

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



2020-02-05 TWG23 meeting, Reykjavik

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# BALTIC SEA HYDROGRAPHIC COMMISSION



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## The Baltic Sea Hydrographic Commission,

which is an integrant 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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## 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 will have its next meeting (CDWG12)  
3-4 March 2020 in Gdynia, Poland

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

### Members of CDWG:

Denmark Mr Peter Ladegård Sørensen  
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. Gennadiy Nepomiluev  
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)

## ➤ 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).

## ➤ 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.

## ➤ 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:

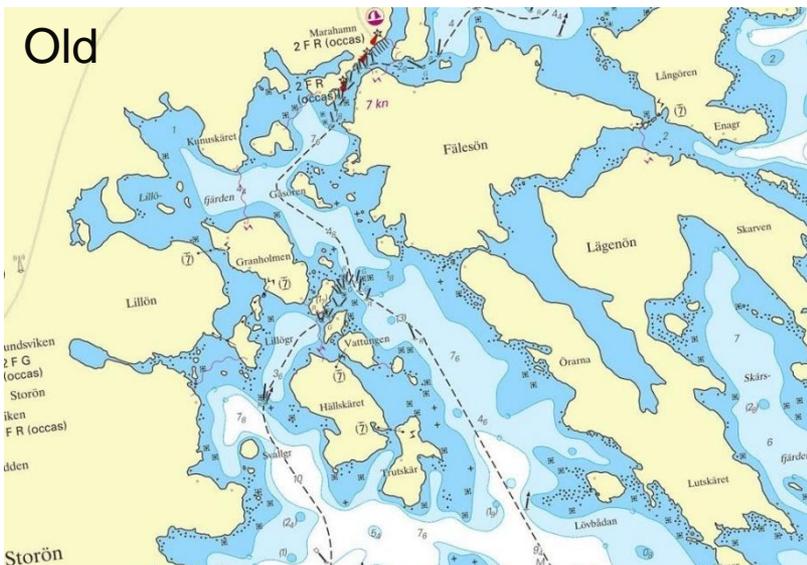
- Search:

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 IHO-ENC 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).	Predecessor :	-
Reference :	Baltic Sea Hydrographic Commission		
Definition Source :	Unspecified		
Similarity to Source :	Unspecified		
Int1 :	<input type="text" value=""/>		
S4 :	<input type="text" value=""/>		
Remarks :	Unspecified		

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# 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



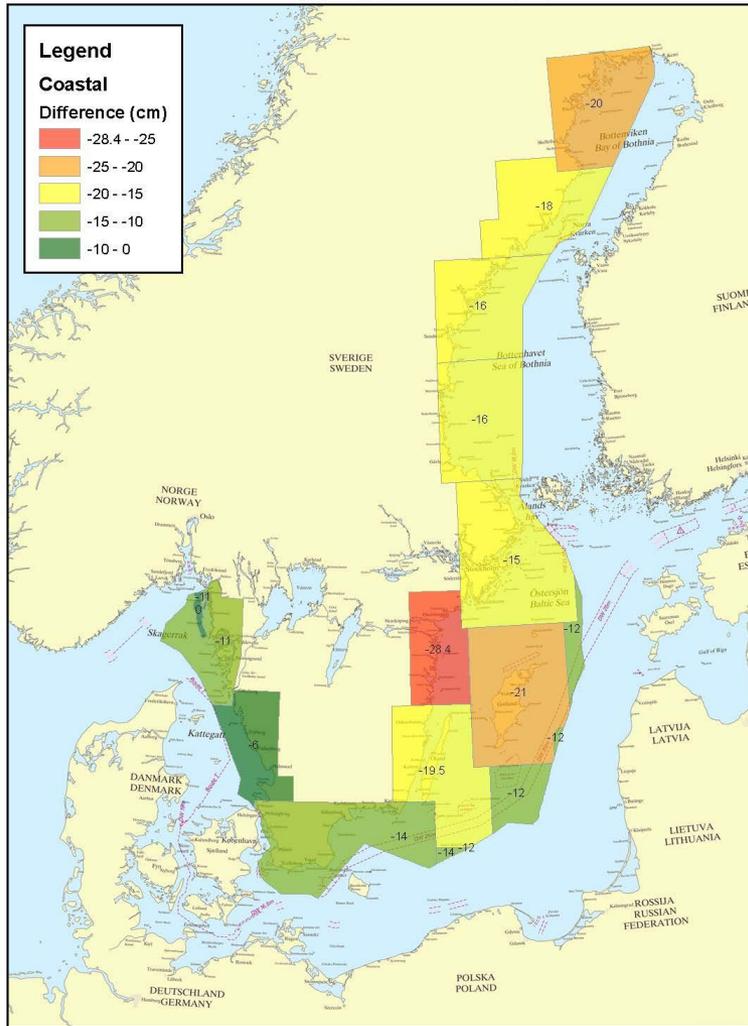
# Difference between present chart datum and BSCD2000

