The Ice Winter of 2008/09 on the German North and Baltic Sea Coasts

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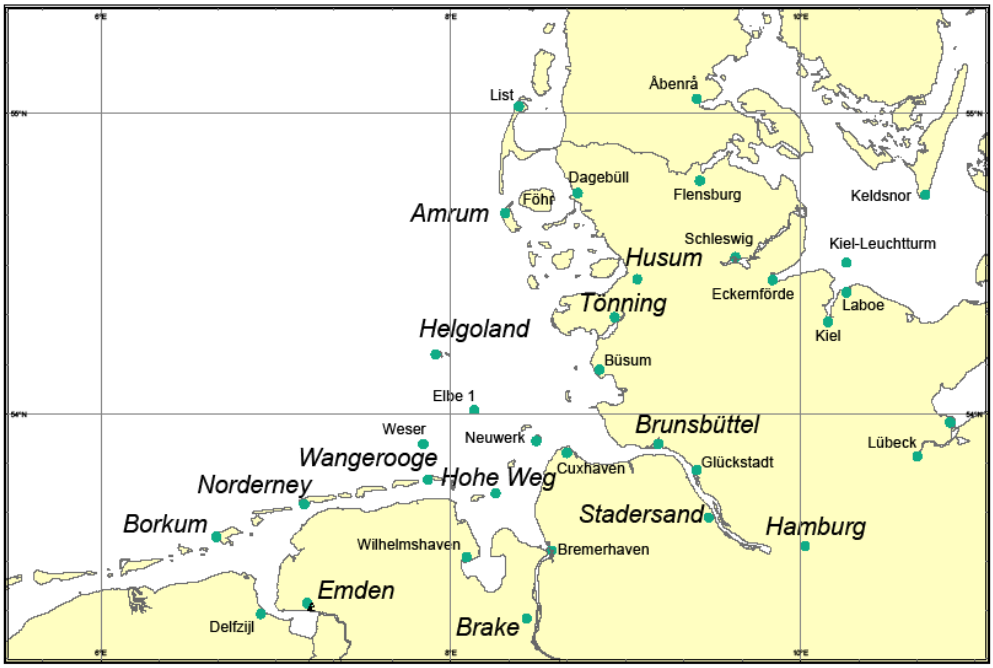
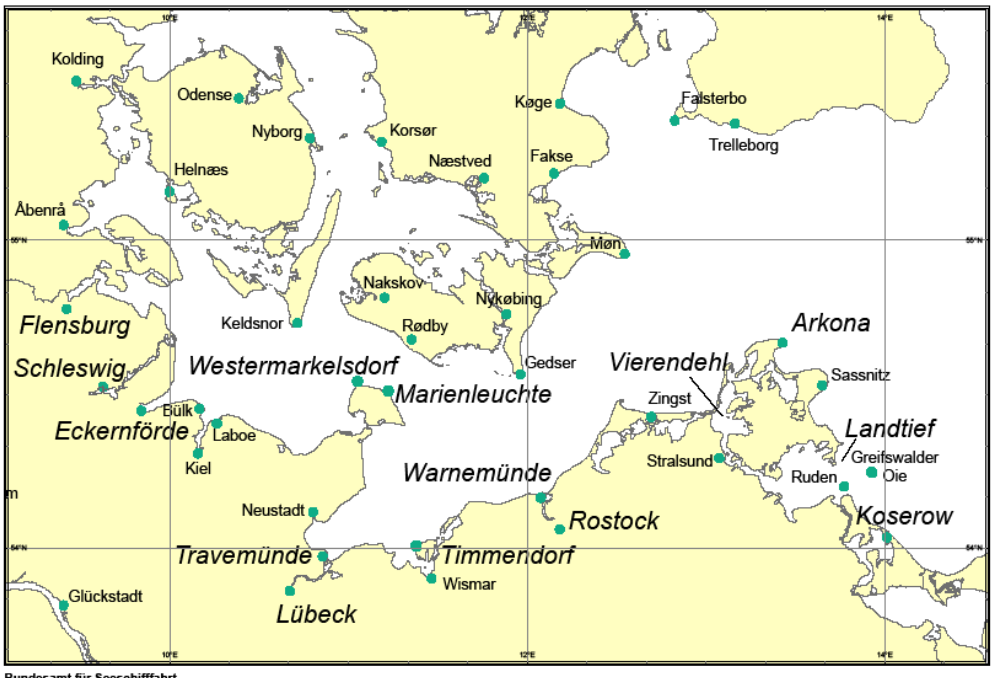
The ice winter of 2008/09 on the German North and Baltic Sea coasts was the third consecutive weak ice winter. The accumulated areal ice volume and the reduced ice sum (http://www.bsh.de/de/Meeresdaten/Beobachtungen/Eis/Kuesten.jsp), computed for 13 ice climatological stations on the North Sea coast and 13 ice climatological stations on the Baltic Sea coast, was 0.19 m and 3.7 for the North Sea, and 0.13 and 4.7 for the Baltic Sea.



Eisklimatologische Stationen an der deutschen Nordseeküste



Eisklimatologische Stationen an der deutschen Ostseeküste

Fig. 1. Ice climatological stations on the North and Baltic Sea coasts

The winter of 2008/09 was characterised by two cold spells leading to ice formation on the German North Sea and Baltic Sea coasts, cf. Fig. 2. In the last week of November, after a prolonged period of calm, mild autumn weather, the first cold spell of the season set in with light night frosts. On the whole, November temperatures in the coastal region were about 1.5 K too high. The first cold spell with permanently negative air temperatures occurred from 30 December to 11 January. During this period, the coastal water cooled down to just above freezing, see Figs. 3, 4 and 5, and large areas in the shallow, sheltered coastal lagoons froze over for the first time this winter season. In mid-January, a change of weather brought a warm spell with strong winds. Although January was too cold in large parts of Germany, coastal temperatures were normal for the season. The second cold spell from late January to mid-February was interrupted by a one-week mild spell which prevented major growth of new ice in parts of the inner Baltic Sea waters. On the North Sea coast, the ice melted completely during the first warm spell, after which the North Sea region remained ice-free throughout the rest of the winter. In early March, the last ice disappeared also on the Baltic Sea coast.

