1st TWLWG Meeting

Niterôi, Rio de Janeiro, 30thMar-1stApr,2009

Report of the Chart Datum Working Group of the Baltic Sea Hydrographic Commission

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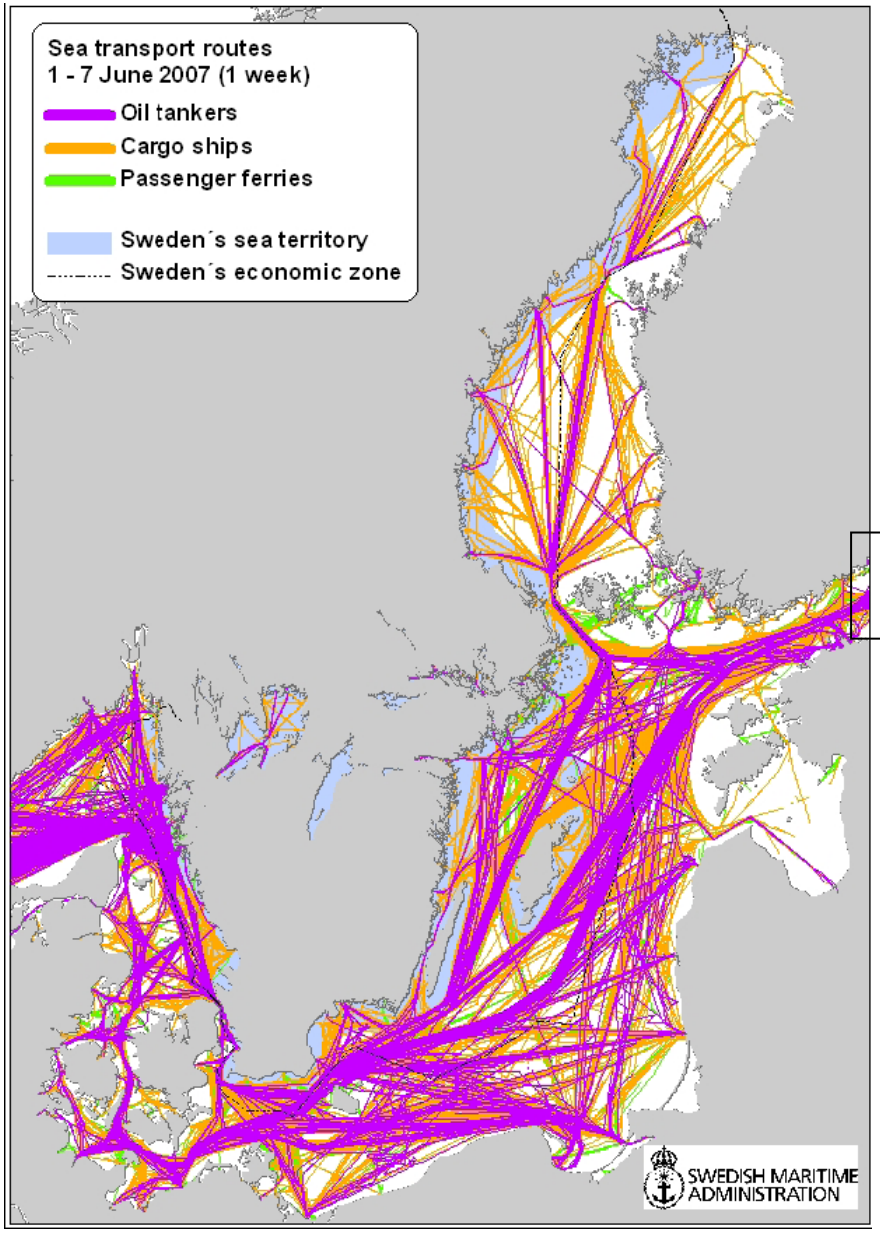
Baltic Sea

