ICELANDIC MARITIME ADMINISTRATION

The Icelandic Information System on Weather and Sea State Related to Fishing Vessels´ Crews and Stability

Seminar on

Fishing Vessels´ Crews and Stability

World Fishing Exhibition 2009, Vigo Spain

September 16th 2009

Gisli Viggosson

Director of Research and Development

Icelandic Maritime Administration

Overviews

Information System on Weather and Sea State

- Will be part of regional VTMIS in North Atlantic
- Comparison of recorded / forecasted waves in Atlantic
- Example of tide simulation model in Icelandic Waters
- IMA´s Drift Model
- Extreme waves - Storm Surge Forecasting
- Waves and stability of small fishing vessels
- Stability Awareness Campaign
- A Programme on the Safety of Seafarers

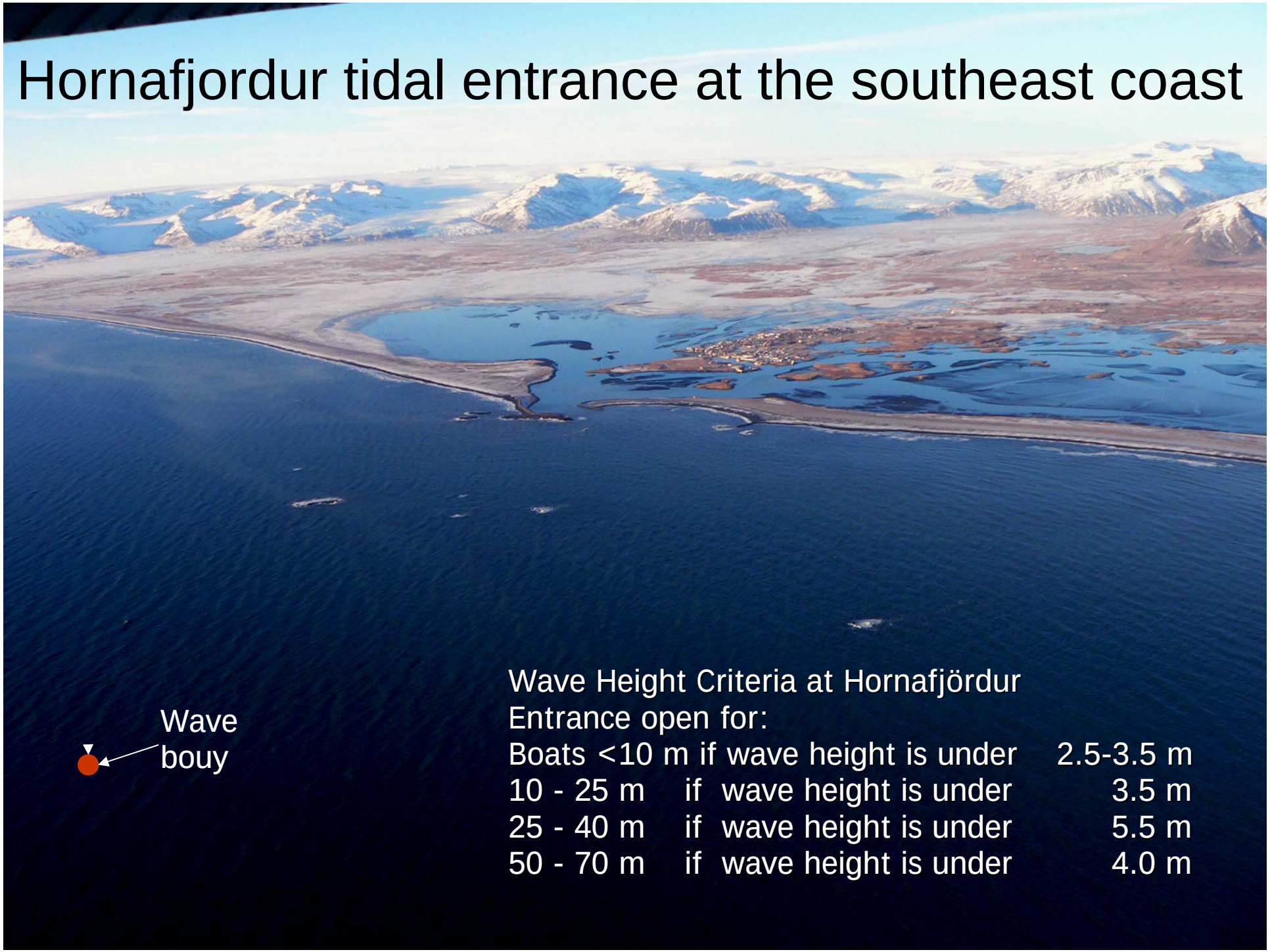
IMA's Information System on Weather and Sea State

- Real-time information is updated every hour
  - 11 offshore wave buoys
  - 19 automatic weather stations
  - 11 automatic harbour stations with weather, tide and wave gauges in harbours
- Wave and weather forecast received twice a day from the ECMWF – European Centre for Medium-Range Weather Forecasts in Reading UK forecasting at 6-hour intervals up to 10 days
- Numerical Tidal Simulation Model to compute tides, tidal currents and storm surge in North Atlantic every hour next two days
- Weather and wave database of all wave and weather data collected by IMA since 1986 and ECMWF ERA 40 since 1958

Access to the Weather and Sea State Information

- IMA´s website http://vs.en.sigling.is
- Text TV http://www.textavarp.is/191
- Automatic Answering Machine: + 354 9021000
- By 2010 the system will be acessible in Icelandic Waters via 3G web browsers
- The experienced seamen have the same need for good information to evaluate sea conditions as pilots have on weather and flight conditions.
- The aim is to increase Safety and more efficient Fishing

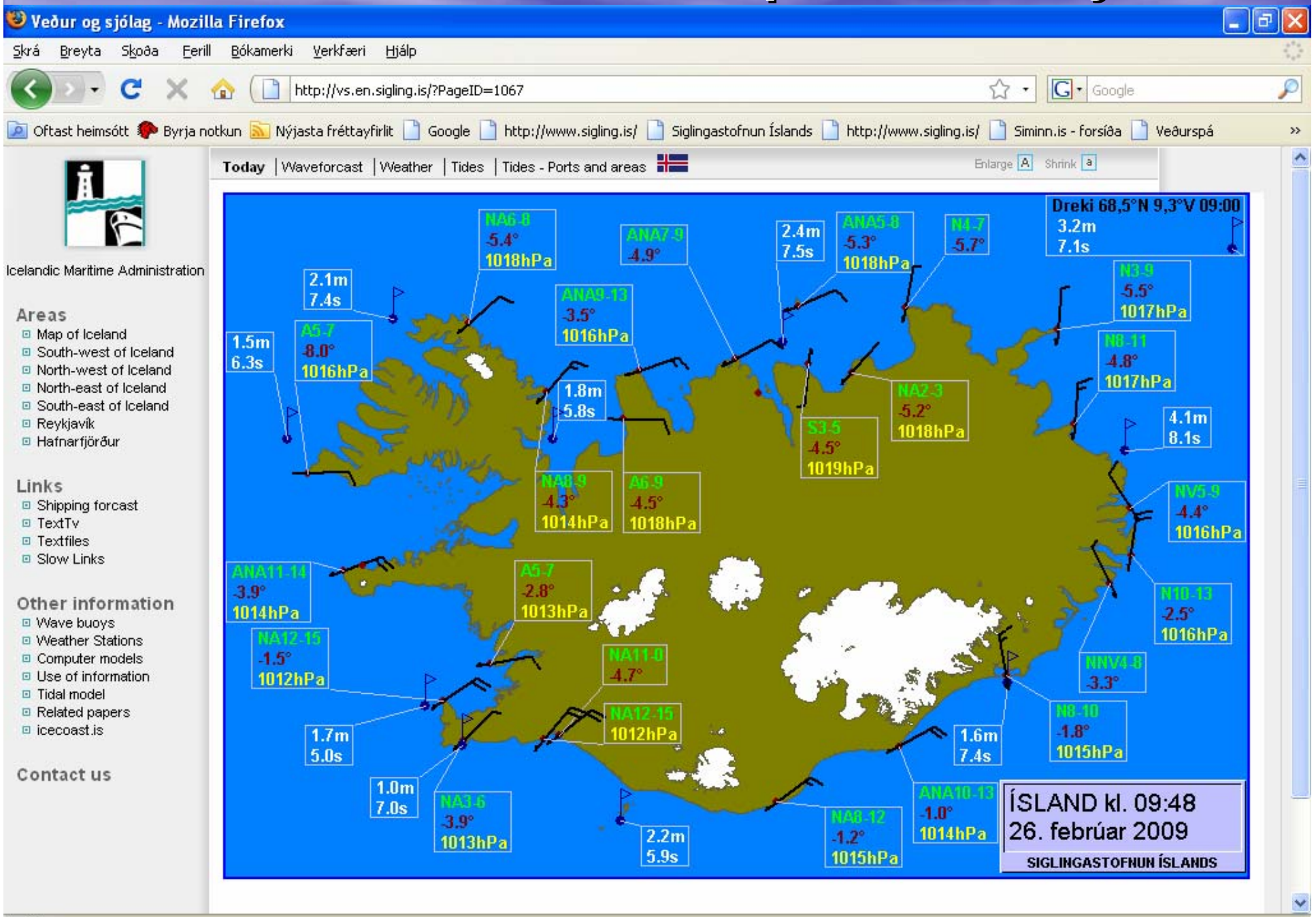
Hornafjordur tidal entrance at the southeast coast

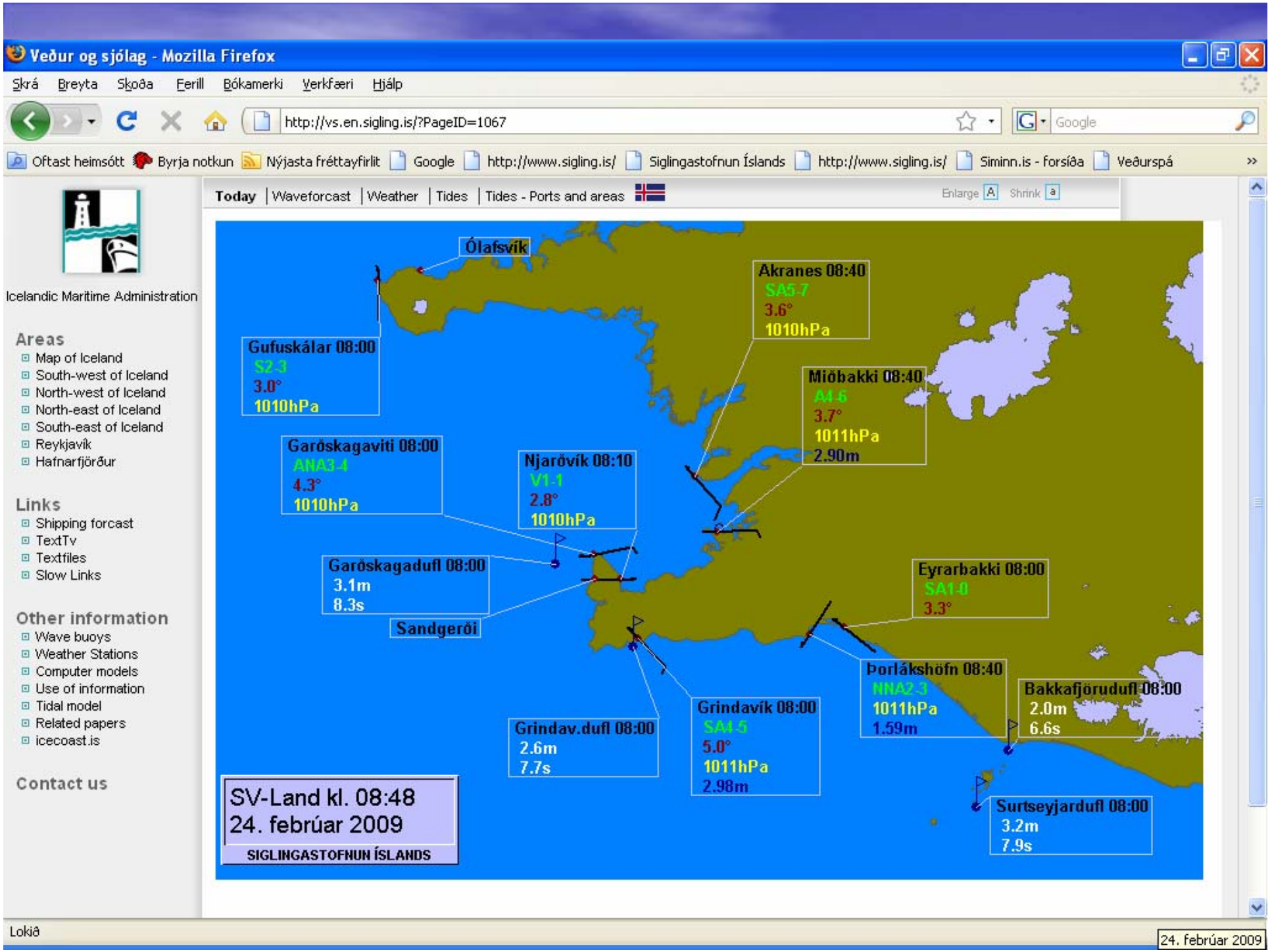


Wave Height Criteria at Hornafjördur
Entrance open for:

Boats <10 m	if wave height is under	2.5-3.5 m
10 - 25 m	if wave height is under	3.5 m
25 - 40 m	if wave height is under	5.5 m
50 - 70 m	if wave height is under	4.0 m

