Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation
Federal Higher Authority subordinated to the Ministry of Transport
and Digital Infrastructure

Investigation Report 19/12

Less Serious Marine Casualty

Grounding of the passenger ship DEUTSCHLAND in Chile near the Italia Glacier on 15 January 2012

21 March 2014

The investigation was conducted in conformity with the Law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Law - SUG) of 16 June 2002, amended most recently by Article 1 of 22 November 2011, BGBl. (Federal Law Gazette) I p. 2279.

According to said Law, the sole objective of this investigation is to prevent future accidents and malfunctions. This investigation does not serve to ascertain fault, liability or claims (Article 9(2) SUG).

This report should not be used in court proceedings or proceedings of the Maritime Board. Reference is made to Article 34(4) SUG.

The German text shall prevail in the interpretation of this investigation report.

Issued by:
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1 Summary

The passenger ship DEUTSCHLAND was on a cruise through the group of islands off southern Chile and reached the Italia Glacier in the northern arm of the Beagle Channel on Sunday 15 January 2012 at about 2300[1]. The master, an officer on watch, a helmsman and a pilot were on the bridge. A few minutes before reaching the glacier, the ship's command asked the pilot if it would be acceptable to sail closer to the glacier than planned so as to provide passengers with the best possible view of this area. The pilot responded with a decision to reduce the speed and sail much closer to the glacier.

The DEUTSCHLAND grounded on her starboard side as she was turning back towards the middle of the fjord two cables away from the coastline. The engine was stopped immediately and instructions to establish the damage to the ship were given.

It was possible to move the ship back in the direction of the middle of the fjord by means of various engine and helm manoeuvres a short time later and continue the voyage to the next port.

Damage to the ship or environment was not found.

[1] Unless stated otherwise, all times shown in this report are local = UTC -3 h (Chilean summer time).

2 FACTUAL INFORMATION

2.1 Photo

© BSU

Figure 1: Photo of ship

2.2 Ship particulars

Name of ship:	DEUTSCHLAND
Type of ship:	Passenger ship
Nationality/Flag:	Germany
Port of registry:	Neustadt
IMO number:	9141807
Call sign:	DMMC
Owner:	Reederei Peter Deilmann GmbH
Year built:	1998
Shipyard/Yard number:	Howaldtswerke-Deutsche Werft GmbH - Kiel/328
Classification society:	Germanischer Lloyd
Length overall:	175.49 m
Breadth overall:	23.0 m
Gross tonnage:	22,496
Deadweight:	3,460 t
Draught (max.):	5.79 m
Engine rating:	12,320 kW
Main engine:	Krupp MAK Maschinenbau GmbH
(Service) Speed:	19.0 kts

Hull material:	Steel
Hull design:	Partly double bottom
Minimum safe manning:	26

2.3 Voyage particulars

Port of departure:	Ushuaia, Argentina
Port of call:	Punta Arenas, Chile
Type of voyage:	Merchant shipping International
Cargo information:	Passengers
Manning:	230
Draught at time of accident:	F: 5.60 m M: 5.80 m A: 5.80 m
Pilot on board:	Yes
Canal helmsman:	No
Number of passengers:	213

2.4 Marine casualty or incident information

Type of marine casualty:	Less serious marine casualty Grounding
Date, time:	15/01/2012, 2300
Location:	Italia Glacier
Latitude/Longitude:	φ 54°55.5'S λ 069°14.1'W
Ship operation and voyage segment:	Harbour mode
Place on board:	Forecastle/starboard side
Consequences (for people, ship, cargo, environment, other):	None

Excerpt from Nautical Chart 12700, SHOA

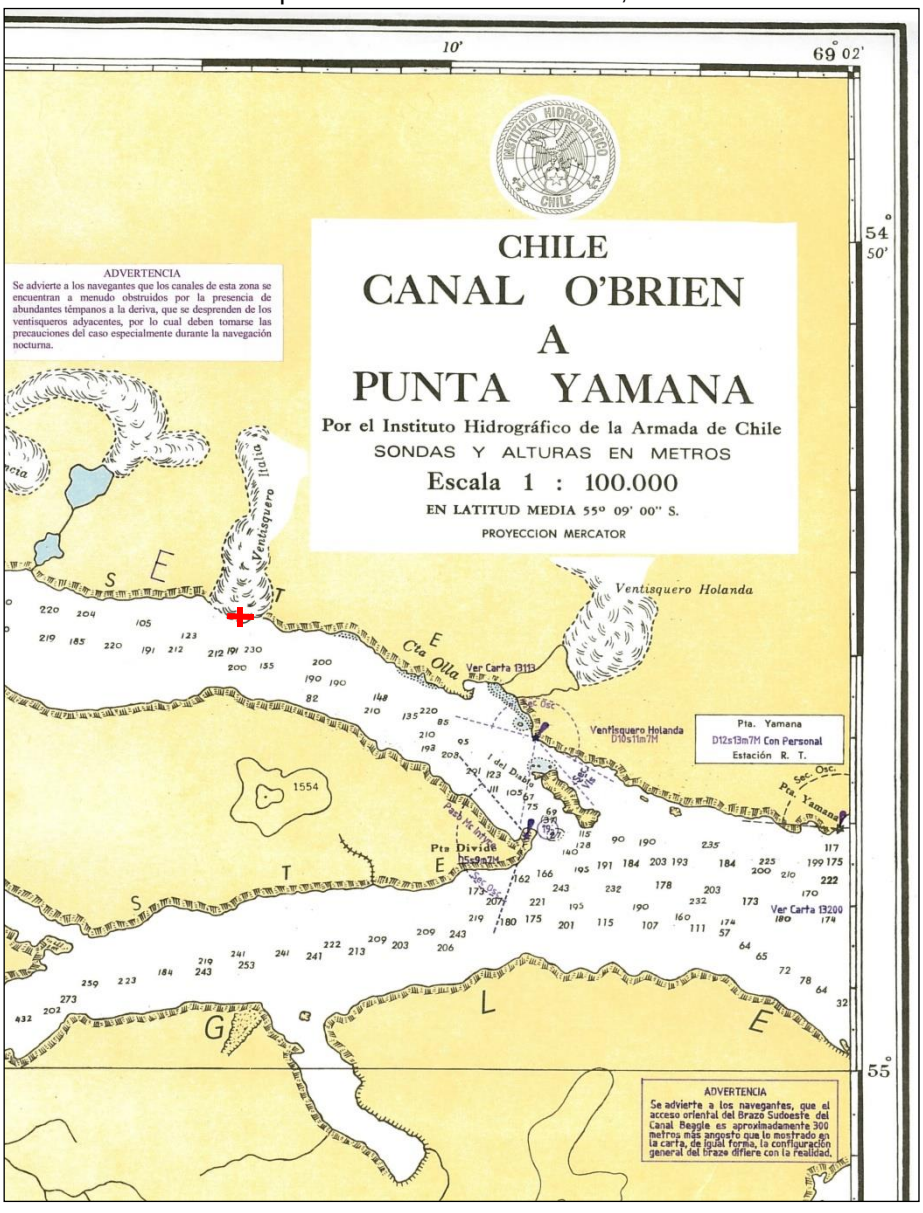

Figure 2: Excerpt from nautical chart showing the scene of the accident

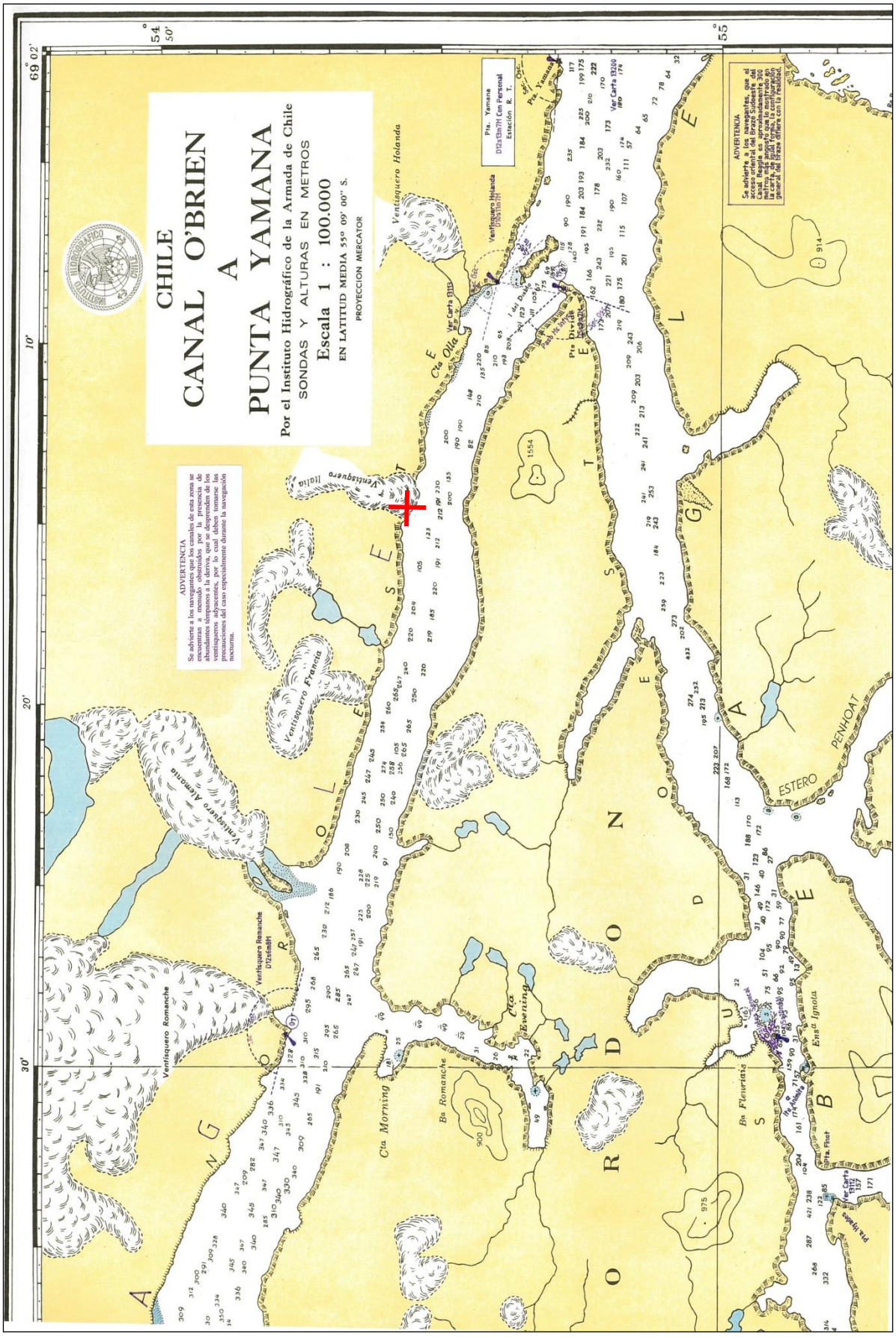

Figure 3: Chilean nautical chart

2.5 Shore authority involvement and emergency response

Agencies involved:	MRCC Chile, SHOA[2]
Resources used:	Shipboard propulsion
Action taken:	Engine and helm manoeuvres, damage ascertained
Results achieved:	Ship refloated, voyage continued to next scheduled port, no damage

