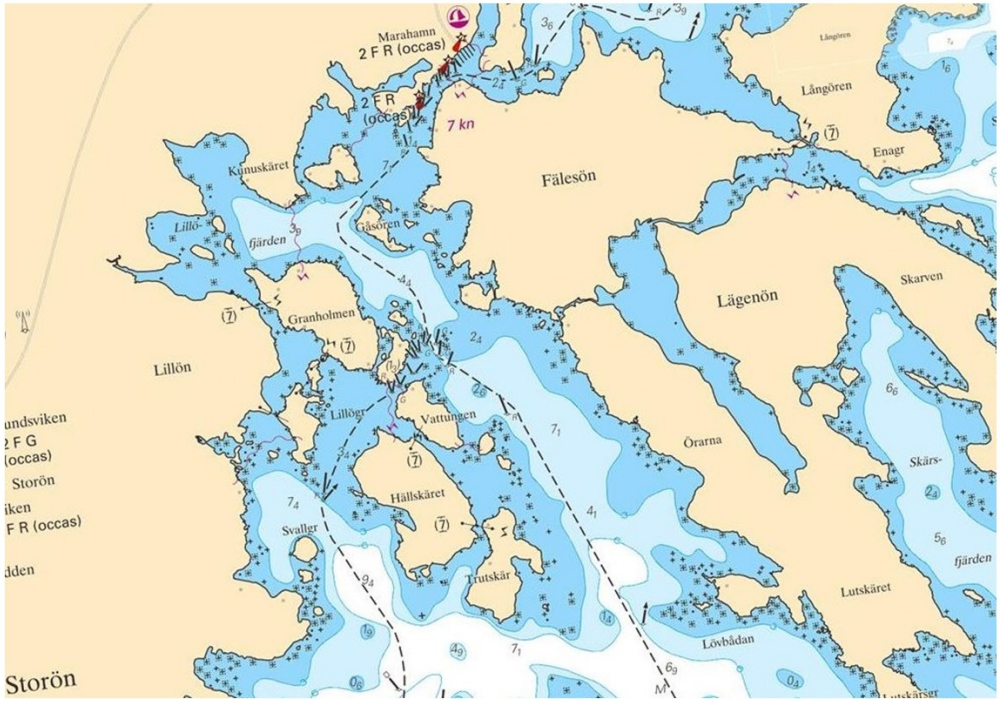
Baltic Sea Chart Datum 2000 – a common reference level for nautical charts and sea level information in the Baltic Sea



2019-03-12 NKG-meeting, Lyngby

Thomas Hammarklint Thomas.Hammarklint@sjofartsverket.se

SWEDISH MARITIME ADMINISTRATION

BALTIC SEA HYDROGRAPHIC COMMISSION

IHO

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.

You are here: Home

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 surve
- The development of the sciences in the field of hydrography and the techniques employed in descriptive oceanography

BALTIC SEA HYDROGRAPHIC COMMISSION

IHO

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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

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.

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

http://www.bshc.pro/working-groups/cdwcwg

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:**

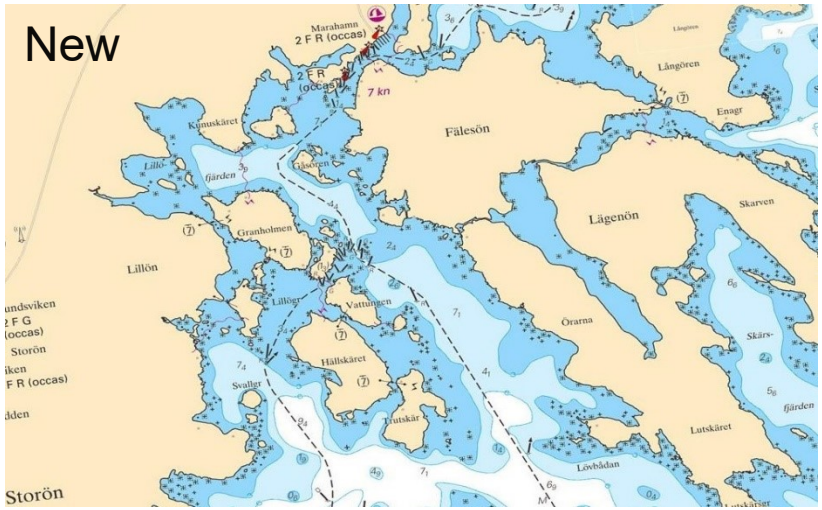
Mean Sea Level (Baltic Sea Chart Datum 2000$^{\text{national realization name}}$)
or
Mean Sea Level (Baltic Sea Chart Datum 2000)

SWEDISH MARITIME ADMINISTRATION

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

SWEDISH MARITIME ADMINISTRATION

Swedish Chart Improvement project



Mean Sea Level (Baltic Sea Chart Datum 2000^{RH2000})