Real-time information is updated every hour




Veður og sjólag - Mozilla Firefox
Skrá Breyta Skoða Ferill Bókamerki Verkfæri Hjálp
http://vs.en.sigling.is/?PageID=1067
Google
Oftast heimsótt Byrja notkun Nýjasta fréttayfirlit Google http://www.sigling.is/ Siglingastofnun Íslands http://www.sigling.is/ Siminn.is - forsíða Veðurspá
Icelandic Maritime Administration
Areas
Map of Iceland
South-west of Iceland
North-west of Iceland
North-east of Iceland
South-east of Iceland
Reykjavík
Hafnarfjörður
Links
Shipping forcast
TextTv
Textfiles
Slow Links
Other information
Wave buoys
Weather Stations
Computer models
Use of information
Tidal model
Related papers
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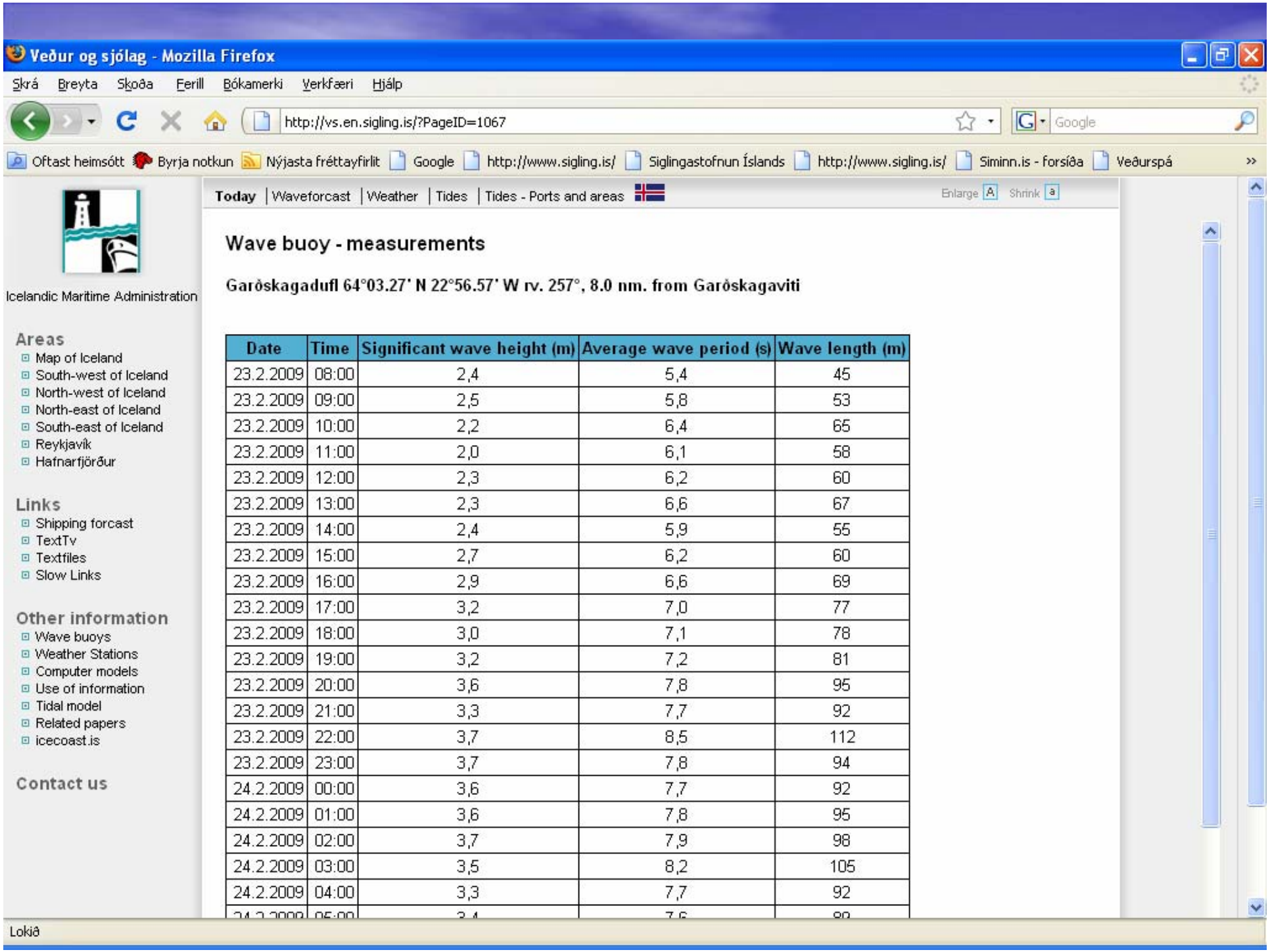
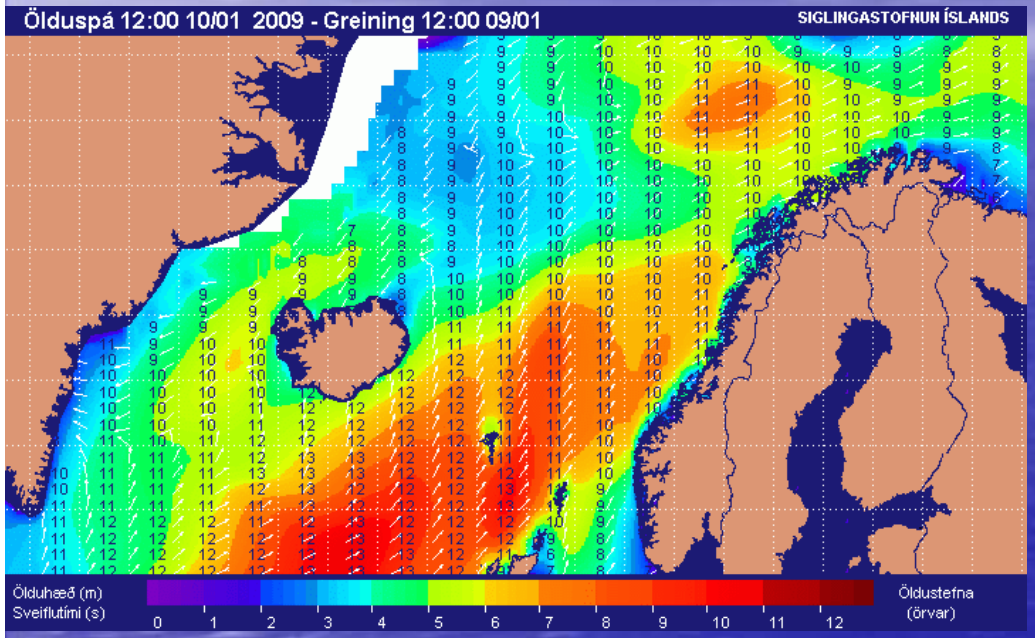
Today | Waveforcast | Weather | Tides | Tides - Ports and areas
Enlarge A Shrink a
Ólafsvík
Akranes 08:40
SA5-7
3.6°
1010hPa
Gufuskálar 08:00
S2-3
3.0°
1010hPa
Miðbakki 08:40
A4-6
3.7°
1011hPa
2.90m
Garðskagaviti 08:00
ANA3-4
4.3°
1010hPa
Njarðvík 08:10
V1-1
2.8°
1010hPa
Garðskagadufl 08:00
3.1m
8.3s
Sandgerði
Eyrarbakki 08:00
SA1-0
3.3°
Þorlákshöfn 08:40
NNA2-3
1011hPa
1.59m
Bakkafjöruduflí 08:00
2.0m
6.6s
Grindavík 08:00
SA4-5
5.0°
1011hPa
2.98m
Grindav.dufl 08:00
2.6m
7.7s
Surtseyjardufl 08:00
3.2m
7.9s
SV-Land kl. 08:48
24. febrúar 2009
SIGLINGASTOFNUN ÍSLANDS
Lokið
24. febrúar 2009



Date	Time	Significant wave height (m)	Average wave period (s)	Wave length (m)
23.2.2009	08:00	2,4	5,4	45
23.2.2009	09:00	2,5	5,8	53
23.2.2009	10:00	2,2	6,4	65
23.2.2009	11:00	2,0	6,1	58
23.2.2009	12:00	2,3	6,2	60
23.2.2009	13:00	2,3	6,6	67
23.2.2009	14:00	2,4	5,9	55
23.2.2009	15:00	2,7	6,2	60
23.2.2009	16:00	2,9	6,6	69
23.2.2009	17:00	3,2	7,0	77
23.2.2009	18:00	3,0	7,1	78
23.2.2009	19:00	3,2	7,2	81
23.2.2009	20:00	3,6	7,8	95
23.2.2009	21:00	3,3	7,7	92
23.2.2009	22:00	3,7	8,5	112
23.2.2009	23:00	3,7	7,8	94
24.2.2009	00:00	3,6	7,7	92
24.2.2009	01:00	3,6	7,8	95
24.2.2009	02:00	3,7	7,9	98
24.2.2009	03:00	3,5	8,2	105
24.2.2009	04:00	3,3	7,7	92

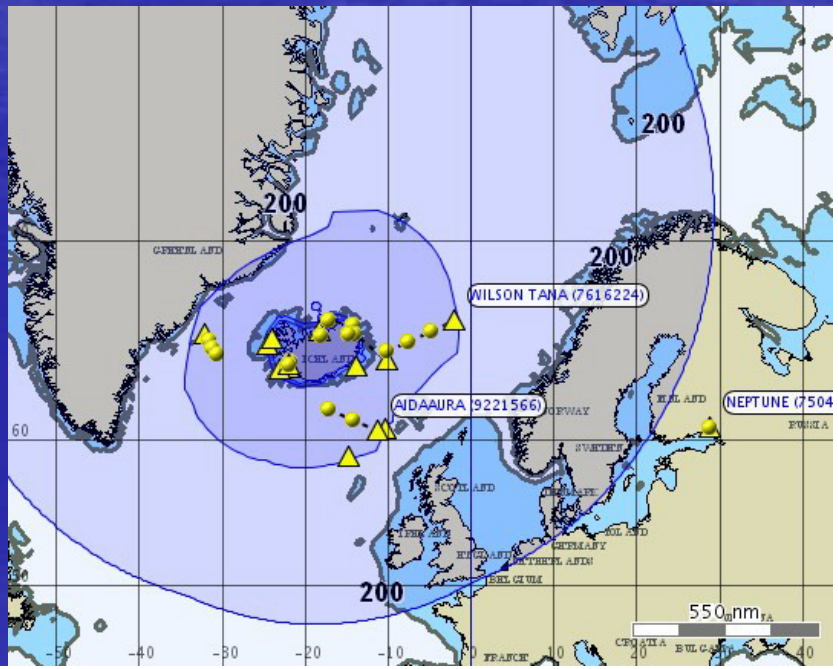
Information System on Weather and Sea State



The system will consist of the SafeSeaNet, AIS and Long Range Identification and Tracking Systems and Information on Weather and Sea State

Extension of forecast area in relation to a new regional monitoring system for ships in the North Atlantic (EMSA)

1 July 2009

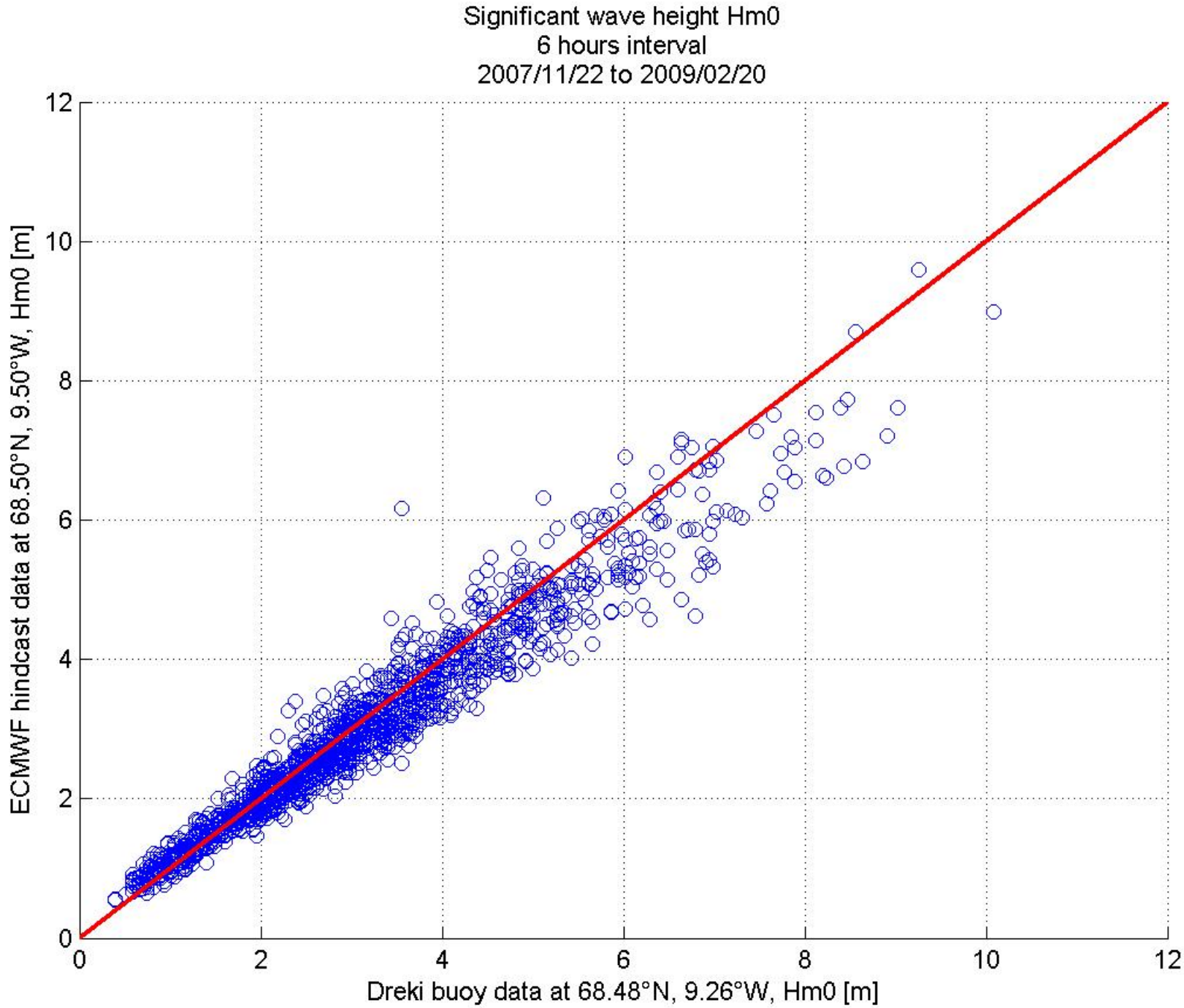


Weather- and wave buoy at Dreki

Dreka-buoy at
68°26,56´N
09°15,78´W

Installed on 23 Nov. 2007 at 850 m depth some 180 nautical miles offshore northeast of Iceland.

Records weather, waves and currents.