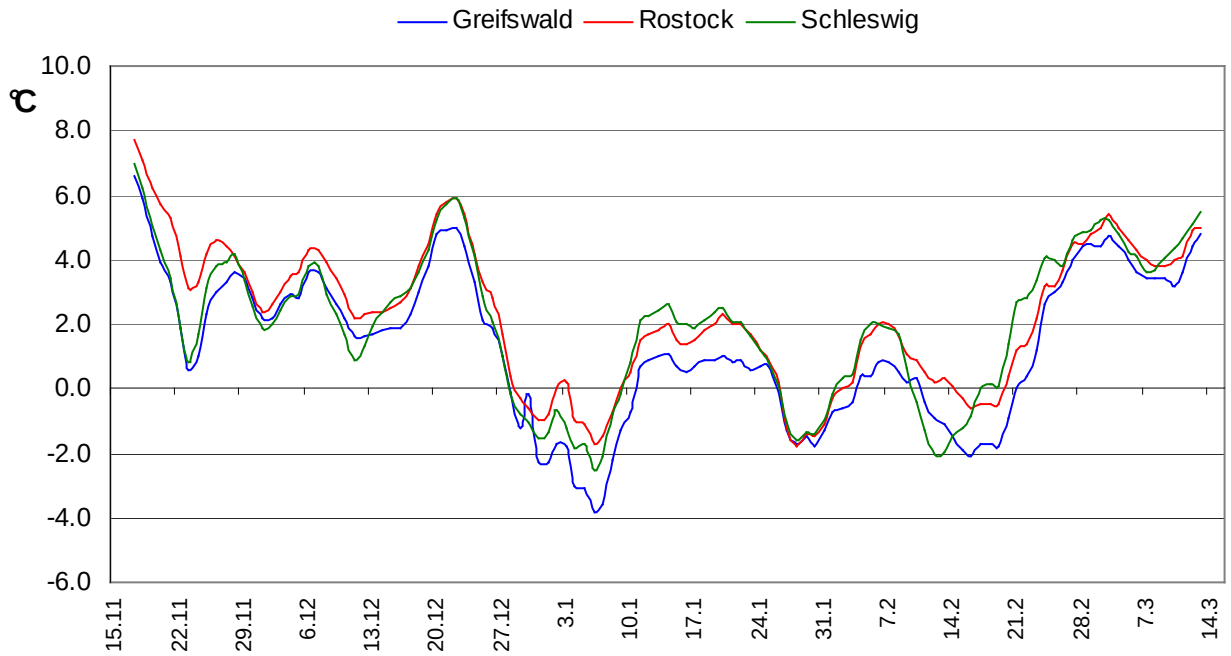


Fig. 2. Daily mean temperatures in the winter of 2008/09 (data from Deutscher Wetterdienst, www.dwd.de)

Table 1. Monthly mean air temperatures (℃) in the winter of 2008/09 and their deviation (in K) from the 1961 - 1990 climatic mean (data from Deutscher Wetterdienst, www.dwd.de)

Station	November		Dezember		Januar		Februar		März	
	℃	K	℃	K	℃	K	℃	K	℃	K
Schleswig	6.1	1.2	2.5	0.8	0.4	0.1	1.1	0.5	4.6	1.8
Rostock-Warnemünde	6.9	1.6	2.9	1.0	0.5	0.3	1.1	0.4	4.6	1.5
Greifswald	6.1	1.6	2.2	1.1	–0.5	0.1	0.2	0.2	4.4	1.7

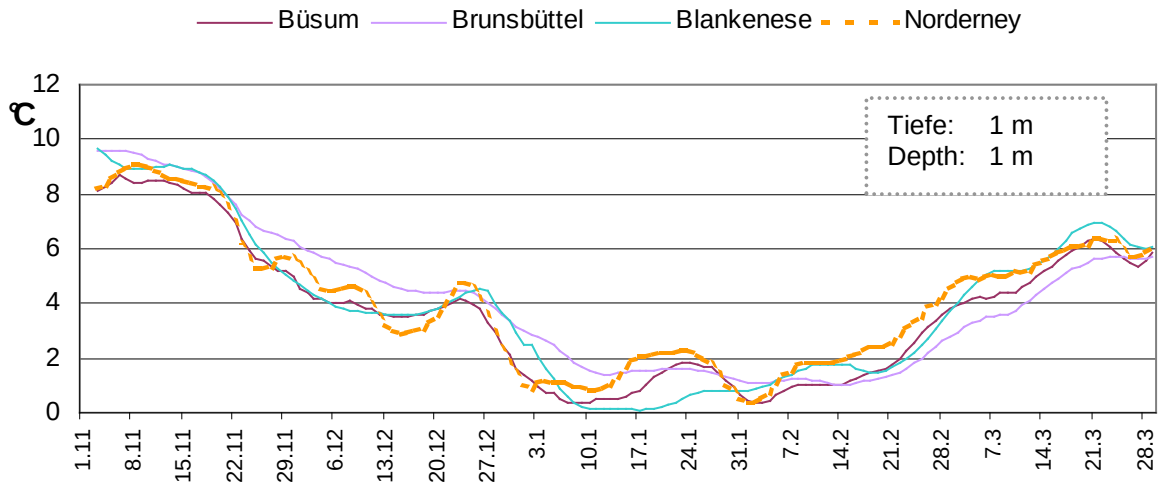


Fig. 3. Water temperatures (7 a.m. CET) on the North Sea coast and in the river Elbe