Ship routes



St. Petersburg
Primorsk

1 April 2009

TWLWG1, Niterôi, 30 May - 1 April, 2009

The Baltic Sea

- No tide (< 10 cm)
- The water level varies normally ± 50 cm
- Extreme values – 1 to + 2 meters
- Water level changes are not periodical
- However it is possible to predict next 2-3 days
- Long and shallow fairways!!, hard rocky bottom
- Minimum underkeel clearances, dredgins
- Maximum drafts < 16 meters
- Postglacial land uplift (Finland, Sweden)

Introduction

The Baltic Sea Hydrographic Commission (BSHC) has established a Chart Datum Working Group. The primary tasks for the group are the following:

- to study the feasibility to use the European geodetic height reference system as a principal alternative for a harmonised vertical reference system for Baltic Sea nautical charts,

- to specify the existing differences of chart datums used in the Baltic Sea area, especially
    - possible inconsistency in the nations area
    - differences across the borders of the neighbouring countries
    - differences compared to the common geodetic height datum

TOR:s (continued)

- to study
  - the status of water level information
  - distribution of water level information
  - interpolation and prediction of water levels

- to prepare recommendations how the sea level and its variations should be shown on nautical paper and ENC charts and publications, and conveying water level information to mariners [ref. IHO T.R. A2.5.2. note ii].

- to clarify the role of other international bodies on this subject and find out points of contacts to them

- keep close contact to HSSC Tidal and Water Level Working Group

MSL, Mean Sea Level

- mean location of the sea level
- related to?
  - center of the earth
  - earth crust, where, below? / closest shore
- total duration of the observation series
- period of observations
- maximum expexted/allowed error

MSL calculation is effected by

- global rise of the oceans
- local ”oceanographic” effects
- unstable soil under the tide gauge
- postglacial rebound on some areas
- instrumental errors and breakdowns

What is the measurand?

- we are not measuring the sea level
- we measure the location of the level related to earth crust
- both are affected by several disturbing factors
- the result is dependent on time (epoch)

Seamless depth data

- on tidal areas it is only natural that the depth information on adjoining charts is not seamless
- but on non-tidal areas the seamless depth database in not only a possibility but could significantly benefit the exploitation of the depth data both in nautical chart production and in other applications