Significant wave height Hm0
6 hours interval
2007/11/22 to 2009/02/20
ECMWF hindcast data at 68.50°N, 9.50°W, Hm0 [m]
Dreki buoy data at 68.48°N, 9.26°W, Hm0 [m]
0
2
4
6
8
10
12

Five days Weather forecast upgraded twice a day

Icelandic Maritime Administration

Five days forecast

Icelandic Waters
- Wind and air pressure

High seas
- Wind and air pressure

N-Atlantic
- Wind and air pressure

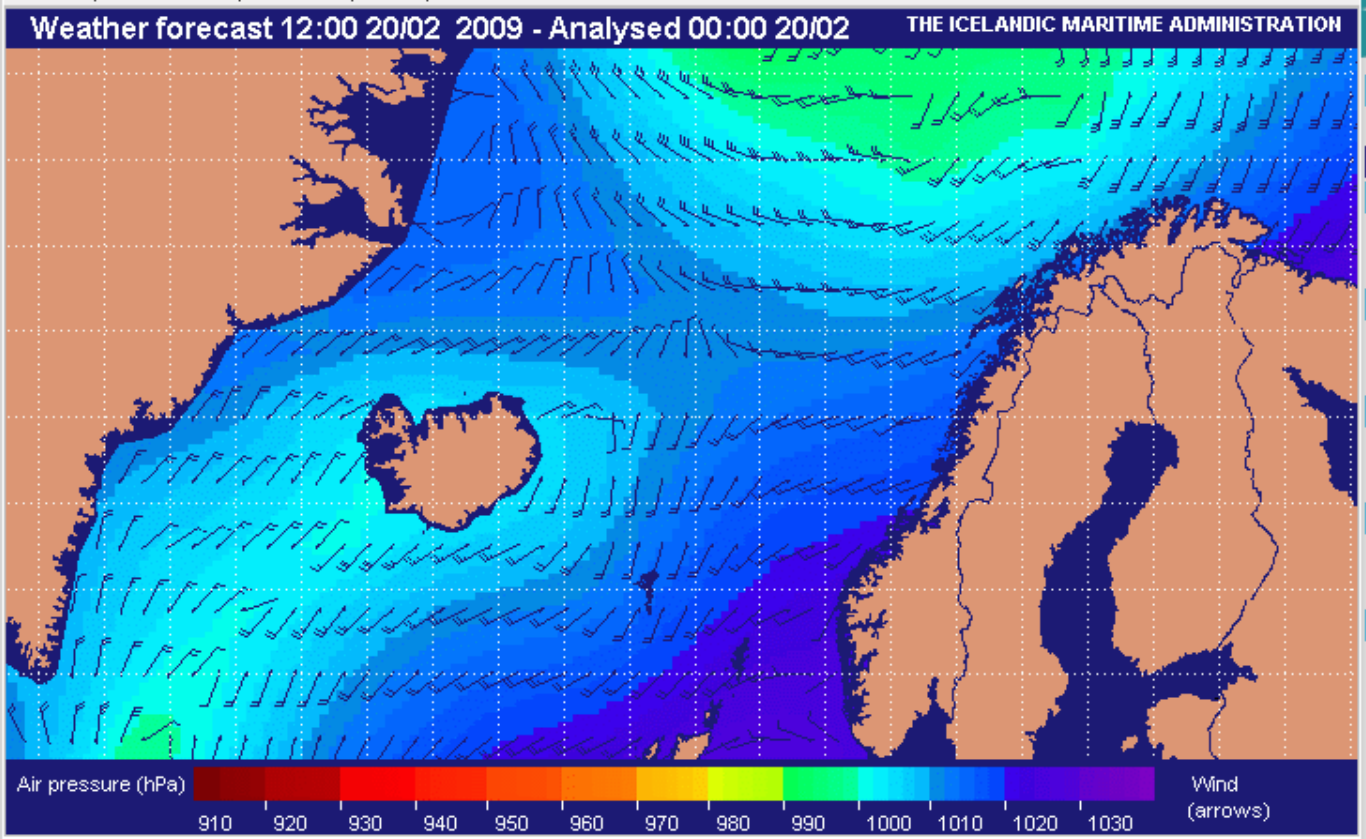
Links
- Shipping forcast
- TextTv
- Textfiles
- Slow Links

Other information
- Wave buoys
- Weather Stations
- Computer models
- Use of information
- Tidal model
- Related papers
- icecoast.is

Contact us

Today | Waveforcast | **Weather** | Tides | Tides - Ports and areas

Enlarge A Shrink a



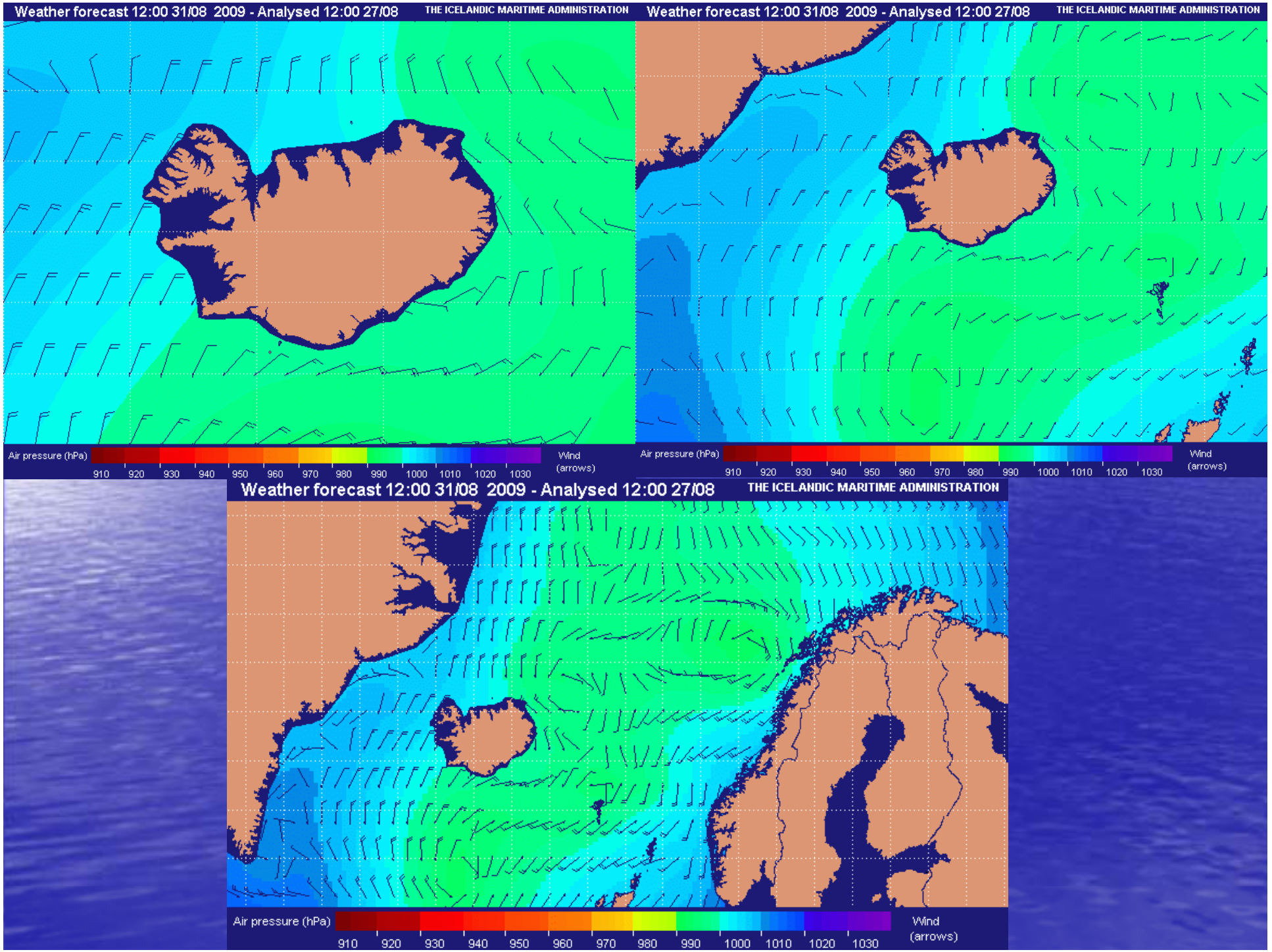
FYRRI

NÆSTA

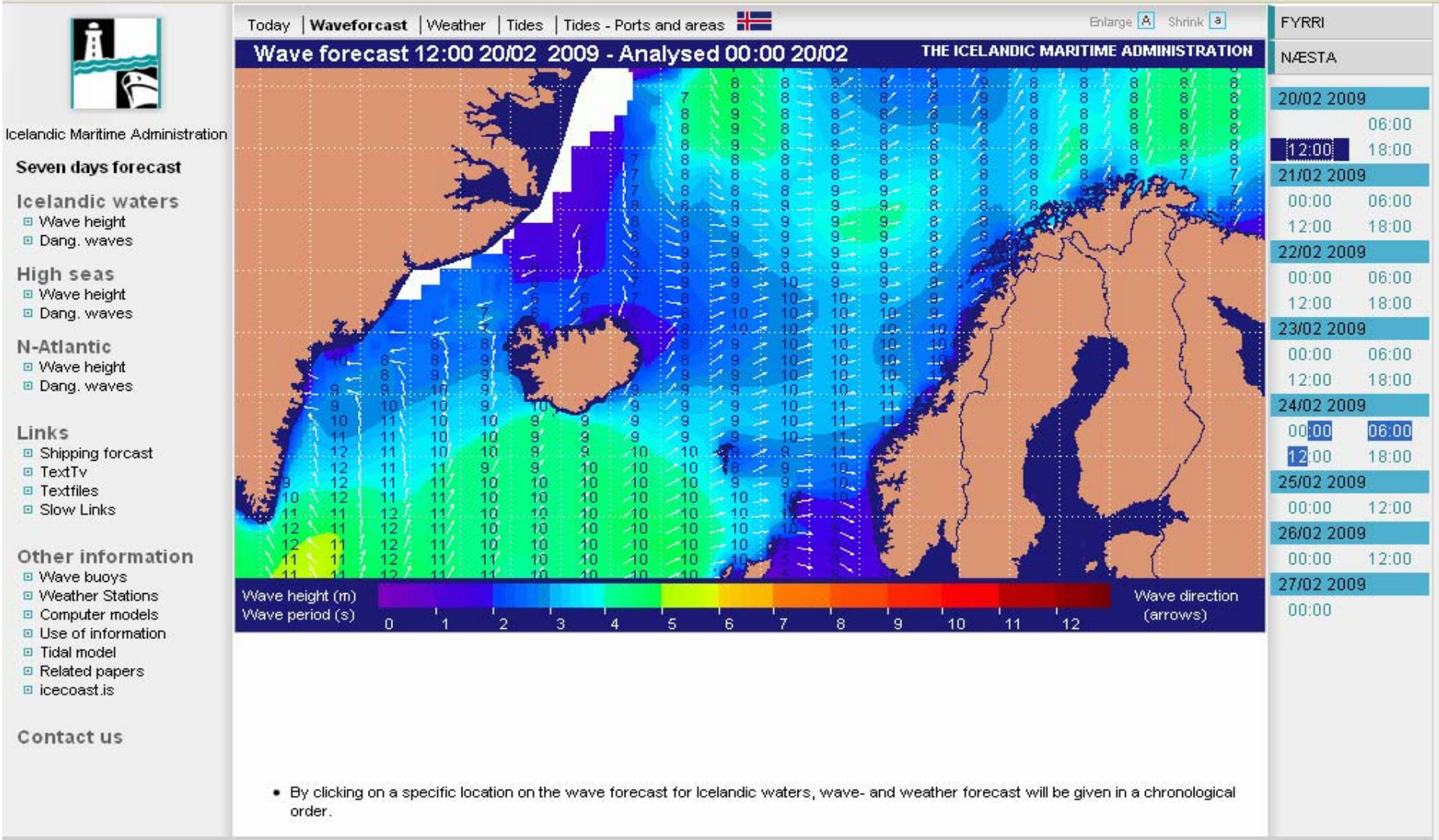
20/02 2009
00:00 06:00
12:00 18:00
21/02 2009
00:00 06:00
12:00 18:00
22/02 2009
00:00 06:00
12:00 18:00
23/02 2009
00:00 06:00
12:00 18:00
24/02 2009
00:00 06:00
12:00 18:00
25/02 2009
00:00

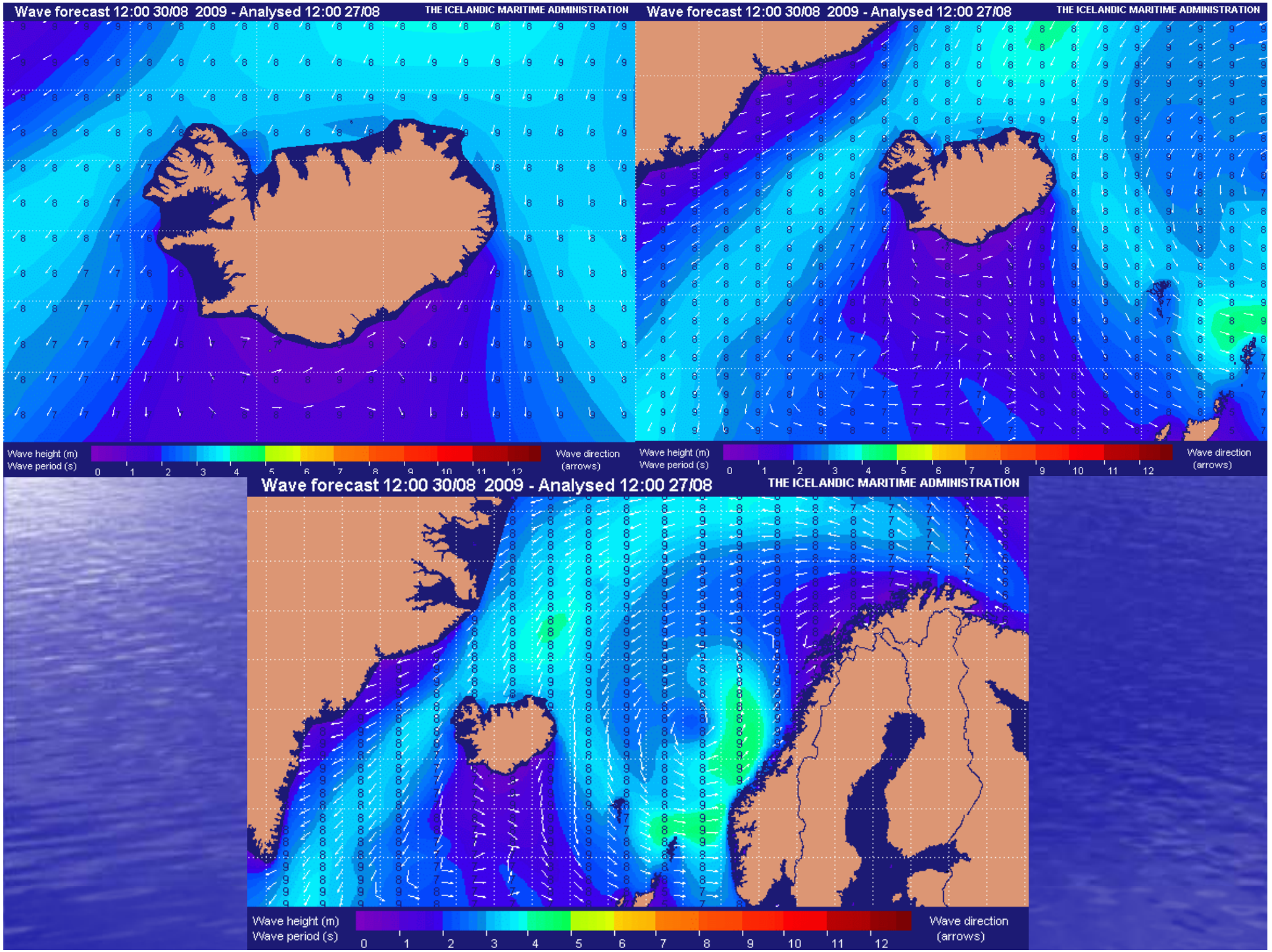
- By clicking on a specific location on the wave forecast for Icelandic waters, wave- and weather forecast will be given in a chronological order.