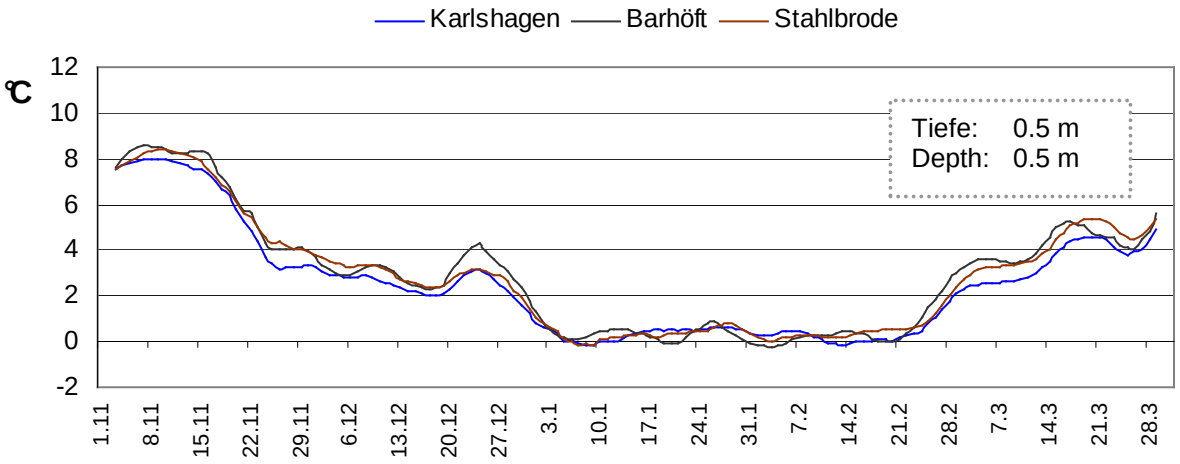


Fig. 4: Water temperatures in the inner coastal waters of Mecklenburg-Vorpommern

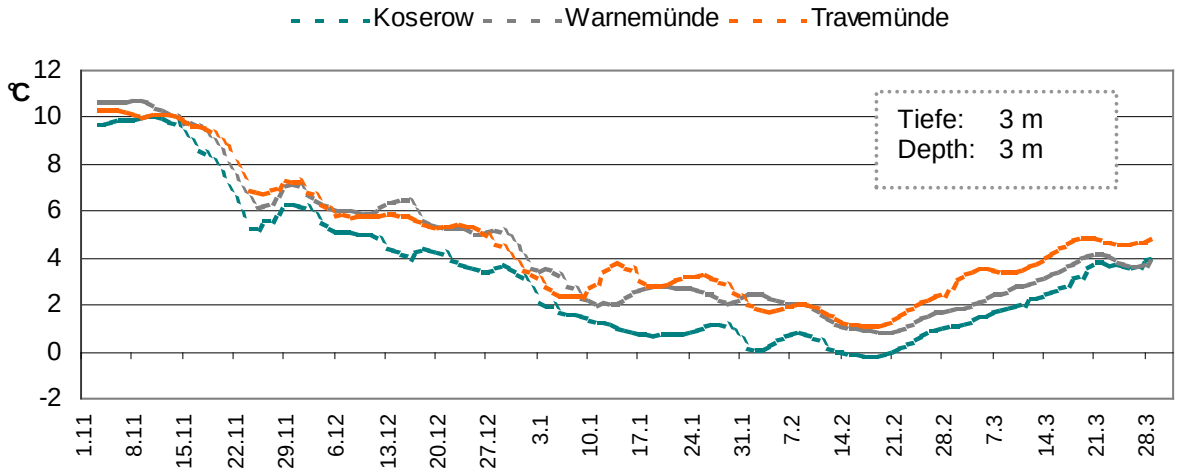
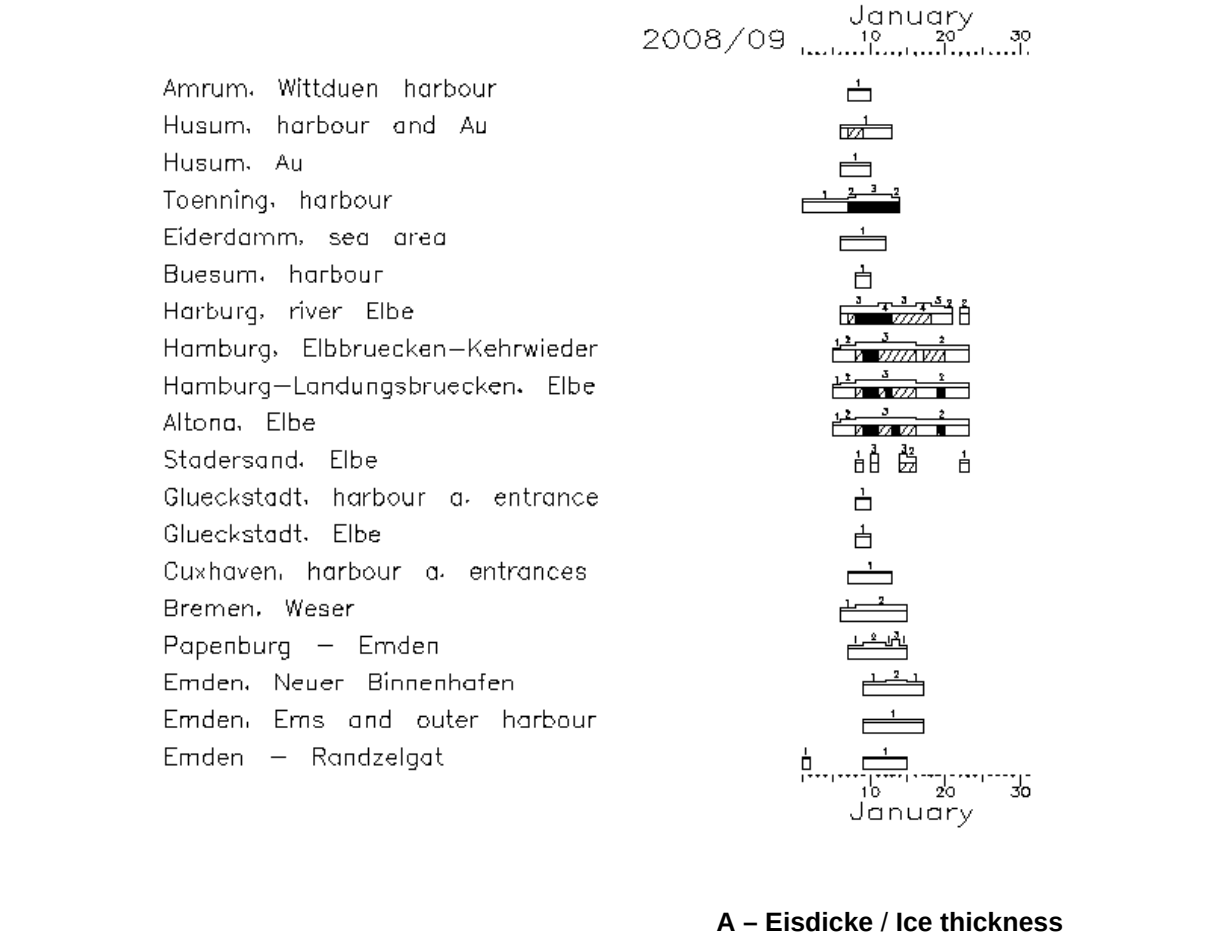