Annex 1 To Questionare, BSHC CDWG

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

Swedish Maritime Administration, Hydrographic Office, May 16, 2013

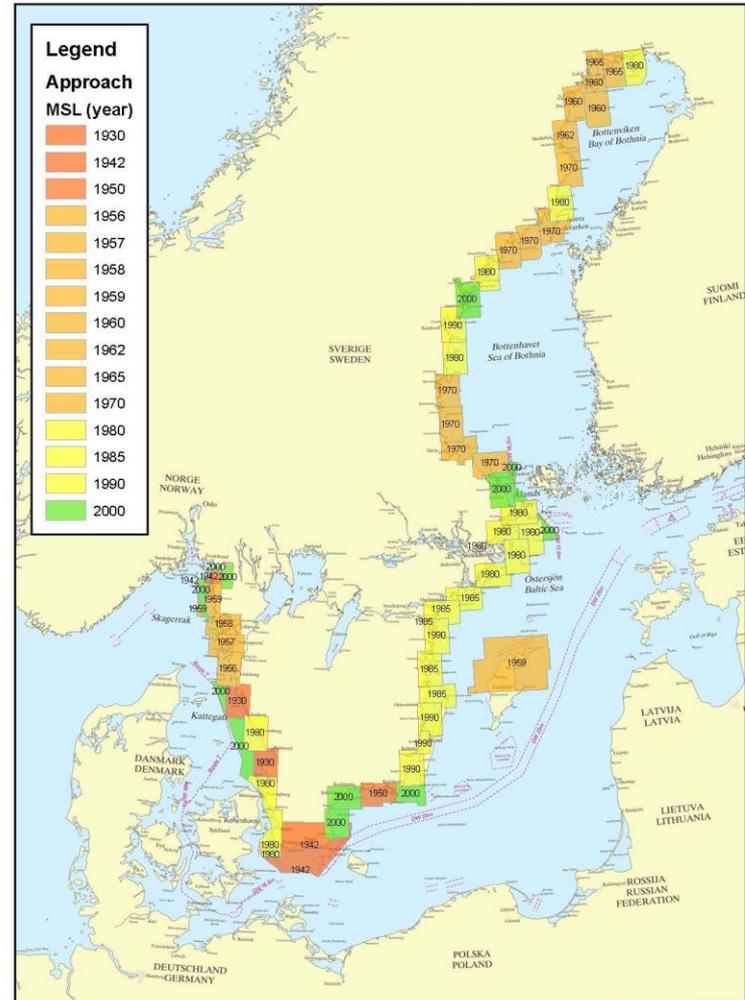


Annex 1 To Questionare, BSHC CDWG

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

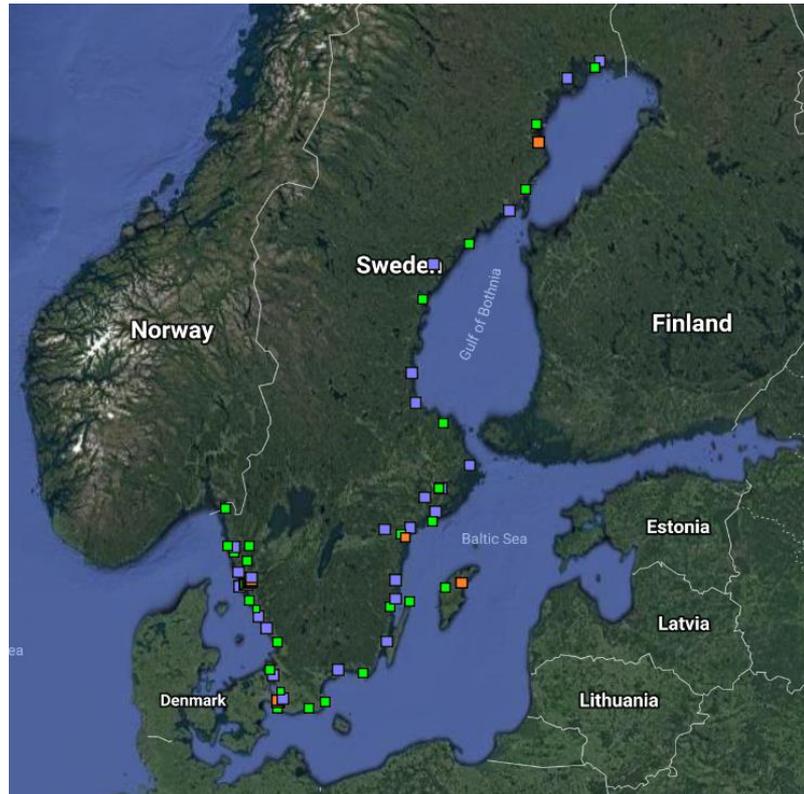
Swedish Maritime Administration, Hydrographic Office, May 16, 2013



# Swedish Sea Level Network



Co-financed by the European Union  
Connecting Europe Facility



- Real-time data in BSCD2000 from 60 stations
- 1-minute values with 1 cm accuracy
- Real-time and delayed mode quality control



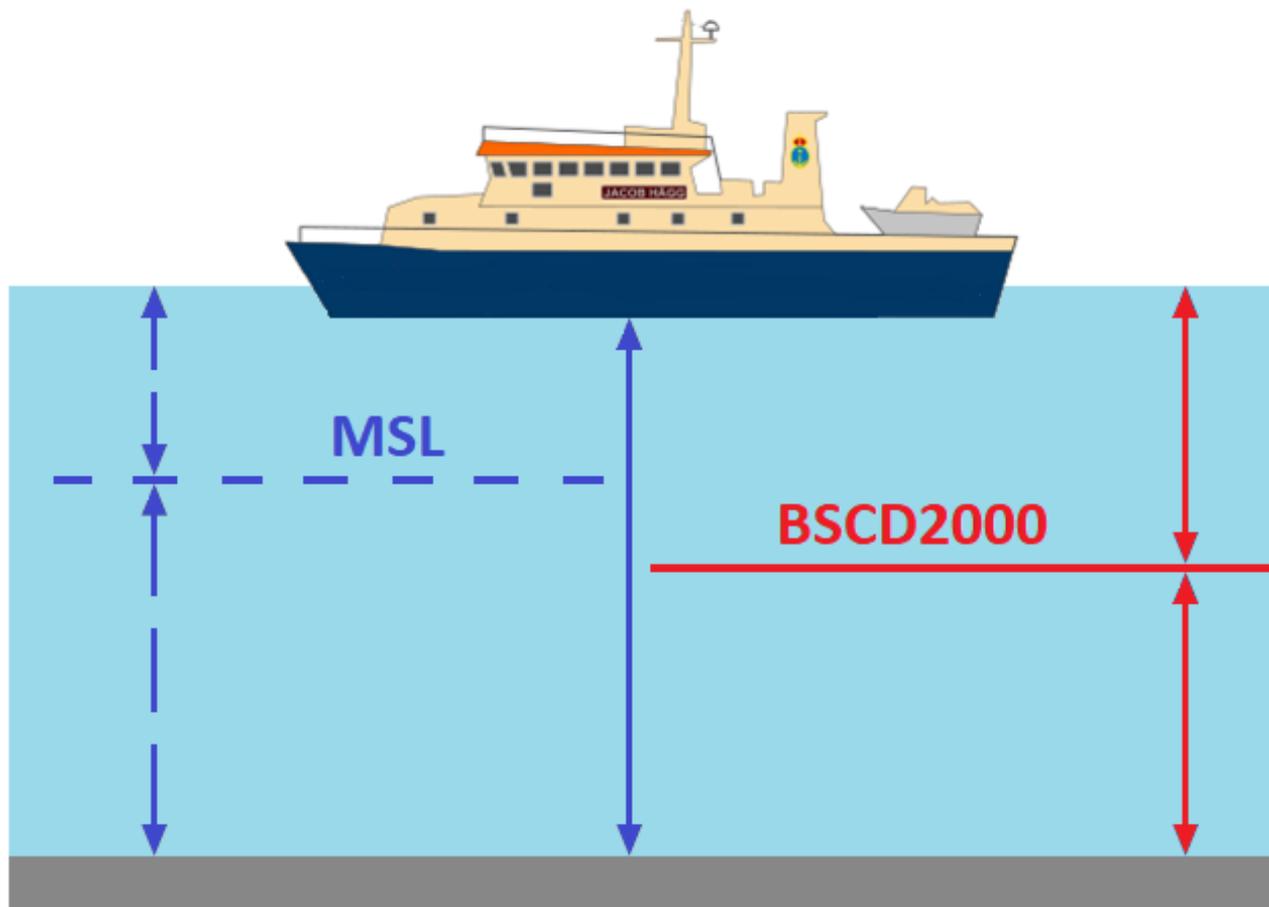
- Class I Upgrade with battery backup
- Class II Upgrade without battery backup
- Class III Unchanged, temporary

