f061westr[001-004]: Westerschelde (the Netherlands)

Purpose

The purpose of this test is to verify the wave model in a complex bathymetry with currents and wind.

Situation

The entrance of the Westerschelde estuary of approximately 60 × 10 km² in the southwest of the Netherlands is considered (Andorka et al., 1997 and Andorka et al., 1998). The depth varies significantly (Figure 1 and Figure 2). At its entrance, a bi-modal wave spectrum is present, as swell is penetrating from deep water into the shallow part of the estuary and a local wind sea is generated in the inner area. A storm event that occurred on December 20, 1991 is considered. The current velocities and water levels used in the computations have been obtained with the WAQUA circulation model and are available in digital format.

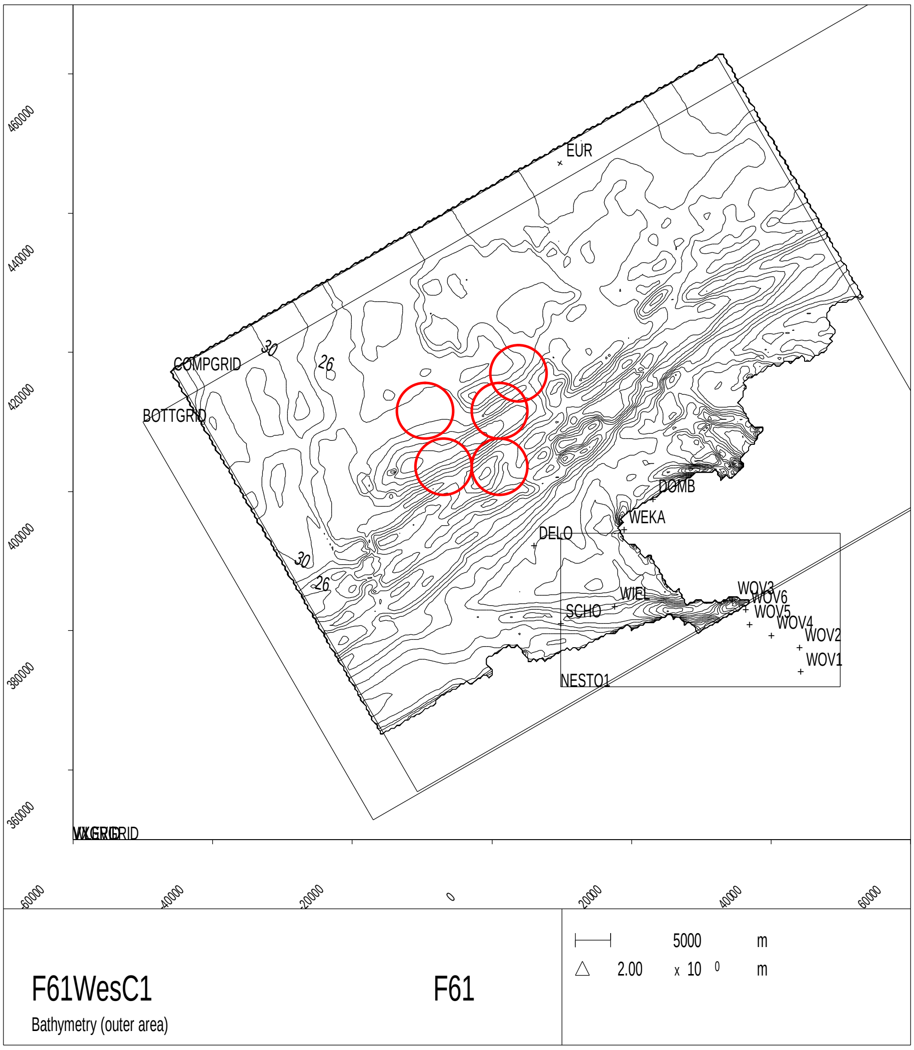

Figure 1 Bathymetry and outline of the computational grid of the outer region and the inner region of the Westerschelde (the Netherlands) with the locations of the observation stations.

In Table 1 the wind velocities and directions are given for each case in f061westr for the outer and inner region (Figure 2). Generally the wind speeds are slightly higher in the outer region. The last column of Table 1 is just to give an indication of the mean water level for this specific case which is of course the same for both the outer as inner region.

