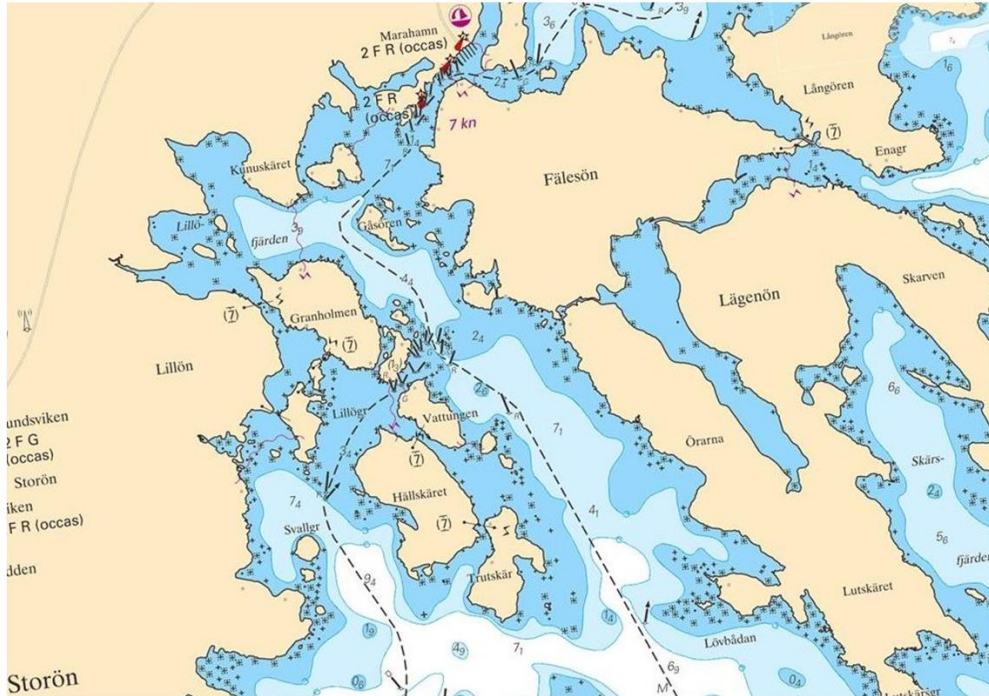


# Baltic Sea Chart Datum 2000 – a common reference level for nautical charts and sea level information in the Baltic Sea



2019-06-12 BOOS Annual meeting, Rostock

Thomas Hammarklint [Thomas.Hammarklint@sjofartsverket.se](mailto:Thomas.Hammarklint@sjofartsverket.se)





# BALTIC SEA HYDROGRAPHIC COMMISSION



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## The Baltic Sea Hydrographic Commission,

which is an integral part of the International Hydrographic Organisation (IHO), promotes the technical co-operation in the domain of hydrographic surveying, marine cartography and nautical information among the neighboring countries of the Baltic Sea region.

The main objectives of the Commission are the coordination of the production of the Baltic Sea INT Charts, the coordination of hydrographic re-surveys, harmonization of chart datums, harmonization of Baltic Sea ENCs, and the exchange of information and the harmonization of practices with regard to various issues related to hydrography.

The most recent development is the [Baltic Sea Bathymetric Database](#) – accessible via this portal.

## International Hydrographic Organization

The International Hydrographic Organization is an intergovernmental consultative and technical organization that was established in 1921 to support safety of navigation and the protection of the marine environment.

The object of the Organization is to bring about:

- The coordination of the activities of national hydrographic offices
- The greatest possible uniformity in nautical charts and documents
- The adoption of reliable and efficient methods of carrying out and exploiting hydrographic surveys
- The development of the sciences in the field of hydrography and the techniques employed in descriptive oceanography

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# BALTIC SEA HYDROGRAPHIC COMMISSION



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## BSHC Chart Datum Working Group

"To implement a common reference level in the Baltic Sea"



Photo: Chart Datum Working Group 11th meeting, 5-6 February 2019, Aalborg, Denmark

The CDWG plans to have its next meeting (CDWG12)  
3-4 March 2020 in Gdansk, Poland

<http://www.bshc.pro/working-groups/cdwg>

### Members of CDWG:

Denmark PhD Joanna Gerlings  
Denmark Mr Philip Sigaard Christiansen  
Estonia Mrs Gabriela Kotsulim  
Finland Mr Jyrki Mononen  
Finland Mrs Janina Tapia Cotrino  
Germany Dr Patrick Westfeld  
Latvia Mr Armands Murans  
Lithuania Mr Mindaugas Zakarauskas  
Poland Cdr Sławomir Lipiński  
Poland Mr Witold Stasiak  
Russia Capt S. Travin  
Russia Mr Leonid Shalnov  
Russia Dr Sergey V. Reshetniak  
Sweden Mr Thomas Hammarklint (Chair)  
Sweden Mr Lars Jakobsson  
Sweden Mr Henrik Tengbert

### Representative of BOOS:

Sweden Mr Thomas Hammarklint

### Observers:

Finland Mrs Mirjam Bilker-Koivula  
Finland Mrs Anni Montonen  
Germany Dr Gunter Liebsch  
Norway Mr Aksel Voldsund  
Sweden Dr Martin Lidberg  
Sweden Dr Jonas Ågren  
Sweden Dr Per-Anders Olsson  
Sweden Mr Mikael Stenström

The BSHC18 (September 2013)  
decided to continue CDWG  
work and wished the  
harmonized Baltic Sea vertical  
reference to be implemented.



# Baltic Sea Chart Datum 2000 (BSCD2000)

## ➤ **Justification:**

The Baltic Sea is an international shallow, non-tidal area in the northern part of Europe with dense traffic. IHO BSHC has approved the name and the adoption of the Baltic Sea Chart Datum 2000.

## ➤ **Definition:**

The datum refers to each Baltic country's realization of the European Vertical Reference System (EVRS) with land-uplift epoch 2000, which is connected to the Normaal Amsterdams Peil (NAP).

## ➤ **Height systems used as national realization of BSCD2000 (EVRS-based):**

Sweden	RH2000	Denmark	DVR90
Germany	DHHN2016?	Poland	PL-EVRF2007-NH
Lithuania	LAS07	Latvia	LAS2000,5
Estonia	EH2000	Finland	N2000

## ➤ **Chart datum name to be shown in paper charts:**

Mean Sea Level (Baltic Sea Chart Datum 2000<sup>national realization name</sup>)

or

Mean Sea Level (Baltic Sea Chart Datum 2000)



# BSCD2000 is now included in IHO Geospatial Information (GI) Registry, as chart datum number 44:



## FCD Register

- Domain: 
 - Item Type: 
 - Status:

- Search:

Details		Management Details	
Item Type :	Enumerated	Proposal Type :	Addition
Domain :	IHO Hydro	Submitting Organization :	SMÅ
Associated Attribute :	<input type="text" value="verticalDatum (Valid)"/>	Proposed Change :	Addition of an enumerated value for verticalDatum.
EnumeratedName:	Baltic Sea Chart Datum 2000	Justification :	The Baltic Sea is an international shallow, non-tidal area in the northern part of Europe with dense traffic. IHO IISHC has approved the name and the adoption of the Baltic Sea Chart Datum 2000.
Enumerated Value Code Number :	44	Proposed :	2018-10-17
Enumerated Value Code In Use :		Accepted :	2018-10-18
Alias :	Unspecified	Amended :	-
CamelCase :	balticSeaChartDatum2000	Successors :	-
Definition :	(BSCD2000) - the datum refers to each Baltic country's realization of the European Vertical Reference System (EVR5) with land-uplift epoch 2000, which is connected to the Normal Amsterdam Peil (NAP).	Predecessors :	-
Reference :	Baltic Sea Hydrographic Commission		
Definition Source :	Unspecified		
Similarity to Source :	Unspecified		
Int1 :	<input type="text" value=""/>		
S4 :	<input type="text" value=""/>		
Remarks :	Unspecified		