[2] SHOA: Servicio Hidrográfico y Oceanográfico de la Armada de Chile (Hydrographic and Oceanographic Service of the Chilean Navy).

3 COURSE OF THE ACCIDENT AND INVESTIGATION

3.1 Course of the accident

The German-flagged passenger ship DEUTSCHLAND usually visits the group of islands off southern Chile once each year. In the previous year (2011), she sailed in a westerly direction from the west coast to the east coast. Two pilots, who alternated during the passage through the Beagle Channel, boarded in the Argentinean port of Puerto Madryn on 10 January 2012. At the time of the accident at about 2300, the master, the Chilean pilot on duty, the chief mate and a helmsman were on the bridge. Since sailing out of the last port, Ushuaia, the progress of the voyage through the fjord had been normal and all the navigating equipment worked properly.
Shortly before reaching the Italia Glacier at 225240 (radar time according to VDR recording), the ship's command asked the pilot whether it would be possible to sail closer to the glacier. He agreed to this on condition that the speed was reduced. The pilot later stated that based on the nautical chart (SHOA 12700) and manoeuvrability of the ship, he had decided to sail up to three cables towards the coast. The speed was reduced to DEAD SLOW (at 5-6 kts). The ship grounded on her starboard side as she was turning back into the middle of the fjord. The engine was immediately stopped and the behaviour of the ship observed. The DEUTSCHLAND righted herself after inclining slightly to port and refloated again immediately after. Following that, the bow thruster was operated to port and the helm set to hard starboard at HALF AHEAD. The ship thus traversed back to the middle of the fjord. Just 15 minutes after, the officers instructed to carry out an assessment in the meantime, informed the bridge that the ship had reportedly not sustained any damage. The ship's command notified MRCC Chile and the Chilean maritime authority about the incident at about 0135.

3.2 Subsequent events

Immediately after grounding and the first manoeuvre commands, the master used the public address system to inform everyone on board about the incident. This information was provided several times in German so as to give reassurance.
An extensive inspection revealed that no fluids had escaped, nor was there any water ingress. Every system, in particular, the bow thruster, the two screws and the helm, was working without any problems. Consequently, it was possible to continue the voyage to Punta Arenas in Chile. Divers inspected the underwater hull when they arrived there on 17 January 2012. The classification society's representative did not find any damage of relevance, meaning the DEUTSCHLAND was able to leave the port that evening in accordance with her schedule.
Furthermore, as the day progressed the Chilean authorities (Armada de Chile - Directemar) summoned the pilot and any other person on the bridge at the time of the accident to a hearing. The pilot used this as an opportunity to report that the information in the nautical chart was incomplete in respect of the approach to the Italia Glacier.

He reportedly also sent this statement to the hydrographic service (SHOA) in writing with a request that new soundings be carried out.

3.3 Investigation

The BSU only received notification by means of an email from the owner on Thursday 19 January 2012.[3] The ensuing preliminary investigation revealed that this accident could not be classified a 'Serious Marine Casualty'. Nevertheless, the BSU may investigate this marine casualty. Since considerable potential for improving safety at sea is envisaged, a decision was made to conduct this investigation and conclude it with safety recommendations.

3.3.1 VDR

A Rutter VDR-100 voyage data recorder (VDR) was on board. The data were backed up and made available to the BSU by the owner. Figure 4 shows the initial situation. At 225327, the DEUTSCHLAND is approaching the Italia Glacier at almost 16 kts. Her course over ground is 293°. The audio recording clarifies that the ship's command asks the pilot whether it would be possible to sail closer. The pilot confirms this immediately and reduces the speed. This can be seen in Figures 5 and 6 below.

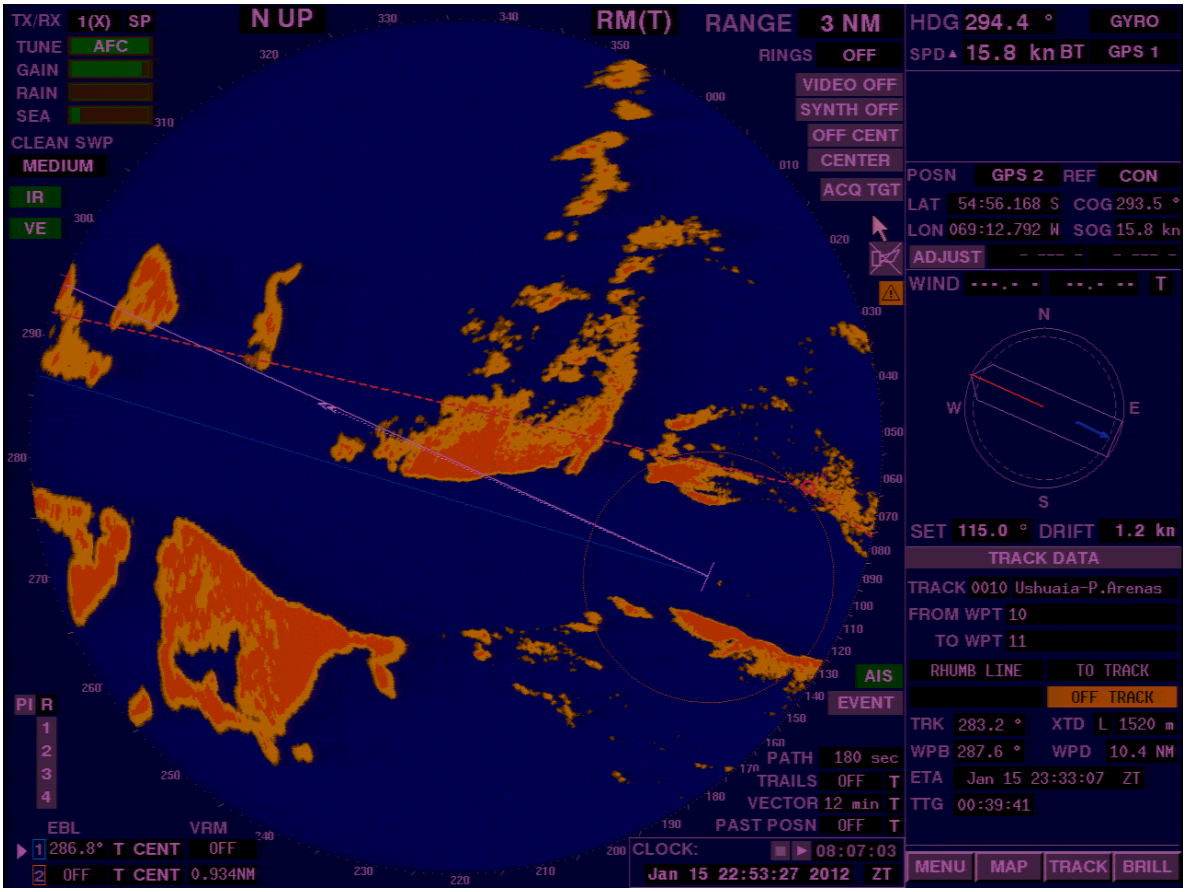

Figure 4: VDR recording of the radar image at 225327

[3] The master attaches importance to his statement that he reportedly informed the owner about the incident and gave advice to involve the BSU immediately.