SWEDISH MARITIME ADMINISTRATION

Plan for transition from MSL to BSCD2000 in nautical charts

Updated 2019-04-08

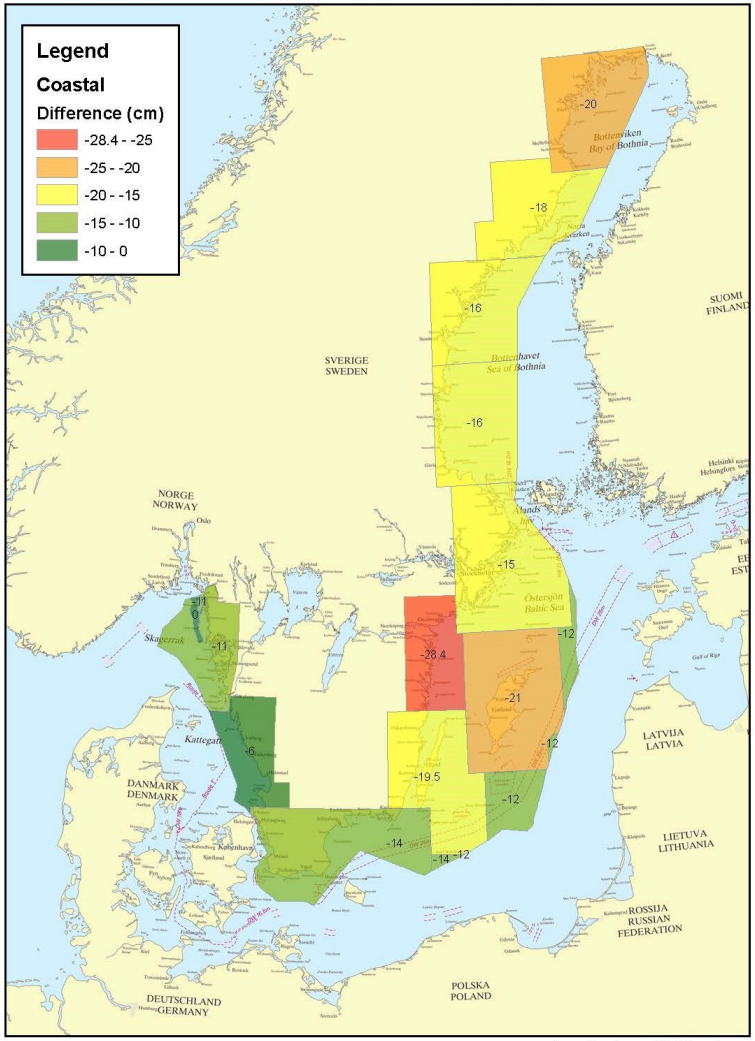
SWEDISH MARITIME ADMINISTRATION

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

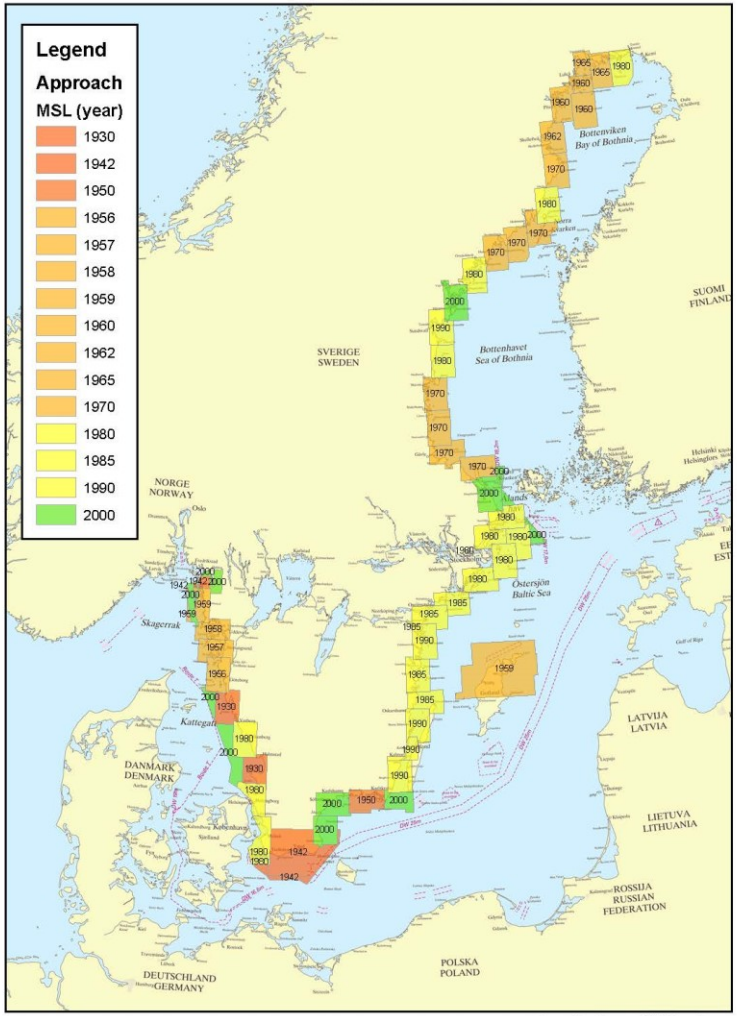


1 centimeters = 60 kilometers

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



1 centimeters = 60 kilometers

SWEDISH MARITIME ADMINISTRATION

Swedish Sea Level Network

Co-financed by the European Union
Connecting Europe Facility

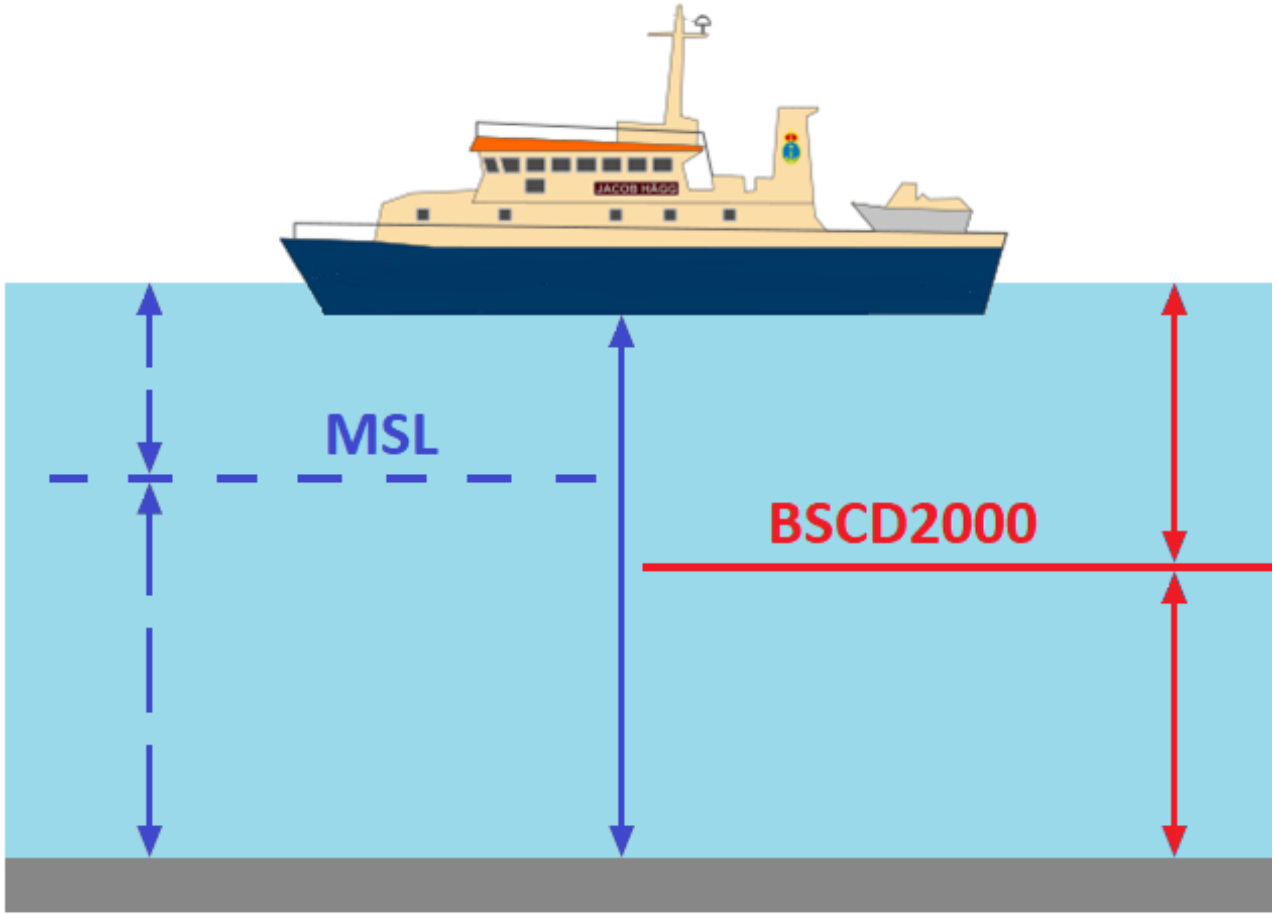
- Real-time data in BSCD2000 from 59 stations
- 1-minute values with 1 cm accuracy
- Real-time and delayed mode quality control