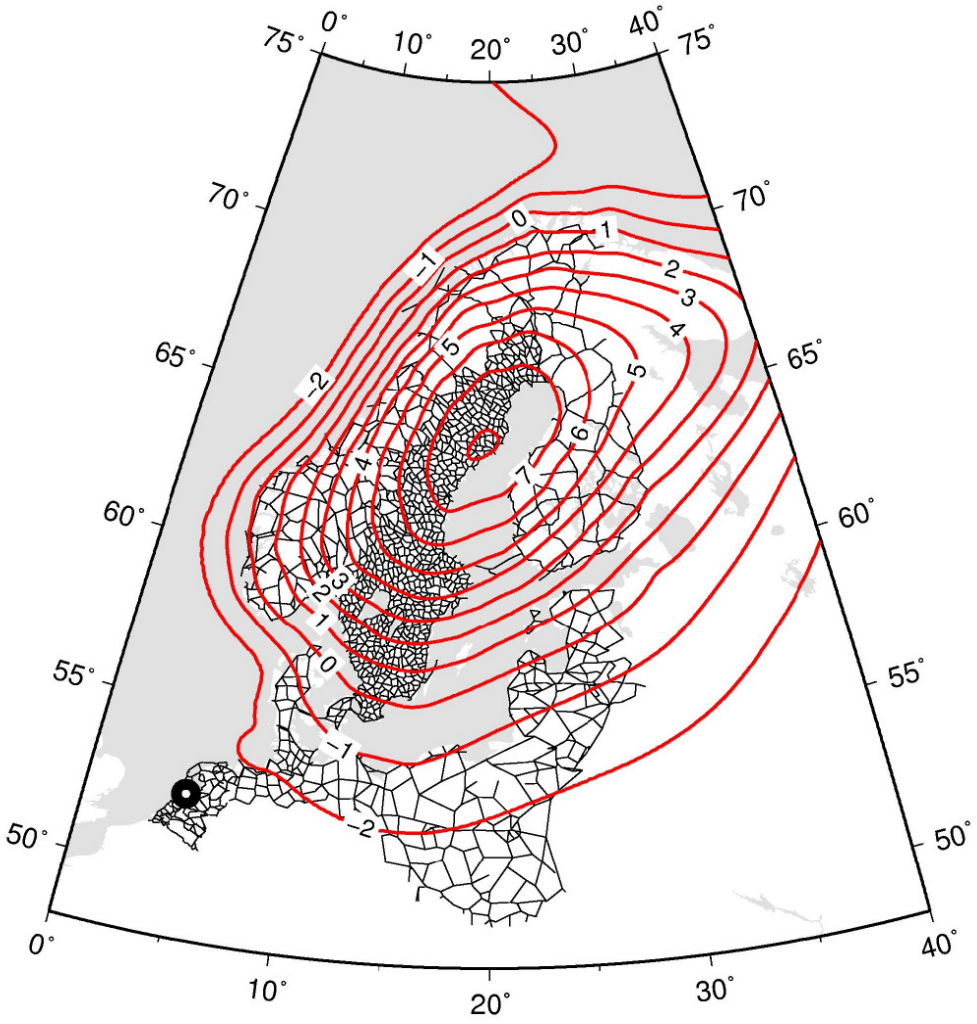
We should change the process

- We should measure and process the depth data by using such depth (height) datum, which is seamless for the whole area
- For charts (navigators) we should finally represent the depth information by maintaining the impression of “Mean Sea Level”
- *The height system of Tide Gauges (Mareographs)*
- The one and only possible choice is that the new depth datum itself is close to MSL

Geodetic reference frames

- The selection of WGS84-spheroid would solve many problems related to the hydrographic surveys. But for charts we would need the accurate physical model of the earth surface (geoid)
- A physical reference frame for heights can be created by levelling networks. Usually such levelling network is calculated by using MSL as zero level
- NOTE: In lack of uniform and accurate geodetic reference frame, the MSL is the only possibility for that area

Baltic Sea Levelling network available



Where is the problem?

- IHO M-3 and M-4 do recognize only MSL without any explanations
- Many countries have adopted a geodetic reference which is approximately MSL
  - What is the allowed difference?
- In case of MSL Datum and area affected by land uplift the charted depths should be changed regularly

(ii) advise on the use of vertical datums;

(iii) advise on tidal and water level observation, analysis and prediction;

(iv) advise on matters concerning the exchange, distribution and use of tidal and water level related data;

(v) propose relevant amendments and improvements to IHO Technical Resolutions (M-3) relating to tidal, water level and vertical datums;

The Work program of TWLWG

- Should we study more
  - Recommendation for MSL-determination on non-tidal vaters
  - The allowed difference of CD and MSL
  - The possibility to even recommend to use geodetic datum
- All these may require new regulations for water level information.

(iii) advise on tidal and water level observation, analysis and prediction;

(iv) advise on matters concerning the exchange, distribution and use of tidal and water level related data;

(vii) study principles and methods for conveying tidal and water level information to mariners.

Real time Water Level information

- Observed Water Level
  - Tide gauge
  - Observation time
  - Reference frame
- Interpolated Water Level
  - Between two or more tide gauges
- Predicted Water Level
  - Prediction for 2 – 4 days
- Continuous data flow / warnings only
- TWLWG should study the user requirements

BSHC Chart Datum WG asks

- Is it allowed to select a geodetic reference frame (or system) to the Chart Datum
  - If yes then his should be *instructed* in TR and M-4
- The opinion of TWLWG about the other issues included to BSHC TOR:s
  - Should they be noted also in the WP of TWLWG
- Are there other sea areas which have similar circumstances and practical requirements like the Baltic Sea

End of the BSHC ChartDatumWG report

Questions, comments?

Thank You!