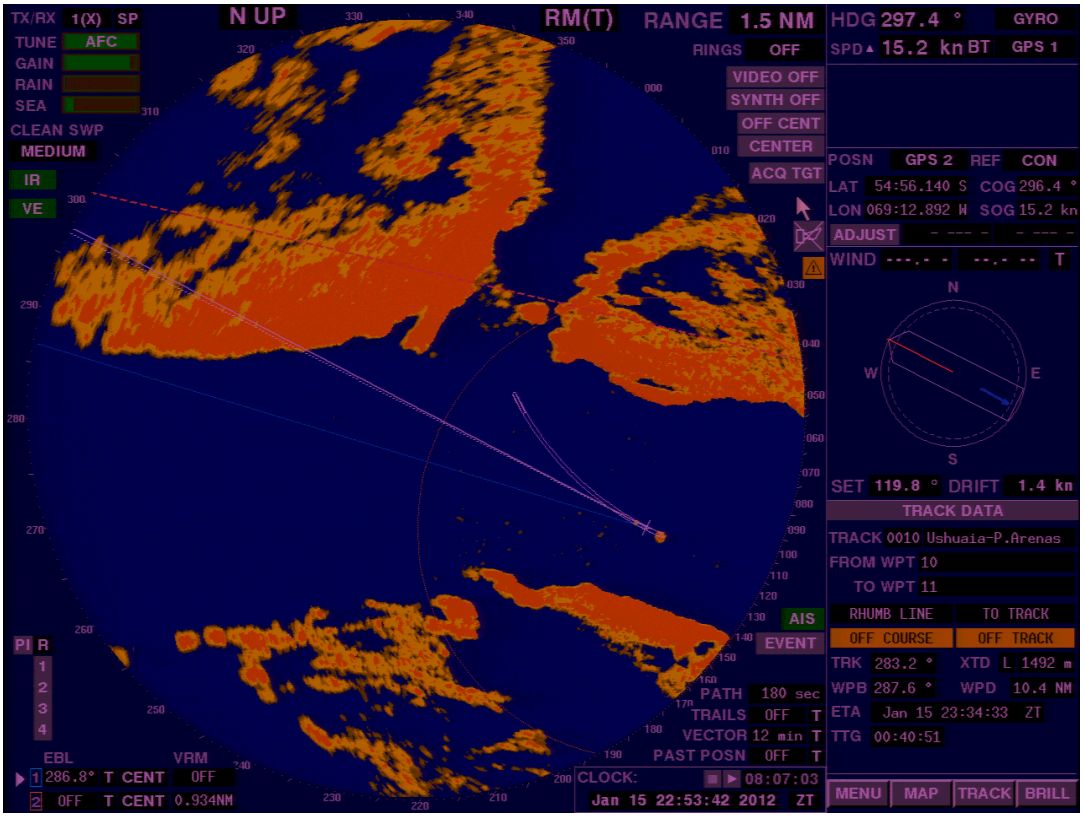

Figure 5: VDR recording of the radar image at 225342

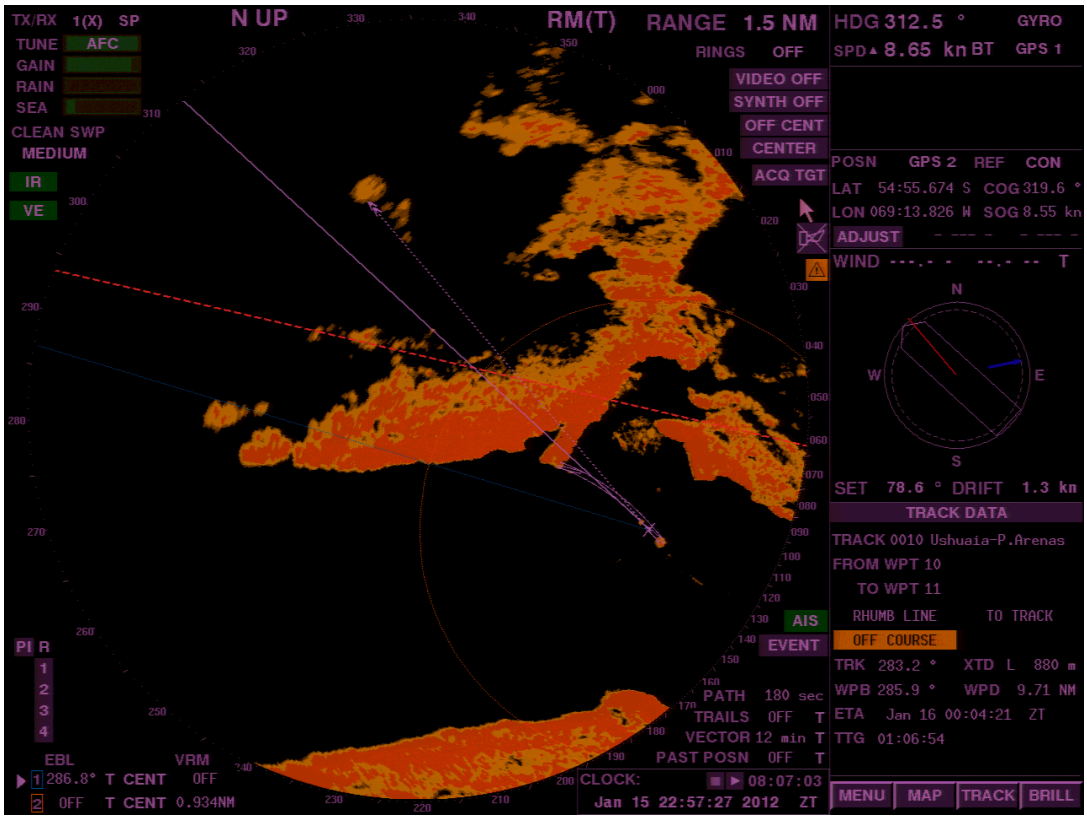

Figure 6: VDR recording of the radar image at 225727

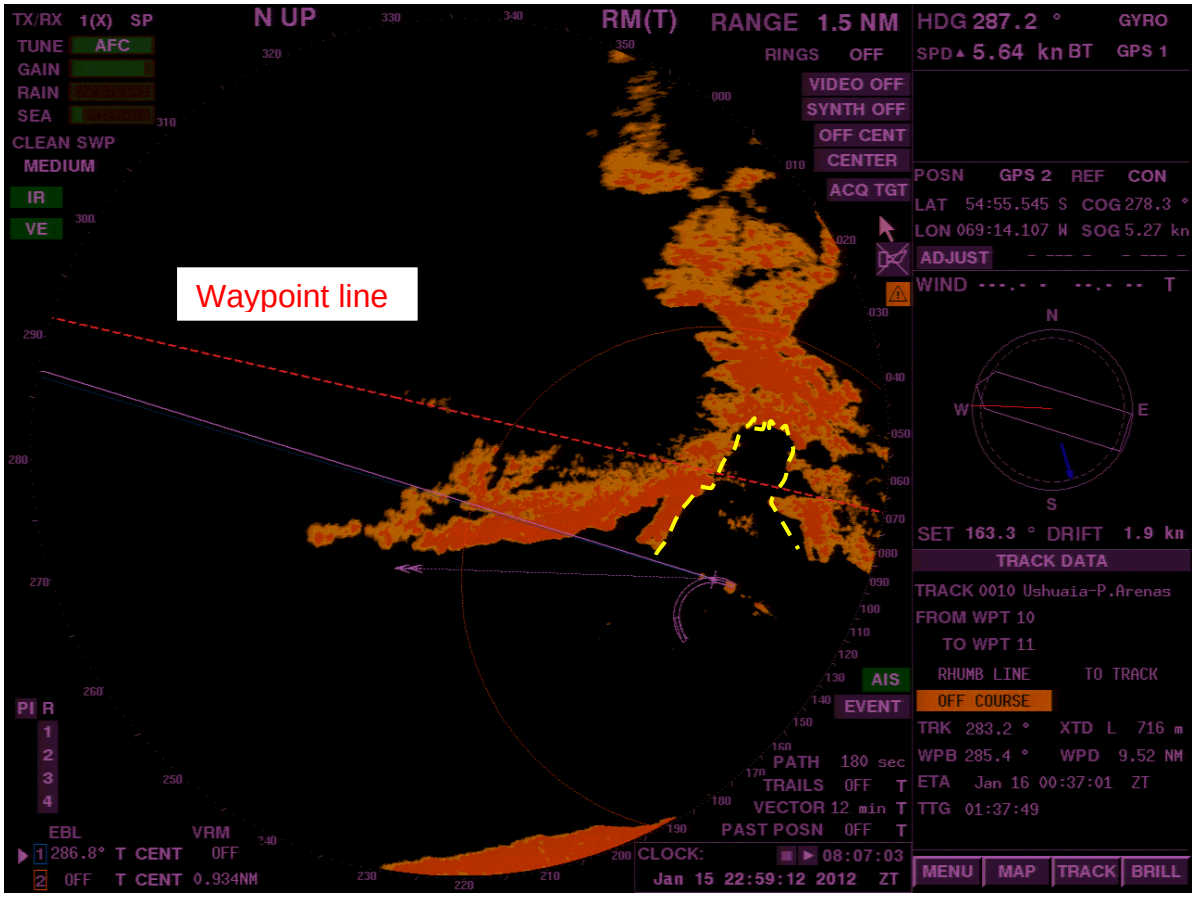

Figure 7: VDR recording of the radar image at 225912

Figure 7 shows the time at which the grounding incident occurred (225912). The ship was already returning to the middle of the fjord by means of a turn to port when she grounded on a submerged object.

The programmed route of the ship is clearly visible in all the figures as a red dotted line. This is based on waypoints entered manually by the ship's command. These were taken from the paper chart and entered into the ARPA. However, since the paper chart is not based on WGS 84[4], the red line actually runs across the shore in places.

It can also be seen very clearly on the radar images that the ice front has receded a long way into the interior (see yellow dotted line).

[4] The World Geodetic System (abbreviated WGS) is a global reference system for use in geodesy and navigation. By WGS, it is usually the so-called WGS 84 – currently the most widely used global reference system – that is referred to today (source: Wikipedia.org on 08/04/2013).