# Swedish Chart Improvement project



Mean Sea Level (Baltic Sea Chart Datum 2000<sup>RH2000</sup>)



# Plan for transition from MSL to BSCD2000 in nautical charts

Updated 2019-04-08





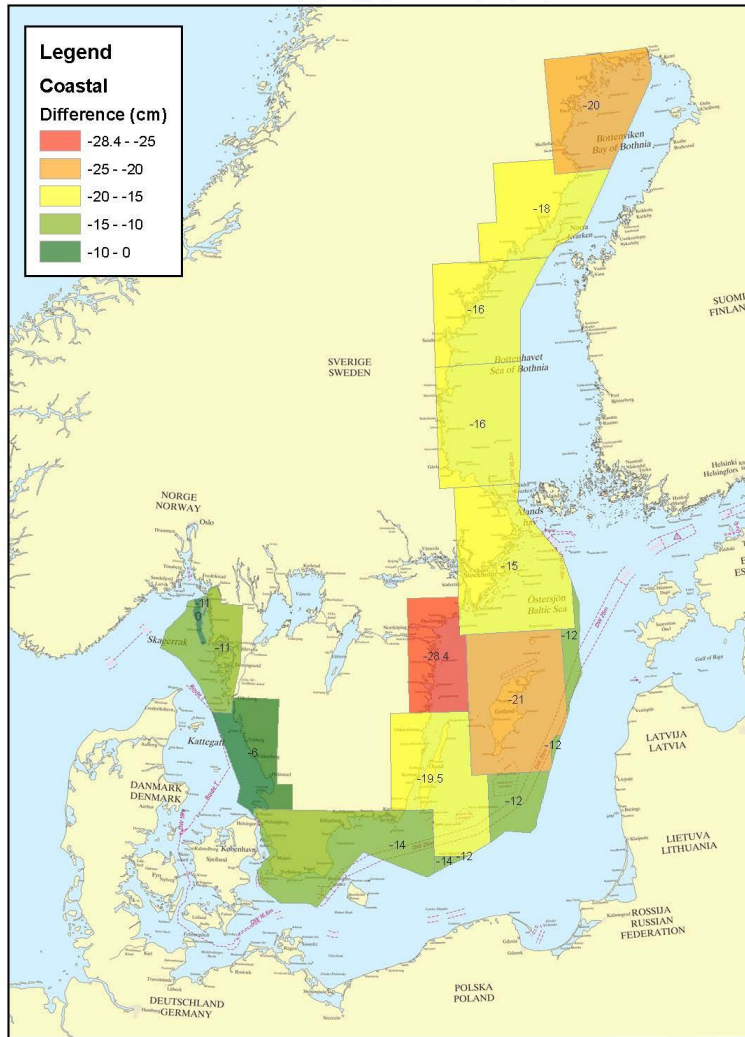
# Difference between present chart datum and BSCD2000

Annex 1 To Questionare, BSHC CDWG

Page 2 (4)

## Difference between existing chart datum and RH 2000 - Coastal

Swedish Maritime Administration, Hydrographic Office, May 16, 2013

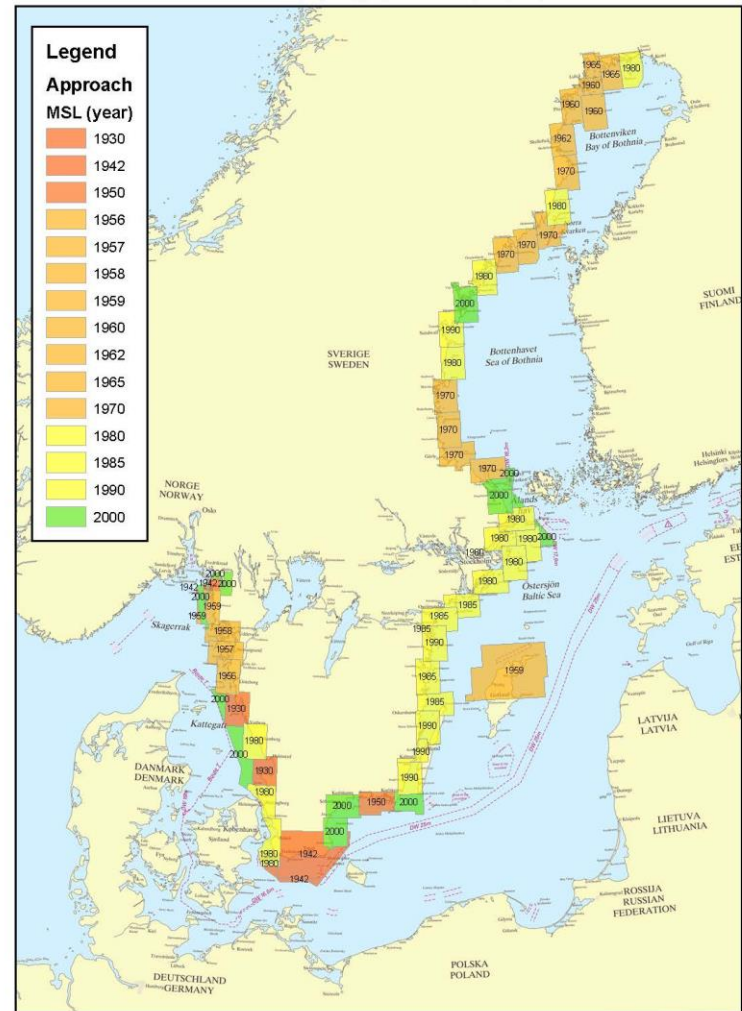


Annex 1 To Questionare, BSHC CDWG

Page 3 (4)