The Icelandic Maritime Administration | Vesturvör 2 | 200 Kópavogur | Tel 354 560 0000 | Fax 354 560 0060 | info@sigling.is


Weather forecast 12:00 31/08 2009 - Analysed 12:00 27/08
THE ICELANDIC MARITIME ADMINISTRATION
Air pressure (hPa)
910 920 930 940 950 960 970 980 990 1000 1010 1020 1030
Wind (arrows)
Weather forecast 12:00 31/08 2009 - Analysed 12:00 27/08
THE ICELANDIC MARITIME ADMINISTRATION
Air pressure (hPa)
910 920 930 940 950 960 970 980 990 1000 1010 1020 1030
Wind (arrows)
Weather forecast 12:00 31/08 2009 - Analysed 12:00 27/08
THE ICELANDIC MARITIME ADMINISTRATION
Air pressure (hPa)
910 920 930 940 950 960 970 980 990 1000 1010 1020 1030
Wind (arrows)

Seven days Wave forecast upgraded twice a day




Wave forecast 12:00 30/08 2009 - Analysed 12:00 27/08
THE ICELANDIC MARITIME ADMINISTRATION
Wave height (m)
Wave period (s)
0 1 2 3 4 5 6 7 8 9 10 11 12
Wave direction
(arrows)
Wave forecast 12:00 30/08 2009 - Analysed 12:00 27/08
THE ICELANDIC MARITIME ADMINISTRATION
Wave height (m)
Wave period (s)
0 1 2 3 4 5 6 7 8 9 10 11 12
Wave direction
(arrows)
Wave forecast 12:00 30/08 2009 - Analysed 12:00 27/08
THE ICELANDIC MARITIME ADMINISTRATION
Wave height (m)
Wave period (s)
0 1 2 3 4 5 6 7 8 9 10 11 12
Wave direction
(arrows)

Icelandic Maritime Administration

Seven days forecast

Icelandic waters
- Wave height
- Dang. waves

High seas
- Wave height
- Dang. waves

N-Atlantic
- Wave height
- Dang. waves

Links
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- TextTv
- Textfiles
- Slow Links

Other information
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- Weather Stations
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- Use of information
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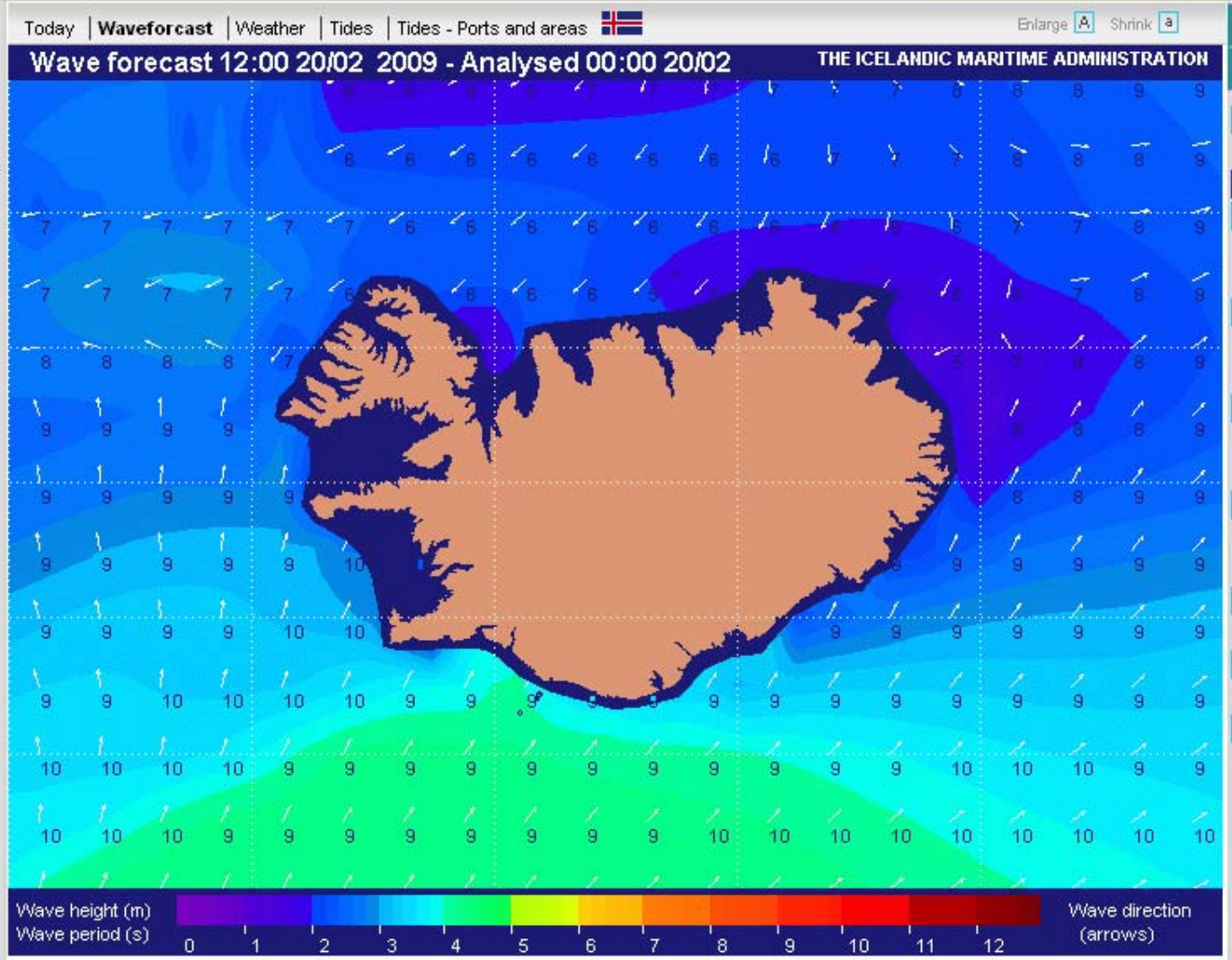
- icecoast.is

Contact us

Today | **Waveforcast** | Weather | Tides | Tides - Ports and areas

Enlarge A Shrink a



- By clicking on a specific location on the wave forecast for Icelandic waters, wave- and weather forecast will be given in a chronological order.

FYRRI

NÆSTA

20/02 2009
06:00
12:00 18:00
21/02 2009
00:00 06:00
12:00 18:00
22/02 2009
00:00 06:00
12:00 18:00
23/02 2009
00:00 06:00
12:00 18:00
24/02 2009
00:00 06:00
12:00 18:00
25/02 2009
00:00 12:00
26/02 2009
00:00 12:00
27/02 2009
00:00

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Icelandic Maritime Administration

Seven days forecast

Icelandic waters
- Wave height
- Dang. waves

High seas
- Wave height
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N-Atlantic
- Wave height
- Dang. waves

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Wave and weather forecast on 64°0' N og 15°0' W

Date	Time	Significant wave height (m)	Mean wave period (s)	Mean wave direction (°)	Air pressure (hPa)	Wind speed (m/s)	Wind direction (°)
5.8.2009	06:00	2,1	7,4	122	1.001	8	80
5.8.2009	12:00	2,0	7,7	132	1.004	8	92
5.8.2009	18:00	2,7	7,3	121	1.001	12	85
6.8.2009	00:00	3,1	8,5	140	1.001	10	113
6.8.2009	06:00	3,0	8,9	155	1.003	8	134
6.8.2009	12:00	2,7	8,7	160	1.005	7	148
6.8.2009	18:00	2,2	8,3	160	1.006	6	137
7.8.2009	00:00	1,9	7,8	158	1.007	6	150
7.8.2009	06:00	1,7	7,5	158	1.008	6	161
7.8.2009	12:00	1,6	7,1	165	1.011	7	194
7.8.2009	18:00	1,5	7,1	174	1.012	5	190
8.8.2009	00:00	1,4	7,2	182	1.013	4	179
8.8.2009	06:00	1,3	7,0	185	1.012	4	145
8.8.2009	12:00	1,2	6,8	183	1.012	5	148
8.8.2009	18:00	1,3	6,6	178	1.010	5	167
9.8.2009	00:00	1,1	7,1	180	1.011	3	194
9.8.2009	06:00	1,0	7,5	182	1.011	2	168
9.8.2009	12:00	1,0	7,9	187	1.011	3	169
9.8.2009	18:00	0,9	8,1	190	1.011	3	193
10.8.2009	00:00	0,9	8,4	192	1.012	2	199
10.8.2009	06:00	0,9	8,6	192	1.011	1	169
10.8.2009	12:00	0,8	8,8	192	1.013	2	207
11.8.2009	00:00	0,8	8,8	193	-999	-999	-999
11.8.2009	12:00	0,8	8,0	185	-999	-999	-999
12.8.2009	00:00	1,1	7,0	149	-999	-999	-999
12.8.2009	12:00	1,1	7,9	156	-999	-999	-999

Value -999 in the table above means there is no forecast data available at this point.

FYRRI
NÆSTA
06/08 2009
06:00
12:00 18:00
07/08 2009
00:00 06:00
12:00 18:00
08/08 2009
00:00 06:00
12:00 18:00
09/08 2009
00:00 06:00
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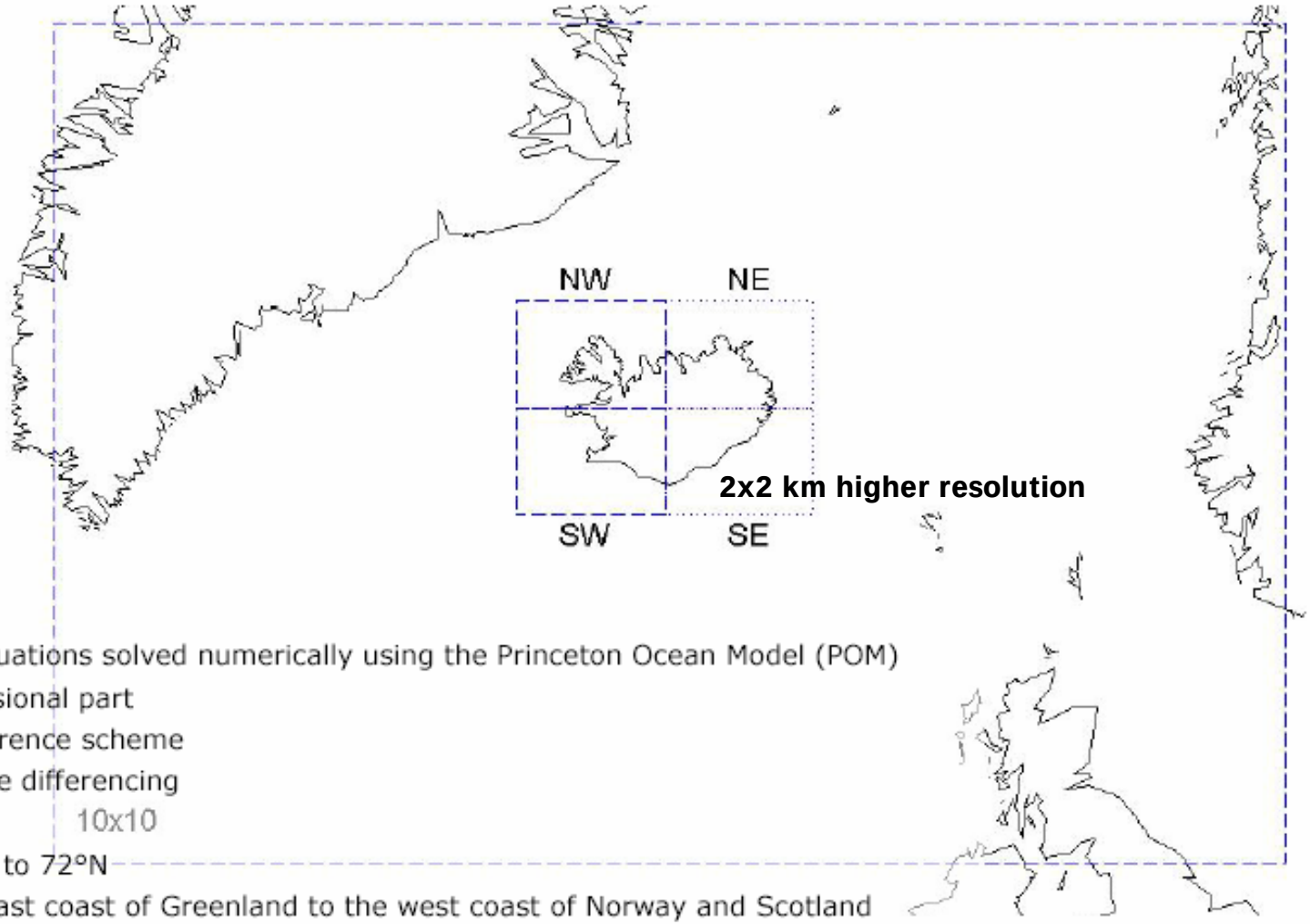
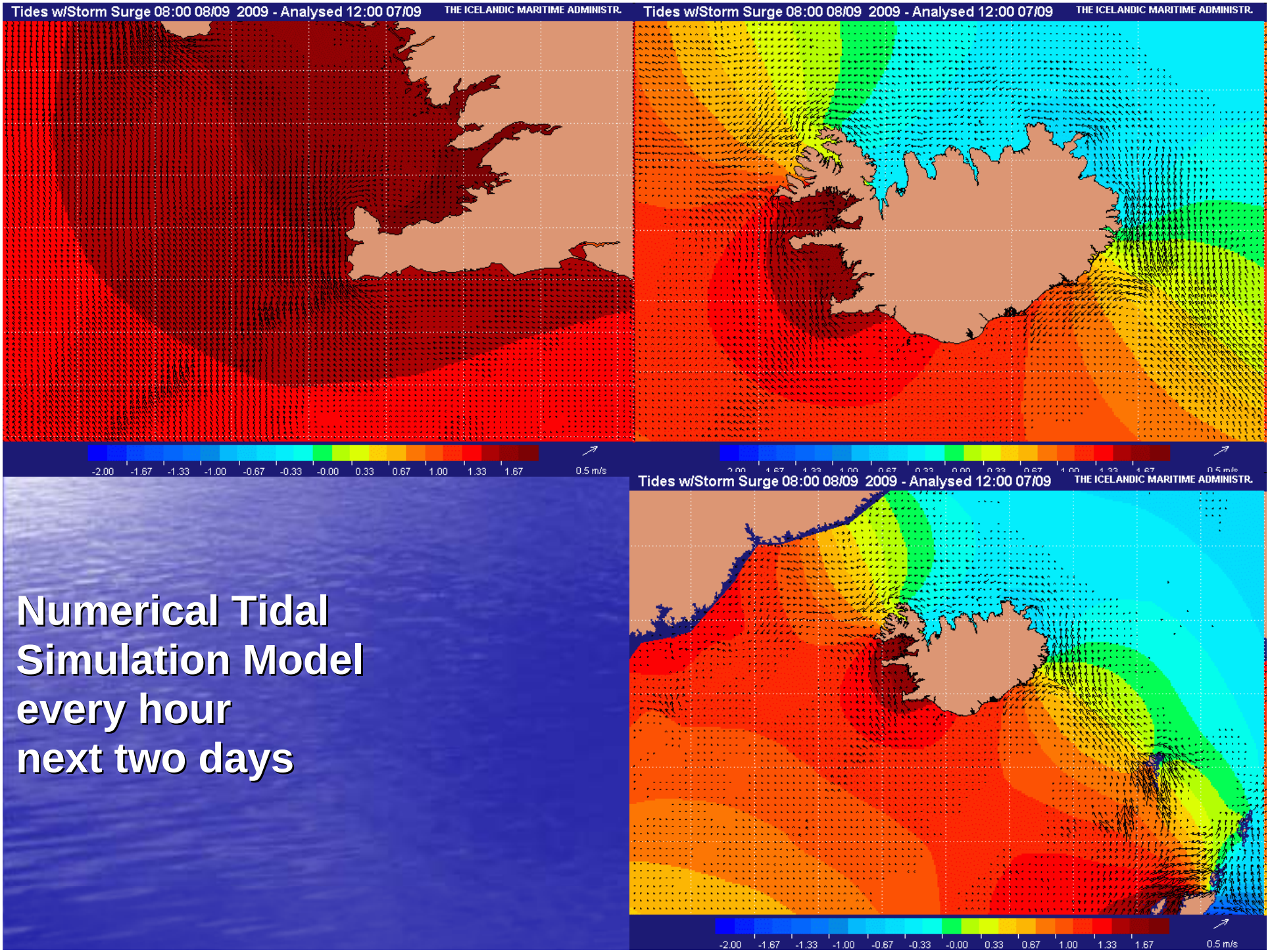
10/08 2009
00:00 06:00
12:00 18:00
11/08 2009
00:00 12:00
12/08 2009
00:00 12:00
13/08 2009
00:00