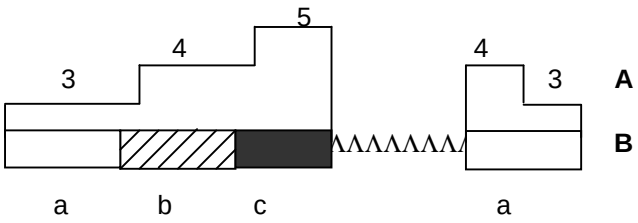
Fig. 5. Water temperatures (7 a.m. CET) in Baltic Sea outer coastal waters

Sources of water temperature data: Waterways and Shipping Boards Stralsund, Lübeck, Brunsbüttel; environmental authorities (StAUN) Rostock and Ueckermünde, German Sea Rescue (DGzRS); Hygienic and Environmental Institute, Hamburg.

North Sea coast

First ice along the German North Sea coast formed in sheltered areas and small harbours in early January; cf. Table 1 and Fig. 6. It lasted for about one week and disappeared completely by mid-January. The outer coasts and offshore waters remained ice-free. A different situation was encountered in the river Elbe: for up to three weeks, mostly close to very close, occasionally compact ice hindered coastal shipping. The rafted and frozen ice floes were up to 20 cm thick. The thickest ice did not form in the Lower Elbe but in the upper reaches of the river, from where it was carried downriver. Air temperatures in the winter of 2008/09 were much lower in the interior of the country than on the coasts, causing stronger ice formation in the inland waters. At the end of the second decade of January, when the ice cover on the upper Elbe broke up, thick ice floes drifted into the harbour of Hamburg, freezing together again in cold nights or blocking the water flow in narrow passages. Between Hamburg and Stadersand, ice was observed until 22 January. The last ice melted downriver, where the water was warmer. Temperatures during the second cold spell in February were not low enough to cause new ice formation in the coastal waters of the North Sea.





A – Eisdicke / Ice thickness
1: < 5 cm 2: 5-10 cm
3: 11-15 cm 4: 16-30 cm
5: 31-50 cm

B – Bedeckungsgrad / Ice Concentration
a: < 7/10 b: 7/10-8/10
c: 9/10-10/10

ΛΛΛΛΛ- aufgepresstes Eis / ridged ice

Fig. 6. Concentration and thickness of ice in the fairways and harbours of the German North Sea coast in the winter of 2008/09

Table 2. Ice conditions in the coastal waters of the German North Sea in the winter of 2008/09