## Year of MSL in Swedish chart database - Approach (Swedish water)

Swedish Maritime Administration, Hydrographic Office, May 16, 2013

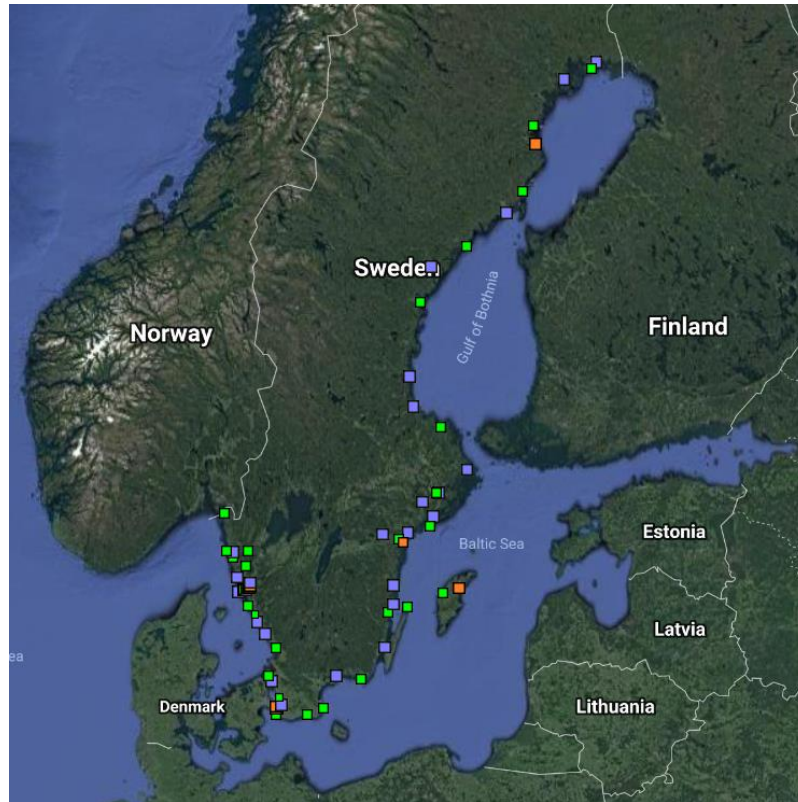




# Swedish Sea Level Network (SHIP)



Co-financed by the European Union  
Connecting Europe Facility



- Real-time data in BSCD2000 from 59 stations
- 1-minute values with 1 cm accuracy
- Real-time and delayed mode quality control

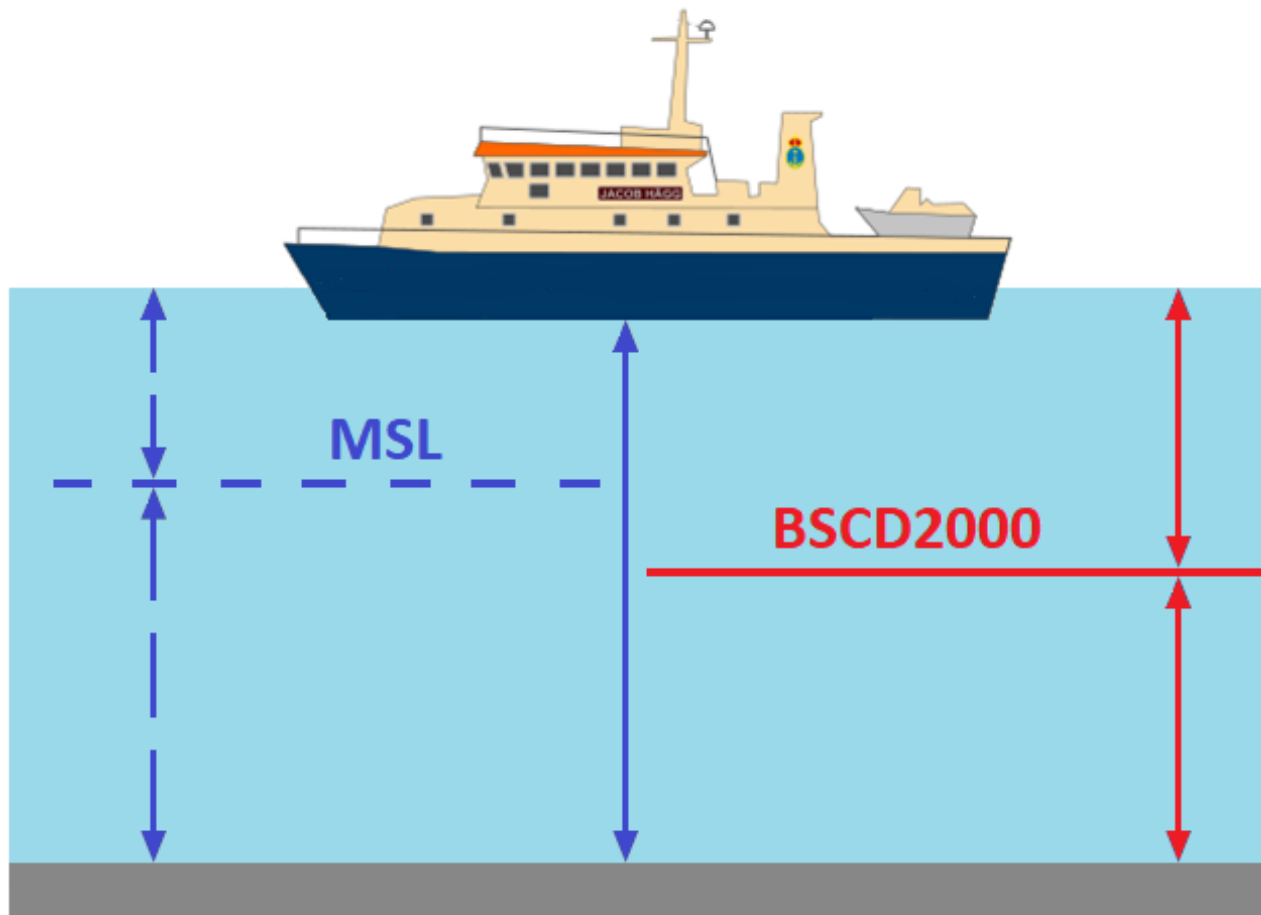


Class I	Upgrade with battery backup	27 stations (24 SMHI + 3 SMA)
Class II	Upgrade without battery backup	26 stations (26 SMA)
Class III	Unchanged, temporary	6 stations (6 SMA)