Class I	Upgrade with battery backup	28 stations (24 SMHI + 3 SMA +1 CTH)
Class II	Upgrade without battery backup	26 stations (23 SMA + 3 GBG)
Class III	Unchanged, temporary	5 stations (5 SMA)

SMHI

SWEDISH MARITIME ADMINISTRATION

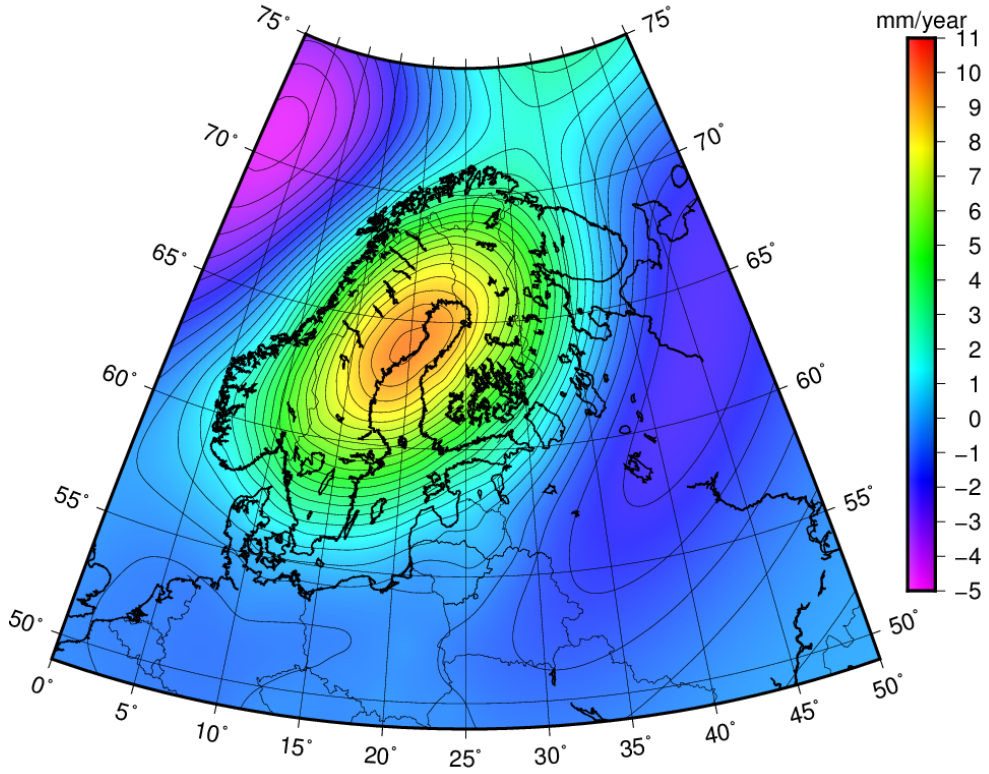
New reference datum for sea level



The water depth remains!

SWEDISH MARITIME ADMINISTRATION

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

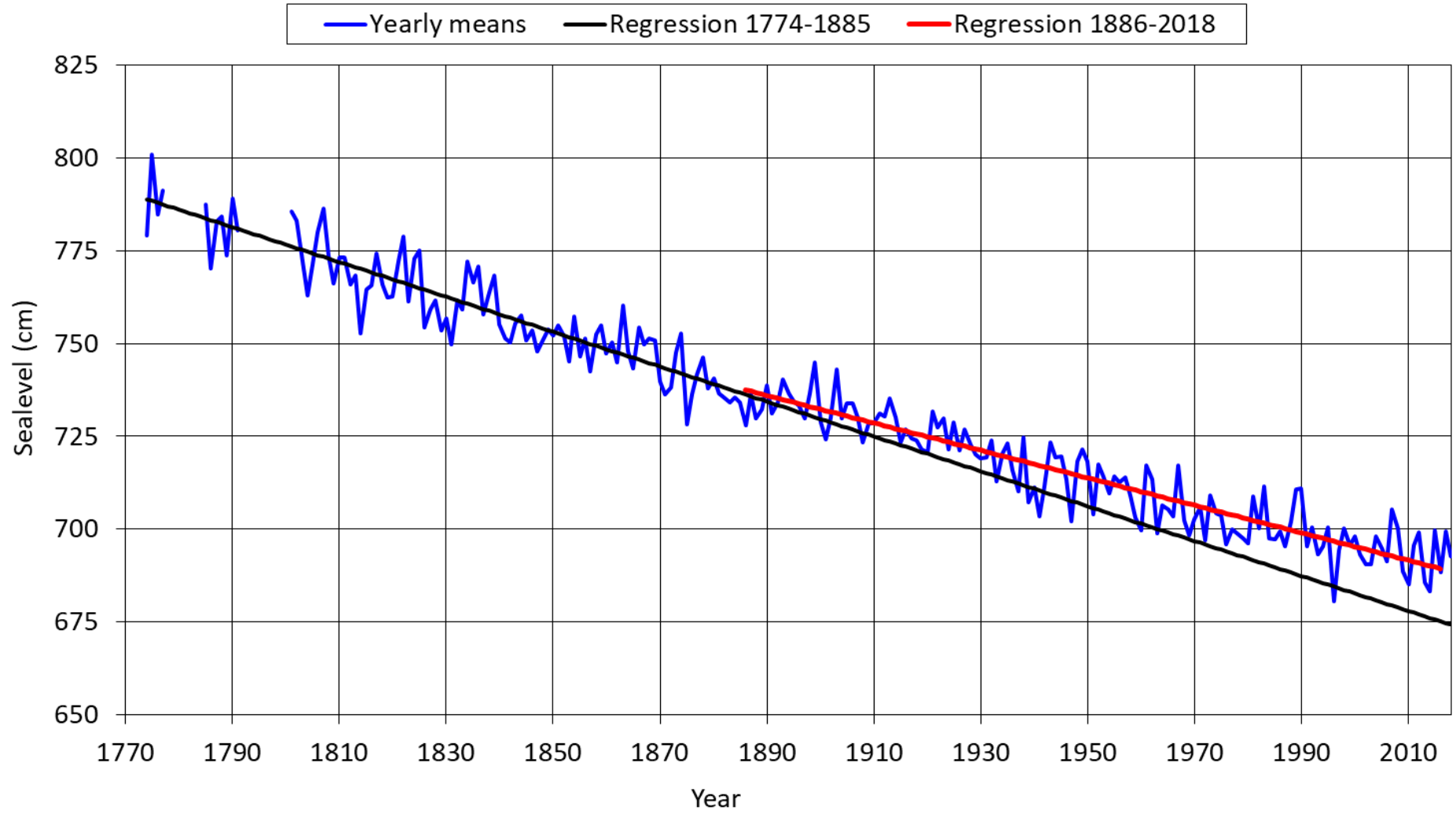
(NKG2016LU_LEV, rates relative to the geoid)