IMA's Numerical Tidal Simulation Model

VERKÍS

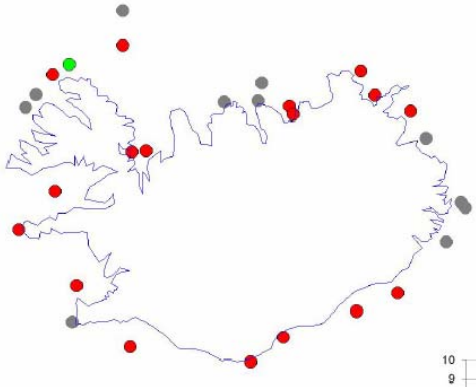


- Shallow water equations solved numerically using the Princeton Ocean Model (POM)
  - Two dimensional part
  - Finate difference scheme
  - Explicit time differencing
- Model domain 10x10
  - From 54°N to 72°N
  - From the east coast of Greenland to the west coast of Norway and Scotland
  - Approx. 5.7 million km²
- Resolution
  - 10 km x 10 km (higher resolution regional models)
  - Approx. 57,900 grid points of which 45,300 are at sea
  - Time stepping 15 seconds


Tides w/Storm Surge 08:00 08/09 2009 - Analysed 12:00 07/09
THE ICELANDIC MARITIME ADMINISTR.
-2.00 -1.67 -1.33 -1.00 -0.67 -0.33 -0.00 0.33 0.67 1.00 1.33 1.67
0.5 m/s
Tides w/Storm Surge 08:00 08/09 2009 - Analysed 12:00 07/09
THE ICELANDIC MARITIME ADMINISTR.
Tides w/Storm Surge 08:00 08/09 2009 - Analysed 12:00 07/09
THE ICELANDIC MARITIME ADMINISTR.
-2.00 -1.67 -1.33 -1.00 -0.67 -0.33 -0.00 0.33 0.67 1.00 1.33 1.67
0.5 m/s
Numerical Tidal
Simulation Model
every hour
next two days

Calibration of tides in Icelandic Waters

Calibration of tidal elevation in Icelandic Waters 2006 - 2009 in cooperation with seven domestic research institutions



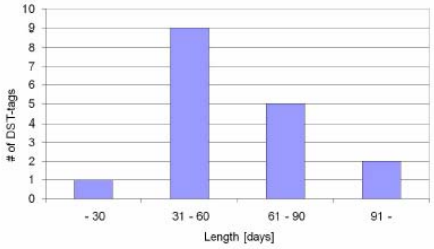
DST-tags lost

DST-tags: 17 locations

Measure: Pressure and temperature

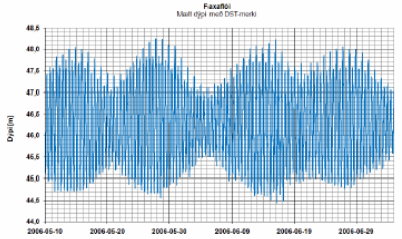
Timestep: 2 – 5 minutes

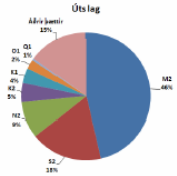
Length: 4 to 19 weeks

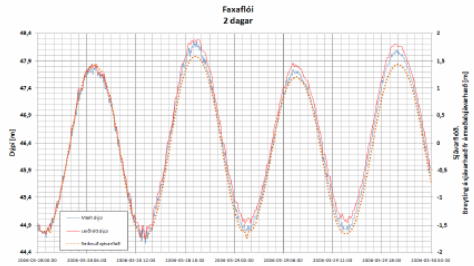


VERKÍS

Faxaflói 1C2715







	Útslag		Fasi	
	A	σ_A	g	σ_g
	[m]	[%]	[°]	[°]
M2	1.24	0.3	209.3	0.2
S2	0.48	1.1	248.5	0.6
N2	0.25	1.9	188.0	1.1
K2	0.13	1.1	248.5	0.6
K1	0.10	3.4	131.7	2.0
Mm	0.07	6.0		
O1	0.07	4.6	78.0	2.7
nu2	0.05	1.9		
L2	0.04	19.2		
Q1	0.01	19.9	78.0	2.7

ÓRK / 2009-02-13

Icelandic Maritime Administration

- Tides
- Storm Surge
- Tides with Storm Surge

Forecasts of tides and storm surges

Areas

- Icelandic Waters 10x10
- High seas
- SW-quarter 10x10
- SW-Coast 2x2
- Faxaflói 2x2
- NW-quarter 10x10
- Breiðafjörður 2x2
- VestfjarðarWaters 2x2
- NW-Coast 2x2
- NE-quarter 10x10
- NE-Coast 2x2
- E-Coast North 2x2
- SE-quarter 10x10
- E-Waters South 2x2
- SE-Waters 2x2
- Hornafjörður 2x2

Links

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Other information

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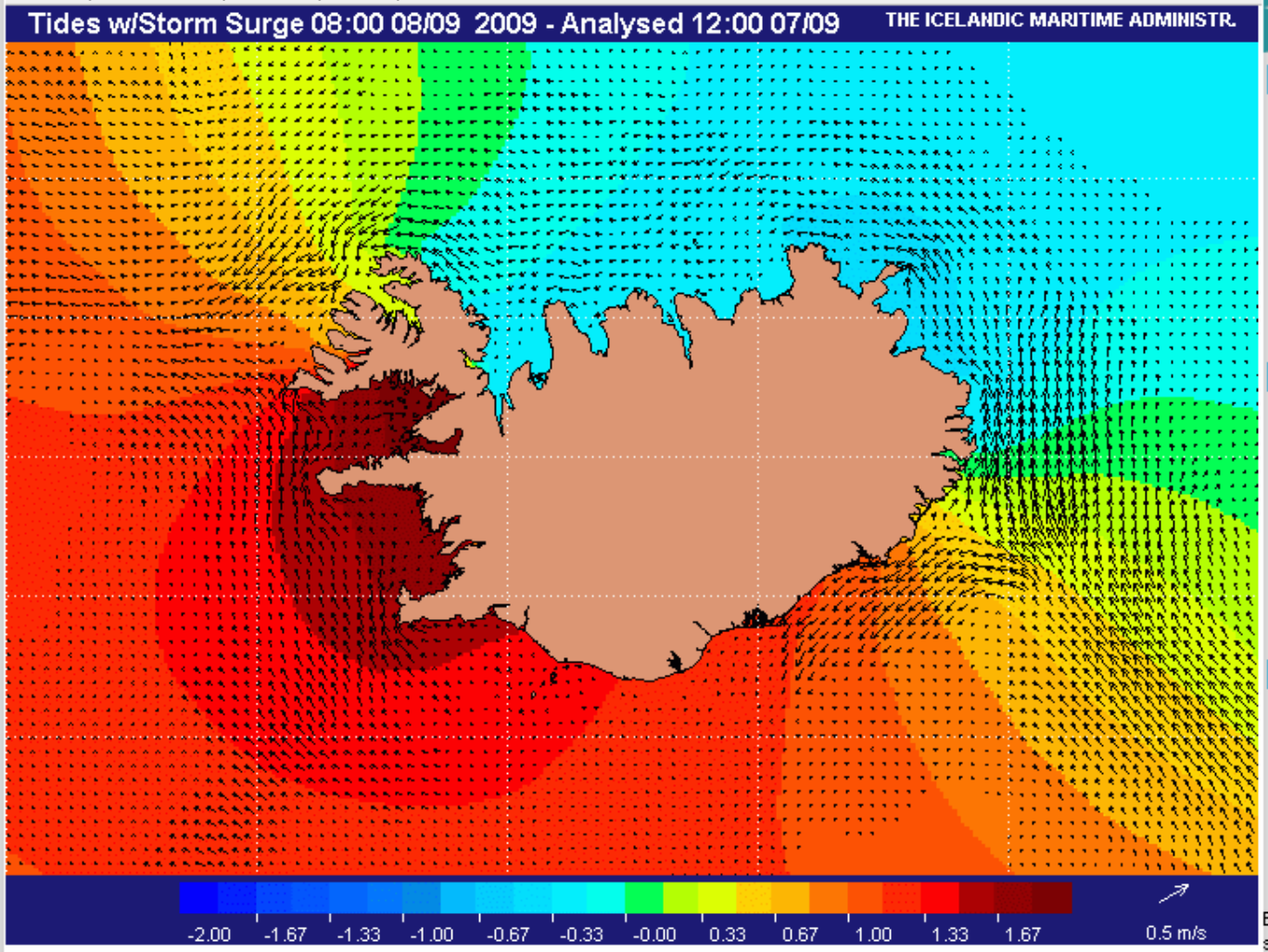

The coloured areas stand for tides and each color means sea level change of 0,165 m. Arrows stand for current velocity and direction according to the arrow in the right hand corner. Tides and storm surges due to wind and air pressure just outside harbours can be found here.

FYRRI
NÆSTA

08/09 2009
00:00 01:00 02:00
03:00 04:00 05:00
06:00 07:00 **08:00**
09:00 10:00 11:00
12:00 13:00 14:00
15:00 16:00 17:00
18:00 19:00 20:00
21:00 22:00 23:00

09/09 2009
00:00 01:00 02:00
03:00 04:00 05:00
06:00 07:00 08:00
09:00 10:00 11:00
12:00 13:00 14:00
15:00 16:00 17:00
18:00 19:00 20:00
21:00 22:00 23:00

10/09 2009
00:00 01:00 02:00
03:00 04:00 05:00
06:00 07:00 08:00
09:00 10:00 11:00
12:00

By clicking on a specific location on the tides, forecast of tides, storm surge, sea height, tidal direction and tidal current are given in a chronological order.

Icelandic Maritime Administration

- Tides
- Storm Surge
- Tides with Storm Surge

Forecasts of tides and storm surges

Areas

- Icelandic Waters 10x10
- High seas
- SW-quarter 10x10
- SW-Coast 2x2
- Faxaflói 2x2
- NW-quarter 10x10
- Breiðafjörður 2x2
- VestfjarðarWaters 2x2
- NW-Coast 2x2
- NE-quarter 10x10
- NE-Coast 2x2
- E-Coast North 2x2
- SE-quarter 10x10
- E-Waters South 2x2
- SE-Waters 2x2
- Hornafjörður 2x2

Links

- Shipping forcast
- TextTv
- Textfiles
- Slow Links

Other information

- Wave buoys
- Weather Stations
- Computer models
- Use of information
- Tidal model
- Related papers
- icecoast.is

Tides with storm surges and currents on 65°30' N og 26°0' W

Date	Time	Tides (m)	Storm surge (m)	Sea height (m)	Current direction (°)	Current speed (m/s)
20.2.2009	02:00	0,20	0,03	0,23	316	0,09
20.2.2009	03:00	0,39	0,04	0,43	350	0,13
20.2.2009	04:00	0,51	0,04	0,55	7	0,18
20.2.2009	05:00	0,53	0,03	0,56	18	0,21
20.2.2009	06:00	0,43	0,03	0,46	29	0,22
20.2.2009	07:00	0,25	0,03	0,28	41	0,21
20.2.2009	08:00	0,02	0,03	0,05	57	0,18
20.2.2009	09:00	-0,21	0,04	-0,17	82	0,15
20.2.2009	10:00	-0,38	0,05	-0,33	113	0,15
20.2.2009	11:00	-0,45	0,05	-0,40	139	0,16
20.2.2009	12:00	-0,42	0,05	-0,37	158	0,18
20.2.2009	13:00	-0,29	0,04	-0,25	169	0,18
20.2.2009	14:00	-0,10	0,04	-0,06	179	0,15
20.2.2009	15:00	0,11	0,04	0,15	194	0,10
20.2.2009	16:00	0,27	0,04	0,32	235	0,05
20.2.2009	17:00	0,35	0,05	0,40	312	0,06
20.2.2009	18:00	0,31	0,07	0,38	333	0,10
20.2.2009	19:00	0,17	0,07	0,25	340	0,11
20.2.2009	20:00	-0,03	0,08	0,04	342	0,11
20.2.2009	21:00	-0,25	0,08	-0,17	341	0,08
20.2.2009	22:00	-0,43	0,08	-0,34	329	0,05
20.2.2009	23:00	-0,51	0,10	-0,41	285	0,02
21.2.2009	00:00	-0,46	0,12	-0,34	238	0,02
21.2.2009	01:00	-0,28	0,14	-0,14	243	0,02
21.2.2009	02:00	-0,01	0,17	0,16	353	0,03
21.2.2009	03:00	0,29	0,19	0,48	12	0,08
21.2.2009	04:00	0,54	0,20	0,74	17	0,16
21.2.2009	05:00	0,68	0,22	0,90	21	0,22
21.2.2009	06:00	0,68	0,24	0,92	26	0,27
21.2.2009	07:00	0,53	0,25	0,78	33	0,28

FYRRI

NÆSTA

20/02 2009
00:00 01:00 02:00
03:00 04:00 05:00
06:00 07:00 08:00
09:00 10:00 11:00
12:00 13:00 14:00
15:00 16:00 17:00
18:00 19:00 20:00
21:00 22:00 23:00

21/02 2009
00:00 01:00 02:00
03:00 04:00 05:00
06:00 07:00 08:00
09:00 10:00 11:00
12:00 13:00 14:00
15:00 16:00 17:00
18:00 19:00 20:00
21:00 22:00 23:00

22/02 2009
00:00 01:00 02:00
03:00 04:00 05:00
06:00 07:00 08:00
09:00 10:00 11:00
12:00

By clicking on a specific location on the tides, forecast of tides, storm surge, sea height, tidal direction and tidal current are given in a chronological order.