**SMHI**



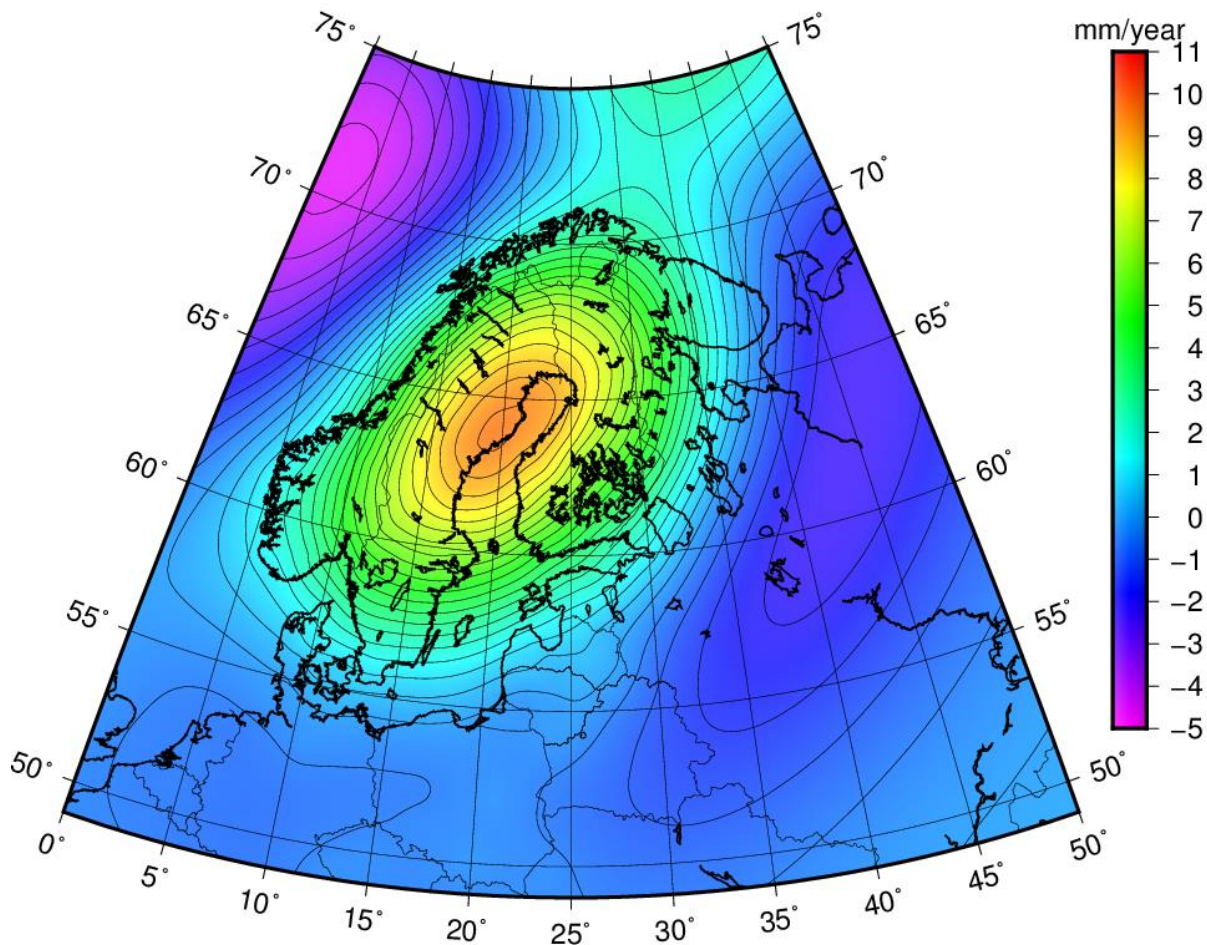
# New reference datum for sea level



**The water depth remains!**



# The land-uplift lowers the mean sea level

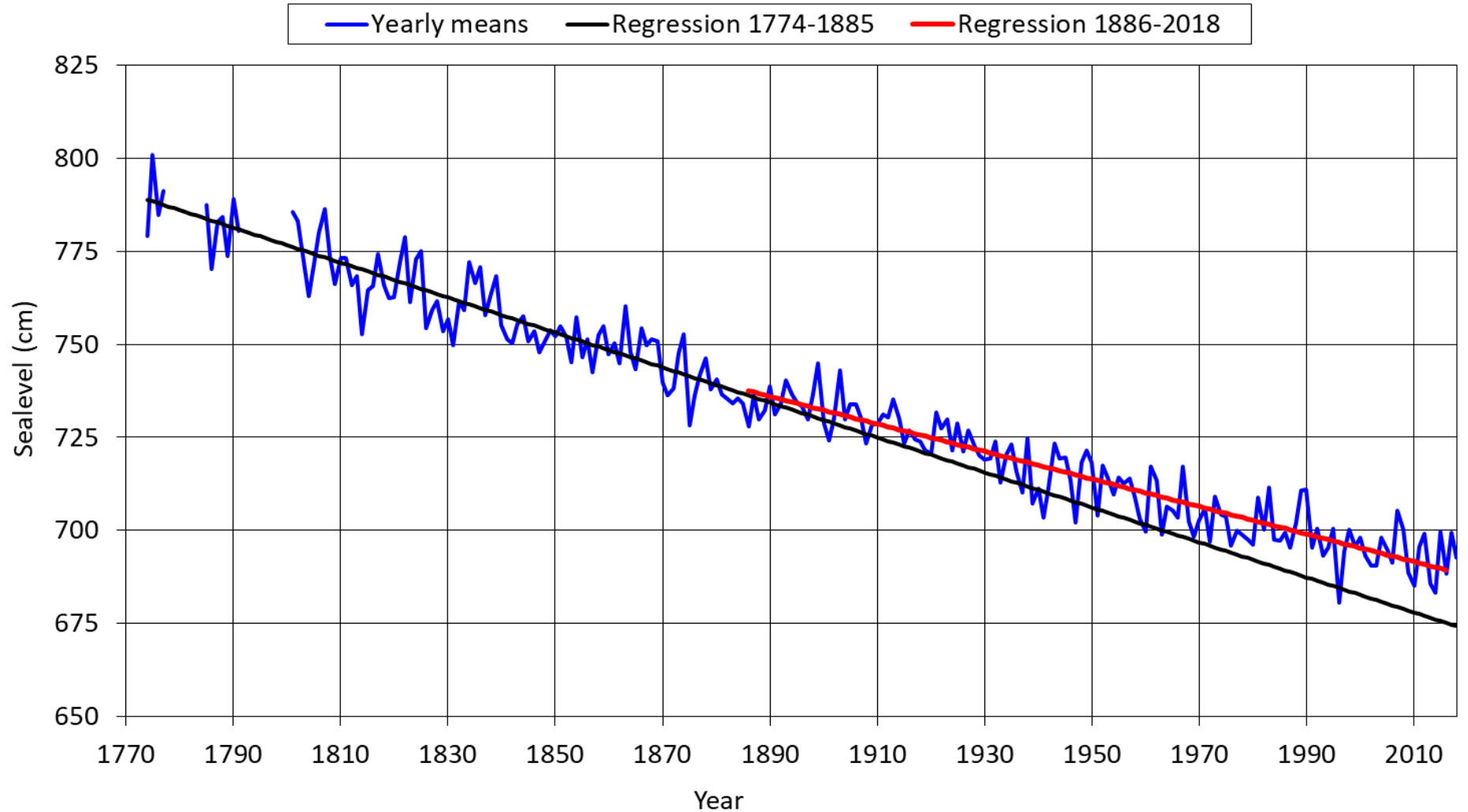




# Stockholm

## "World's longest sealevel record"

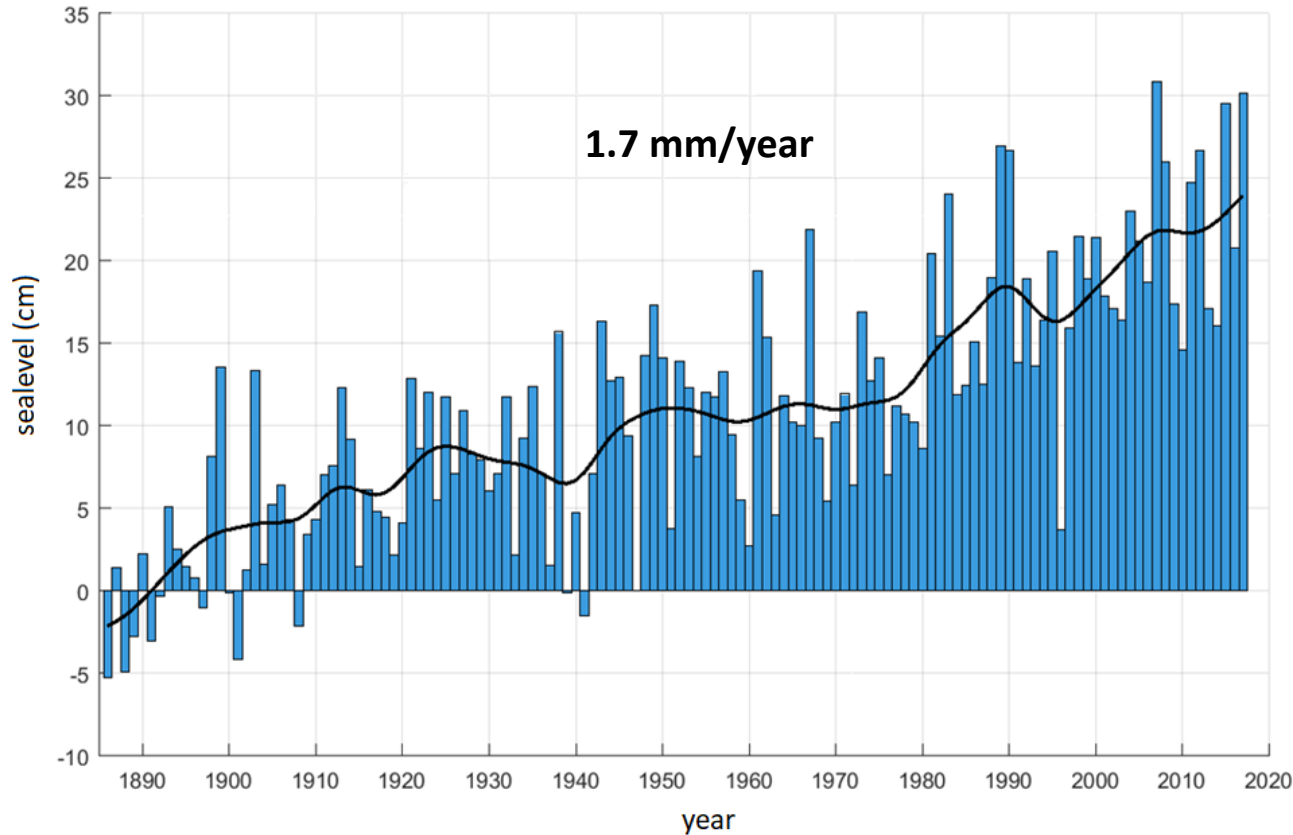
