# TWCWG3, 16-20 May 2018
# National Report of Finland

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- Finland: transition to the Baltic Sea Chart Datum 2000 (Finnish realization: N2000-height system)
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# IHO / Baltic Sea Hydrographic Commission / Chart Datum WG: Baltic Sea Chart Datum 2000

# IHO / BSHC / CDWG

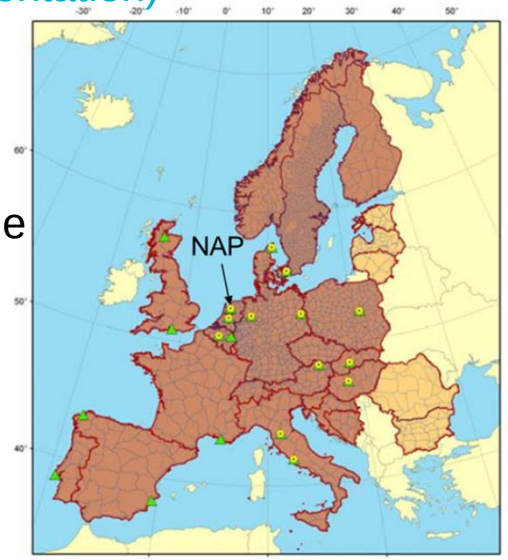
Image by BSHC

- Chart Datum Working Group:

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

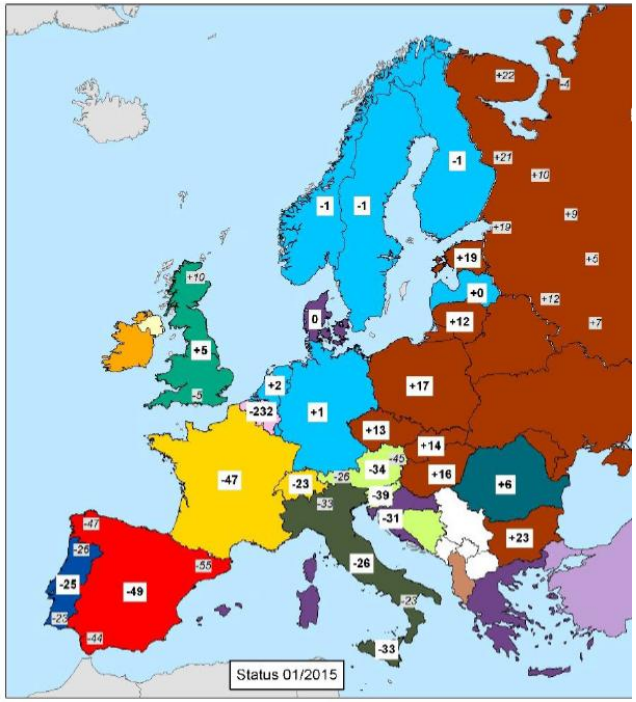
- IHO Baltic Sea Hydrographic Commission (BSHC) has decided to harmonize vertical datums in the Baltic Sea nautical charts and navigational publications
- The harmonized vertical datum is based on EVRS (European Vertical reference System) – well defined geodetic datum (IHO res 3/1919)
- It will be realized by national height systems (e.g. in Finland N2000-height system)
- National realizations agrees with each other within few cm
- BSHC has approved the name: Baltic Sea Chart Datum 2000 (BSCD2000)
- Baltic Sea Chart Datum 2000 will be proposed as a datum in S-100 registry
- S-104 Water level information for Surface Navigation deemed important standard

# EVRS (Jonas Ågren et al: GGHS2016 presentation)




- EVRS is defined using the following four conventions,
  - The vertical datum is defined as the equipotential surface in the level of the Normaal Amsterdams Peil (NAP).
  - The unit of length is meter (SI) and unit of time is second (SI).
  - The height component is specified by normal heights, or equivalently by geopotential numbers.
  - The zero permanent tide system is used.
- Postglacial land uplift epoch is not included as part of the EVRS definition.
- The last pan-European realisation of EVRS is EVRF2007, which has the land uplift epoch 2000.0 (computed using the land uplift model NKG2005LU).

# EVRS and national height systems around Baltic Sea




- The modern national height reference frames have been realized based on EVRS in Sweden, Norway, Finland, Lithuania, Latvia and since 1 Jan 2018 also in Estonia a little bit different ways.
- The postglacial land uplift has been reduced to epoch 2000.0 by the land uplift model NKG2005LU (Latvia to epoch 2000.5)
- The German height reference frame DHHN2016 is not a strict realisation of EVRS; it uses the mean permanent tide system, but agrees within a few cm from EVRF2007.
- The same is true for Denmark, where DVR90 is defined differently, but nevertheless agree very well with EVRF2007.