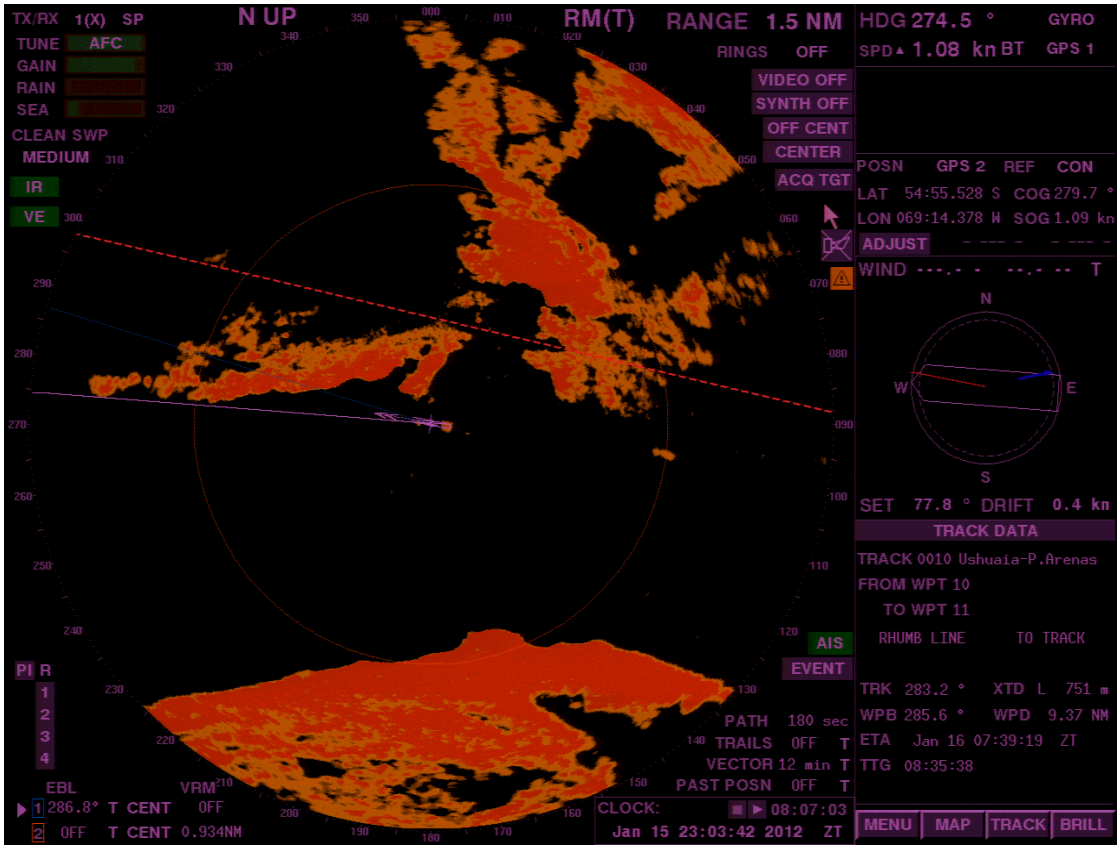

Figure 8: VDR recording of the radar image at 230342

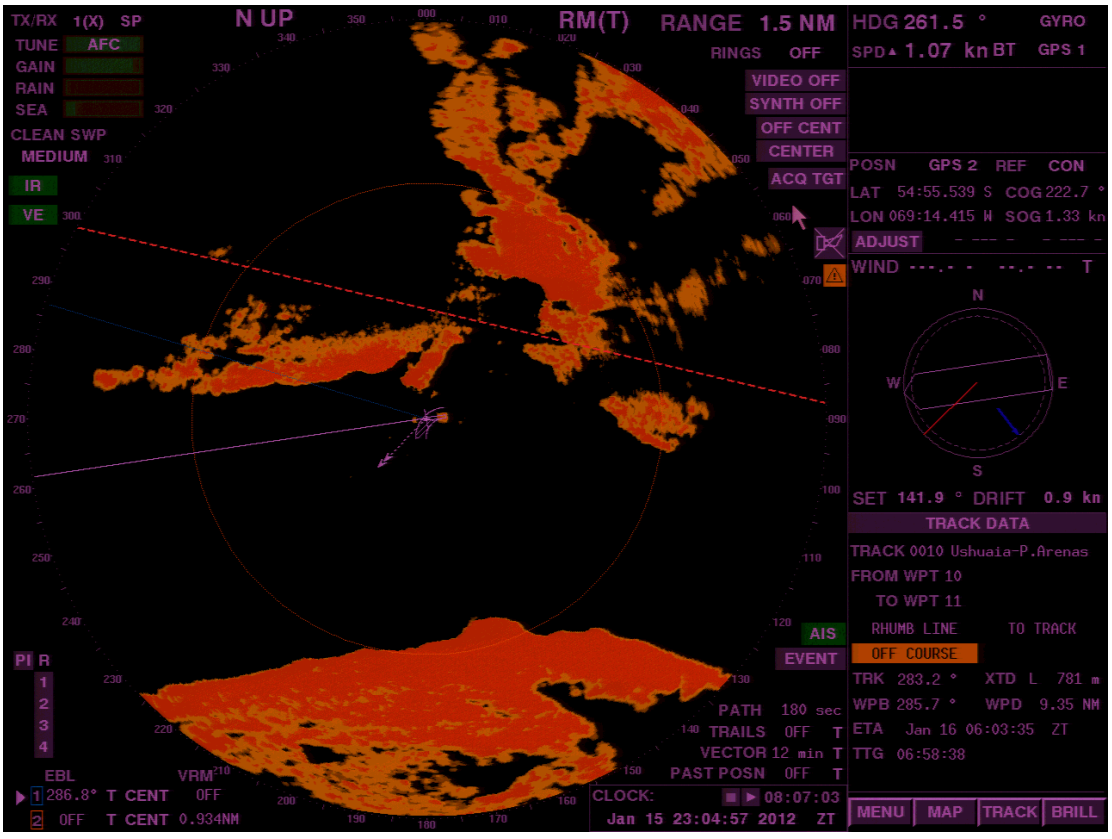

Figure 9: VDR recording of the radar image at 230457

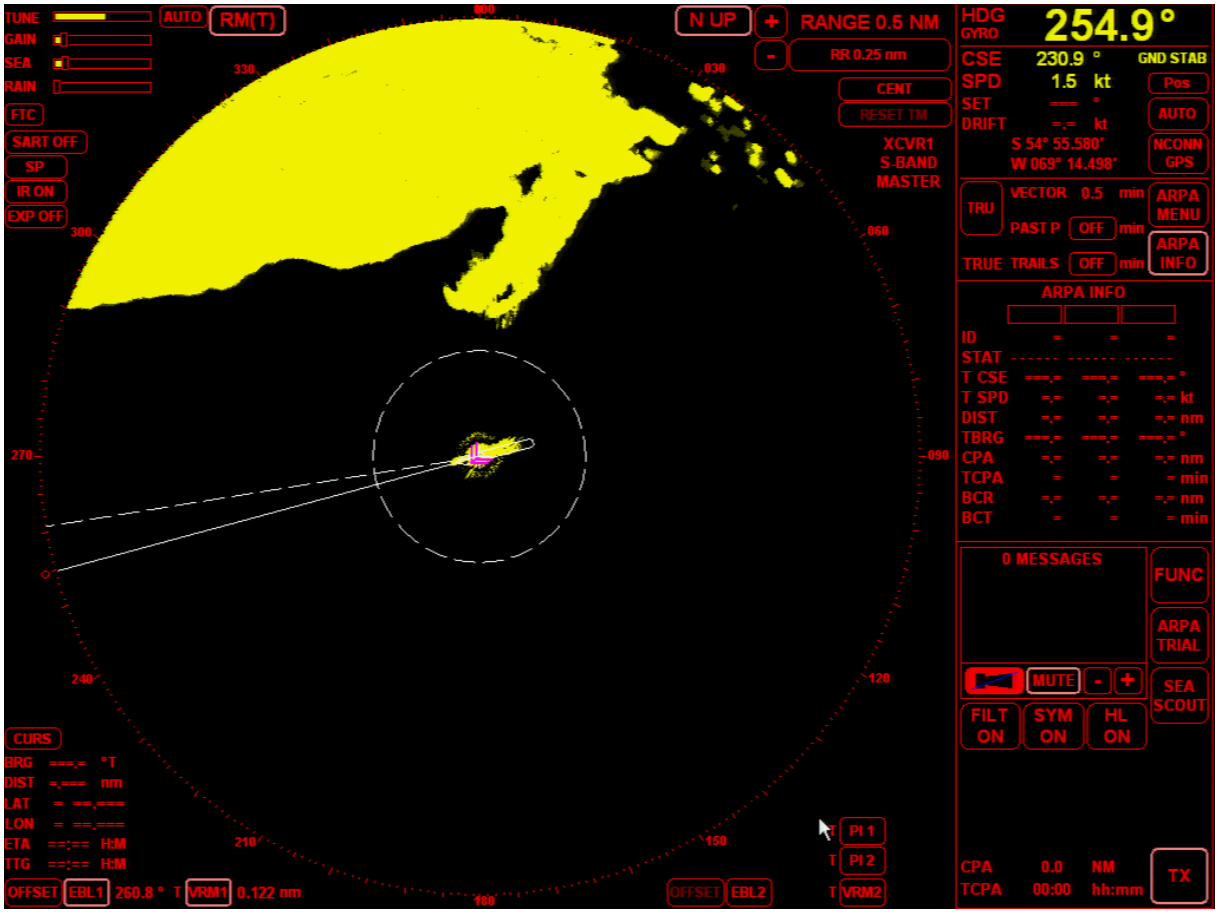

Figure 10: VDR recording of the S-band radar image at 230749

Figures 8 to 10 show how the DEUTSCHLAND slowly refloats and then sails in a westerly direction. Contrary to the statements that the ship's command and the pilot used the radar units, the recordings of the two radar units leave the impression that they were not used actively.

The recorded weather data show that the prevailing winds stood at about 3 Bft during the approach to the Italia Glacier. Due to the area of operation and wind direction, the ship drifted towards the glacier.

3.3.2 Echo sounder

An ELAC Laz 5000 echo sounder (made by L-3 ELAC Nautik GmbH) was on board; its data were saved to the VDR directly. It can be seen that this device continuously displayed depth values of more than 100 m beneath the keel, until they dropped to less than 100 m about one minute before the grounding incident occurred. The values then dropped rapidly to 5.7 m. Here, the ship's command stated that it observed the depth on the display to the left of the helmsman. Unlike the main unit in the chartroom, where tendencies are easier to recognise, only the current values are shown there. The audible alarm (so-called safety depth) in the echo sounder was reportedly set to 10 m so as to have at least 4 m of water beneath the keel at a maximum draught of 6 m.

Accordingly, an audible alarm from the echo sounder cannot be heard in the VDR's audio recordings because the sensor is installed amidships, and the depth there was reportedly still more than 10 m.