### Sealevel Stockholm 1774 - 2018



# The sea level rise raises the mean sea level

**SMHI**

Sea level rise 1886 - 2017

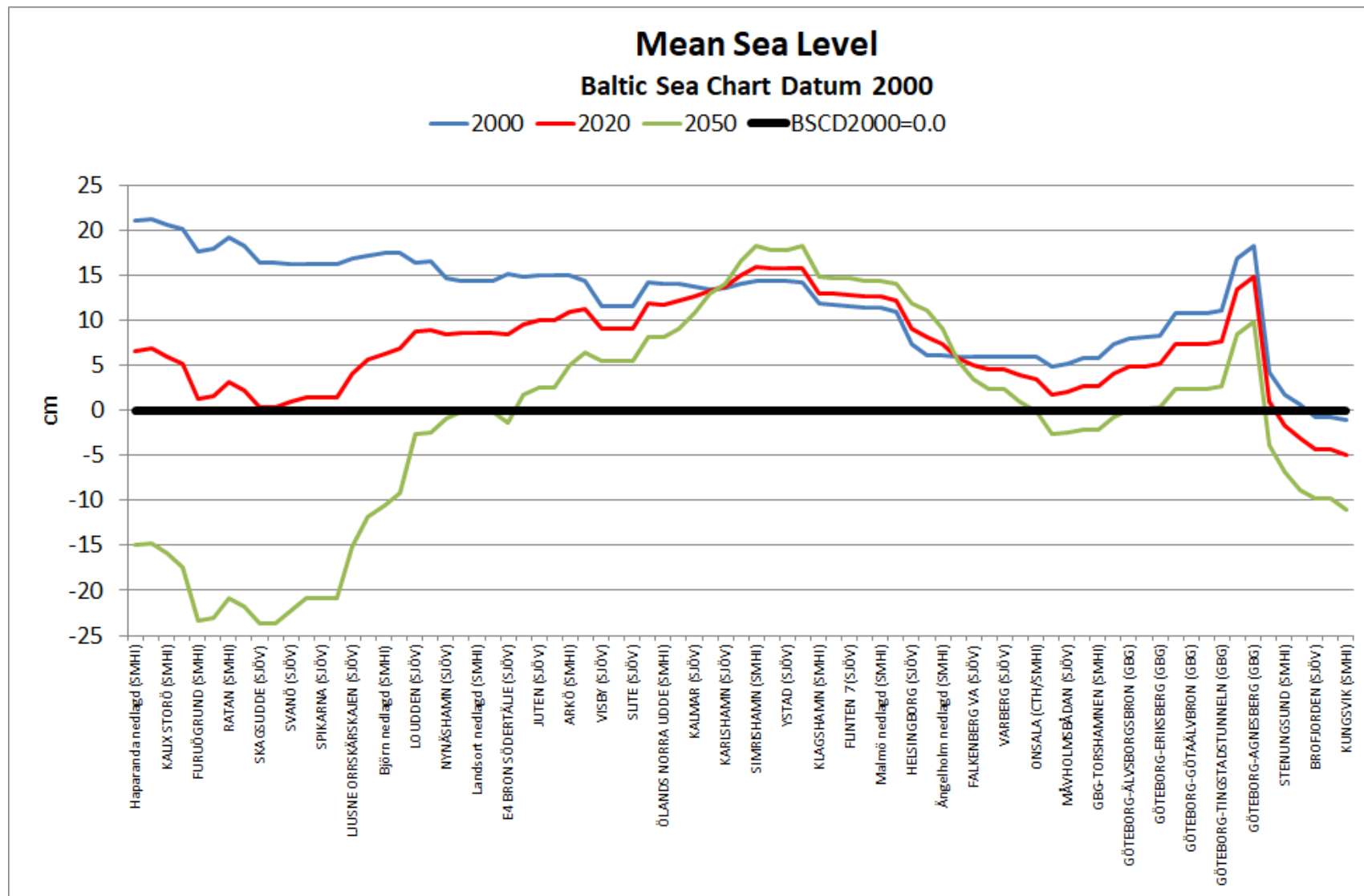


Analysis of 14 Swedish sealevel records since 1886

Sealevel corrected for the levelled land-uplift (glacial isostatic adjustment)