SWEDISH MARITIME ADMINISTRATION

Stockholm

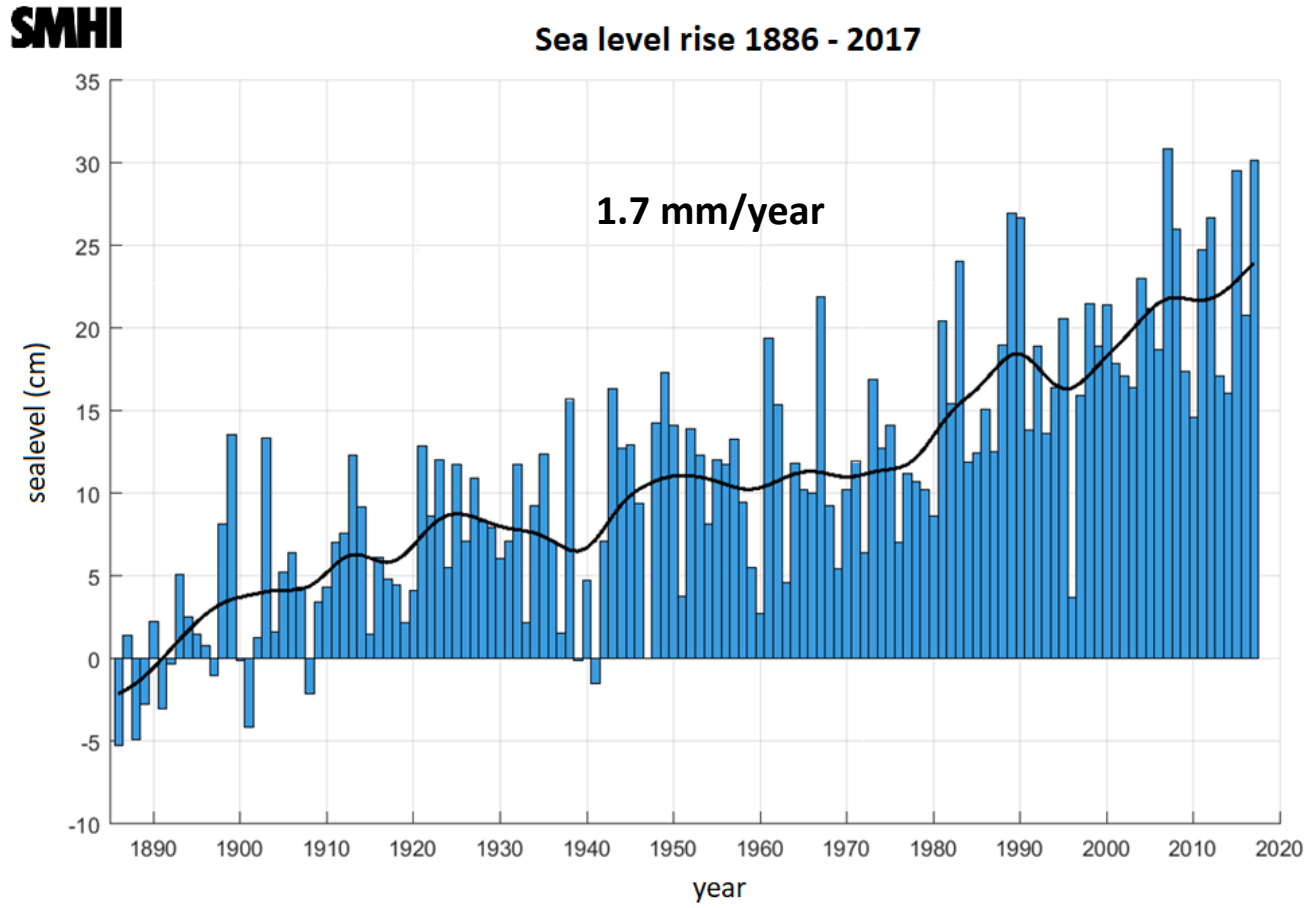
”World’s longest sealevel record”

