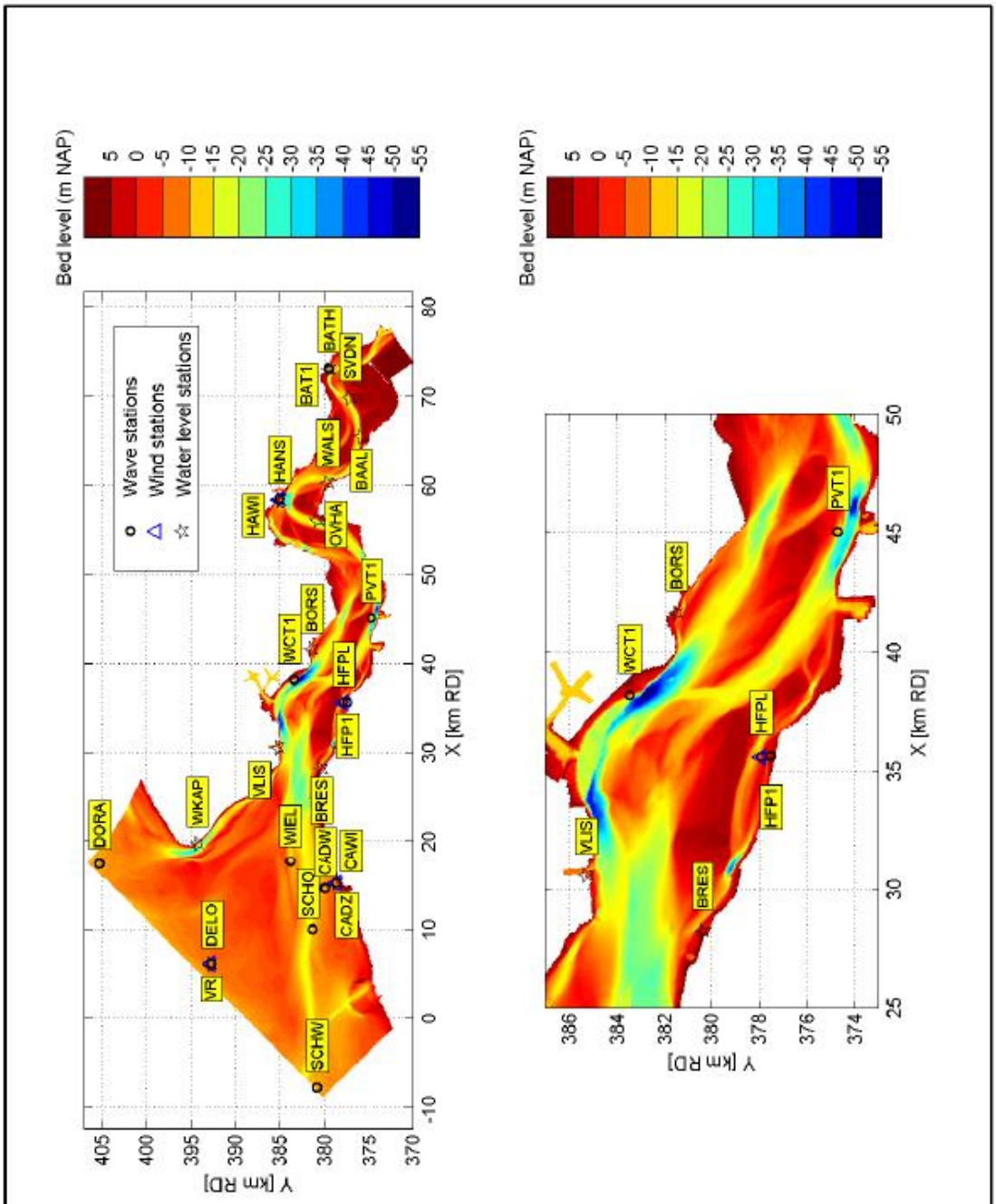
References

Deltares (2010). Validation of wave-current interaction modelling in the Western Scheldt and the Columbia River Mouth

Witteveen & Bos (2010b). Hindcast verification of SWAN in the Western Scheldt..

Acknowledgements

The hindcast is part of the SBW (Strength and Loads on Water Defenses) study commissioned by Rijkswaterstaat-Centre for Water Management in The Netherlands.



Bathymetry of the Western Scheldt field case based on the soundings of the period 2003-2004.		
	Verification wave-current SWAN	
DELTARES	1202120.004	Fig. 3.1