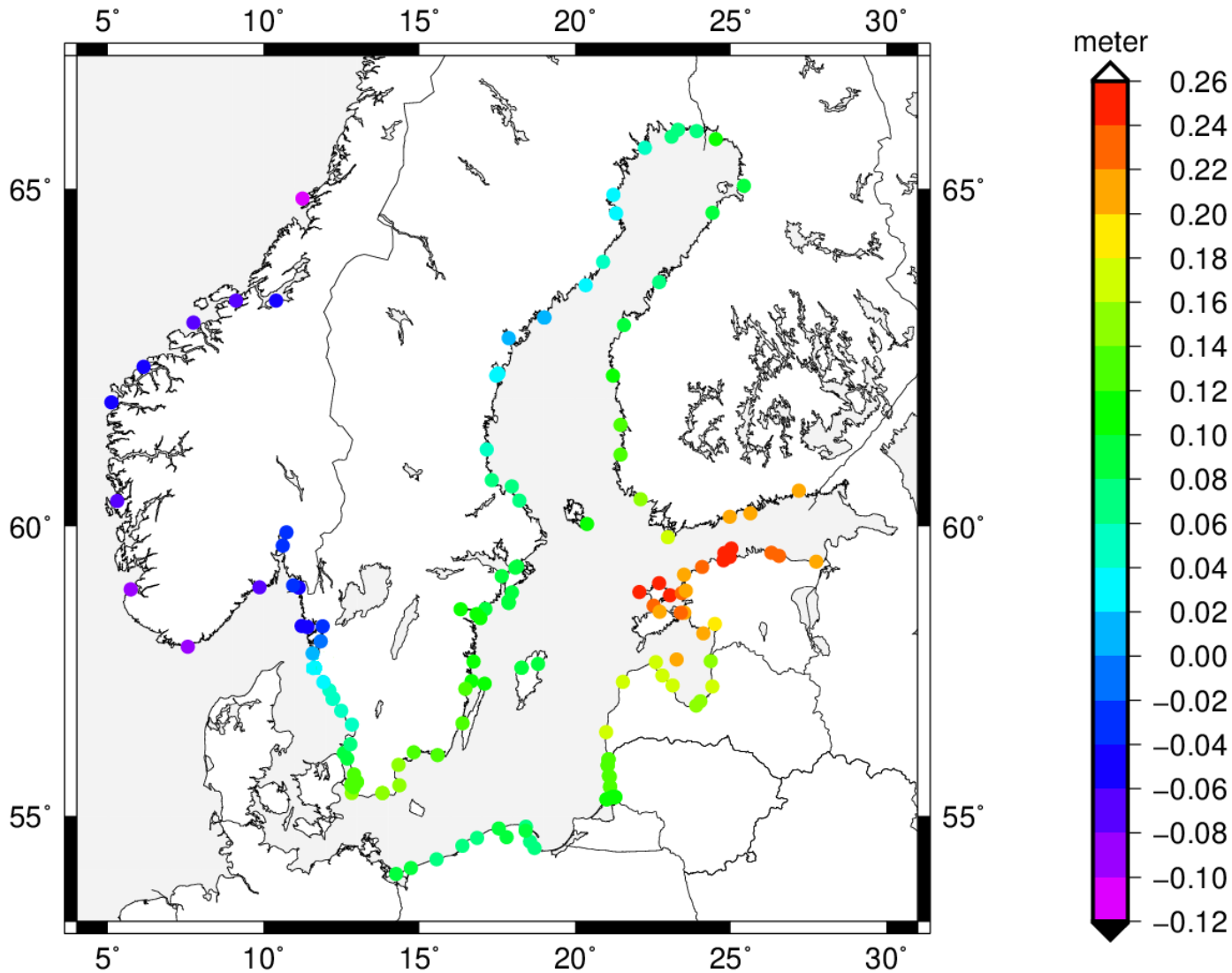


# Changing mean sea level



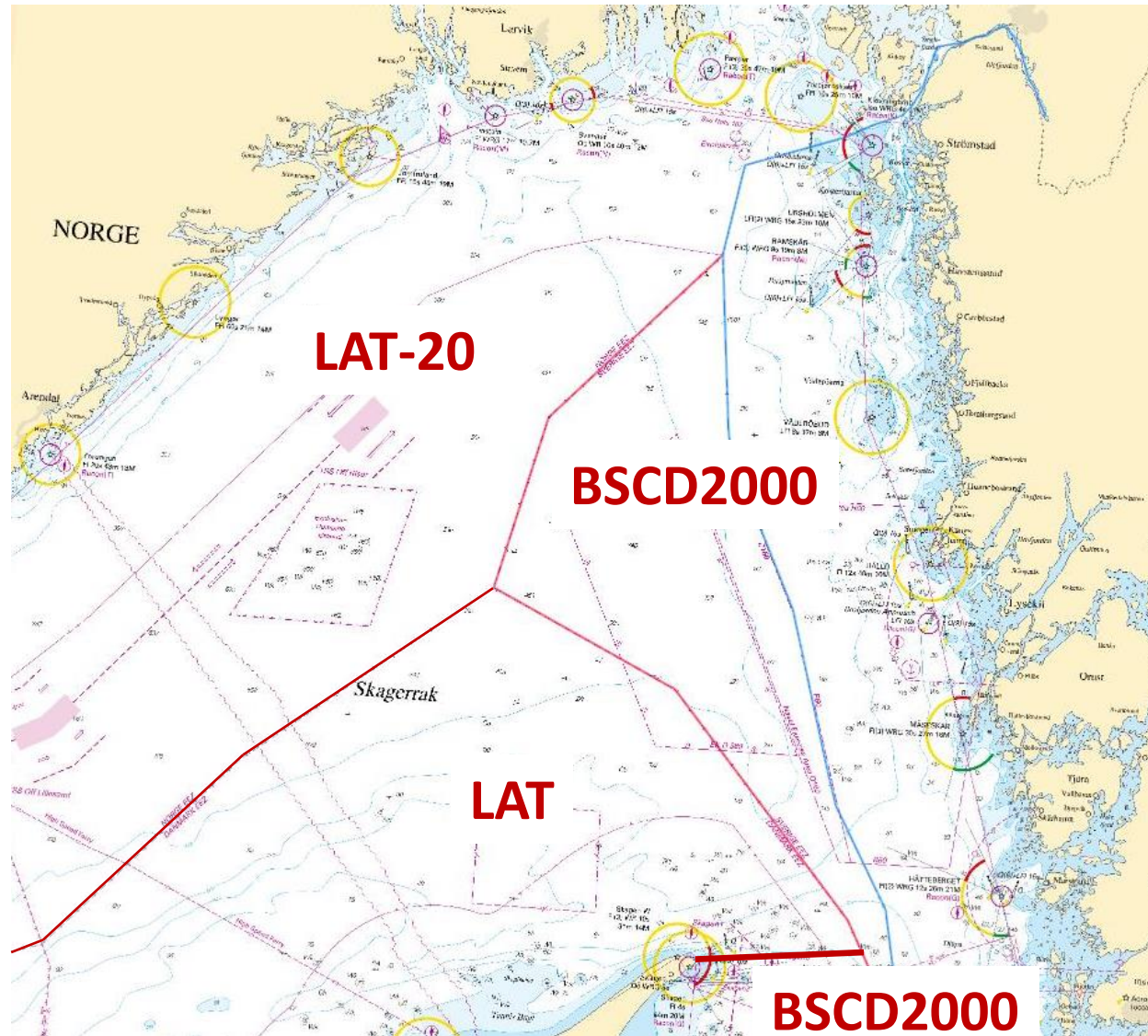


# MSL 2019 in BSCD2000



# Reference datums in Skagerrack

- Norwegian chart datum (LAT-20) ca 50-60 cm below BSCD2000
- Danish LAT ca 20 cm below BSCD2000



# Sweden has changed reference system

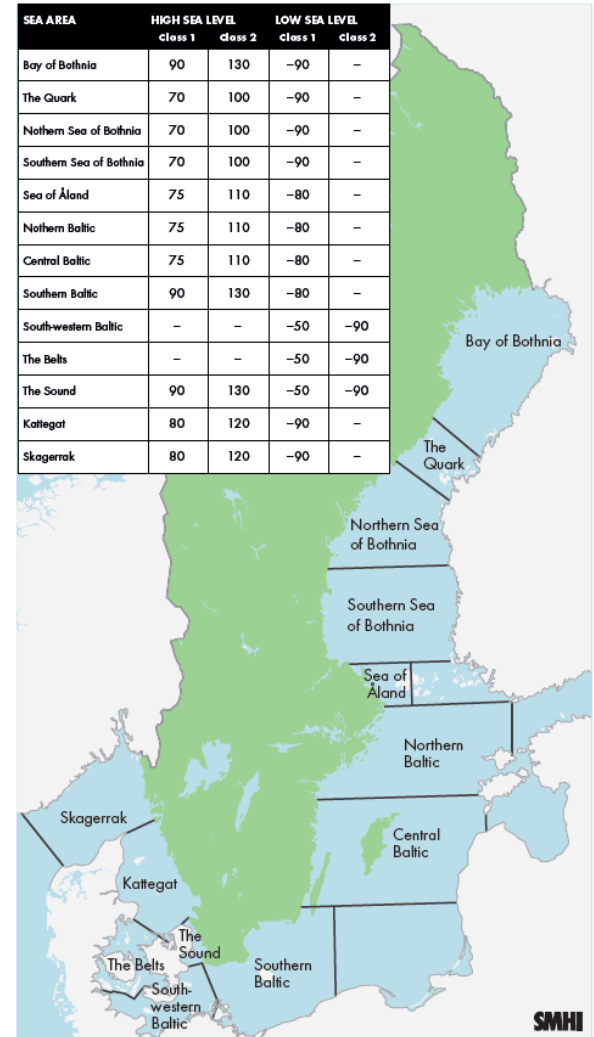
Swedish Maritime Administration (SMA) and Swedish Meteorological and Hydrological Institute (SMHI) will present sea level data relative BSCD2000 from 3rd June 2019