On its website, Elektro-Navigation Schick & Co. GmbH (ELNA), responsible for distribution and customer service, describes the device as follows:
"The LAZ 5000 is a general-purpose BSH-approved echo sounder for navigating in all waters. Its operating range spans shallow water to depths of 2,000 m. It can be operated on standard sound frequencies with one or two transducers. This means it can be retrofitted with existing transducers from other manufacturers. The LAZ 5000 has five basic scale ranges from 0-10 m to 0-2,000 m.
The high-resolution liquid crystal display permits continuous monitoring of bottom recordings and shows any relevant navigation data at the same time. Alarm setting for any required depth. The operating menu appears in the liquid crystal display.
The LAZ 5000 stores measurement data for the previous 24 hours together with information on the respective position. A printout of the 24-hour memory can be made at any time (printer is optional).
The LAZ 5000 is equipped with NMEA serial ports for outputting depth values on the DAZ 25 digital slave display or a similar device and for inputting time, date and position data, as well as a parallel port for a printer."

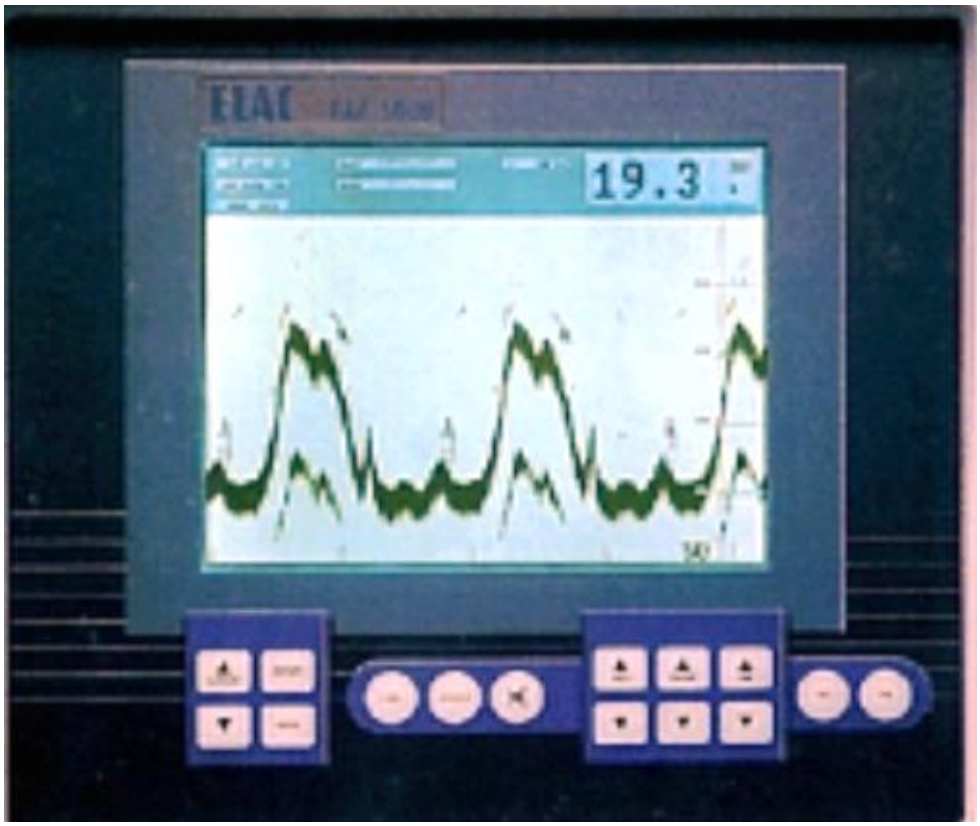

Figure 11: Example of echo sounder's display

3.3.3 Available charts

The Chilean authorities commented on the draft of this report at length. Editorially revised by the BSU, the comments of the Chilean investigating authority (DIRECTEMAR)[5] are shown below in italics:

"From the perspective of the Chilean investigators, the SHOA 12700 nautical chart satisfies all the standards of the International Hydrographic Organization (IHO), is up to date, and was not the cause of the accident.
a) That coastal States have turned to electronic nautical charts does not mean paper charts and local chart datum are obsolete, not updated or that they constitute a risk to navigation.
b) In most regions of the world with many islands, as is the case with Chile, which has more than 2,180 small and 3,739 larger islands, nautical charts for channels merely display the soundings for routes to an extent that conforms to the IHO standards. Areas in which no soundings have been carried out should be deemed unfit for navigation.
c) Regardless of the type of nautical chart (paper chart, local datum, WGS 84 or electronic chart) used, a risk of grounding only existed after the ship strayed from the middle of the sounded channel to approach an area without hydrographic information.
d) The chart contained two warnings in Spanish; these did not constitute the cause of the grounding incident. If these warnings were in English, they would have moved to a different channel than the one the DEUTSCHLAND sailed on and to other warnings in respect of floating ice.
e) The nautical charts and sailing directions of the British Admiralty raster charts were used on board. The pilots took the SHOA nautical charts that were used on the bridge on board because they were more suitable for navigation."

The paper chart used on board, SHOA 12700, is based on measurements taken in 1973. It displays the relevant area at a scale of 1:100000. Evidently, all other internationally approved charts are based on this chart.

"The relevant paper chart conforms to all the recommendations of the International Hydrographic Organization (IHO), which is the body responsible for the standardisation of these charts. This chart was up to date at the time of the accident.

Given the scale, the chart could only be used for navigating in the middle of the channel, which had a depth of about 150 m, according to the depth soundings. The width of the sounded channel is sufficient for ships to pass each other. Passenger ships with a GT of up to 151,400 recently visited this area without any problems at all. Since some of the glaciers in this area have become a tourist attraction, a large number of them were recently plotted in various nautical charts at a more detailed scale to allow ships to approach the same safely.

[5] Directorate General of the Maritime Territory and Merchant Marine of the Republic of Chile

The foregoing confirms that the SHOA 12700 nautical chart contains sufficient information for transiting the channel. However, on no account should this route be deviated from and the coastline approached because soundings have not been carried out there."

Another important factor is that the chart is based on a local chart datum but this is not shown on the nautical chart. Consequently, GPS positions cannot be entered on this nautical chart because they cannot be corrected. Therefore, errors are inevitable. This chart is suitable only for terrestrial navigation (by means of radar or dioptre).
This would not be a problem if there were a corresponding warning on the chart in English. As can be seen in Figure 12, there are warnings on the chart but these are in Spanish. Moreover, even if an international ship's officer is able to understand them, the warnings are only of a general nature. There is no clear warning that this chart is based on a local datum. Furthermore, it cannot be converted to a WGS because no correction parameters are specified.

"*However, this is mentioned in the SHOA 3000 'chart catalogue' publication and was known to the Chilean pilots.*

The bridge crew of the DEUTSCHLAND should have known that the chart is based on a local datum, as the VDR recordings indicate that the course's waypoints, which were entered into the ARPA device manually by the officers (because no approved electronic nautical chart was available) crossed over land in some areas. It should be noted that the crew was familiar with using paper nautical charts such as the SHOA 12700. These charts were used successfully during the 25-hour voyage from Puerto Madryn to Cape Horn and from there to Ushuaia. Moreover, the foregoing, the chart available to the pilot, the English chart set belonging to the ship, was used for planning the voyage from Ushuaia to Punta Arenas."

In a comparison between the paper chart (see red circle in Fig. 12) and the actual radar image (see yellow line in Fig. 7), it is clearly apparent that the ice front has melted and thus receded since the nautical chart was created.

"No soundings have been carried out that would permit navigation in the area where the ice front used to reach into the channel. This means it is not fit for navigation."