- 26 stations (22SMHI, 3SMA, 1CTH)
- 26 stations (22SMA, 1SKB, 3GBG)
- 8 stations (5SMA, 2GBG, 1GU)

**SMHI**



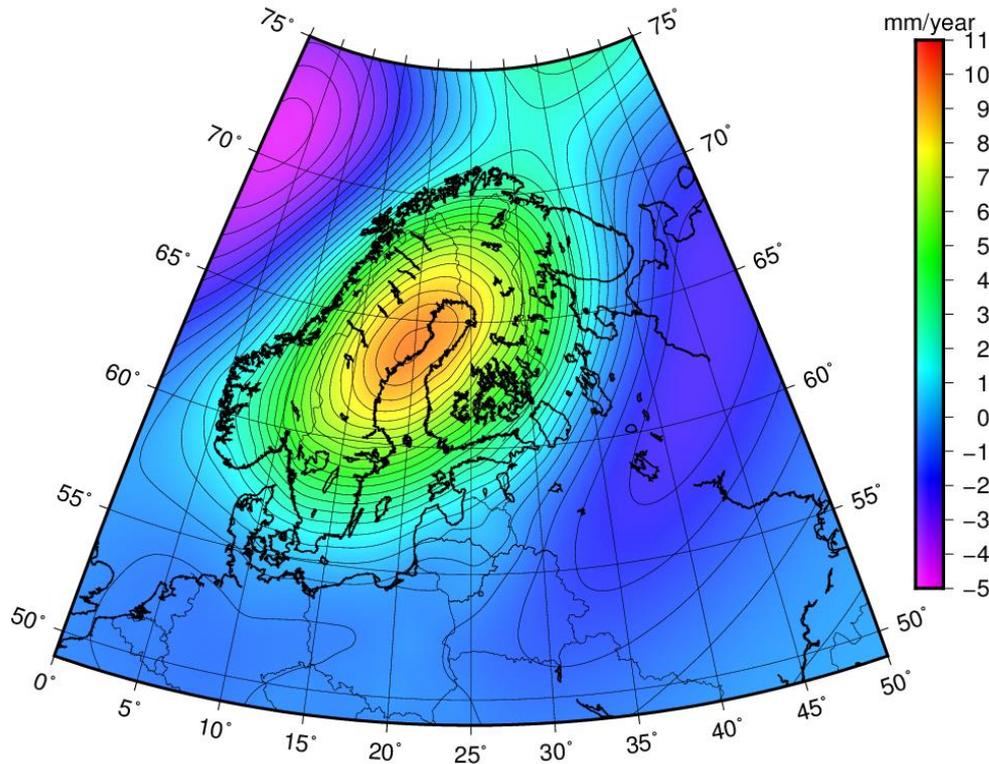
# New reference datum for sea level



**The water depth remains!**



# The land-uplift lowers the mean sea level



## Levelled land-uplift rates

Nr	Time serie	Start year	Rate (cm/year)
1	Furuögrund	1916	0.945
2	Ratan	1891	0.952
3	Draghällan/Spikarna	1897	0.892
4	Björn/Forsmark	1891	0.677
5	Stockholm	1889	0.536
6	Landsort	1886	0.460
7	Visby	1916	0.290
8	Ölands norra udde	1851	0.268
9	Kungsholmsfort	1886	0.133
10	Ystad/Skanör	1886	0.077
11	Malmö/Klagshamn	1924	0.084
12	Varberg/Ringhals	1886	0.252
13	Göteborg	1887	0.289
14	Smögen	1910	0.340

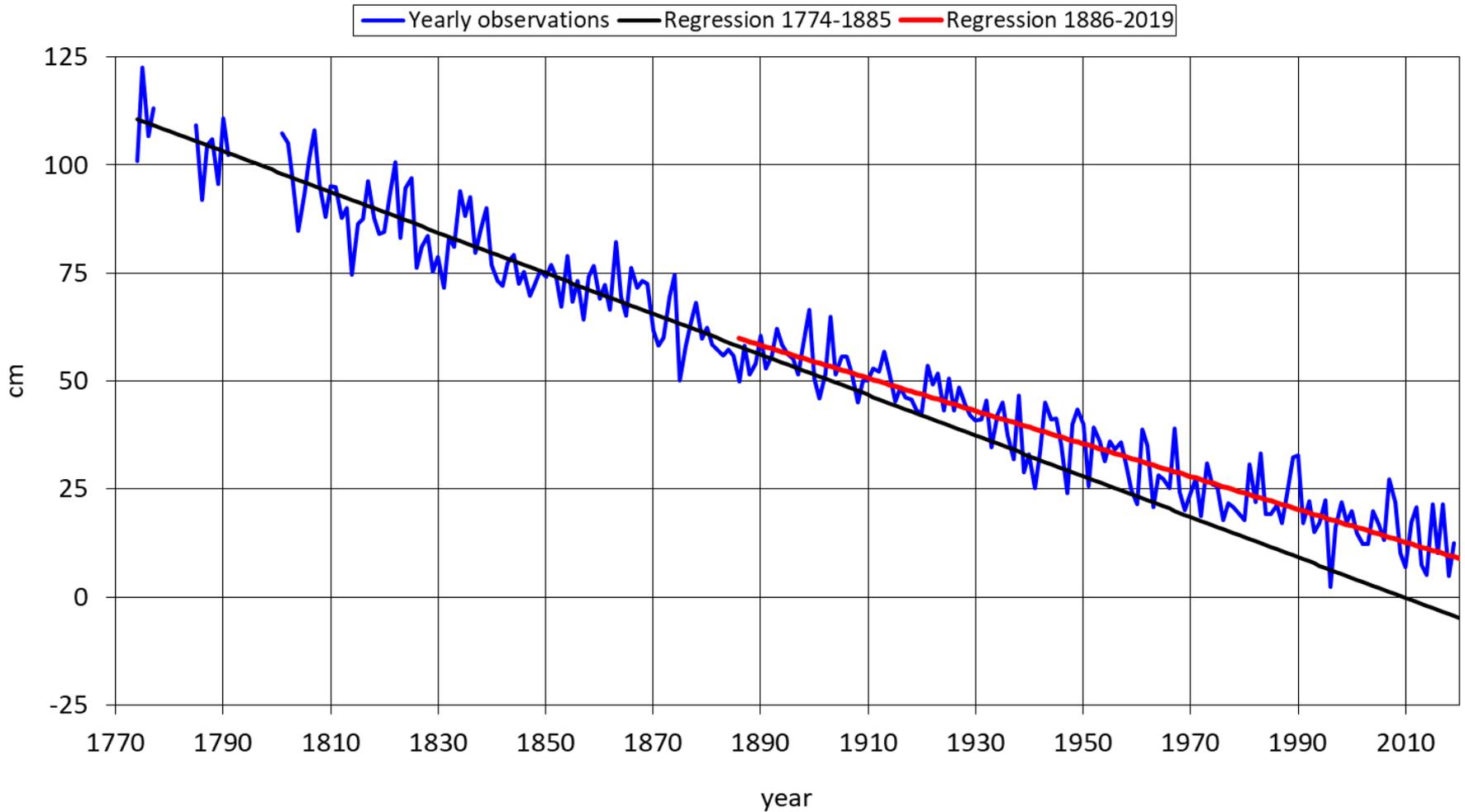
(NKG2016LU\_LEV, rates relative to the geoid)