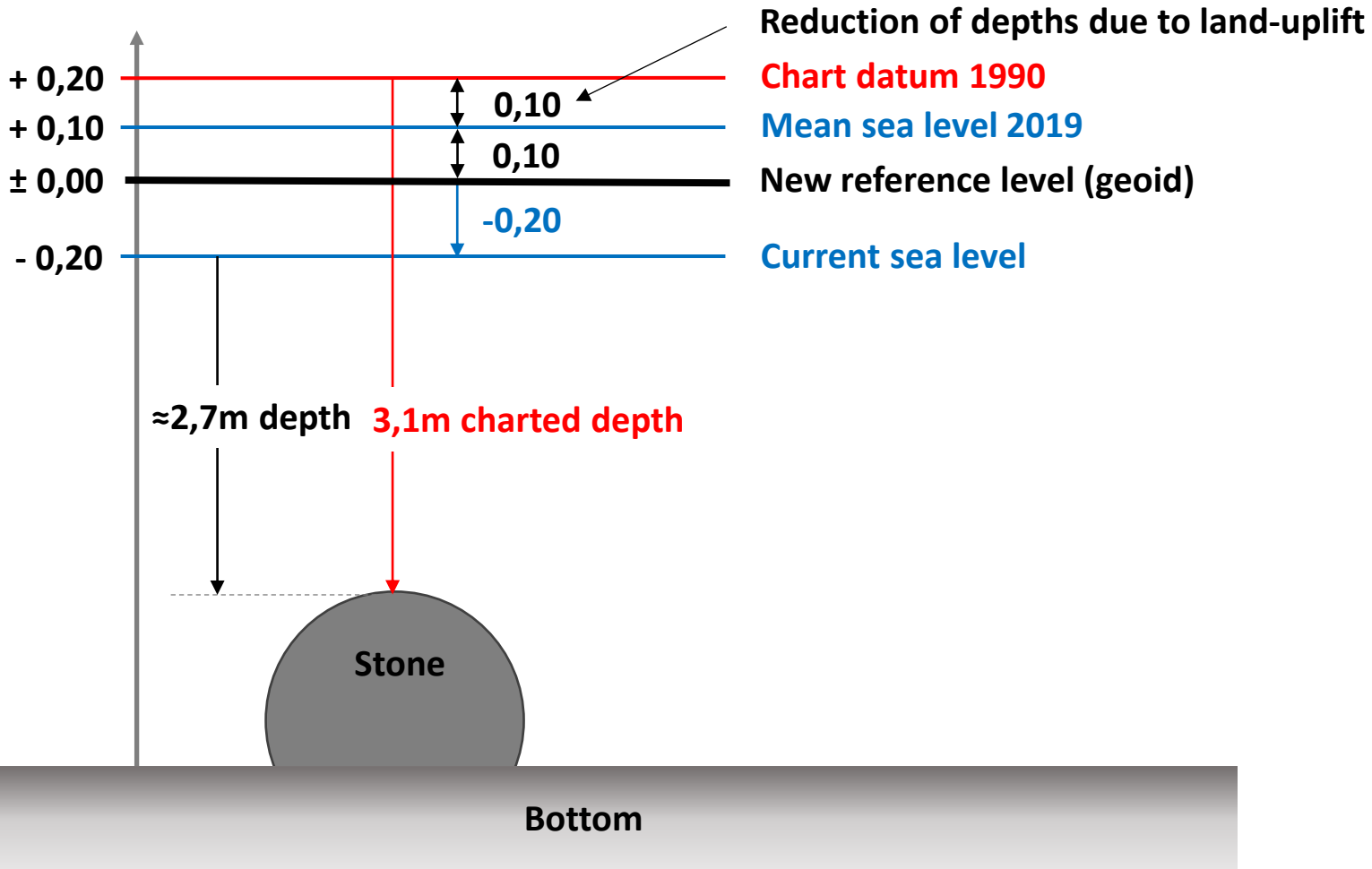
# SMHI oceanographic warning and forecasting service

- An ongoing transition to BSCD2000 (RH 2000) at SMHI -> forecasts, warnings and information about current sea level will be issued in BSCD2000
- Warning levels have been adjusted from MSL to BSCD2000
- **2019-06-03:** Warnings for high and low sea level will be issued in BSCD2000