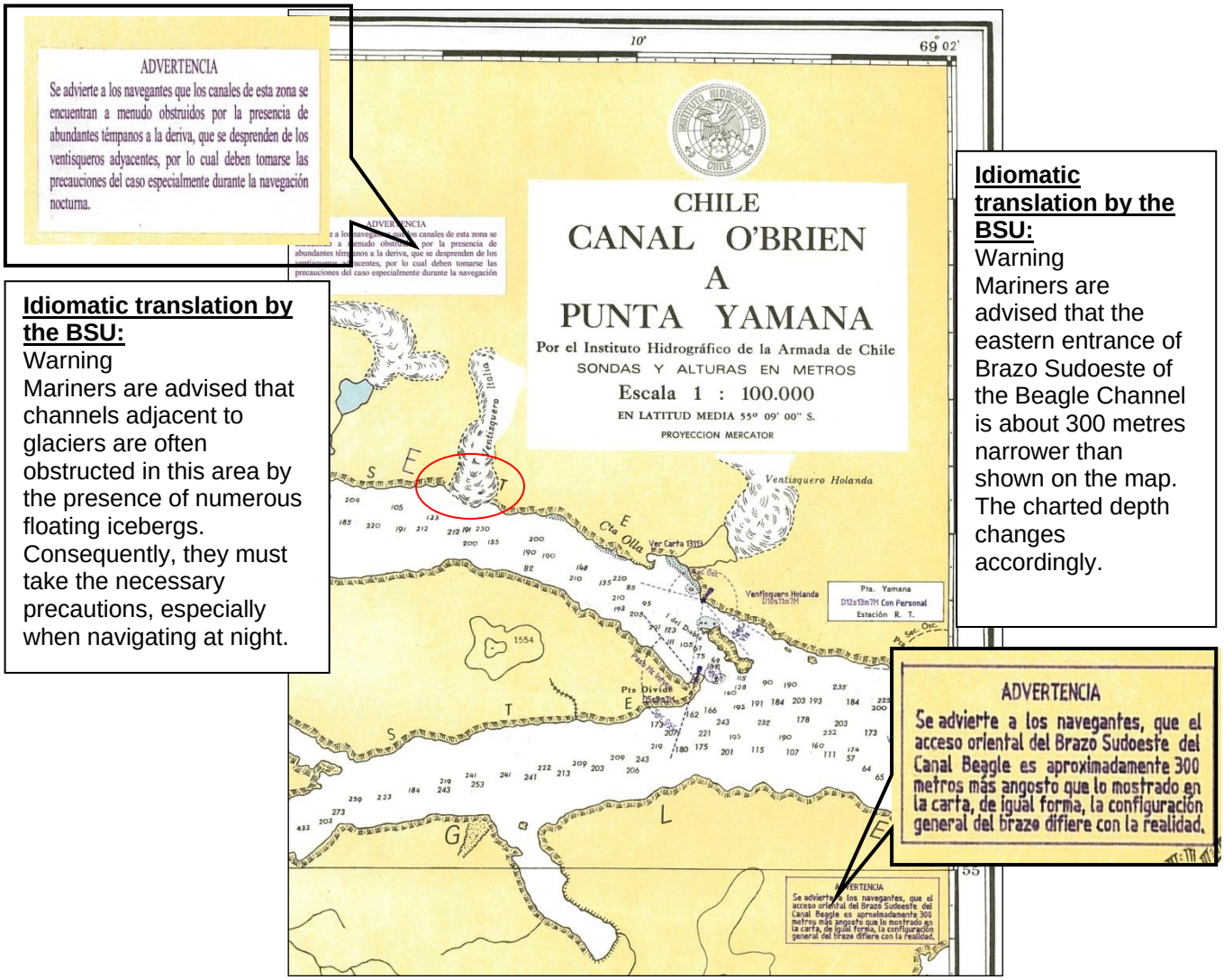

Figure 12: Warnings on the nautical chart in Spanish

Figure 13 shows one of the available ARCS charts[6]. These are scanned images of the original paper charts. English warnings were inserted there; however, they also give no indication that this is a local datum. Nevertheless, it is noted that positions should be entered by bearing and distance rather than by latitude and longitude.

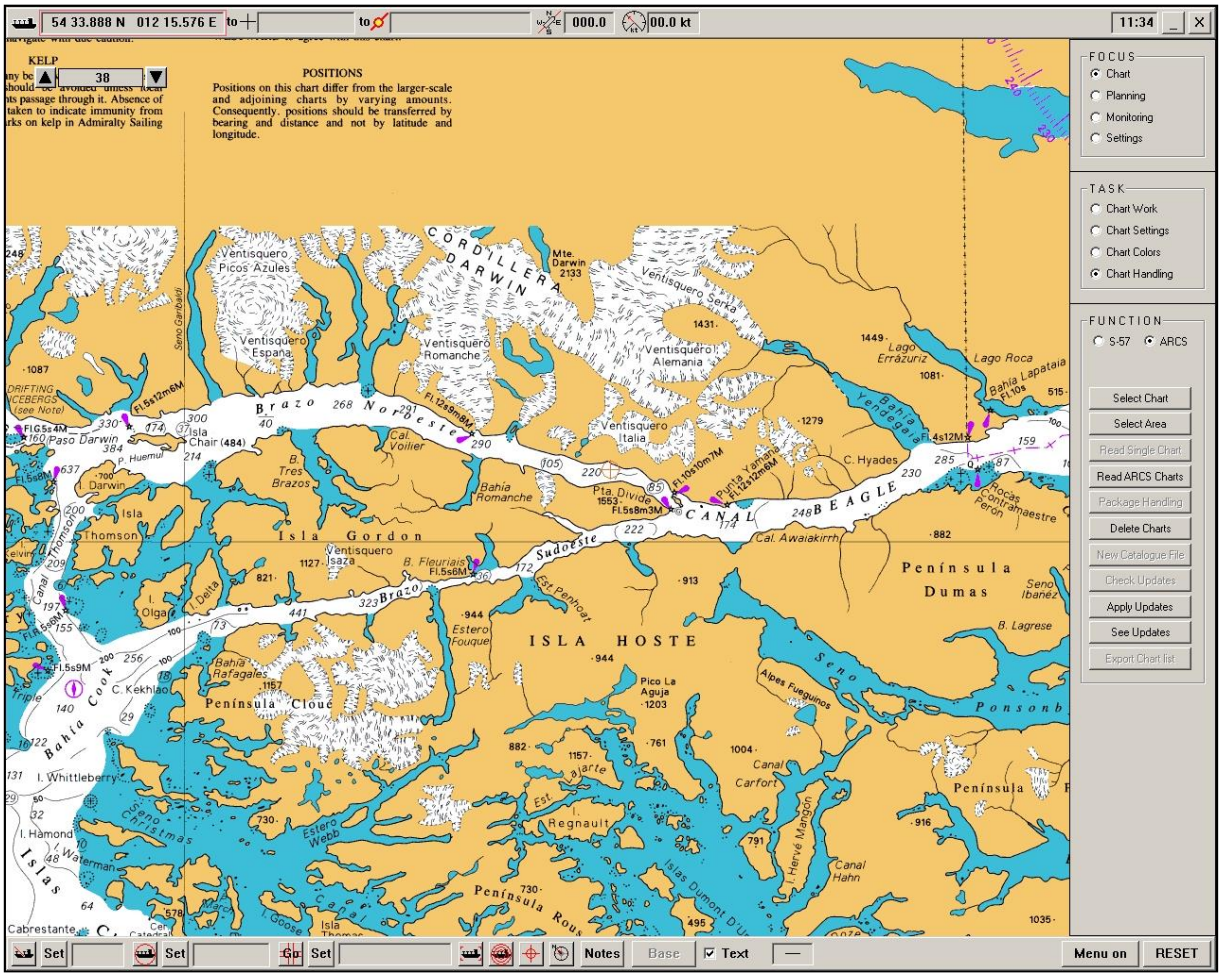

Figure 13: Raster chart – based on 12700

The modern nautical chart display of an officially approved electronic navigational chart (ENC) is based on object-oriented vector data. Very complex measurement and processing operations must be carried out to obtain this. In the recent past, more and more sea areas have thus been represented electronically.

The Hydrographic Institute of Portugal has been requested by the International Hydrographic Organization (IHO) to record the current state of this digitisation and publish it on its website[7]. It is evident from Figure 14 that only a rough outline chart exists for the accident area around the Italia Glacier.

[6] ARCS: *Admiralty Raster Chart Services* with the global nautical chart set of the British Admiralty. These nautical charts are digital copies of the existing paper charts and provided by the United Kingdom Hydrographic Office.

[7] See http://websig.hidrografico.pt/website/icenc/viewer.htm (as updated on 19/04/2012).