Observation station	Beginning of ice occurrence	End of ice occurrence	Number of days with ice	Max. ice thickness cm
Amrum, Wittdün harbour	01.01.	09.01.	6	< 5
Husum, harbour	06.01.	12.01.	7	< 5
Husum, Au	06.01.	09.01.	4	< 5
Tönning, harbour	01.01.	13.01.	13	10-15
Eiderdamm, sea area	06.01.	11.01.	6	< 5
Büsum, harbour	08.01.	09.01.	2	< 5
Harburg, river Elbe	06.01.	22.01.	16	10-15
Hamburg, Elbbrücken-Kehrwieder	05.01.	22.01.	18	10-15
Hamburg-Landungsbrücken, Elbe	05.01.	22.01.	18	10-15
Altona, Elbe	05.01.	22.01.	18	10-15
Stadersand, Elbe	08.01.	22.01.	5	10-15
Glückstadt, harbour and entrance	08.01.	09.01.	2	< 5
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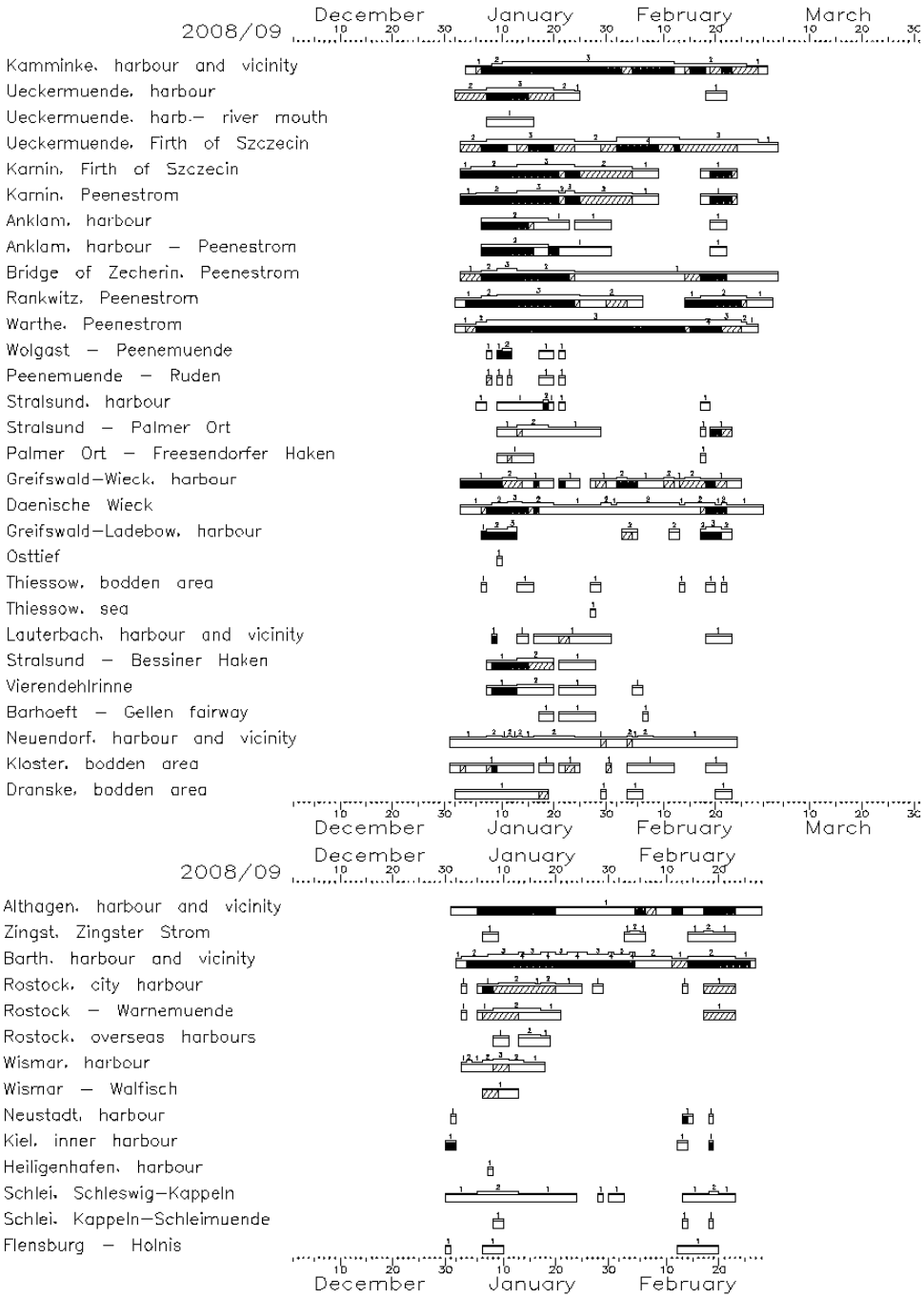
Cuxhaven, harbour and entrance	07.01.	12.01.	6	< 5
Bremen, Weser	06.01.	14.01.	9	5-10
Papenburg – Emden	07.01.	14.01.	8	5-15
Emden, new inner harbour	09.01.	16.01.	8	5-10
Emden, Ems and outer harbour	09.01.	16.01.	8	< 5
Ems, Emden – Randzelgat	01.01.	14.01.	7	< 5

Baltic Sea coast

Photo: Jürgen Holfort

New-ice formation on the Unterwarnow and in the city harbour of Rostock, 17 February 2009



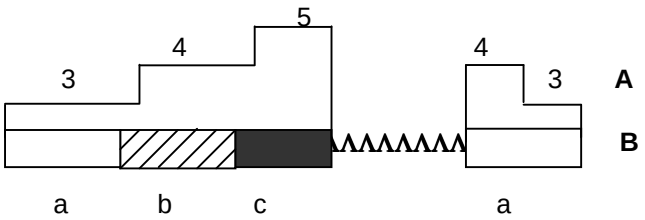


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Fig. 7. *Concentration and thickness of ice in the fairways and harbours of the German Baltic Sea coast in the winter of 2008/09*

Although ice formation in the inner coastal waters of the German Baltic Sea coast started early, during the last days of December, a complete ice cover did not form during this winter. On the coasts of Schleswig-Holstein and Mecklenburg-Vorpommern, ice occurred on just a few days. Exceptions were the inner Schlei river (39 days) and the city harbour of Rostock (30 days) (cf. Table 2 and Fig. 7) where small quantities of different types of new ice were observed.