Sealevel Stockholm 1774 - 2018



SWEDISH MARITIME ADMINISTRATION

The sea level rise raises the mean sea level

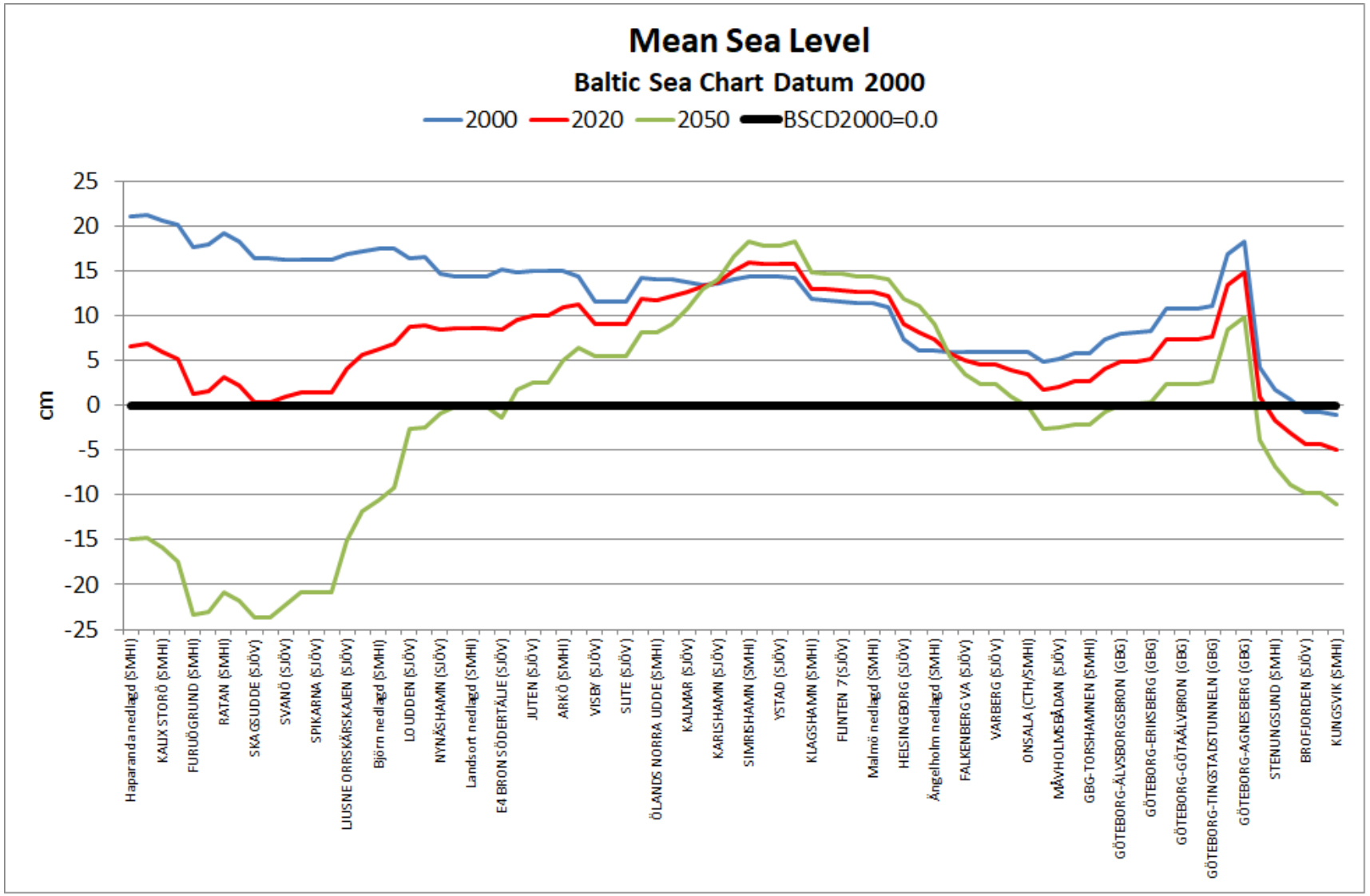


Analysis of 14 Swedish sealevel records since 1886

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

SWEDISH MARITIME ADMINISTRATION

Changing mean sea level



SWEDISH MARITIME ADMINISTRATION

Difference between old reference system and BSCD2000

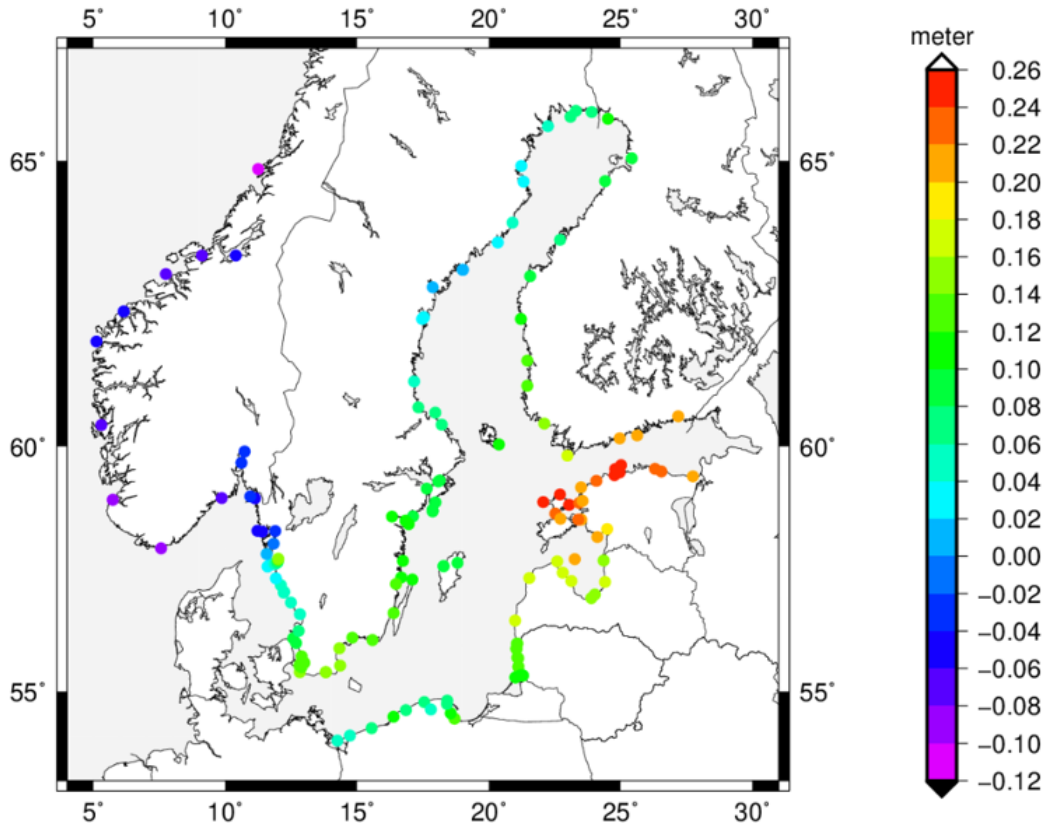
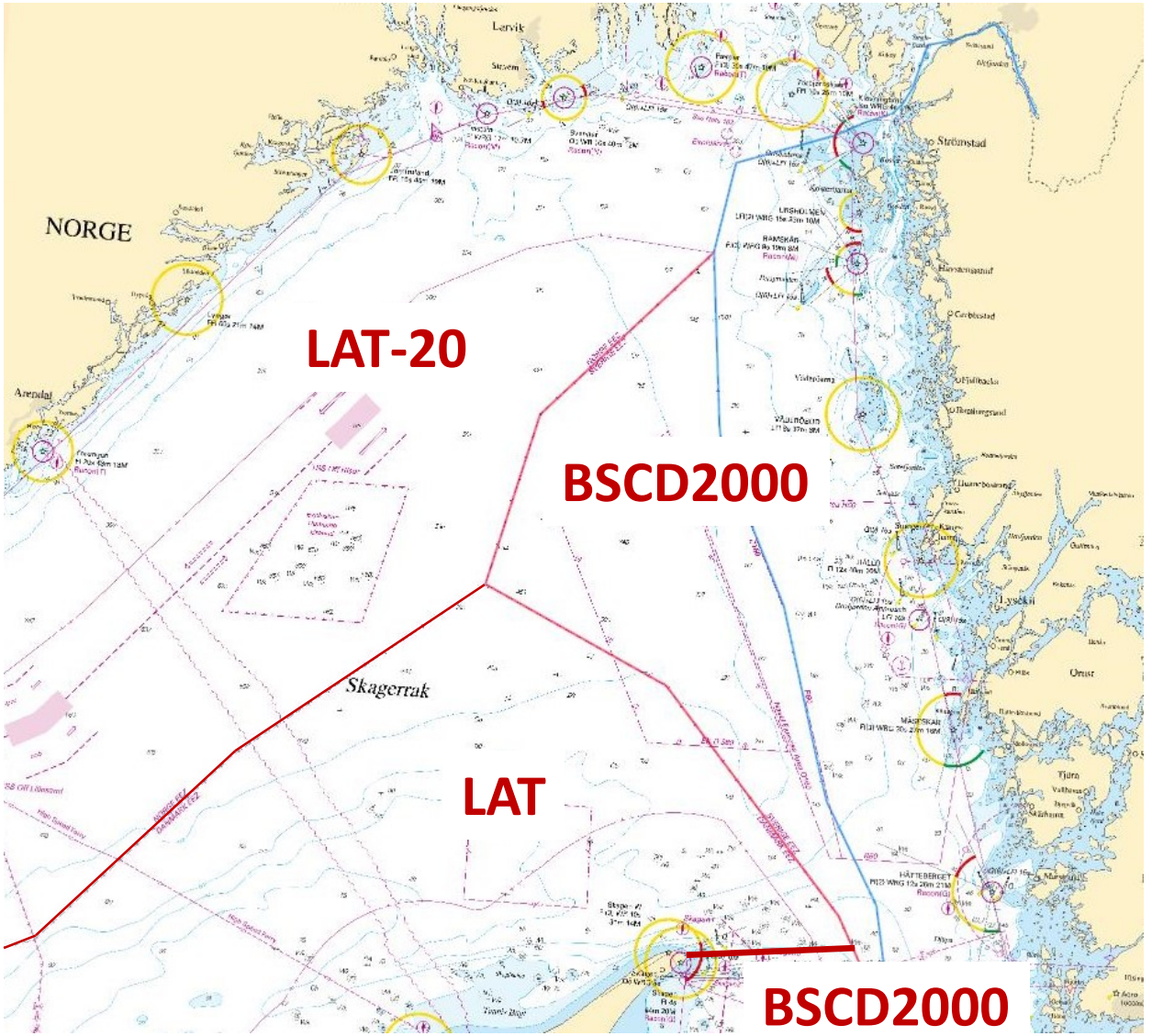


Fig. 4b: Differences between the reference levels of the old national chart datums with respect to BSCD2000. In