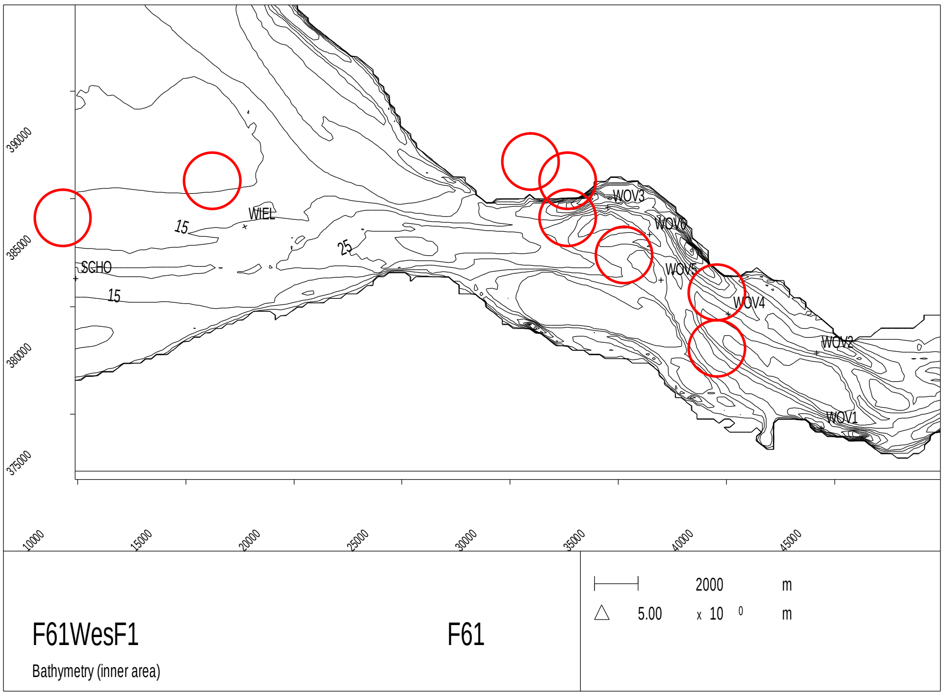

Figure 2 **Bathymetry and the computational domain of the inner region of the Westerschelde (the Netherlands) with the locations of the observation stations.**

Case nr.	Date/Time	Wind (U_{10}) [m/s] inner/outer	Direction [°] inner/outer	MWL+NAP [m]
01	20-12-1991 / 12:00 hrs	17.5/14.5	0/350	1.78
02	20-12-1991 / 15:00 hrs	18/16	350/340	1.46
03	20-12-1991 / 18:00 hrs	18.5 /14	340/340	0.45
04	20-12-1991 / 21:00 hrs	16/13.5	340/340	0.63

Table 1 **Physical parameters for case f061westr. Wind direction according to nautical convention.**

Comparison

Comparisons are made for energy density spectra, significant wave height H_{m0} and mean wave period T_{m01}.

Default Model commands

Model commands (outer region) – f061westr00X_01 (X = 1,2,3,4)

	COMPUTATIONAL GRID						
	SET	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
	nautical	2D	-45669	417500	300	70000	90000

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	500	1000	0°	360°	15°	0.05	0.8	29

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	on	on	on	on	on	on	off

	BOUNDARY CONDITIONS										
	TYPE	BOU	C/V	P/R	SHAPE	PE/ME	DSPR	LEN	HS	PER	DIR	DD
001	side	NW	con	par	Jonswap	peak	degrees	-	4.15	8.38	277	39
001	side	NE/SE	var	par	Jonswap	peak	degrees	0	4.15	8.38	277	39
001								58000	4.15	8.38	277	39
002	side	NW	con	par	Jonswap	peak	degrees	-	3.63	7.98	280	42
002	side	NE/SE	var	par	Jonswap	peak	degrees	0	3.63	7.98	280	42
002								58000	3.63	7.98	280	42
003	side	NW	con	par	Jonswap	peak	degrees	-	4.84	8.91	291	37
003	side	NE/SE	var	par	Jonswap	peak	degrees	0	4.84	8.91	291	37
003								58000	4.84	8.91	291	37
004	side	NW	con	par	Jonswap	peak	degrees	-	4.45	9.18	292	36
004	side	NE/SE	var	par	Jonswap	peak	degrees	0	4.45	9.18	292	36
004								58000	4.45	9.18	292	36

	BOTTOM:	**WIND:**		**CURRENT:**	**WATER LEVEL:**
001	'f061westr001_01.bot'	U_{10}: 17.5 m/s	θ_W: 270°	'f061westr001.cur'	'f061westr001.lev'
002	'f061westr002_01.bot'	U_{10}: 18. m/s	θ_W: 280°	'f061westr002.cur'	'f061westr002.lev'
003	'f061westr003_01.bot'	U_{10}: 18.5 m/s	θ_W: 290°	'f061westr003.cur'	'f061westr003.lev'
004	'f061westr004_01.bot'	U_{10}: 16 m/s	θ_W: 290°	'f061westr004.cur'	'f061westr004.lev'

Model commands (inner region) - f061westr00X_02 (X = 1,2,3,4)

	COMPUTATIONAL GRID					
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC
	2D	10000	372000	0	40000	22000

	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
	250	200	0°	360°	15°	0.05	0.8	29

	PHYSICS								
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
	3	on	on	on	on	on	on	on	off

	BOUNDARY CONDITIONS
001	‘f061westr001.nst’
002	‘f061westr002.nst’
003	‘f061westr003.nst’
004	‘f061westr004.nst’

	BOTTOM:	**WIND:**		**CURRENT:**	**WATER LEVEL:**
001	'f061westr001_02.bot'	U_{10}: 14.5 m/s	θ_W: 280°	'f061westr001.cur'	'f061westr001.lev'
002	'f061westr002_02.bot'	U_{10}: 16 m/s	θ_W: 290°	'f061westr002.cur'	'f061westr002.lev'
003	'f061westr003_02.bot'	U_{10}: 14 m/s	θ_W: 290°	'f061westr003.cur'	'f061westr003.lev'
004	'f061westr004_02.bot'	U_{10}: 13.5 m/s	θ_W: 290°	'f061westr004.cur'	'f061westr004.lev'

References

Andorka Gal, J.H. and P. Roelse, 1997: Wave modelling in the Westerschelde estuary and wave conditions along the sea defences (Westerschelde golfmodellering en golfrandvoorwaarden voor de dijkvakken, in Dutch), Rep. RIKZ/AB-96.868x, Ministry of Transport, Public Works and Water Management, Den Haag, The Netherlands

Andorka Gal, J.H., A.T. Kamsteeg and S.R. Holterman, 1998: Verification set Case Study Petten, Rep. RIKZ/OS-98.122x, Ministry of Transport, Public Works and Water Management, Den Haag, The Netherlands

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