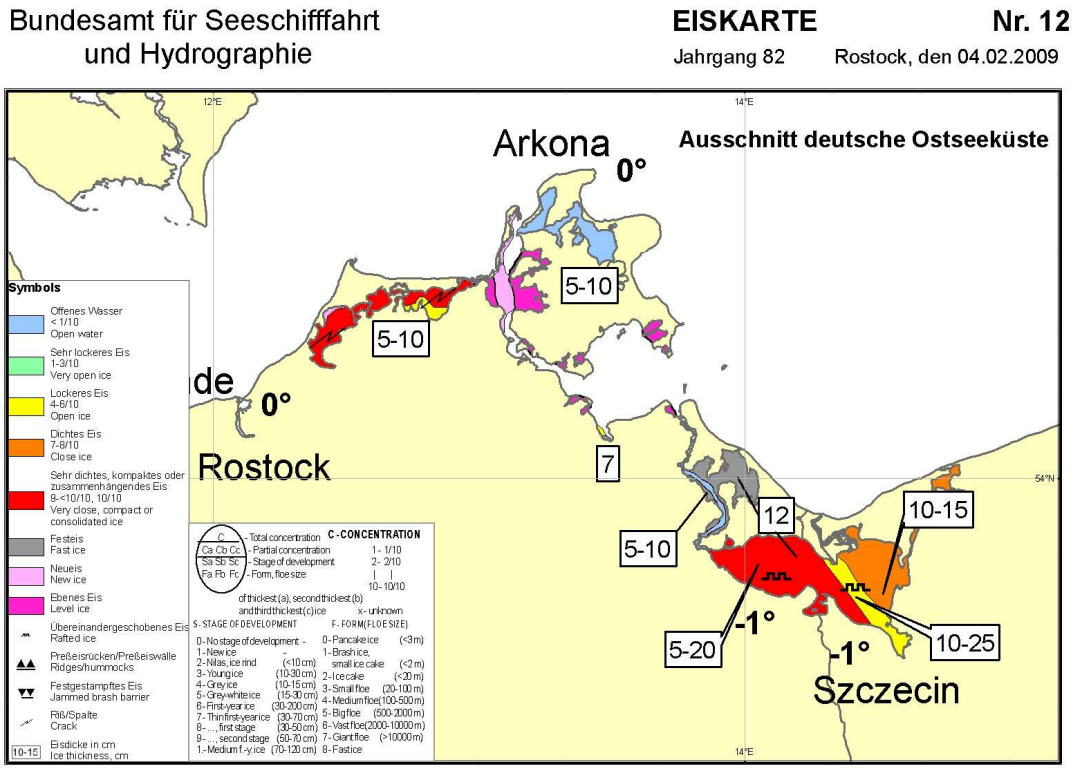

Fig. 8. Maximum extent of ice cover in the inner coastal waters of the German Baltic Sea coast in the winter of 2008/09

In the bodden waters south of the Darss/Zingst peninsula ice was observed on about 60 days, but the ice thickness never exceeded 10 cm, cf. ice chart of 4 February in Fig. 8.

In the navigation channels of Stralsund, new ice or thin ice occurred on about 20 days. Navigation was not obstructed by the ice. In the area of Greifswalder Bodden, new ice often formed close to shore during the night but melted again by day or drifted away. Only parts of the sheltered "Dänische Wiek" were covered with a 10-cm layer of ice.

The ice season of 2008/09 lasted longest on the coast of eastern Vorpommern. On the southern Peenestrom and in the waters of Achterwasser and Kleines Haff, the ice lasted two months. The thickness of level ice reached 10-15 cm. Fresh winds from northerly directions pushed the ice toward the south coast of Kleines Haff in mid-February, where it formed hummocks of about 2 m height close to shore. Large ships with sufficient hull strength generally were not obstructed by ice in the Vorpommern waters but smaller craft had to call the service vessel GÖRMITZ for assistance on some days.

The winter of 2008/09 was not cold enough to produce ice in the German outer coastal and offshore waters.

Table 3. Ice conditions in the German Baltic Sea waters in the winter of 2008/09

Observation station	Beginning of	End of	Number of	Max. ice thickness
	ice occurrence	ice occurrence	days with ice	cm
Kamminke, harbour and vicinity	03.01.	01.03.	58	12
Ueckermünde, harbour	01.01.	21.02.	28	5-10
Ueckermünde, harbour – river mouth	07.01.	15.01.	9	< 5
Ueckermünde, Firth of Szczecin	02.01.	03.03.	61	10-20
Karnin, Firth of Szczecin	02.01.	23.02.	45	10-15
Karnin, Peenestrom	02.01.	23.02.	45	10-15
Anklam, harbour	06.01.	21.02.	27	5-10
Anklam, harbour – Peenestrom	06.01.	21.02.	28	5-10
Bridge of Zecherin, Peenestrom	02.01.	03.03.	61	10-15
Rankwitz, Peenestrom	01.01.	02.03.	53	12
Warthe, Peenestrom	01.01.	27.02.	58	13
Wolgast – Peenemünde	07.01.	21.01.	8	5-10
Peenemünde – Ruden	07.01.	21.01.	7	< 5
Stralsund, harbour	05.01.	18.02.	16	5
Stralsund – Palmer Ort	09.01.	22.02.	25	5-10
Palmer Ort – Freesendorfer Haken	09.01.	17.02.	8	< 5
Greifswald-Wieck, harbour	02.01.	24.02.	51	8
Dänische Wiek	02.01.	28.02.	58	10
Greifswald-Ladebow, harbour	06.01.	22.02.	18	10-15
Osttief	09.01.	09.01.	1	< 5
Thiessow, bodden area	06.01.	21.02.	10	< 5
Thiessow, sea area	27.01.	27.01.	1	< 5
Lauterbach, harbour and vicinity	08.01.	22.02.	23	< 5
Stralsund – Bessiner Haken	07.01.	27.01.	20	5-10
Vierendehlrinne	07.01.	05.02.	22	5-10
Barhöft – Gellen fairway	17.01.	06.02.	11	< 5
Neuendorf, harbour and vicinity	31.12.	23.02.	55	5
Kloster, bodden area	31.12.	21.02.	37	< 5
Dranske, bodden area	01.01.	22.02.	25	< 5
Althagen, harbour and vicinity	31.12.	27.02.	59	5
Zingst, Zingster Strom	06.01.	22.02.	16	7
Barth, harbour and vicinity	01.01.	26.02.	57	10-15
Rostock, city harbour	02.01.	22.02.	30	10
Rostock – Warnemünde, Unterwarnow	02.01.	22.02.	23	6
Rostock, overseas harbours	08.01.	18.01.	9	5-10
Wismar, harbour	02.01.	17.01.	16	< 5
Wismar – Walfisch	06.01.	12.01.	7	< 5
Neustadt, harbour	31.12.	18.02.	4	< 5
Kiel, inner harbour	30.12.	18.02.	5	< 5
Heiligenhafen, harbour	07.01.	07.01.	1	< 5
Schlei, Schleswig – Kappeln	30.12.	22.02.	39	5-10
Schlei, Kappeln – Schleimünde	08.01.	18.02.	4	< 5
Flensburg – Holnis	30.12.	19.02.	13	< 5

Photo Frank Sakuth

Thin ice and new ice in the harbour of Thiessow (Greifswalder Bodden), 18 February 2009

In the Danish and Swedish waters in the western Baltic Sea and Kattegat, new ice and thin ice formed in small harbours and shallow, sheltered coastal waters during the two cold spells but did not hinder commercial navigation. Smaller fjords on the Norwegian coast of the Skagerrak were completely covered with ice from early January to the end of March. Ice growth was continuous and reached thicknesses of more than 30 cm. The Oslo Fjord remained largely ice-free, but in the harbour of Oslo low-powered ships temporarily had difficulties navigating in compact ice.