Icelandic Maritime Administration

Forecasts
- Akranes
- Arnarstapi
- Rif
- Ólafsvík
- Stykkishólmur
- Patreksfjörður
- Bolungarvík
- Skagaströnd
- Skagafjörður
- Dalvík
- Akureyri
- Húsavík
- Raufarhöfn
- Vopnafjörður
- Seley
- Djúpivogur
- Hornafjörður
- Ingólfshöfði
- Dyrhólaey
- Vestmannaeyjar
- Þorlákshöfn
- Grindavík
- Sandgerði
- Njarðvík
- Reykjavík

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Contact us

Tides and storm surges

Reykjavík, 20.2.2009

Date	Time	Tides (m)	Storm surge (m)	Sea height (m)
19.2.2009	14:00	2,47	-0,05	2,41
19.2.2009	15:00	2,53	-0,06	2,47
19.2.2009	16:00	2,48	-0,04	2,43
19.2.2009	17:00	2,32	-0,03	2,30
19.2.2009	18:00	2,12	-0,02	2,11
19.2.2009	19:00	1,92	0,00	1,92
19.2.2009	20:00	1,77	0,01	1,77
19.2.2009	21:00	1,69	0,00	1,69
19.2.2009	22:00	1,72	0,00	1,72
19.2.2009	23:00	1,86	0,02	1,88
20.2.2009	00:00	2,11	0,04	2,15
20.2.2009	01:00	2,41	0,05	2,47
20.2.2009	02:00	2,68	0,07	2,76
20.2.2009	03:00	2,86	0,09	2,95
20.2.2009	04:00	2,91	0,09	3,00
20.2.2009	05:00	2,79	0,09	2,88
20.2.2009	06:00	2,54	0,10	2,64
20.2.2009	07:00	2,22	0,11	2,33
20.2.2009	08:00	1,91	0,11	2,02
20.2.2009	09:00	1,67	0,12	1,79
20.2.2009	10:00	1,53	0,13	1,66
20.2.2009	11:00	1,54	0,13	1,67
20.2.2009	12:00	1,71	0,11	1,82
20.2.2009	13:00	2,00	0,10	2,10
20.2.2009	14:00	2,31	0,10	2,41
20.2.2009	15:00	2,57	0,09	2,66
20.2.2009	16:00	2,71	0,08	2,80
20.2.2009	17:00	2,69	0,09	2,78
20.2.2009	18:00	2,51	0,10	2,61
20.2.2009	19:00	2,24	0,09	2,33
20.2.2009	20:00	1,92	0,08	2,00

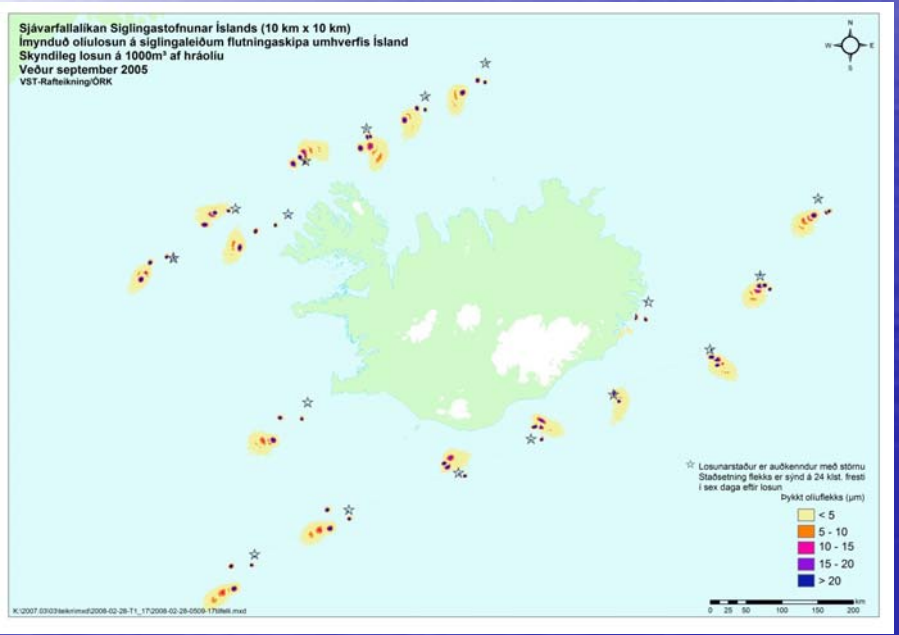
ICELANDIC MARITIME ADMINISTRATION

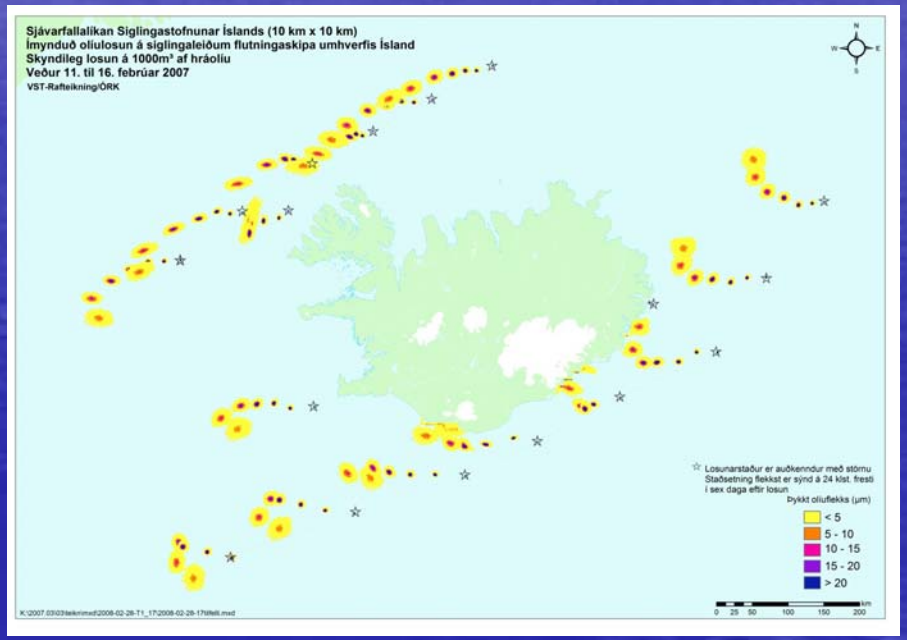
IMA's Drift Model

- Model based on the „particle tracking“ method
- The following factors are included in the model:
  - Drift caused by wind, waves, tidal currents and ocean currents
  - Drift of oil, life rafts, ice and ships
  - Spreading of oil, evaporation, sinking and stranding of oil

IMA's Drift Model

Spreading of oil, evaporation, sinking and stranding of oil along the sailing routes around Iceland

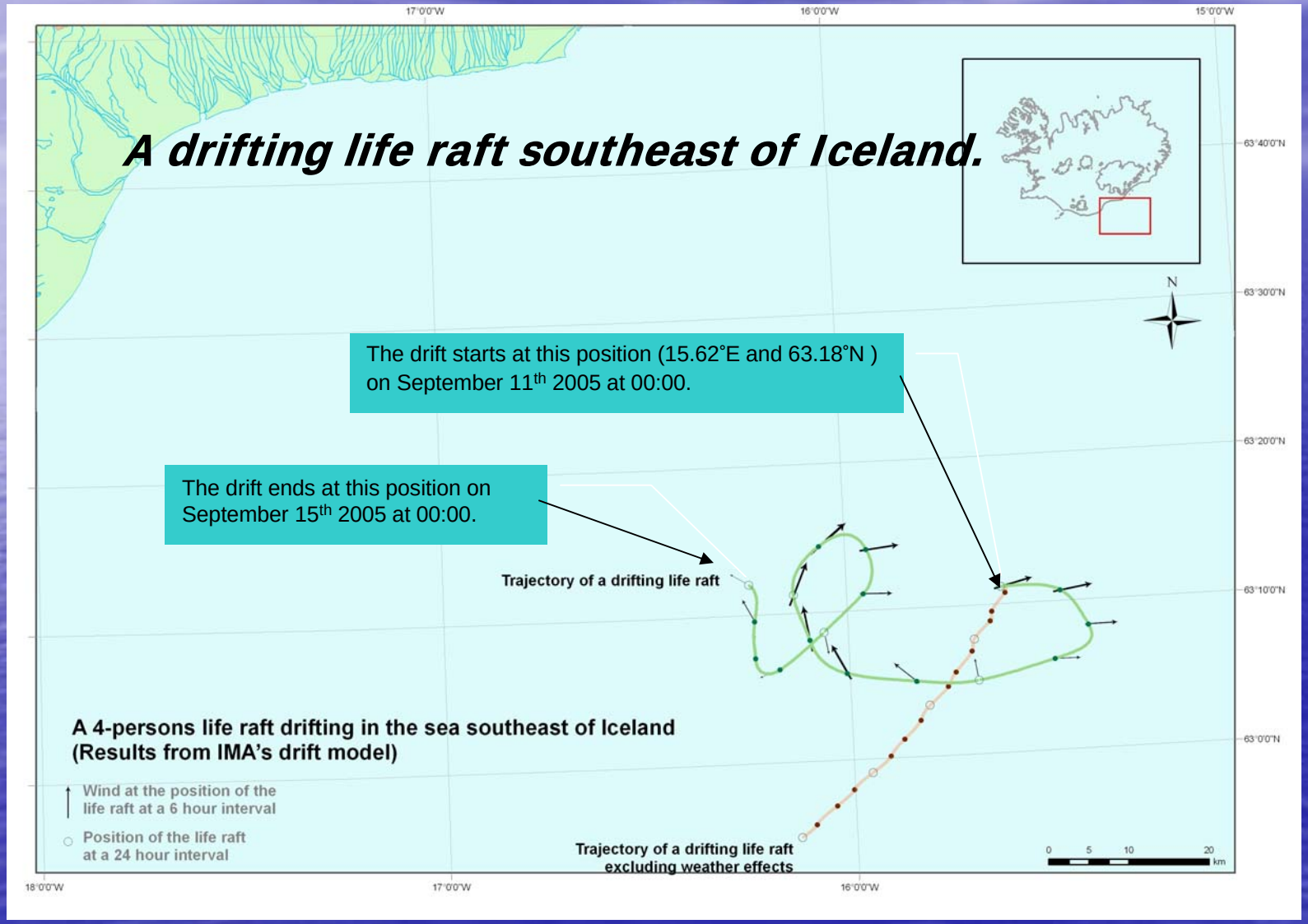




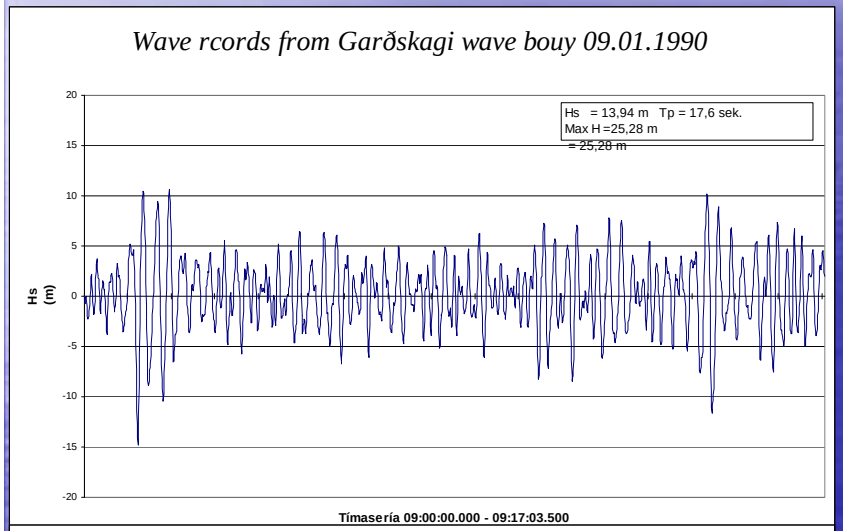
Legend: Sudden release of 1000 m^3 of IFO 380 oil.

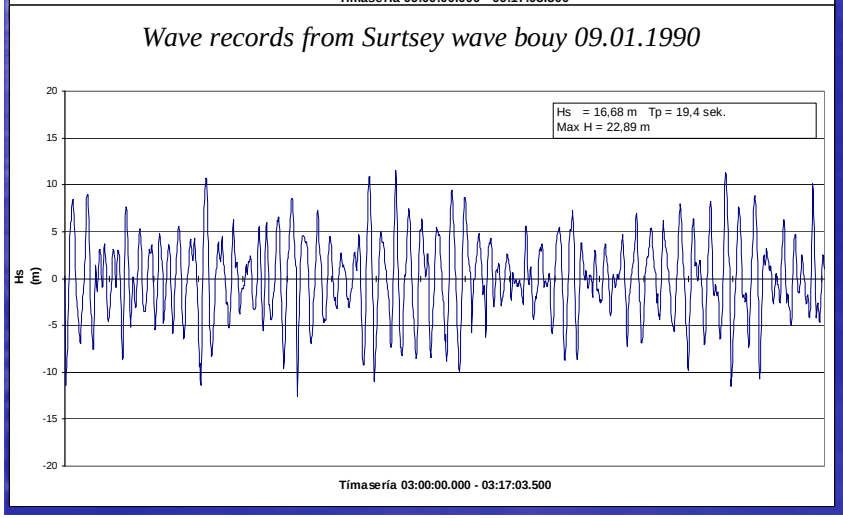
The colours represents oil thickness in micrometre