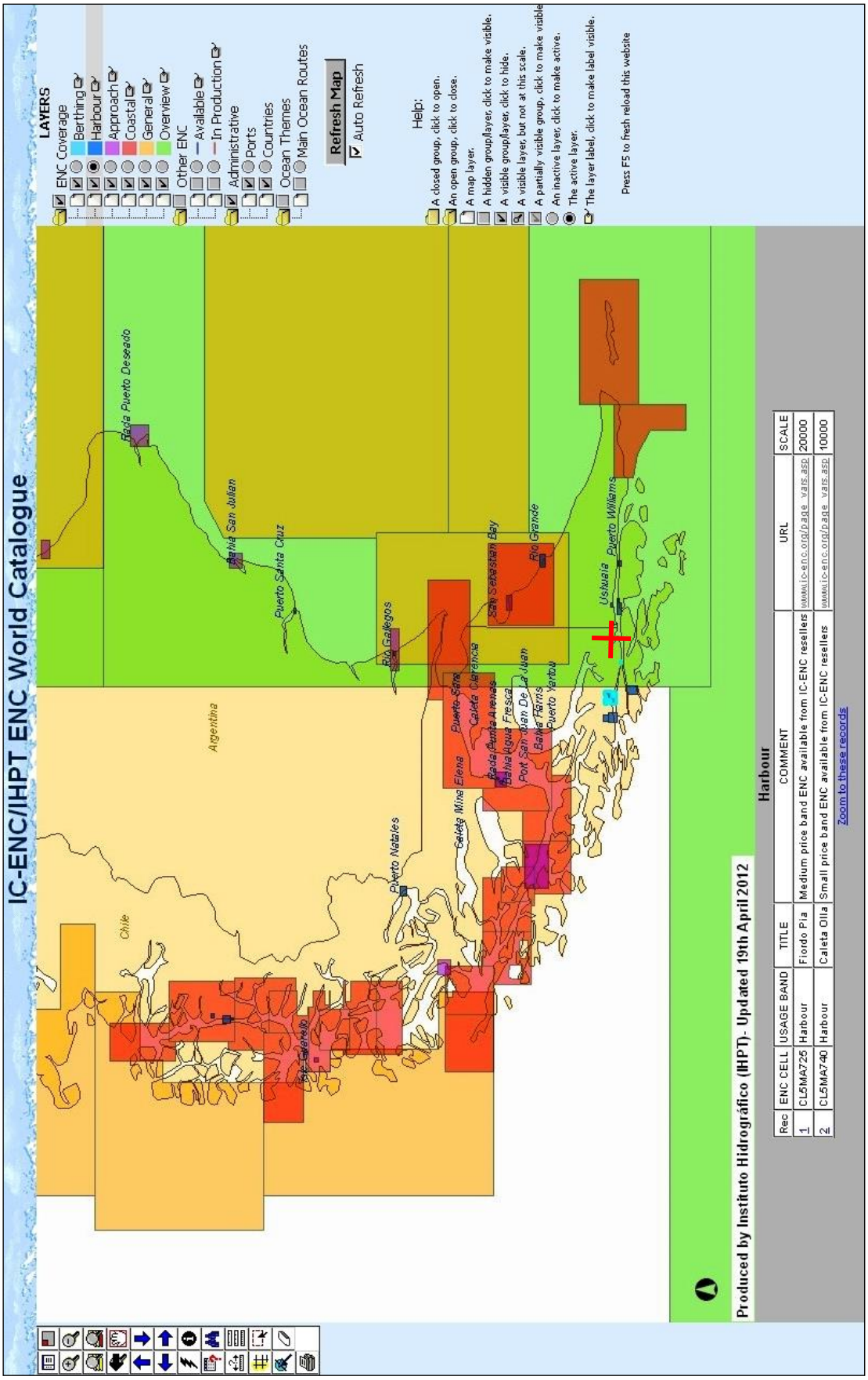

Figure 14: Display with existing ENC data for South America

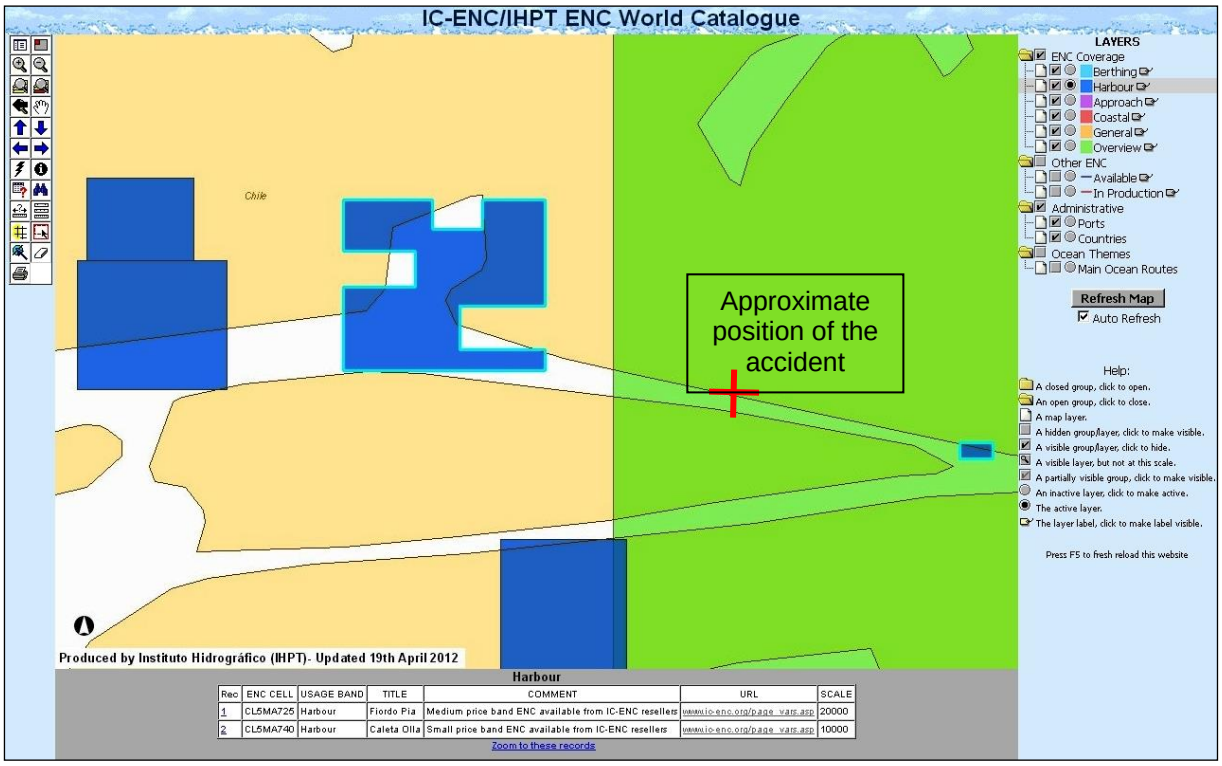

Figure 15: Detailed display with existing ENC data for the area of the accident

The scale used in Figure 15 shows more clearly that only an outline chart (in green) is digitised around the glacier. The blue areas are displayed on detailed nautical charts.

Here, the Chilean authority added:
"They display glaciers near the Italia Glacier: Fjordo Pia 1:20000 and Caleta Olla 1:10000. As mentioned by the Hydrographic Institute of Portugal, they were registered in the charts with WGS 84. The datum and scale are fit for safe navigation in the area of the discussed glaciers. Approaching both areas was considered in the DEUTSCHLAND's above-mentioned voyage planning.

To sum up, taking into account the nautical charts available for approaching the Italia Glacier, one can conclude that it was only possible to navigate using paper charts; positions had to be determined using the radar and bearings to a landmark. It was not possible to navigate with satellite systems because the nautical chart did not refer to WGS 84. The existing nautical charts allowed for consistent and safe navigation in the middle of the channel's fairway, but not near the coast. In view of its scale (1:100000), the chart was not created for this purpose and soundings have not been made close to the glacier."

3.3.4 Pilotage

The Chilean authority adds:
"Before the accident, the pilots had already been on board for five days. Moreover, they had advised the ship's command in the channel for 25 hours. This is considered sufficient to preclude a lack of familiarisation with the bridge team, the ship or the charts of the sea area. The 'voyage log' is enclosed to illustrate the progress of the pilotage assignment. The text at '3.3.4 Pilotage' was reconciled with and supplemented by the information in the voyage log."

Two Chilean pilots boarded in Puerto Madryn on 10 January 2012 and assumed responsibility on an alternating basis for pilotage from the Argentinean pilot at 2136 on 12 January 2012. The pilots are considered experienced, as they advise ships on this passage almost every week. They navigated through the Beagle Channel up to Puerto Williams and through the southern channels. The ship reached Cape Horn at 1531 on 13 January. From Cape Horn, the Chilean pilots returned to the Beagle Channel via the Chilean channels, arriving there at 2246 on 13 January 2013. The Argentinean pilot took over there for the voyage to the port of Ushuaia. The pilots were able to rest properly on board the DEUTSCHLAND in this port. All the manoeuvres described above were carried out with the help of the chart that referred to a local chart datum. This means that radar and bearings were used to determine the positions. This caused no problems whatsoever.

The DEUTSCHLAND sailed out of the port of Ushuaia at 1930 on 15 January 2012; the Argentinean pilot advised her. After reaching Chilean waters at 2118, the so-called 'Chilean' pilot took over.
He handed over to the so-called 'First Chilean Pilot' at 2200[8]. In accordance with requirements, a report was made to the maritime authority when the Yamana Lighthouse was passed at 2240. At the same time, the DEUTSCHLAND navigated the northwest arm of the Beagle Channel.
The pilots used their own laptop, which had WinPlotterPilot software installed. The SHOA 12700 paper chart was displayed as a raster chart. The device was connected to a GPS receiver on the ship. Since – as WGS 84 data – the positions and programmed waypoints of the agreed route corresponded with each other, they could be displayed on the laptop and navigated. Having said that, this did not correspond with reality because of the unknown chart reference.
"However, navigation was based on the paper chart that the pilot had displayed on the bridge. DIRECTEMAR has found that the WinPlotterPilot software is only referential and does not replace the official nautical charts."

[8] These are proper/official names, which also express the precedence of the pilots in relation to each other. Although each pilot advises the ship's command individually, the advice of the first pilot carries more weight in cases of doubt.