Northern Baltic region

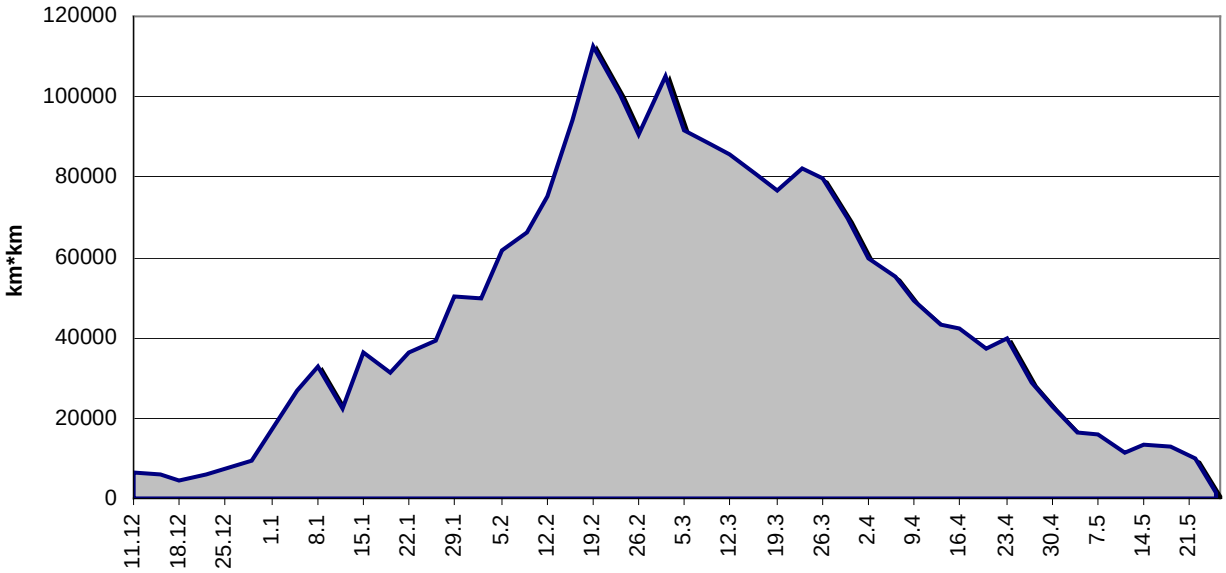

Fig. 9. Total ice-covered Baltic Sea area during the winter of 2008/09

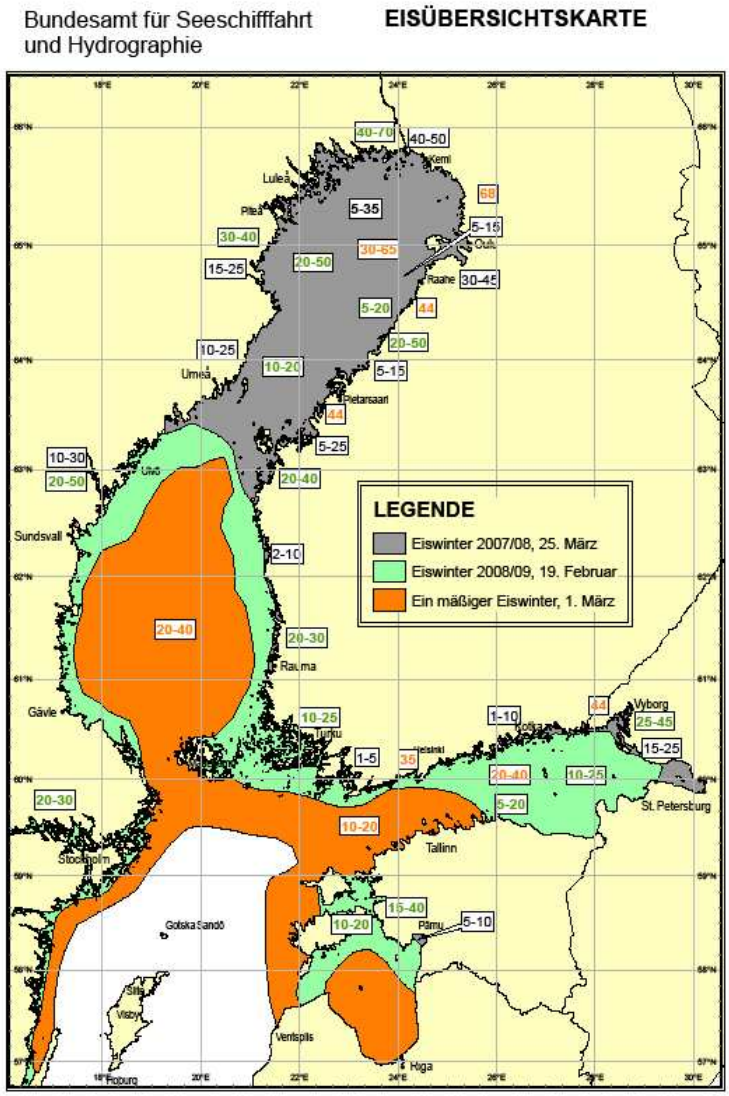

Fig. 10. Comparison of maximum ice extent in a normal ice winter, in the ice winter of 2007/08 (49,000 km^2), and in the ice winter of 2008/09 (112,000 km^2).

Also in the northern Baltic Sea region, the ice winter of 2008/09 was mild. At the time of maximum ice extent around 20 February 2009, the ice covered some 112,000 km^2, about twice the area covered in the ice winter of 2007/08, cf. Figure 10. Measured ice thicknesses were typical of a weak ice winter.