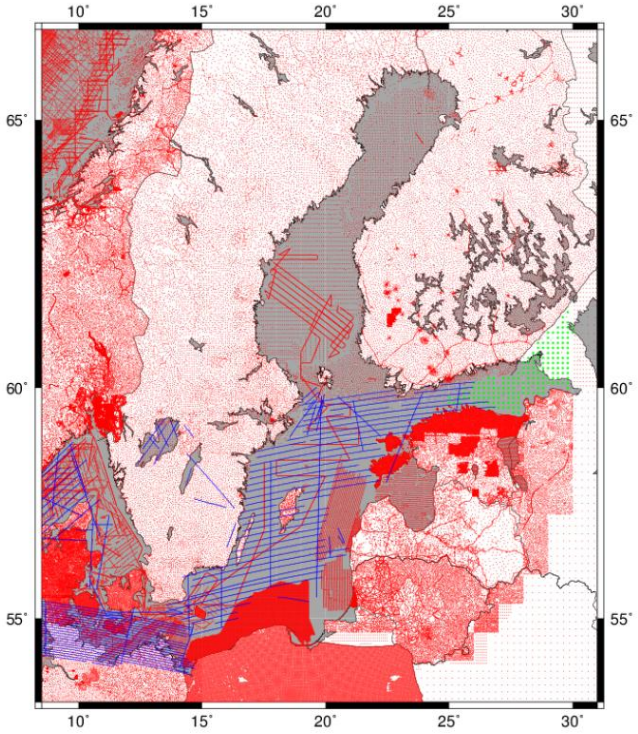
# Specification of the Baltic Sea Chart Datum 2000

- Includes the conventions the Baltic Chart Datum 2000 is based on
- Describes the principles what the national realizations shall follow, what is the uncertainty level to be achieved, guidelines for use of GNSS-augmentation services
- National realization should
  - follow the definition strictly or
  - agree within a few cm from the official pan-European EVRS realisation with epoch 2000.0 (now EVRF2007).

# Specification (continues)

- Land uplift epoch 2000.0 (important especially in northern part of the Baltic Sea)
- Land uplift corrections shall be applied in areas with significant land uplift
- The goal for the geodetic infrastructure for realization is to provide standard uncertainty better than 5 cm the whole Baltic Sea
  - ⇒What is needed? Good geoid model covering the Baltic Sea
  - ⇒ EU co-financed (INEA CEF-TRANSPORT) FAMOS project includes shipborne gravimetry surveys and geoid calculations
  - ⇒ interim geoid models calculated

# FAMOS gravity observations




Joachim Schwabe and Jonas Ågren, 2017-02-21: FAMOS Activty 2: Initial validaton of geoid models in the Baltic Sea.

The gravity observations used for FAMOS geoid are plotted in the figure. Red dots and tracks are terrestrial and marine data. Blue dots are airborne data. Green dots are “pseudo observations” generated by the satellite-only model.

- Several gravity survey campaigns have been executed by different FAMOS-project stakeholders (dedicated, piggy-bag, opportunity based -campaigns)
- Still  some areas not sufficiently covered by gravity observations and new campaigns are planned

FAMOS
FINALISING SURVEYS FOR THE BALTIC MOTORWAYS OF THE SEA

# Finland

# Finland – Transition to Baltic Sea Chart Datum 2000

- Finnish national height system N2000 is the realization of the Baltic Sea Chart Datum 2000 in Finnish waters
- Decided to start transition to the Baltic Sea Chart Datum 2000 in the nautical charts and navigational publications
- Informing in FTA's web pages (https://www.liikennevirasto.fi/web/en/merchant-shipping/paper-charts/baltic-sea-chart-datum-2000)
- Hydrographic surveys refers to N2000 after 2013
- Some lake-charts already referred to N2000
- Mareographs has been connected to N2000-height system
- Planning of providing water level information in BSCD2000 has been started with the Finnish Meteorological Institute (FMI)