Sweden, Finland and Norway, the old reference levels are equal to Mean Sea Level transferred to year 2019 (according to different national conventions). In Estonia, Latvia, Lithuania and Poland, 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.

SWEDISH MARITIME ADMINISTRATION

Reference datums in Skagerack

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



SWEDISH MARITIME ADMINISTRATION

Sweden will change reference datum

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

SWEDISH MARITIME ADMINISTRATION

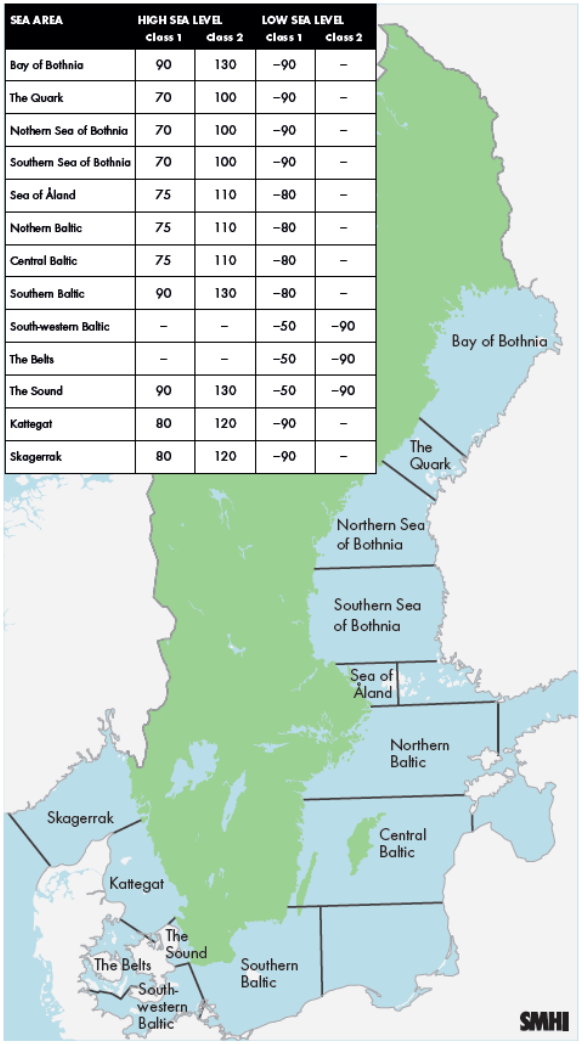
SMHI oceanographic warning and forecasting service