The ice winter began in the skerries of the northern Bay of Bothnia at the end of November, about two weeks later than normal, and in the eastern part of the Gulf of Finland on 16 December, about three weeks later than normal. Until the end of December, ice development stagnated in the entire northern part of the Baltic Sea due to mild weather. In early January, predominantly northwesterly winds between a high pressure centre over the North Sea and low pressure over North Scandinavia and the Barents Sea brought cold polar air into the Baltic region. Temporarily strong continuous frost caused increased ice formation in the northern Baltic Sea region. In the Gulfs of Bothnia, Finland, and Riga, mostly moderate frost led to a gradual growth of the ice cover until early February 2009. Ice formation then intensified under the influence of high atmospheric pressure with severe to very severe frost, and maximum ice coverage was recorded around 20 February: the Bay of Bothnia was covered completely, and a 10-15 nautical mile wide belt of thin ice extended along the shores of the Sea of Bothnia. In the Gulf of Finland, compact 10-25 cm thick ice covered an offshore area extending to the latitude of Gogland, and farther west thin ice and new ice occurred up to a line connecting Hanko – Helsinki lighthouse – Loksa. Fast ice up to 30 cm thickness and locally thin ice occurred in the Pärnu Bight and Moon Sound in the Gulf of Riga, cf. Fig. 11.

The 2008/09 ice season in the northern Baltic region ended at the end of May, the long-term mean date.

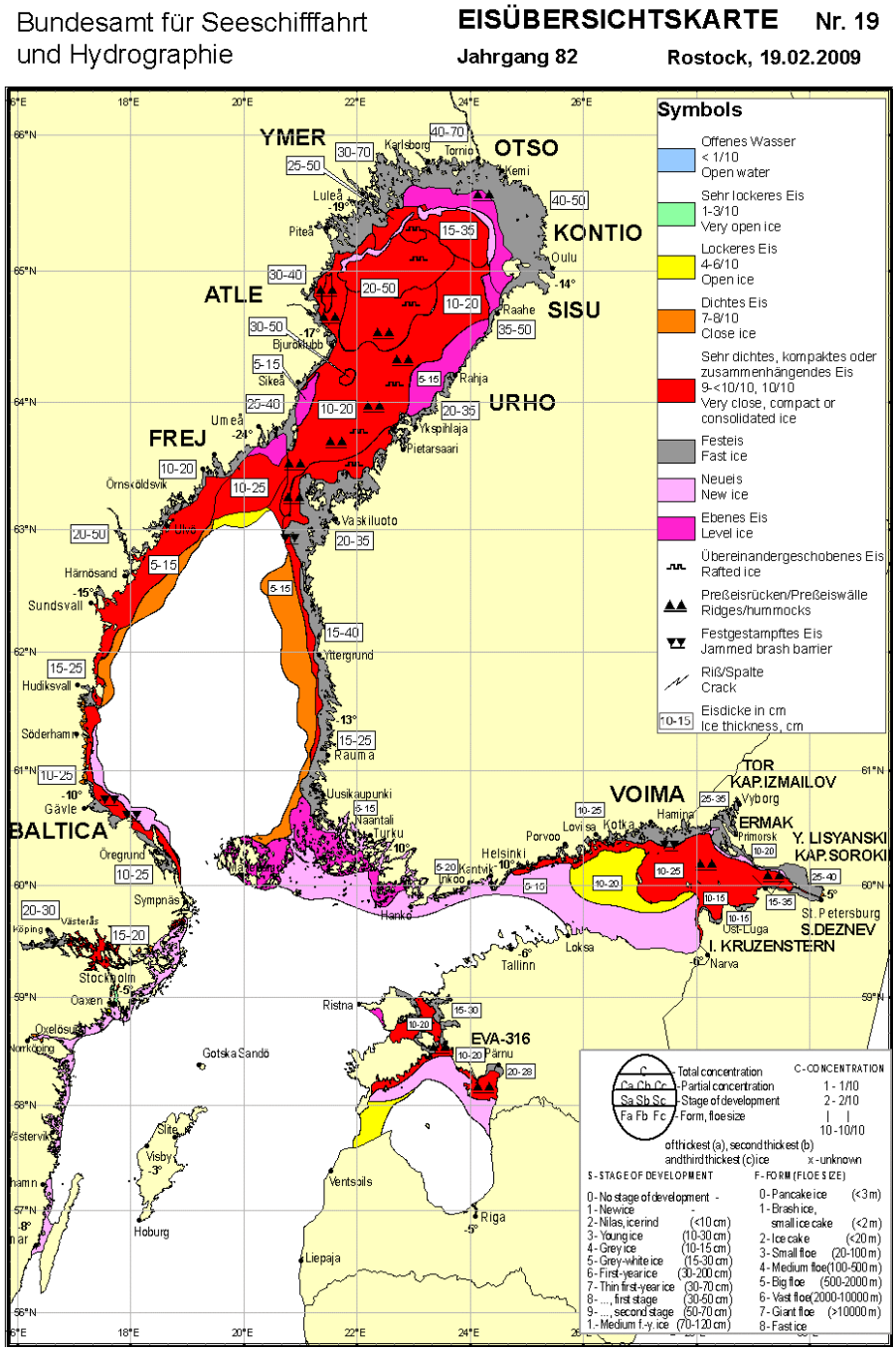

Fig. 11. General ice chart of 19 February 2009 showing maximum extent of ice cover

In the ice winter of 2008/09, the BSH issued the following publications showing the ice situation and expected ice development in the entire Baltic Sea and German coastal waters:

- 109 ice reports (official daily journal, available at a fee)
- 46 general ice charts (twice weekly, as an attachment to the ice reports)
- 40 German Ice Reports (international exchange, published when ice has formed on the German navigation channels)
- about 100 NAVTEX reports (in German and English for the German North and Baltic Sea coasts)
- 36 ice reports "German Baltic Sea coast" (detailed description of the ice situation for German users)
- 23 special ice charts (sections of the German Baltic Sea coast)
- 5 special ice charts (entire Baltic Sea)
- 23 weekly reports (information to Ministry of Transport, Building and Urban Affairs, and to MURSYS)
- information provided to individual users.