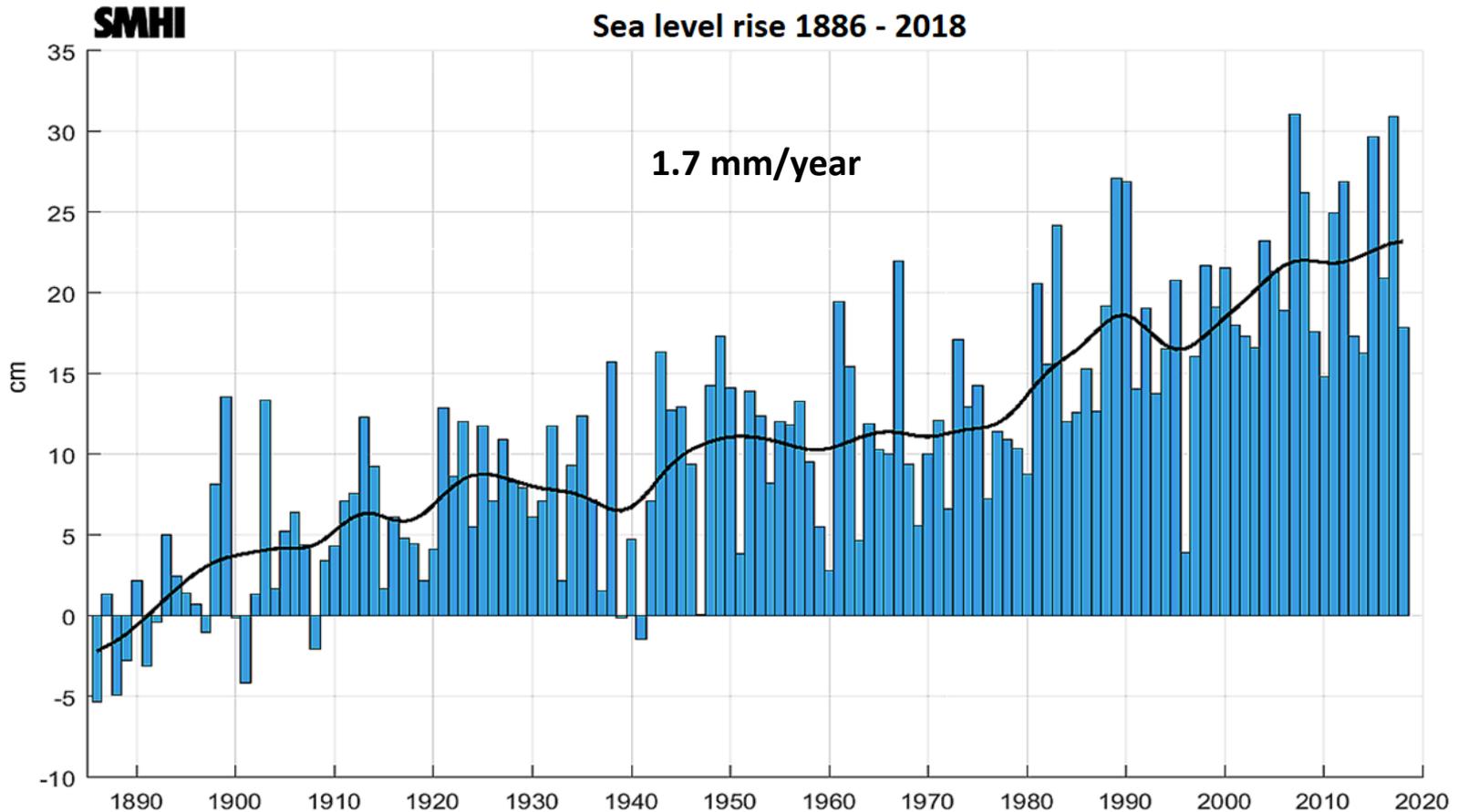
# Stockholm

## "World's longest sealevel record"

### Sealevel Stockholm 1774 - 2019



# The sea level rise raises the mean sea level



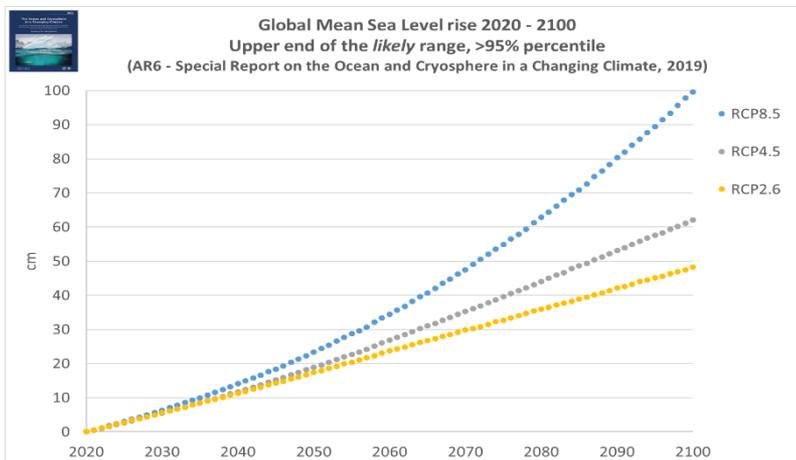
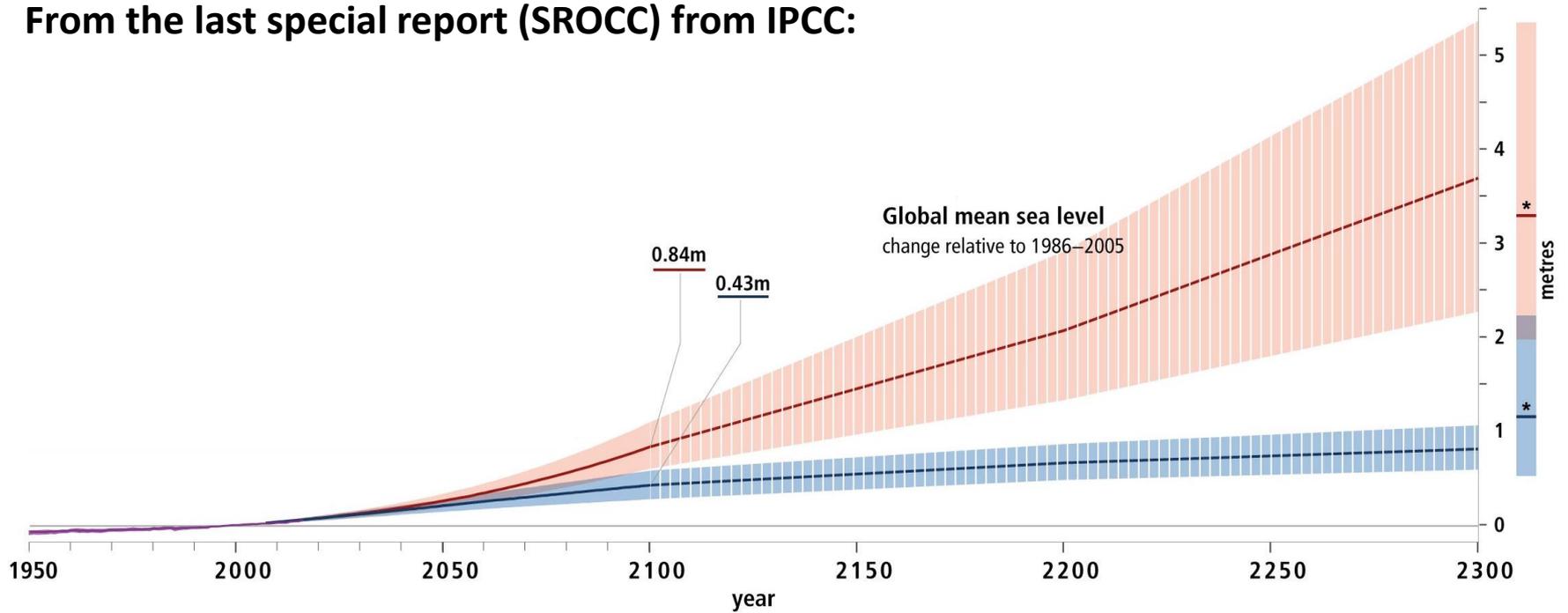
Analysis of 14 Swedish sealevel records since 1886