- 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

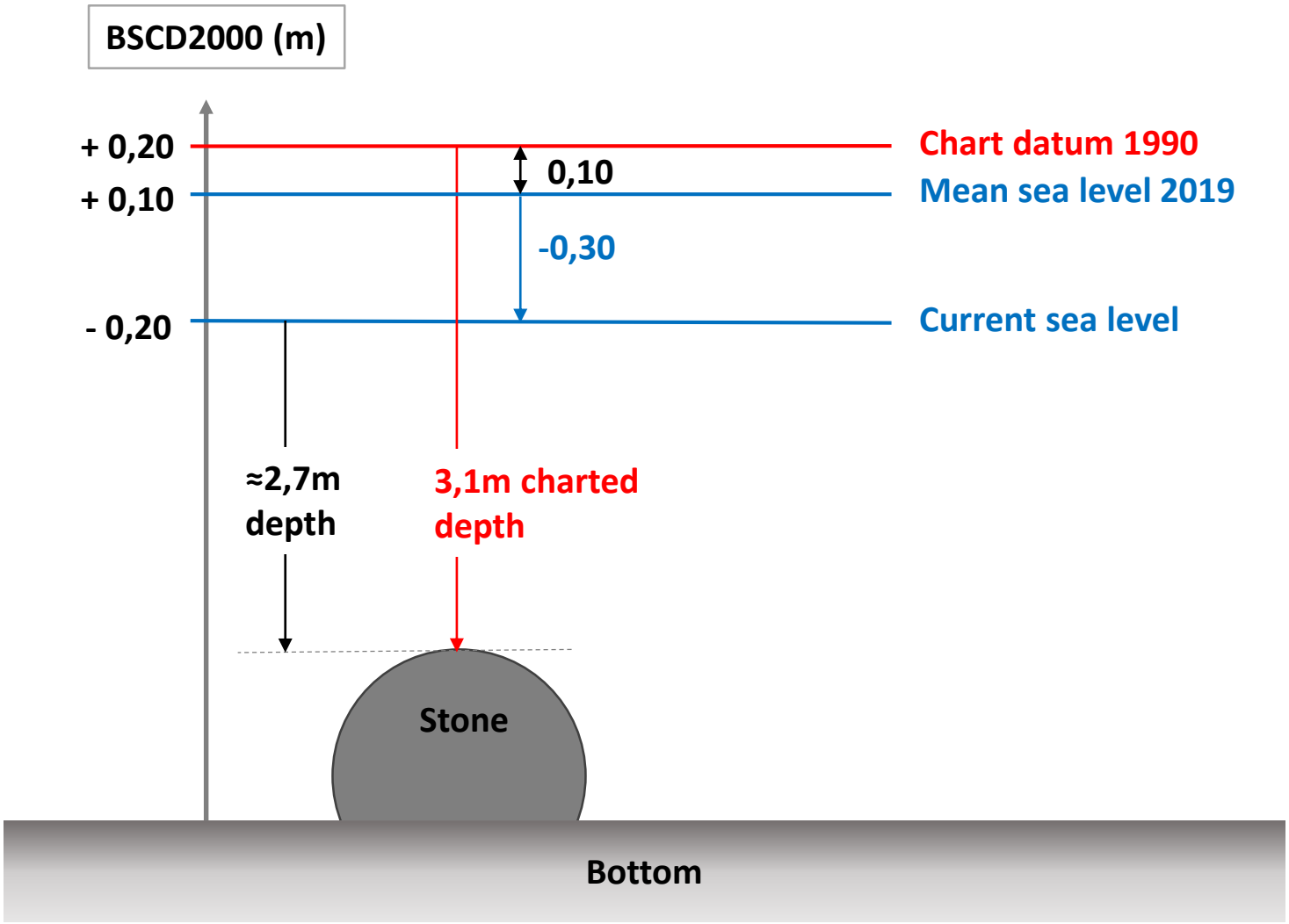
- **2019-06-03**: Warnings for high and low sea level will be issued in BSCD2000

SEA AREA	HIGH SEA LEVEL		LOW SEA LEVEL	
	class 1	class 2	class 1	class 2
Bay of Bothnia	90	130	−90	–
The Quark	70	100	−90	–
Nothern Sea of Bothnia	70	100	−90	–
Southern Sea of Bothnia	70	100	−90	–
Sea of Åland	75	110	−80	–
Nothern Baltic	75	110	−80	–
Central Baltic	75	110	−80	–
Southern Baltic	90	130	−80	–
South-western Baltic	–	–	−50	−90
The Belts	–	–	−50	−90
The Sound	90	130	−50	−90
Kattegat	80	120	−90	–
Skagerrak	80	120	−90	–