IMA´s Drift Model



Storm Surge Forecasting

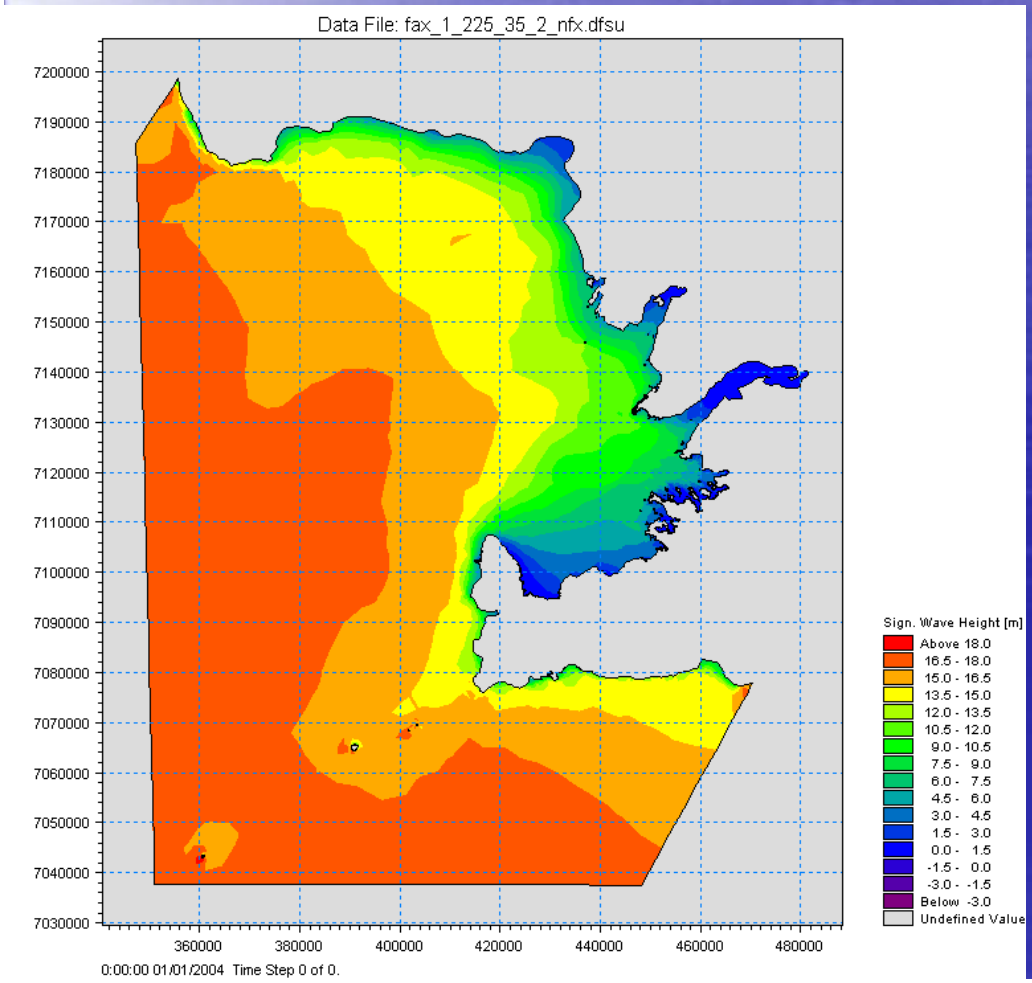


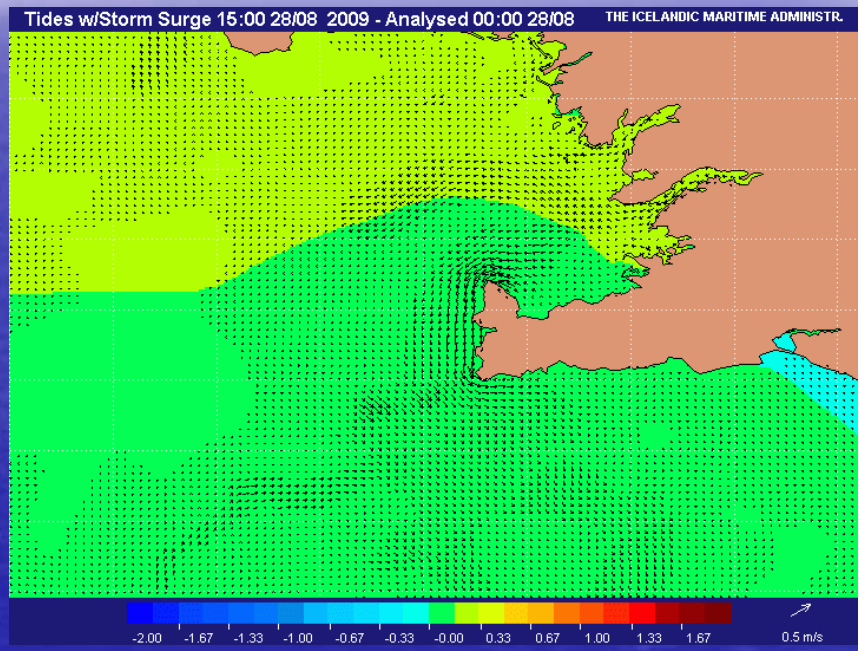


Extreme wave conditions south and southwest of Iceland

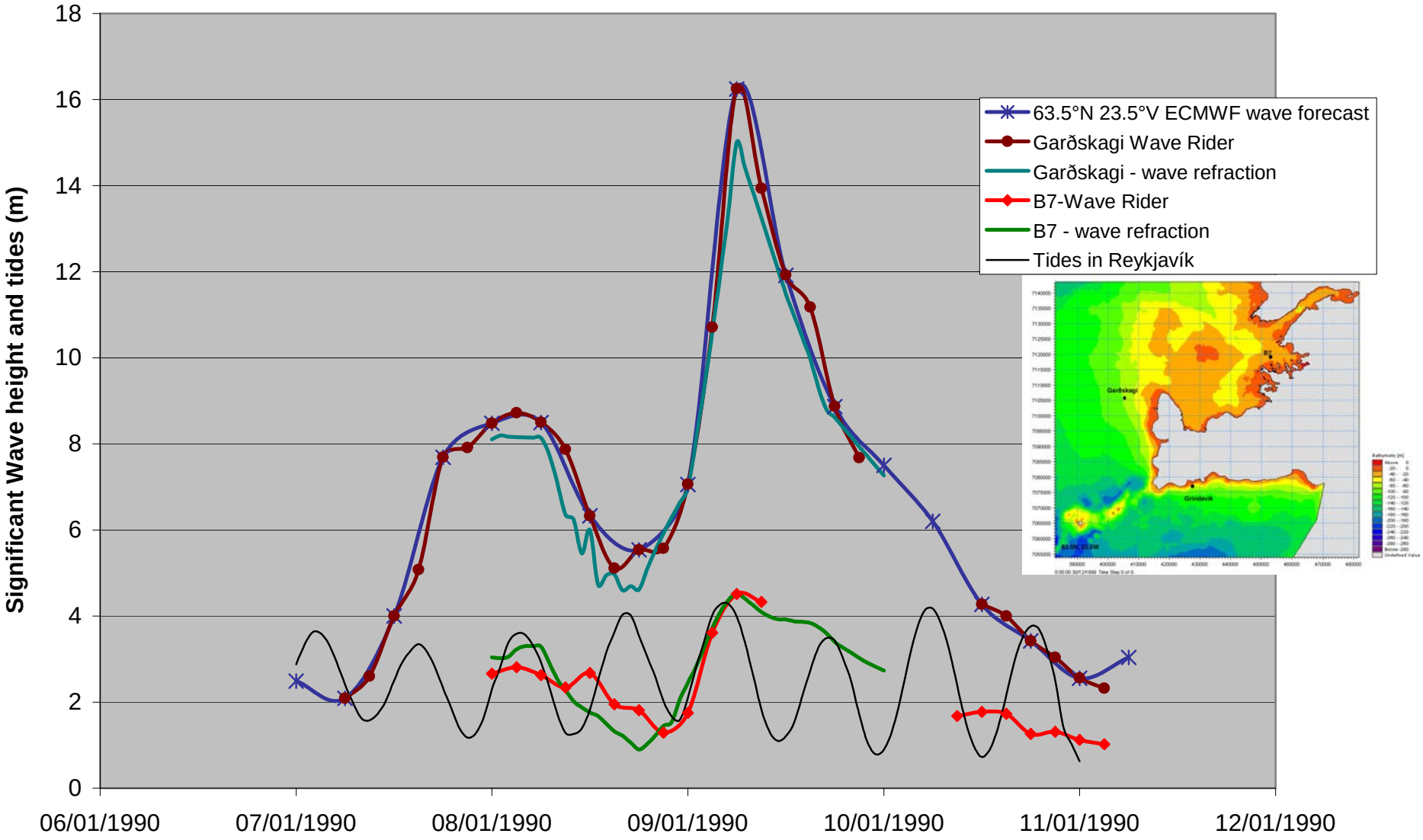
Significant wave height measure up to 16.3 – 16.7 m at two locations with max. wave height 25.3 m

Wave analysis + storm surge tide





Hs = 16.7m, Tp = 20.0 s
Wind 35 m/s, SW direction
Spring tide



Comparison between wave measurements and wave refraction analysis on 9 January 1990

Storm Surge Forecasting

IMS´Wave and Weather Database

Iceland map

Weather stations

Wave buoy

Tides at location

Wind

Waves

Date from
08/08/2009

Date to
11/08/2009

Position
63°00'N 21°00'W

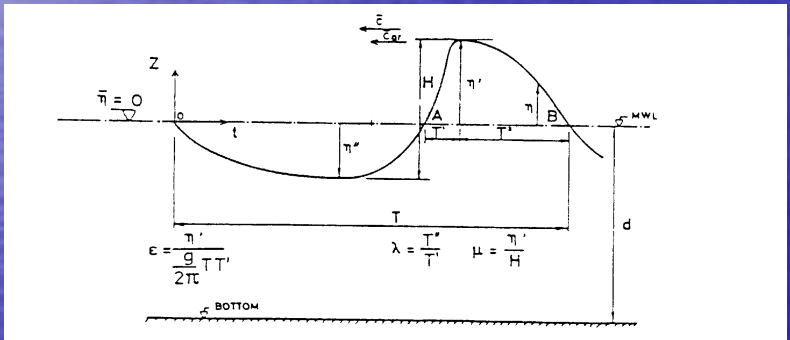
Load data

Siglingastofnun - Gagnalind

Date and time	Tides [m]	Storm surge [m]	Tital elevation [m]	Current direction [°]	Current speed [m/s]
8.8.2009 00:00:00	-0,91	0,06	-0,85	291	0,11
8.8.2009 01:00:00	-1,14	0,04	-1,1	290	0,09
8.8.2009 02:00:00	-1,07	-0,02	-1,09	291	0,05
8.8.2009 03:00:00	-0,74	-0,02	-0,75	261	0,01
8.8.2009 04:00:00	-0,22	0,01	-0,2	109	0,04
8.8.2009 05:00:00	0,34	0,04	0,38	112	0,07
8.8.2009 06:00:00	0,79	0,04	0,83	105	0,08
8.8.2009 07:00:00	1,02	0,03	1,05	106	0,07
8.8.2009 08:00:00	0,96	0,03	1	95	0,04
8.8.2009 09:00:00	0,64	-0,01	0,63	311	0,01
8.8.2009 10:00:00	0,12	0,01	0,13	293	0,05
8.8.2009 11:00:00	-0,44	0,03	-0,42	290	0,08
8.8.2009 12:00:00	-0,9	0	-0,9	286	0,09
8.8.2009 13:00:00	-1,13	0	-1,13	281	0,07
8.8.2009 14:00:00	-1,07	0,06	-1,01	271	0,04
8.8.2009 15:00:00	-0,73	0,04	-0,69	189	0,01

Waves and stability of small fishing vessels (Near breaking - dangerous waves)

The sea state is dangerous to the seamen when waves become so steep that they almost break



Dangerous waves (near-breaking waves):

- increasing wind waves
- waves against current
- in two and three-directional sea state

Small fishing vessel safety limits

Dahle, Myrhaug and Viggosson 1997

– The relation between dangerous waves and the dynamic stability of small ships has been established.

$$H_c = \sqrt{Energy/90}$$

where “Energy“ is the area under the GZ-curve in meters degrees, multiplied by the displacement in tonnes.

The IMA forecast for dangerous waves is based on a risk assessment for smaller vessels, predicted from:

- *dynamic stability*
- *accident frequency*
- *acceptable risk level*
- *forecast for dangerous waves*

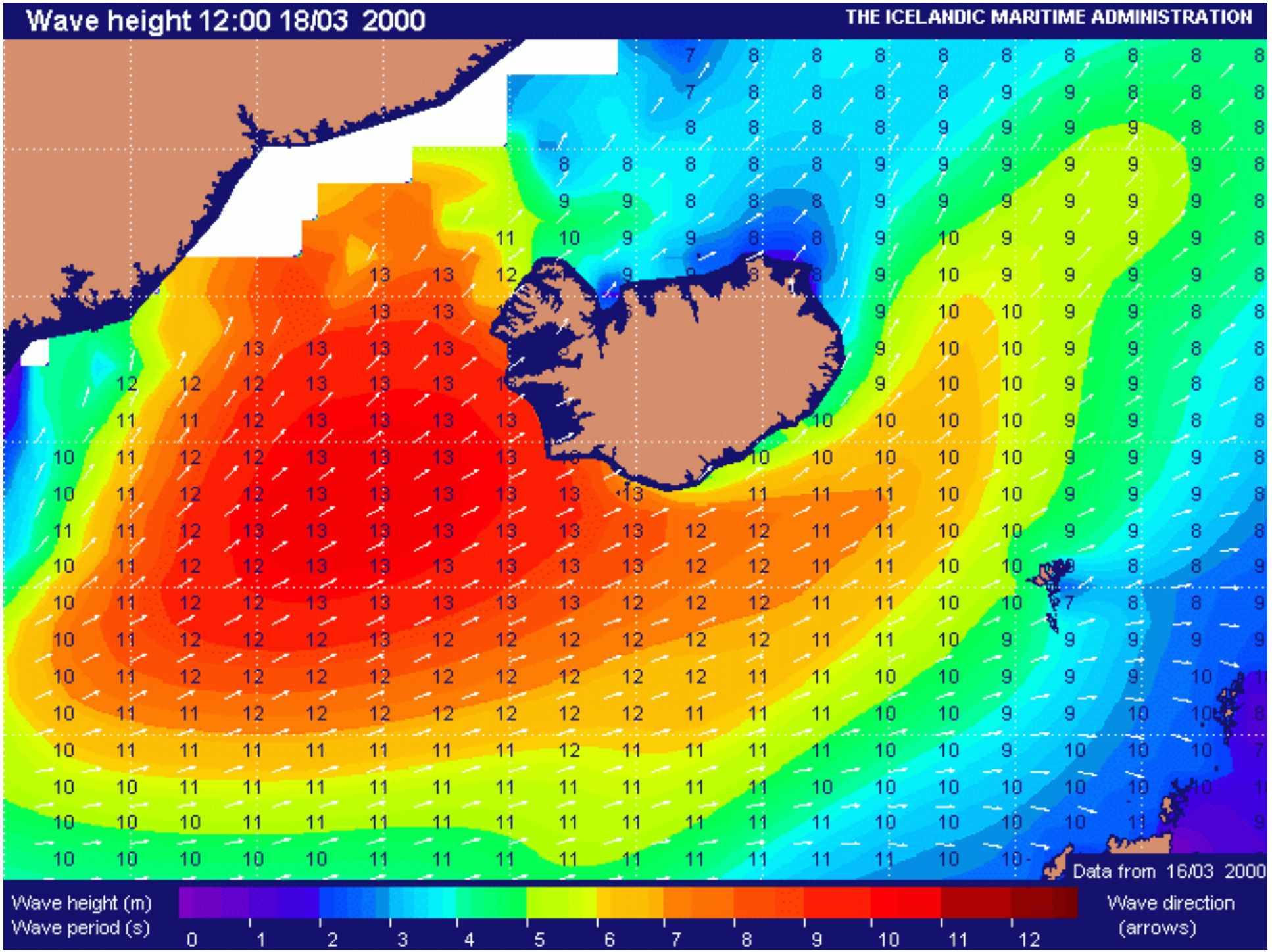
The critical value of Hc^* with acceptable risk of capsize