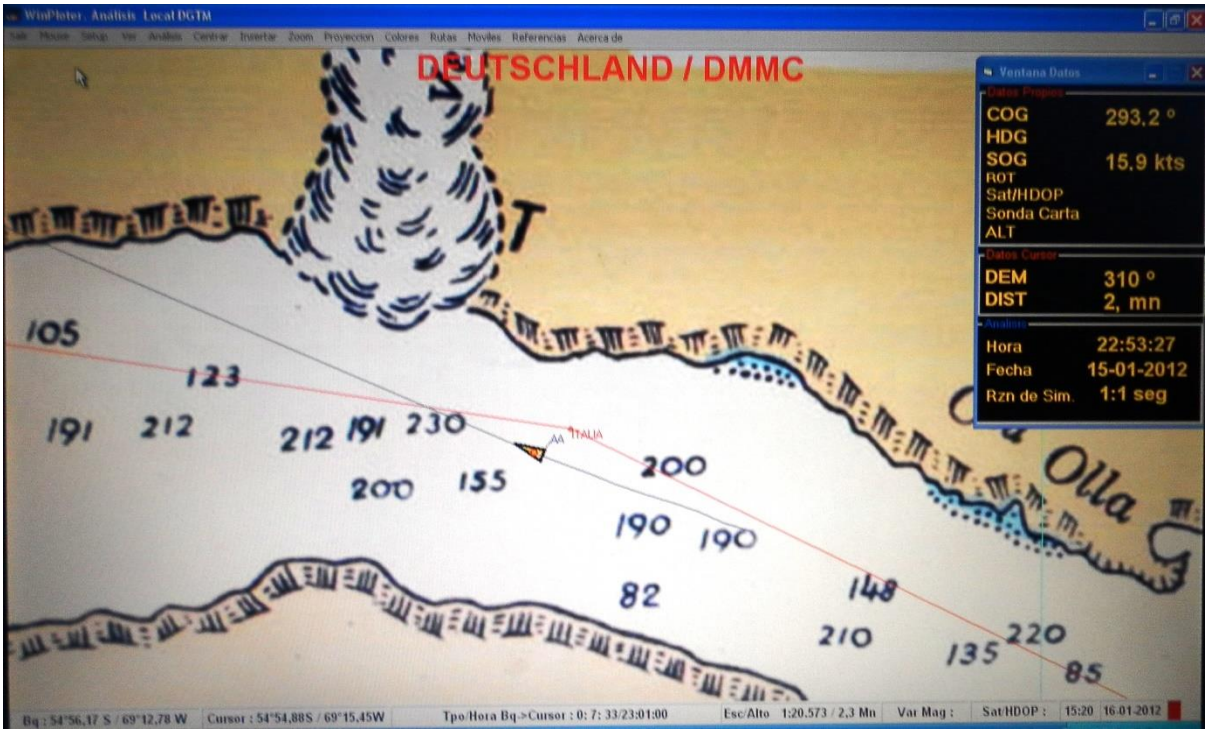

Figure 16: ARCS display of the pilots' laptop at 225327

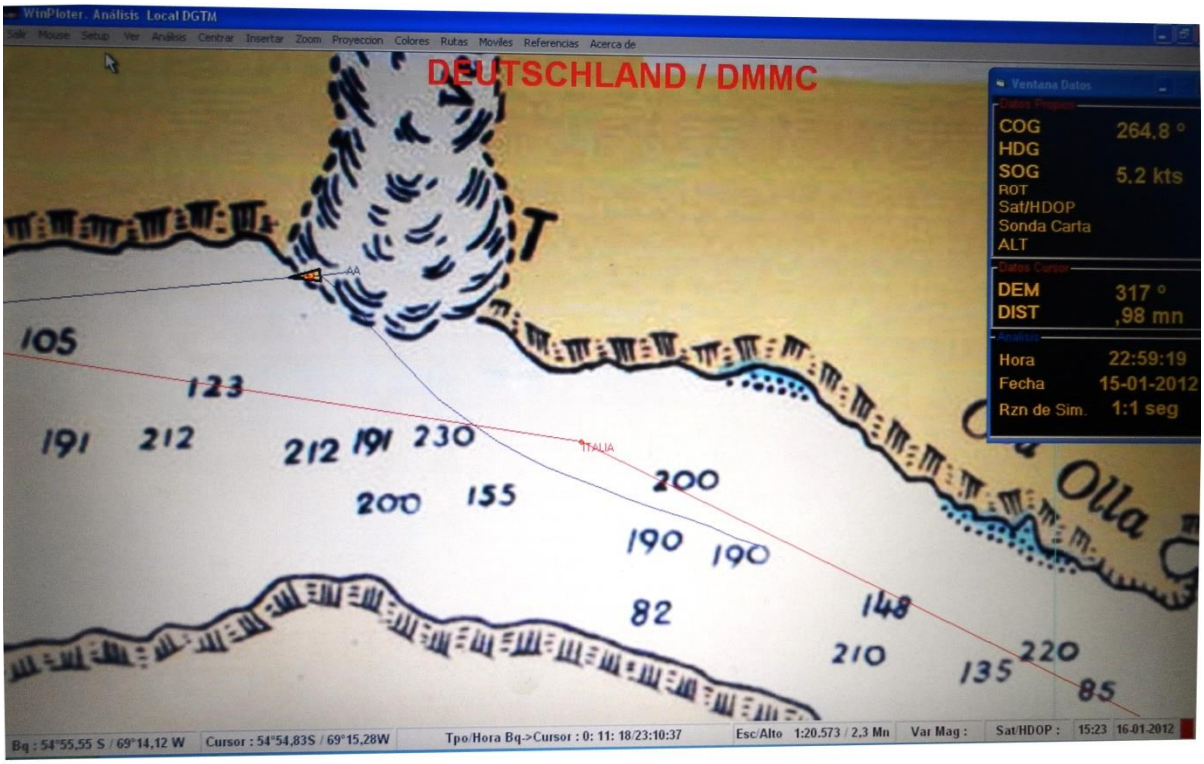

Figure 17: ARCS display of the pilots' laptop at 225919

4 ANALYSIS

The coastlines on the SHOA 12700 nautical chart have changed so severely since the initial survey that they are no longer fit for use in navigation. On top of that, the chart is shown at a scale of 1:100000, meaning it should not be used for navigating through sea areas that have not been sounded and for which this chart thus contains no charted depths. This is especially true near glaciers, the size of which varies as a function of global warming and thus produces a completely unknown channel. The radar images clearly show that the Italia Glacier has melted so much that the ice from its ice front has receded a long way into the interior.[9]

The online encyclopaedia Wikipedia states the following with regard to the term 'ice front' (on 08/04/2013):
"The ice front is the – often tongue-shaped – lower part of a glacier. *Often intersected by radial crevasses, it forms the area at which the ice melts. When the edge of a glacier converges with the sea, chunks of ice break off from it and float away in the form of icebergs – the glacier 'calves*'. *When the iceberg melts, rocks that are still encapsulated in the ice drop to the seabed* in the form of 'dropstones'.
*Receding glaciers leave terminal moraines – **more or less crescent-shaped hills that formed ahead of the ice front** – at the point of their broadest expanse. In addition to various types of moraine, other debris left by former glaciers include other forms of deposition and erosion, such as glacial polish, U-shaped valleys* or *glacial erratics*."

In consequence, it can be assumed with a high degree of certainty that the starboard side of the DEUTSCHLAND grounded on debris left from the melting glacier.
The decision of the ship's command to sail closer to the glacier than previously planned in spite of not having nautical charts that contained charted depths for this sea area must be regarded as the cause.

This decision may be based on the assumption that the passengers should be 'offered something special'.

The original voyage plan did not envisage approaching the glacier and straying from safe water as a consequence of that. Although the master was on the bridge, he failed to assess the risks attached to his decision properly and to take additional measures to monitor navigation.

Although the pilot decided not to move closer than three cables to the glacier, the distance actually dropped to two cables. This must be attributed to the absence of effective monitoring of the track control.

[9] Even more evident in the photos on Google Earth (and other providers on the Internet).

The bridge crew did not plot a new course in the nautical chart to steer close to the glacier.

Since the route covered by the ship ran parallel to the channel, it seems as if the large windage area created by the ship's superstructure, as well as the wind, which blew at up to 3 kts in the direction of the glacier, could be responsible for approaching the coast.

Drifting would have been easier to identify and avoid if positions had been plotted on the chart at short intervals with the help of the radar to monitor the track and a parallel index line was set on the radar.

Use of the echo sounder should also be mentioned. Although the ship's command gave its assurance that the echo sounder was continuously monitored, nothing can be heard in the audio recordings of the VDR in this regard. It is possible that the grounding incident could have been prevented if the sudden decrease in depth was responded to immediately by the individual who recognised it notifying so that everyone could hear. On top of that, it appears that the echo sounder's audible alarm had still not triggered.

5 CONCLUSIONS

Since the ship's command of the DEUTSCHLAND was aware that it was navigating with a nautical chart that only contained soundings taken in the middle of the fairway, it relied on the pilot to sail the ship closer to the glacier. Fortunately, the hull was not severely damaged because the speed was heavily reduced on the advice of the pilot. The possible consequences of a shipwreck at winter temperatures and far away from any civilisation for the 443 people on board is something one would rather not envisage.

In this context, it is important to draw attention to Regulation VIII/2 in Part A of the STCW Code.[10] The relevant regulations (numbers 5-7) are as follows:

"**5 Planning prior to each voyage**
Prior to each voyage, the master of every ship shall ensure that the intended route from the port of departure to the first port of call is planned using adequate and appropriate charts and other nautical publications necessary for the intended voyage, containing accurate, complete and up-to-date information regarding those navigational limitations and hazards which are of a permanent or predictable nature and which are relevant to the safe navigation of the ship.

6 Review and plotting the planned route on nautical charts
After reviewing the route planning, taking into consideration all pertinent information, the planned route shall be clearly plotted on appropriate nautical charts. These nautical charts shall be continuously available to the officer in charge of the navigational watch, who shall review each course to be followed prior to using it during the voyage.

7 Deviation from planned route
If a decision is made, during a voyage, to change the next port of call of the planned route, or if it is necessary for the ship to deviate substantially from the planned route for other reasons, then an amended route shall be planned prior to deviating substantially from the route originally planned."

It is possible that the grounding incident would have been avoided if those recommendations were complied with.

Lastly, it must also be accepted that usually the consequences of a melting glacier are not known. At any rate, the ship's command of the DEUTSCHLAND could not be expected to know about the debris left by the melting glacier below the water surface.

The BSU would like to thank the ship's command, the owner, the Chilean pilots and the Chilean maritime authorities for their excellent cooperation during the review of the incident; this report will certainly contribute to the prevention of such incidents in the future.

[10] Annex to the STCW Convention

6 SAFETY RECOMMENDATIONS

The following safety recommendations do not constitute a presumption of blame or liability in respect of type, number or sequence.

6.1 Deilmann (owner)

The Federal Bureau of Maritime Casualty Investigation recommends that the owner, Deilmann, urge its ship's command to comply with the procedures defined by the owner and the ISM Code by not taking any unnecessary risks.

6.2 Ship's command of the MV DEUTSCHLAND

The Federal Bureau of Maritime Casualty Investigation recommends that the ship's command of the MV DEUTSCHLAND desist from taking unnecessary risks and, where applicable, give the safety of passengers greater priority than their wishes.

6.3 Ship's commands that sail in Chilean waters

The Federal Bureau of Maritime Casualty Investigation recommends that any ship's command that sails in Chilean waters pay close attention to the information given on the nautical charts and navigate accordingly, as well as avoid sea areas where soundings are insufficient.

6.4 Hydrographic and Oceanographic Service of the Chilean Navy (Servicio Hidrográfico y Oceanográfico de la Armada de Chile)

The Federal Bureau of Maritime Casualty Investigation recommends that SHOA keep its nautical charts as current as possible. In particular, Nautical Chart SHOA 12700 should be revised as soon as possible. Even a statement (in English) that the chart is based on a local datum and thus not compatible with other WGSs would be helpful. Moreover, attention should be drawn to shallows, especially on the coastline of glaciers.
Due to the constant geomorphological changes as a function of global warming, it could be helpful to warn against approaching the shoreline of glaciers.

6.5 Chilean pilot

The Federal Bureau of Maritime Casualty Investigation recommends that pilots discourage masters who sail the Chilean channels from taking unnecessary navigational risks, and give the highest priority to the safety of passengers, crews, cargo, and the environment wherever possible when advising them.

7 SOURCES

- Investigations by the Directorate General of the Maritime Territory and Merchant Marine of the Republic of Chile, DIRECTEMAR
- Written statements
  - Ship's command
  - Owner
  - Pilot
- Witness accounts
- Technical paper of the BSH
- Nautical charts and ship particulars, Federal Maritime and Hydrographic Agency (BSH)
- Wikipedia: http://en.wikipedia.org/wiki/Ice_front, http://en.wikipedia.org/wiki/World_Geodetic_System
- Hydrographic Institute of Portugal (http://websig.hidrografico.pt/website/icenc/viewer.htm)