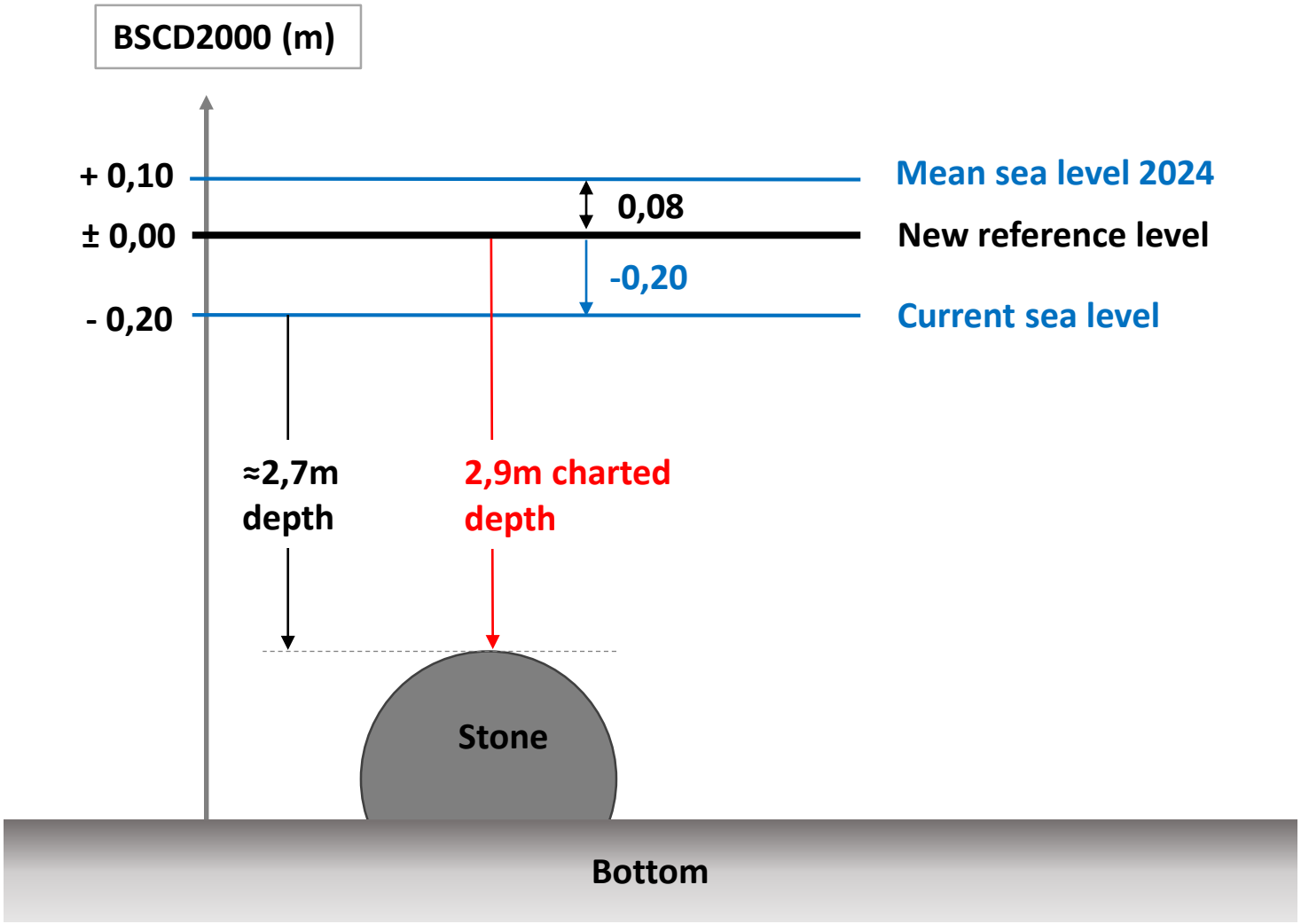
SWEDISH MARITIME ADMINISTRATION

Present situation (March 2019)



SWEDISH MARITIME ADMINISTRATION

Future situation (2024)



SWEDISH MARITIME ADMINISTRATION

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

Svensk

English

SWEDISH MARITIME ADMINISTRATION

A uniform reference system from land to sea

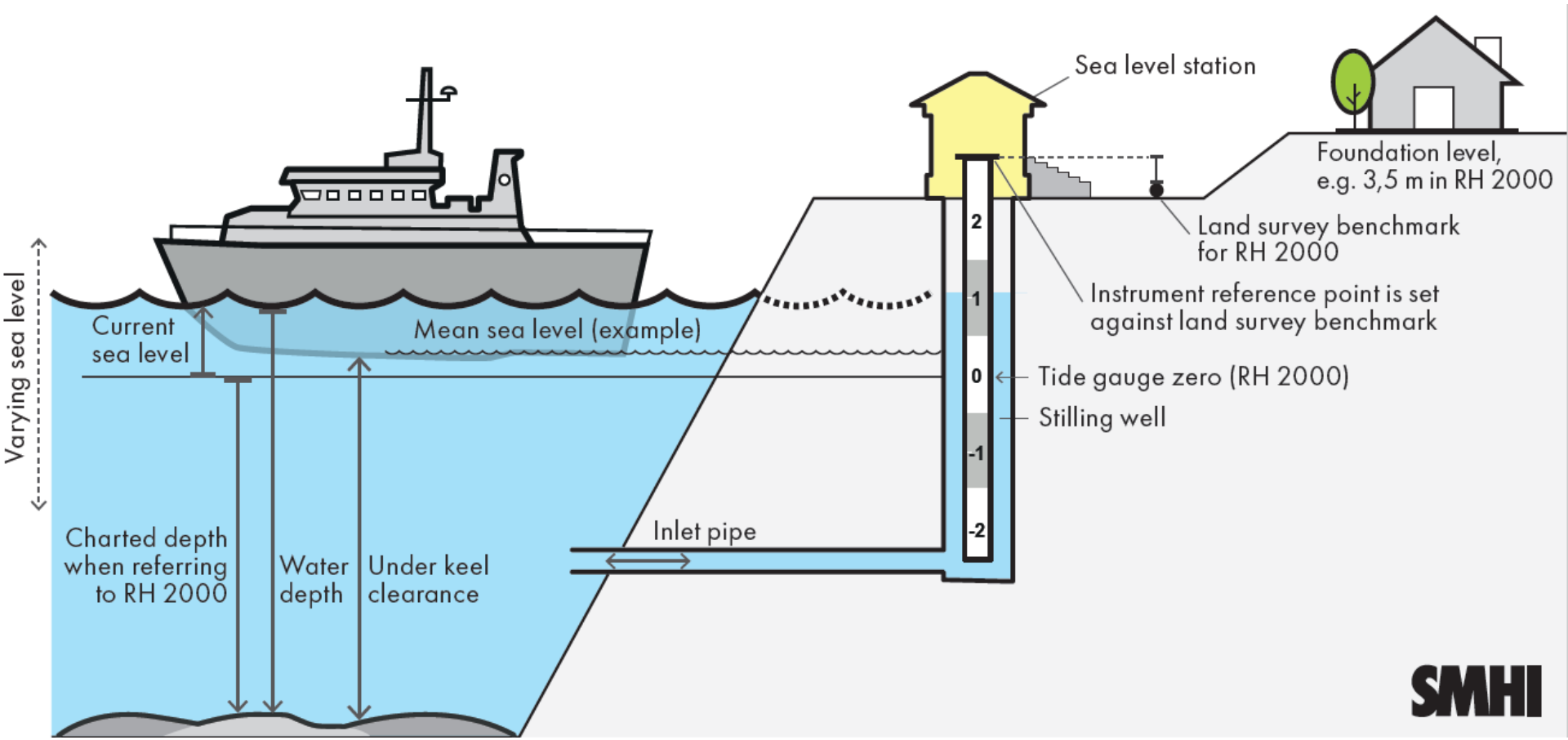


Illustration Veronica Wärn SMHI

SWEDISH MARITIME ADMINISTRATION

Thank you!

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