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

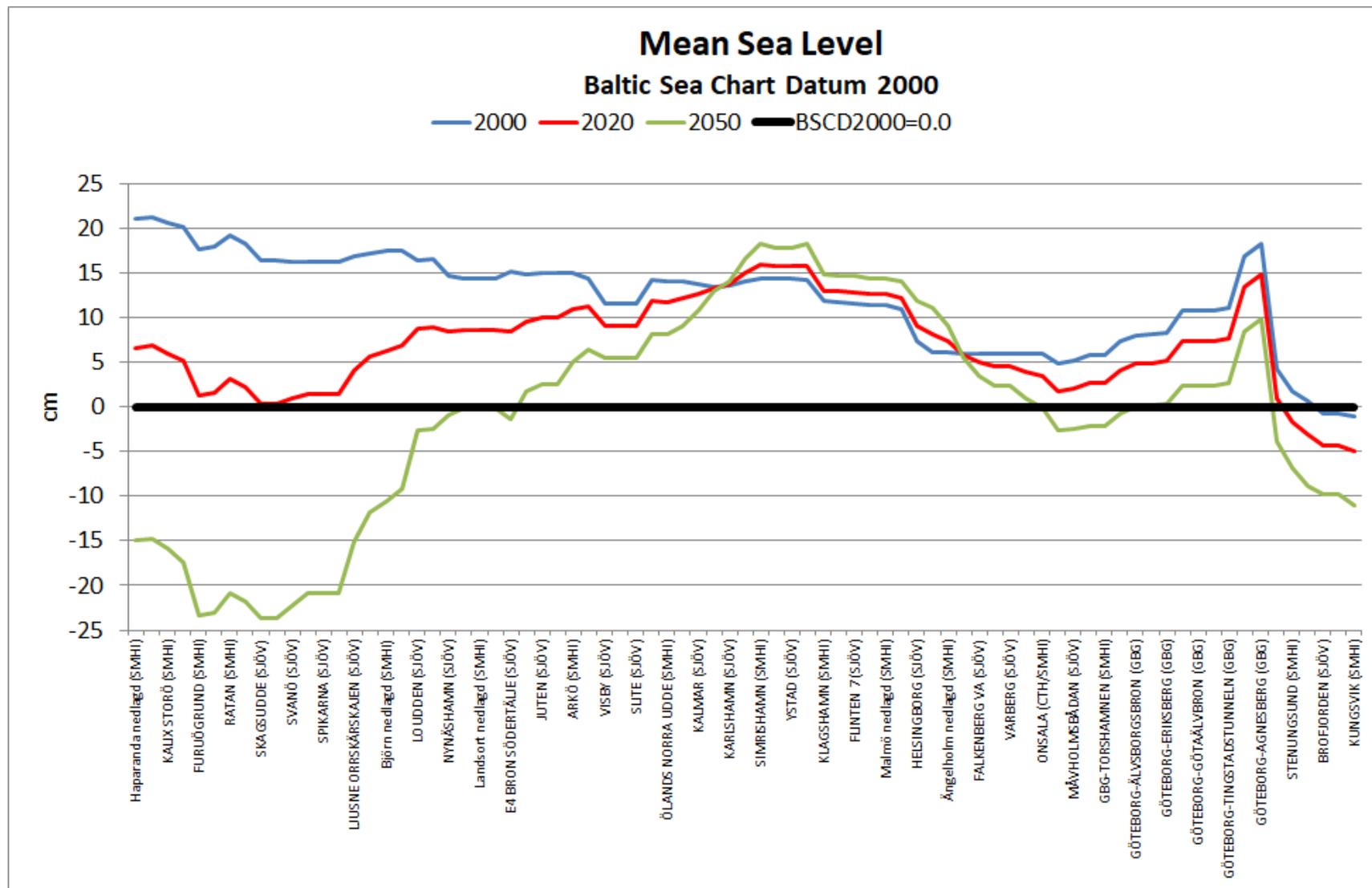


# Future global mean sea level

From the last special report (SROCC) from IPCC:



# Changing mean sea level



# Difference between old reference system and BSCD2000

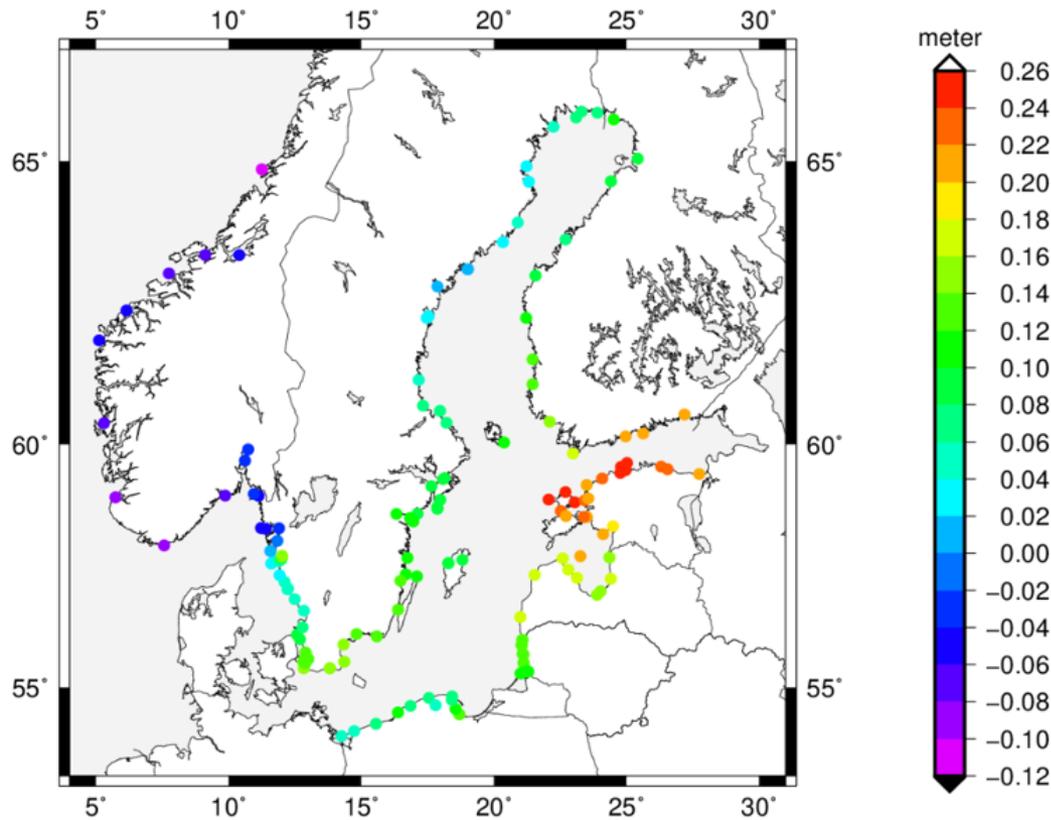
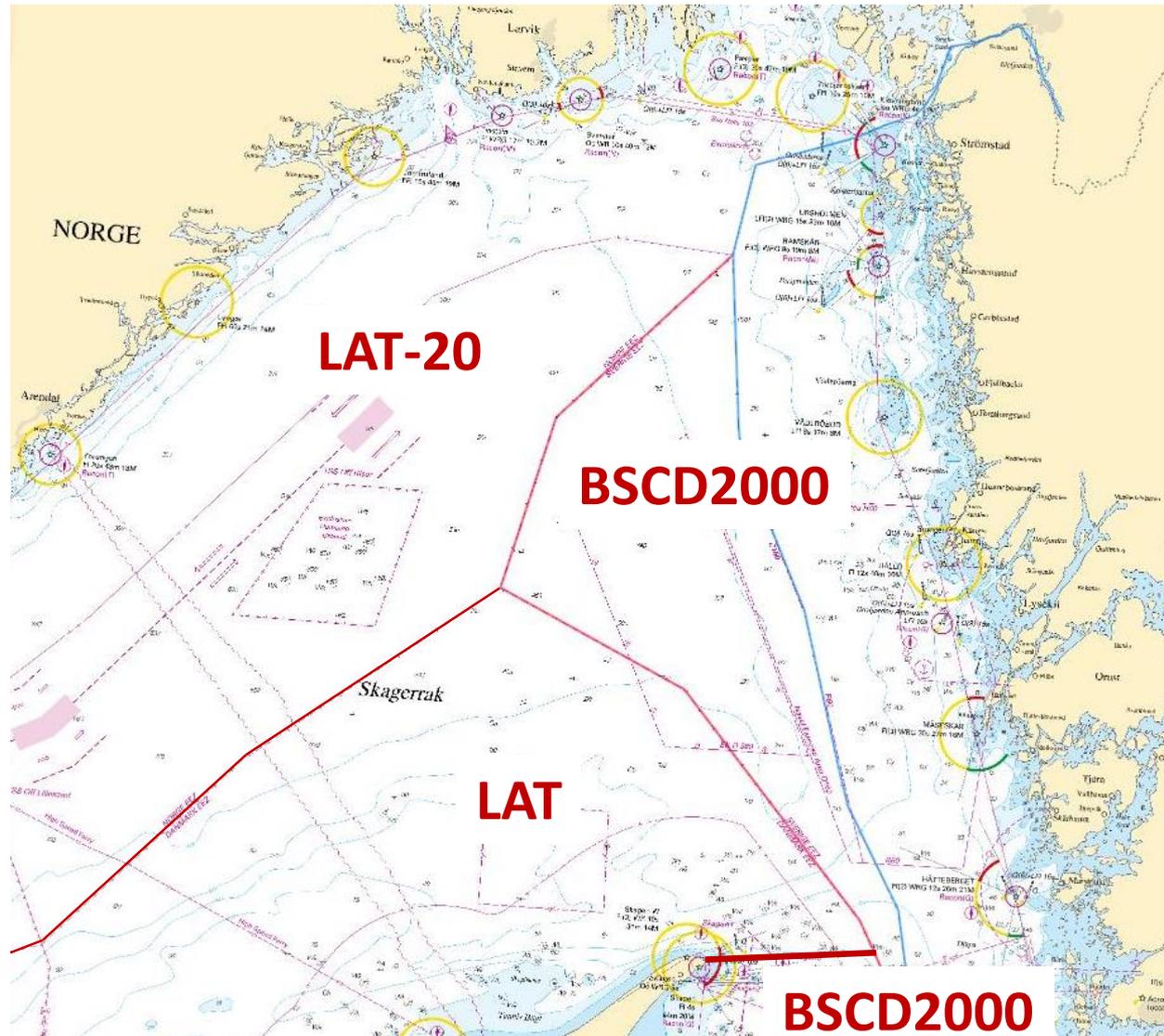


Fig. 4b: Differences between the reference levels of the old national chart datums with respect to BSCD2000. In Sweden, Finland and Norway, the old reference levels are equal to Mean Sea Level transferred to year 2019 (according to different national conventions). In Estonia, Latvia, Lithuania and Poland, the Kronstadt reference level is used as old chart datum. Notice how postglacial rebound reduces the magnitude of the mean sea level in the Bay of Bothnia; it is now just a few cm near the land uplift maximum.



