A HARMONIZED VERTICAL REFERENCE SYSTEM FOR THE BALTIC SEA

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Because there is no common vertical reference system for hydrographic or navigational tasks, Baltic Sea Hydrographic Commission (BSHC) has considered to be important to harmonize chart datums in the Baltic Sea. Countries have their own national systems differing from each other. Systems are based principally on mean sea level (MSL), but national realizations of MSL are different. This kind of situation is inconvenient for navigators, for data transfer between Hydrographic Offices and for other use of depth and water level data.

BSHC decided in 2005 to establish a Chart Datum Working Group (CDWG) to study and foster the harmonization of vertical reference systems. CDWG members include representatives from all Baltic Sea Hydrographic Offices, permanent representatives and observers from national geodetic and oceanographic organizations and BOOS.

The working group studied first the feasibility of the European Vertical Reference System (EVRS) as a principal alternative for a harmonized vertical reference system for Baltic Sea nautical charts. It also studied possible time schedules and necessary preconditions necessary for each Baltic Sea country to move to use harmonized datum on their nautical charts. The working group develops recommendations and guidelines on how the transfer period could be implemented.

The EVRS has been found to be feasible as a harmonized vertical reference system for the Baltic Sea. The change to the EVRS based reference system would have practically no effect in the southern parts of the Baltic Sea, but in the northern parts it would have around 15 – 20 cm effect on depths. There is good commitment among the Baltic Sea countries to take this harmonized datum in to use.

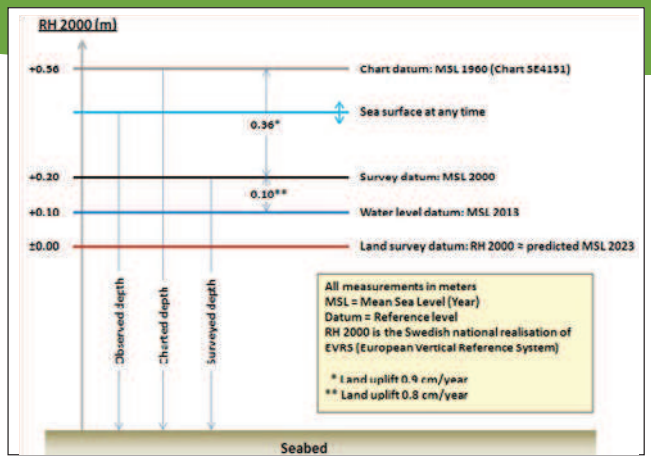
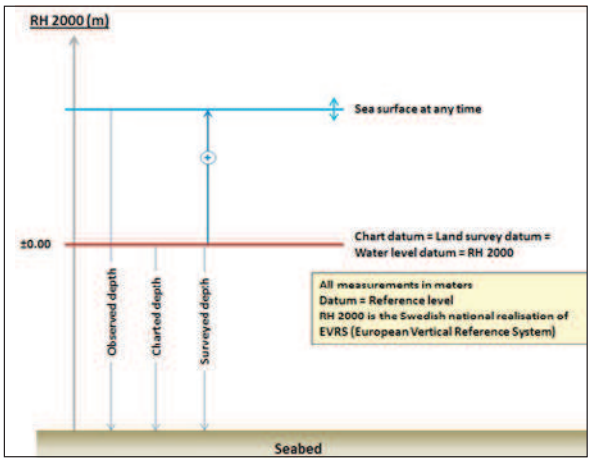


Fig. 1a. Present situation.



Images: Lars Jakobsson, Swedish Maritime Administration

Fig. 1b. Situation with harmonized chart datum.

There are a lot of benefits which can be achieved with a well-defined, international EVRS based harmonized vertical reference system when all the depth and water level information can be provided in the same datum within the whole Baltic Sea. E.g. elimination of confusion between different chart datums, and safer and easier data transfer between national Hydrographic Offices and other organisations. Further on a harmonized vertical reference system enhances wider and easier use of the data in accordance with the INSPIRE directive and enables the full utilization of future enhanced navigation systems based on International Hydrographic Organization (IHO) S-100 standards.

Other benefit for the EVRS is that it is a common European vertical reference system to which many national height systems are based on. Thus depths on sea and heights on land will be referenced to the same reference system. The common levelling network around the Baltic Sea, Baltic Levelling Ring (BLR), computed and adjusted in 2006 has given the possibility to tie all mareographs to this common datum.

Figure 1a illustrates the present complex situation with different MSL based chart datums. Figure 1b

illustrates the clear situation after the EVRS based harmonized vertical reference system has been taken into use.

It is vital for the mariner that charted depths and broadcasted water level information are in the same reference system. To provide all the information safely and reliably to the users during the transition period, it is essential to have a good cooperation and communication between different organisations like national hydrographic offices, geodetic and oceanographic organizations (e.g. BOOS) and mariners and other users of water level data both in national and international level.

CDWG will now concentrate on guiding the implementation process of the harmonized vertical reference system by preparing a road map and monitoring the status of the implementation process. CDWG supports efficient international communication and cooperation with relevant bodies. In addition CDWG will study other water level related issues, e.g. possibilities to develop common geoid model for the Baltic Sea and foster studies related to dynamic topography of sea surface in the Baltic Sea.

The implementation process will take several years: the transition is estimated to be completed by 2020. To make the transition process successful one of the key issues is to get all relevant national and international bodies to communicate and cooperate together. CDWG is one node point for this important international network.

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INSTITUTIONAL RESEARCH TOPIC AT THE MARINE SYSTEMS INSTITUTE FOR 2014 - 2019

Urmas Lips

Background

A six-year project aiming at enhancing predictability of the Baltic Sea system was initiated by the research team of the Marine Systems Institute at Tallinn University of Technology in 2014 (supported by the Estonian Ministry of Education and Research). The project is focused on multi-scale physical processes that significantly control the biogeochemical cycles of substances as well as mixing and dispersion of particles and pollutants, especially in the boundary layers (near-surface and near-bottom layer) and in the pycnoclines (seasonal thermocline and halocline) of the Baltic Sea. The in-situ observations using novel technologies combined with remote sensing and high-resolution numerical simulations are the main study method that allows tracking of physical and biogeochemical signal dynamics at a wide range of temporal and spatial scales. We aim to make a substantial step forward in the quantitative description of submesoscale processes and their impact on the biogeochemical cycles in the stratified Baltic Sea.

Methods of in-situ observations

While the study is based on the combined use of the data from in-situ and remote sensing observations and numerical simulations, here the approaches of in-situ observations focused on processes in the upper and subsurface (thermocline) layers are presented. The core of the measurement complex