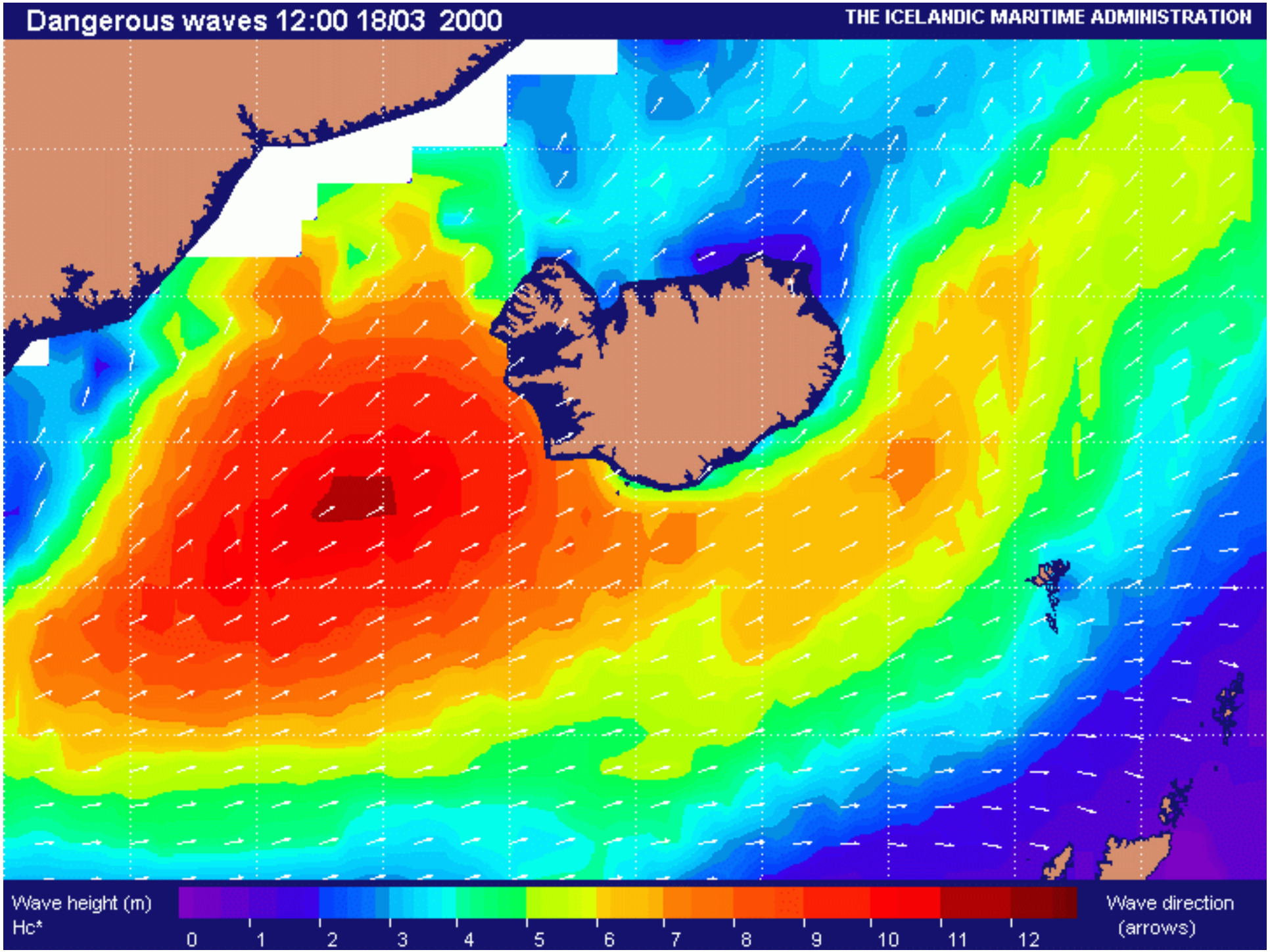
Dahle, Myrhaug and Viggosson 1997

- An estimate for the probability of occurrence of steep ($\varepsilon \geq \varepsilon_c$) and high ($H \geq H_c$) waves for a given sea state (H_{sj}, T_{zk}) is given by $P_{3jk.}$ and the critical value of **Hc*** for which the risk of capsize is acceptable can be obtained:

- $P_{3jk} < 3{,}06\ 10^{-4}\ [F(C_1)_{acceptable} / F(C)_{historical}] \bullet F(W)_{in\ a\ year} \bullet T_{zk}$

  - $F(W)_{in\ a\ year}$ = 0.98 10^{-4} for Iceland ($H \geq H_c$ = 4m)
  - $F(C_1)_{acceptable}$ = 1.25 10^{-4} losses of vessels per year
  - $F(C)_{historical}$ = 8.4 10^{-4} ship losses in 1983 – 1991 out of 2540 boats


Wave height 12:00 18/03 2000
THE ICELANDIC MARITIME ADMINISTRATION
Data from 16/03 2000
Wave height (m)
Wave period (s)
0 1 2 3 4 5 6 7 8 9 10 11 12
Wave direction
(arrows)


Dangerous waves 12:00 18/03 2000
THE ICELANDIC MARITIME ADMINISTRATION
Wave height (m)
Hc*
0
1
2
3
4
5
6
7
8
9
10
11
12
Wave direction
(arrows)

Icelandic fishing vessels' stability

In 1998, a law was passed in Iceland providing that the stability of every decked vessels should be known.

As of 2004, all vessels of over 15 m in length would undergo an inclining test every 10th year.

IMA´s Stability Awareness Campaign

The IMA conducted a stability awareness campaign during the years 1996 to 2000

In 2001, stability information existed and was available for all 800 decked Icelandic fishing vessels.

In IMA´s database on basic stability data of decked vessels is available.

Stability Awareness Campaign since 1998

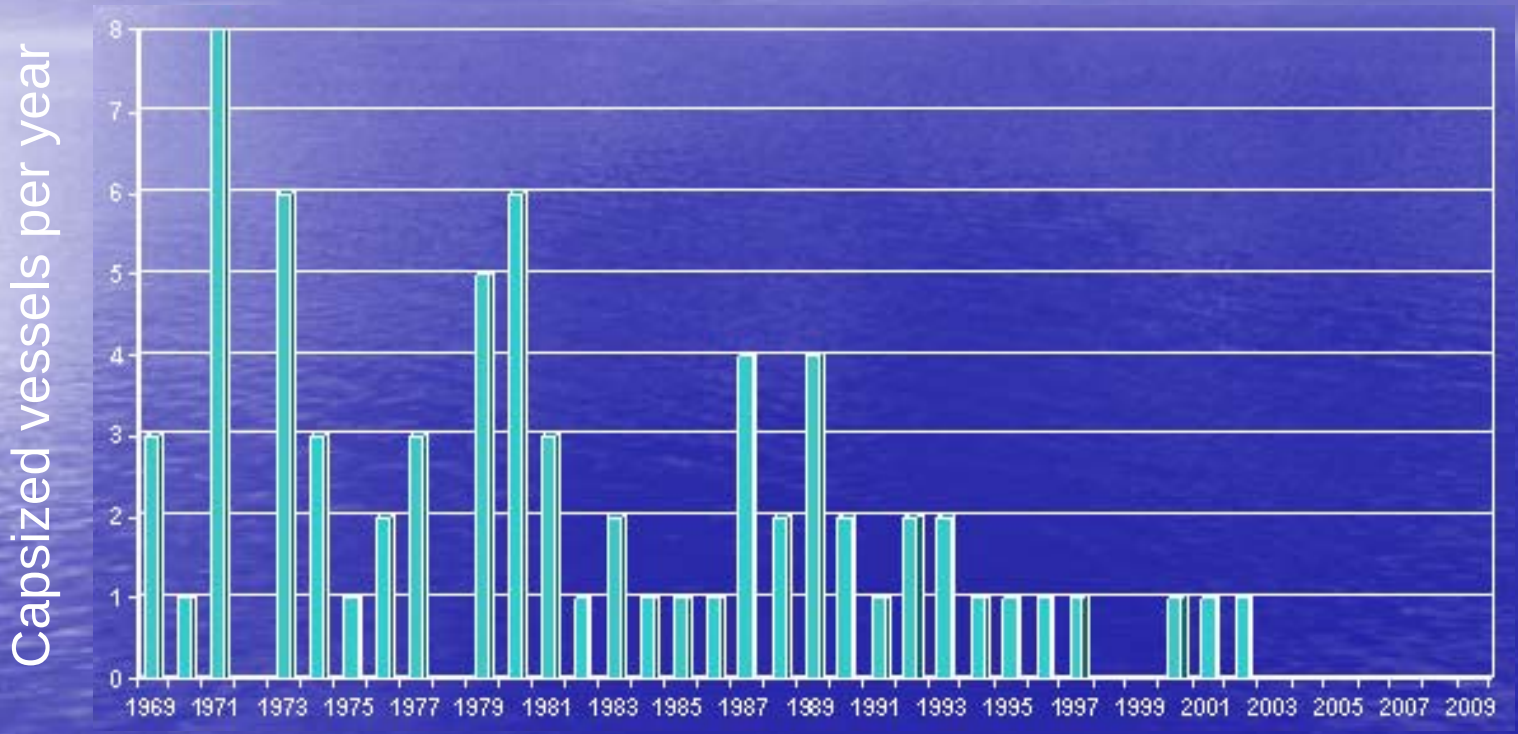
The following was achieved with the stability awareness campaign:

- Vessels with the least stability were scrapped
- Vessels' stability was enhanced
- Seafarers' awareness of stability was increased

Perished fishing vessels in Icelandic Waters 1997 800 decked and 1100 open fishing boats

Size of vessels / year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Vessels <12 m	6	3	3	8			4	3	3	0	0	1
Vessels 12-24 m	1			1	1	3		4	1	1	0	0
Vessels >24 m	2			1	2	1	3	1		0	0	0
Total	9	3	3	10	3	4	7	8	4	1	0	1

159 decked fishing vessels perished in from 1969, 71 vessels capsized. A total of 129 seamen were lost with these 71 vessels.



No fishing vessels have capsized in the last six years.

Stability of fishing vessels

The key towards increased safety for seafarers relies on:

- Awareness of the limits of ships' stability
- Knowing the interactions between wave heights, stability and loading conditions in addition to good seamanship
- Knowing when conditions are within safety limits
- Showing utmost caution on board in those circumstances
- Easy access to weather and wave height information

Siglingastofnun Íslands

ICELANDIC MARITIME ADMINISTRATION

LANDHELGISGÆSLA ÍSLANDS

ICELANDIC COAST GUARD

IMTS ICELANDIC MARITIME TRAFFIC SERVICE

Monitors all Icelandic fishing vessels for safety and fisheries inspection purposes.
Fishing vessels in sea area A1 are monitored at 15-minute intervals but outside that area at one-hour intervals.

112 EINN EINN TVEIR

NATIONAL EMERGENCY HOTLINE

SLYSAVARNAFÉLAGIÐ LANDSBJÖRG

ICELANDIC ASSOCIATION FOR SEARCH AND RESCUE

Maritime Safety and Survival Training Centre

Icelandic law provides that all fishermen participate in safety training courses before they go out to sea for the first time. Also, at five-year intervals they must renew their training at the Centre.

SLYSAVARNAFÉLAGIÐ LANDSBJÖRG

ICELANDIC ASSOCIATION FOR SEARCH AND RESCUE

A Programme on the Safety of Seafarers

The Research and Development Division at IMA is responsible for implementing the Programme on the Safety of Seafarers, which commenced in the year 2000.

The project management board, consisting of representatives from seafarers and ship owners' organizations, the Icelandic Association for Search and Rescue (ICE-SAR) and representatives from the Ministry of Transport and Communications.

A Programme on the Safety of Seafarers

The main items of the Programme

- Education and Training
- Instruction Material and Dissemination of Information
- Safety Management
- Research and Development Projects

Casualty in fishing vessels in Icelandic Waters since 1997

Size of vessels / year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Vessels <12 m	2	1	2	1				1			3	
Vessels 12-24 m					3	2						
Vessels >24 m					4			1	1	2	1	
Total	2	1	2	1	7	2	1	2	1	2	4	0

Last year is the first year with no casualty in Icelandic Waters and the same was true for the Norwegian and the Maldives Waters.

6700 fishermen in 1997 and 4400 in 2008

Accidents Reporting in Icelandic Waters 1997–2008

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number	460	378	381	361	348	413	379	309	366	266	423	290

Only one serious accident reported in Icelandic Waters in the period of 2000-2008

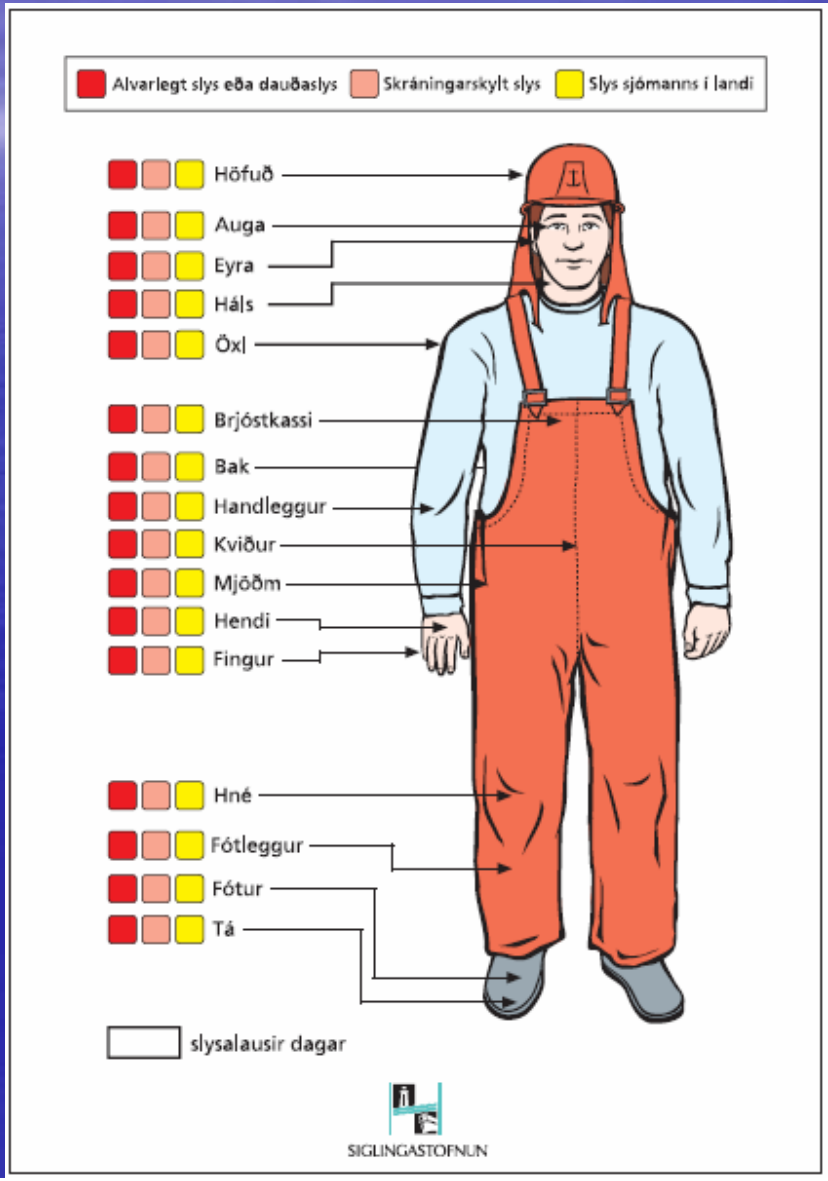
IMA intends to introduce quality control on safety issues and safety culture on board vessels to reduce accidents at sea

The goal is to introduce a safe management system on board fishing vessels and in the fishing industry which is equivalent to the ISM Code

A Programme on the Safety of Seafarers

The Safety Management System for fishing vessels

- Fewer accidents on board
- Safety culture
- Safety management
- Increased overall safety
- The project is ongoing



Conclusions

- All decked fishing vessels must fulfil IMA/IMO stability criteria in Iceland.
- No fishing vessels have capsized last six years in Iceland
- No FV casualty in Icelandic Waters last year.
- One serious accident occurred during last eight years but reported accidents are far too many.
- Therefore, IMA will focus on quality control systems on board fishing vessels and within the fishing industry to improve safety and the safety culture.
- The System on Weather and Sea State plays a vital part in increased Safety and more efficient Fishing in the Icelandic Waters

THANK YOU FOR YOUR ATTENTION

ICELANDIC MARITIME ADMINISTRATION