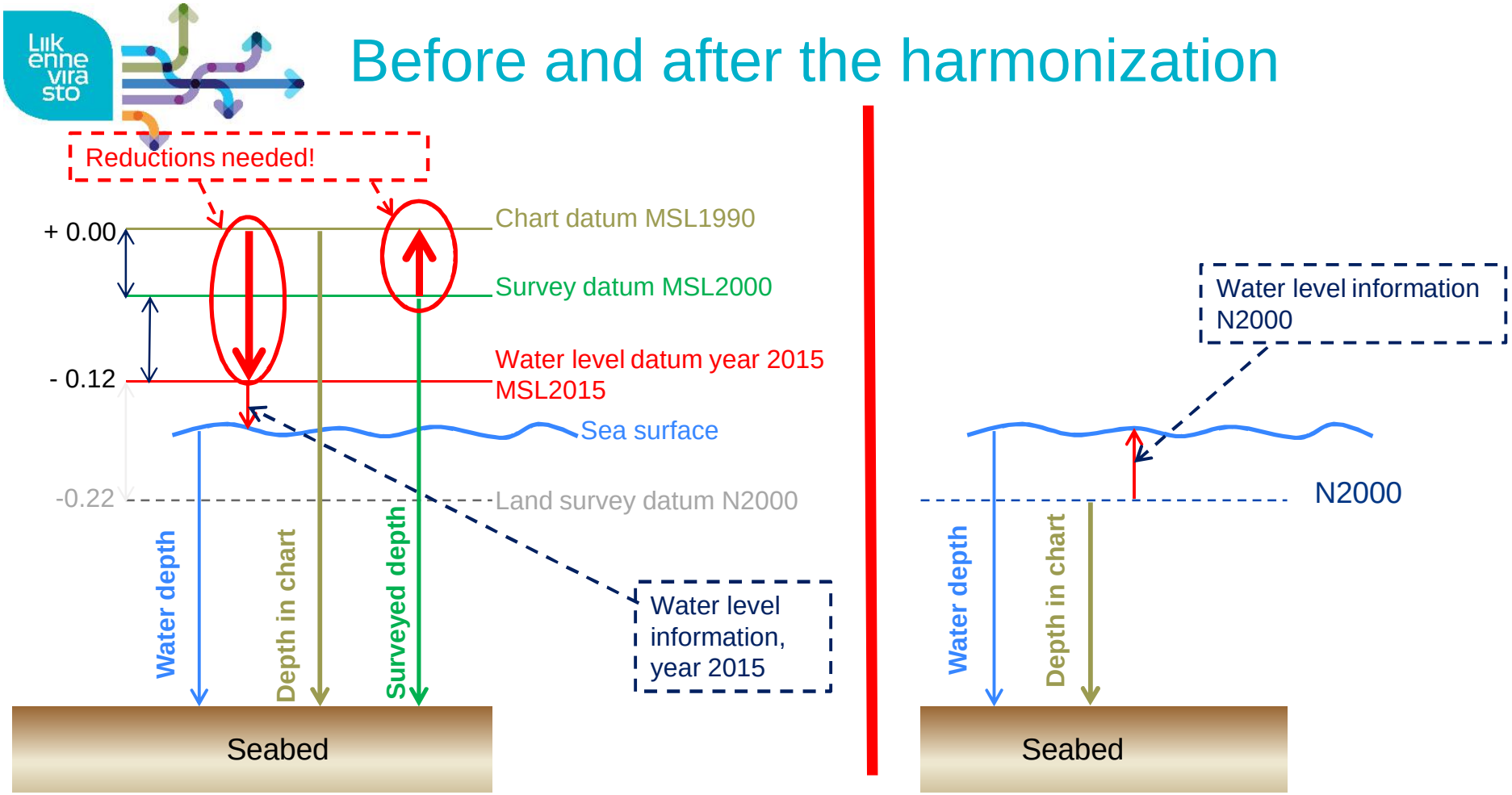
# Finland – What changes

- Depth figures in charts will be decreased
- Nominal depths of fairways will decrease in most cases
- Depths on sea and heights on land will be in the same height system
- Different MSL-datums will be changed to one N2000 / BSCD2000 –datum
- Supports data exchenge between different organizations and neighbouring countries HOs
- Supports future 3D-navigation
- Takes into account postgalcial land uplift – will be visible in the water level information

# Finland – Challenges

- How to avoid confusions during the transition period?
  - Different datums in use at the same time
- How mariners and other users can choose the right water level referring to chart in use?
  - using MSL chart and choosing water level in BSCD2000 (N2000) => risk of groundings, because combination results too big depths
  - Using BSCD2000 chart and choosing MSL water level => economical risk, results too small depths and loosing draught -> too less cargo
- Education/informing different stakeholders, customers, end users – not at all homogeneous groups

# Before and after the harmonization



# Finland: other relevant matters

- Renewal of bathymetric information system
  - system acceptance passed in Feb 2018
  - data migration started
- Renewal of chart production system
- Transformation parameters for horizontal coordinates from ITRF to ETRF (EUREF-FIN)
  - To be applied in Finnish territorial waters
  - Updates to parameters within every year or every ? years
  - Defined as 7-parameter similarity transformation between two sets of coordinates (Jivall, L. (2013): Simplified transformations from ITRF2008/IGS08 to ETRS89 for maritime applications. Lantmäteriet.)

# Thank you – Questions?