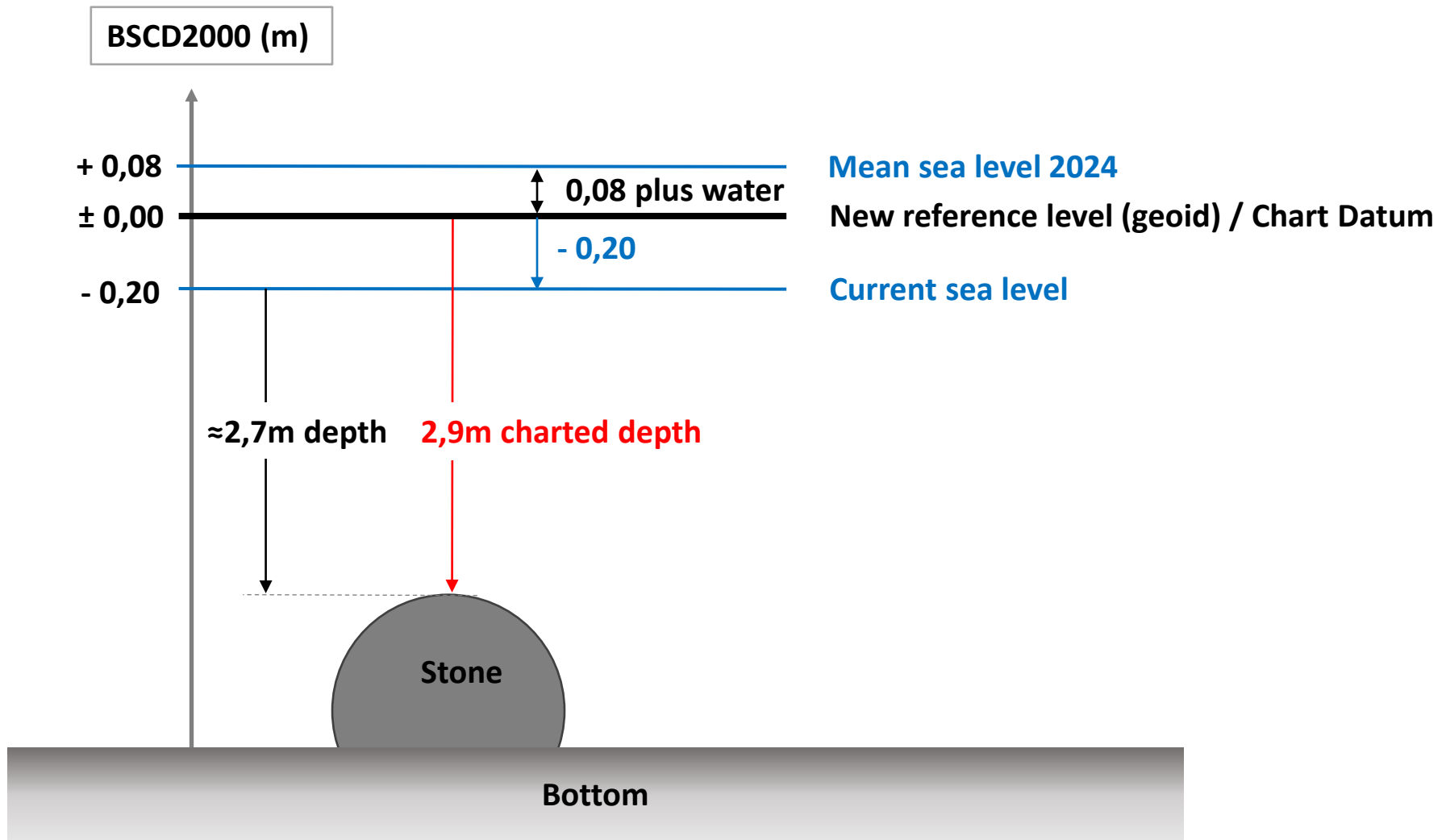


# Present situation (June 2019)

BSCD2000 (m)



# Future situation (2024)



# Notices to mariners

Example from Sweden, 2019-04-18

<http://www.sjofartsverket.se/UfsPdf/751EN.pdf>

2019-04-18

3

No 751

## ANNOUNCEMENTS

\* 13917

**New reference system for sea level, nautical charts and warnings. BSCD 2000.**

See: 2018:716/13140

On June 3, 2019, Sweden's national reference system for heights and depths will be changed to the 'Rikets Höjdsystem 2000', or RH 2000. (International name Baltic Sea Chart Datum 2000, BSHC 2000)

The zero level in RH 2000 is fixedly linked to land, and is not affected by land uplift, changes in sea level or geographical variations.

The change means that observations, forecasts, and warnings in the Swedish Maritime Administration's and Swedish Meteorological and Hydrological Institute's (SMHI) viewing services from 3 June 2019 refer to the new reference level and no longer to the 'mean sea level'.

The Swedish Maritime Administration is gradually adapting the charts to the new reference system. This is a time consuming process. During the transition period, it is important to know which reference system is used in the different charts. If the text "Baltic Sea Chart Datum 2000", or "BSCD2000" is printed in the chart, the update has been performed.

More information: [www.sjofartsverket.se/RH2000](http://www.sjofartsverket.se/RH2000) and [www.smhi.se](http://www.smhi.se)

[www.sjofartsverket.se/RH2000](http://www.sjofartsverket.se/RH2000)

[www.smhi.se](http://www.smhi.se)

SMHI och Sjöfartsverket. Publ. 18 april 2019





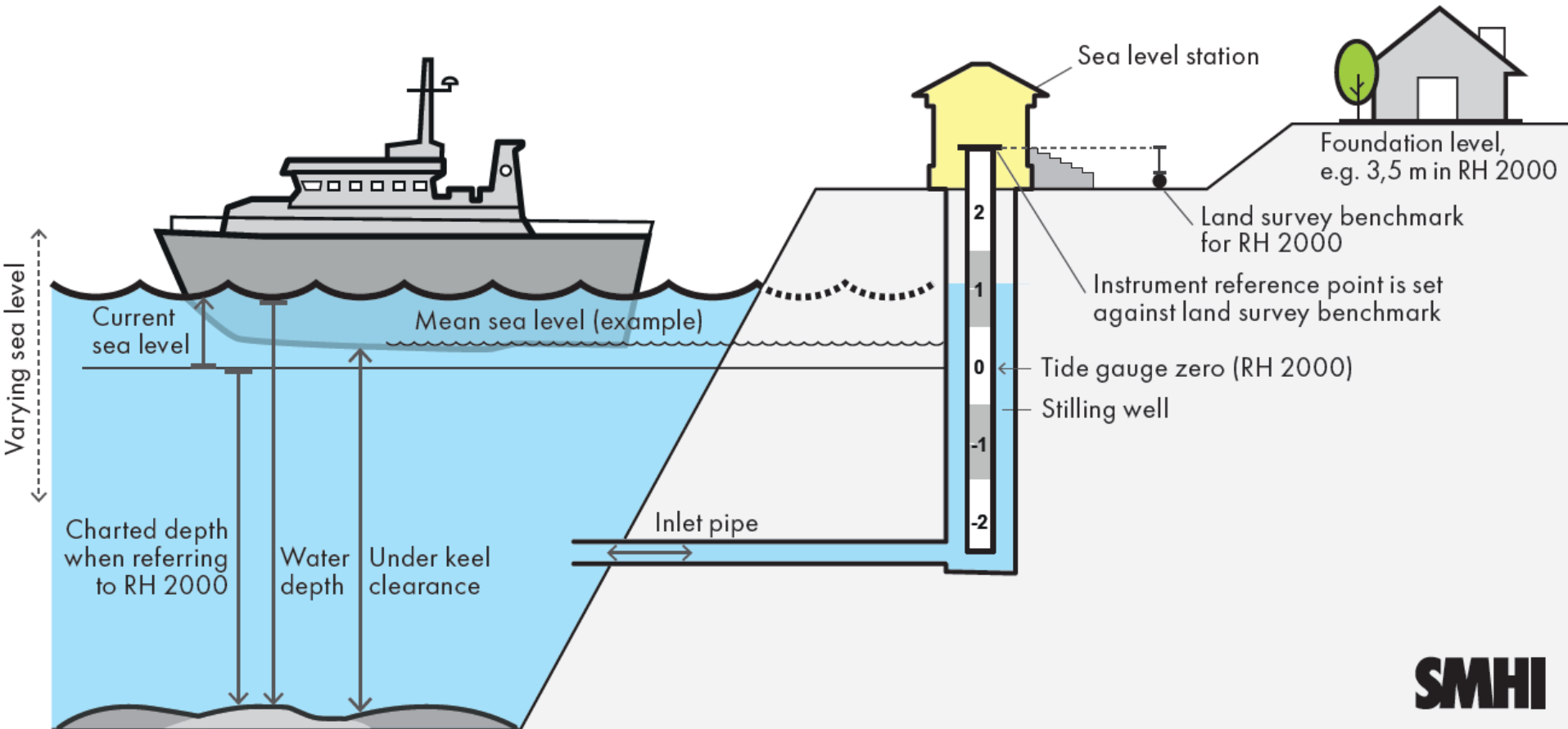
# New info sheet about the transition to BSCD2000 as the new reference level for sea level, nautical charts and warnings

[Svensk](#)

[English](#)



# A uniform reference system from land to sea



**SMHI**



**Thank you!**



Thomas Hammarklint  
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