# Reference datums in Skagerrack

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



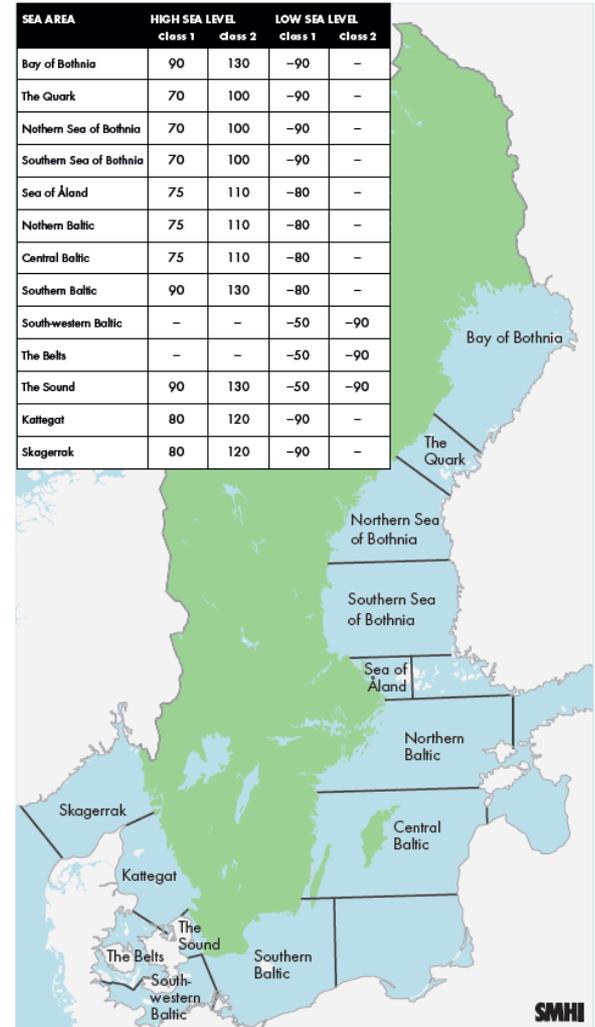
# Sweden has changed reference system

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

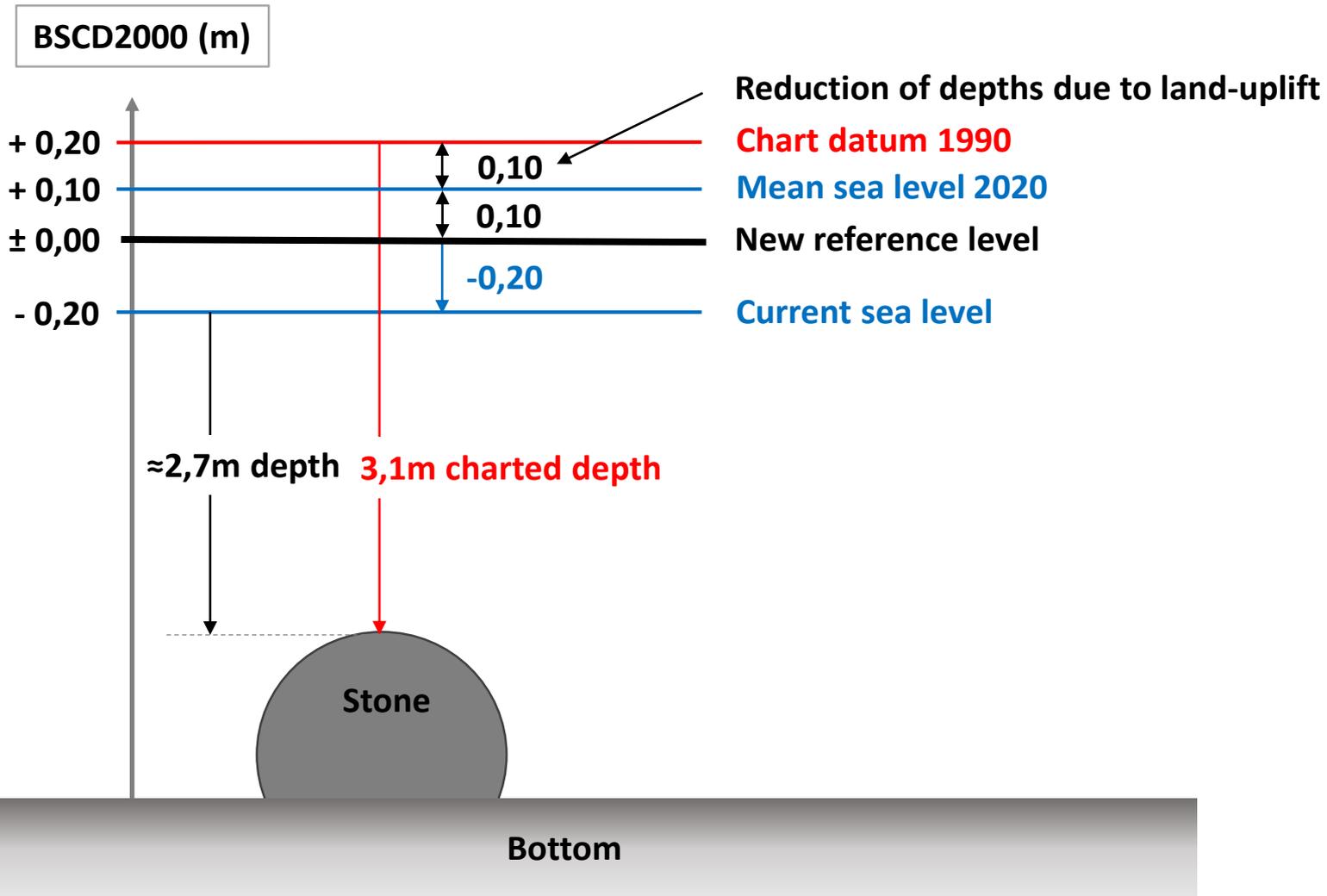


# SMHI oceanographic warning and forecasting service

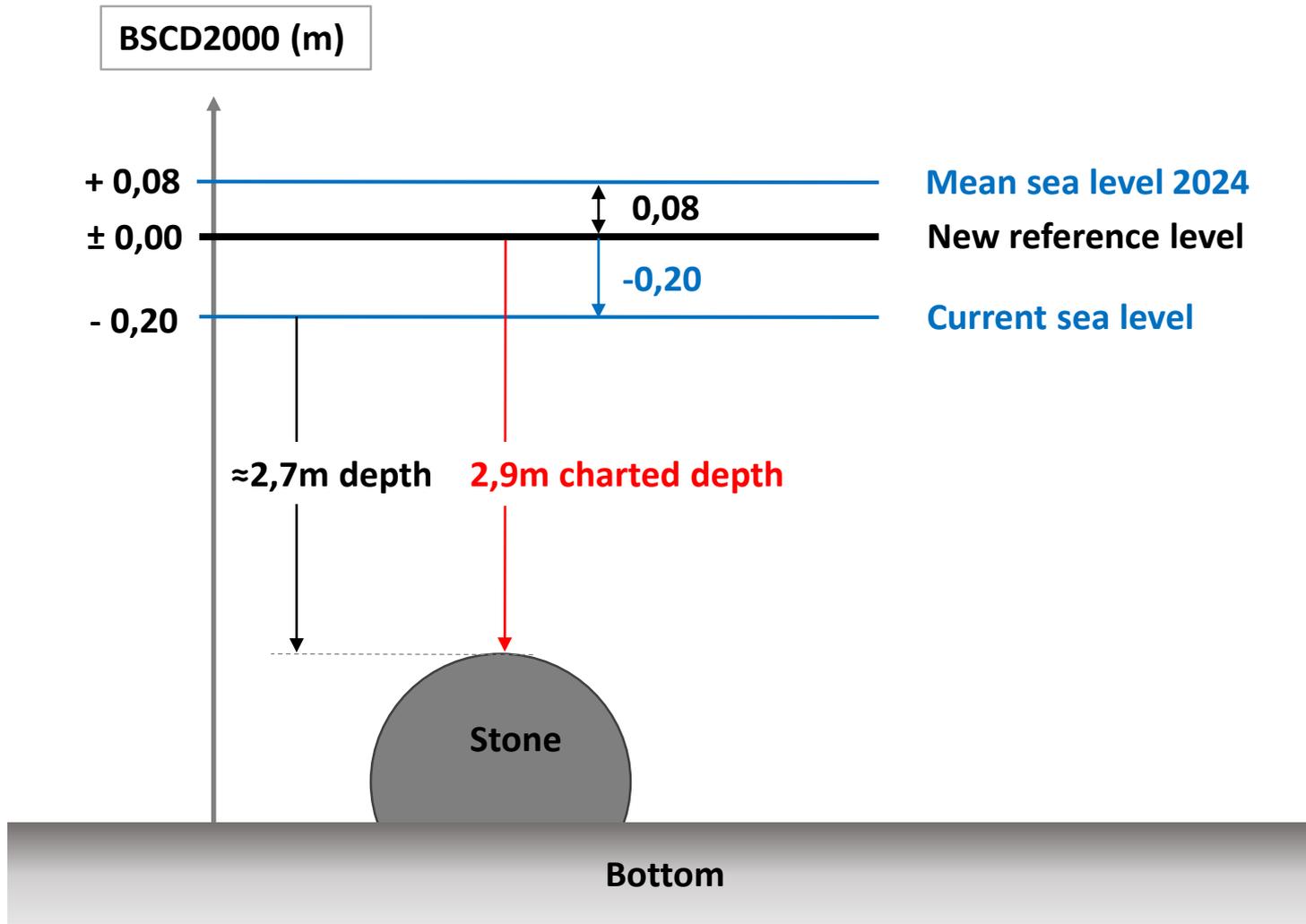
- An ongoing transition to BSCD2000 (RH 2000) at SMHI -> forecasts, warnings and information about current sea level will be issued in BSCD2000
- Warning levels have been adjusted from MSL to BSCD2000
- **2019-06-03:** Warnings for high and low sea level is issued in BSCD2000



# Present situation (February 2020)



# Future situation (2024)



# Notices to mariners

Example from Sweden, 2019-05-15 [English version](#)

\* 14040

**Sweden. not area bound. New reference system for sea level, nautical charts and warnings.  
BSCD2000 / RH 2000.**

Expired notices: 2019:754/13917

See: 2018:716/13140

As of June 3, 2019, the Swedish national height system 'Rikets Höjdsystem 2000', or RH 2000 (international name 'Baltic Sea Chart Datum 2000', BSCD2000) will constitute the reference level for observations and forecasts of the water level in Swedish waters.

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, or soon thereafter, 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 which will take several years to complete. During the transition period, it is important to know which reference level 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. 15 May 2019*



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

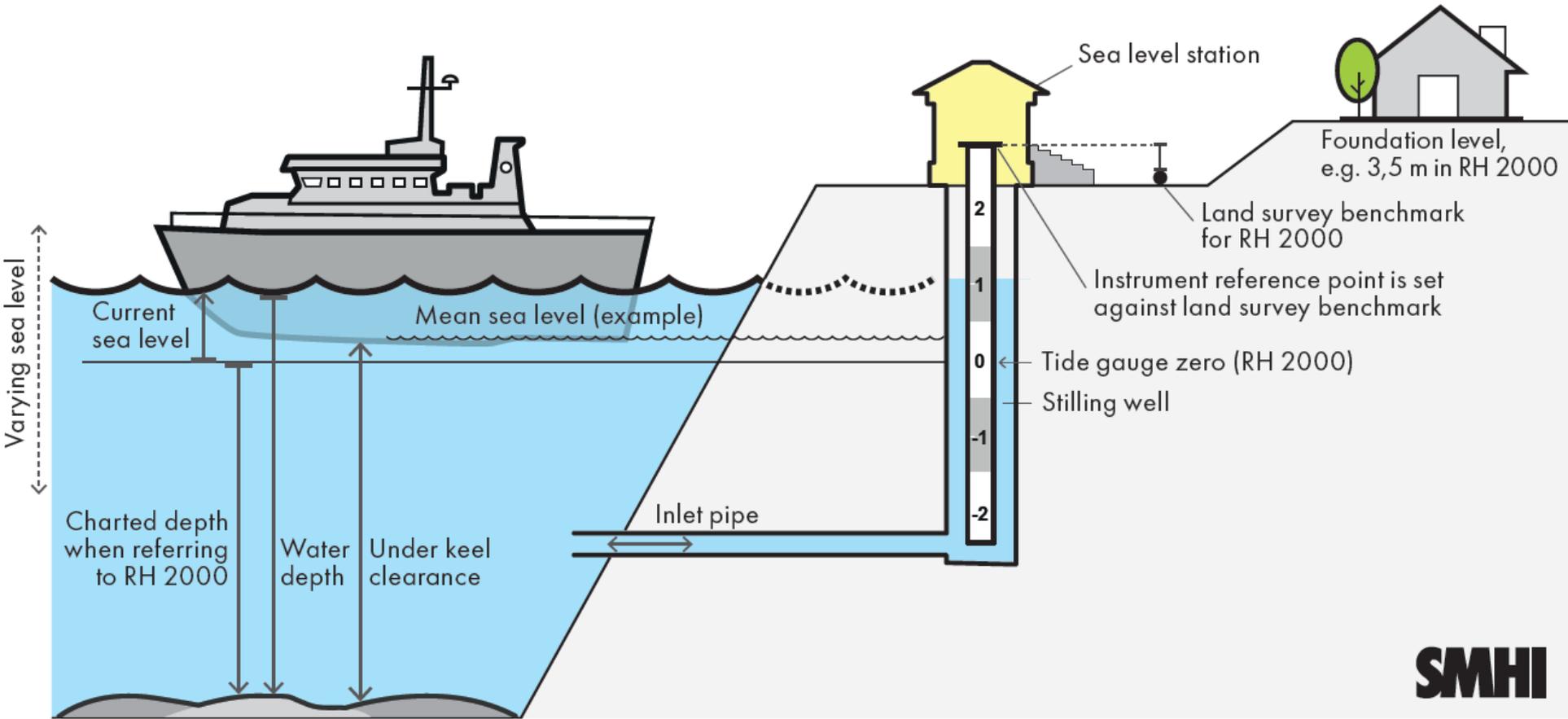
[Svensk](#)



[English](#)



# A uniform reference system from land to sea



**SMHI**

Illustration Veronica Wörn SMHI



**Thank you!**



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