



Minutes

of the BSHC CDWG9 Meeting on 4-5 April 2017

at the Bundesamt für Seeschifffahrt und Hydrographie (BSH)
Rostock, Germany

[16 May 2017]

1. Welcome and formalities

The meeting convened on 4 April 9:00 a.m. The chair welcomed all the participants to the meeting.

Welcome of the host gave the Hydrographer of Germany, Vice President of BSH, *Dr Mathias Jonas*, who warmly welcomed the participants in the BSH. He also pointed out the importance of the CDWG work on harmonization of the vertical reference system in the Baltic Sea. At the same time he gave a wider perspective to harmonization by pointing out that harmonization is also needed in other sea areas around Europe. Dr Jonas also emphasized the good and efficient cooperation within the Baltic Sea area and BSHC members which is unique in IHO. The Baltic Sea is a blue print for other regions and groups.

Since CDWG doesn't have appointed secretary, *chair* proposed *Dr Wilfried Ellmer* as a secretary for the meeting helping *chair* to keep the minutes. *Dr Wilfried Ellmer* was appointed as a secretary for the meeting.

The draft program was adopted with a changing ending time to 3:00 p.m. [\[CDWG9 Program\]](#)

The draft agenda was adopted without any amendments. [\[CDWG9 Agenda 15March2017\]](#)

It was deemed that since all the participants knew each other there was no need for introduction of participants. [\[CDWG9 List of Participants\]](#)

Apologies were received from *Lars Jakobsson (Sweden)*, *Mirjam Bilker-Koivula (Finland)*, *Tõnis Siilannarusk (Estonia)*, *Peeter Väiling (Estonia)* and *Joanna Gerlings (Denmark)* since they were not able to participate.

The meeting took following reservation by Russian Federation delegate, *Dr Sergey Reshetniak*: "All decisions that would be taken during CDWG9 meeting would be accepted by Russian Hydrographic Service only after consultations and should be confirmed by the Department of Navigation and Oceanography of the Ministry of Defence of the Russian Federation."

2. Review the work of the CDWG and actions since the last meeting

The chair noted that final minutes of the last meeting has been delivered for all CDWG members after the last meeting on 21 May 2016, thus all participants agreed that there was no need to review them. [\[CDWG8 Final Minutes 23-24 Feb 2016\]](#)

CDWG8 status of actions were reviewed and approved. [\[CDWG8_List of Actions\]](#) Mostly all actions were accomplished. Some not accomplished actions deemed to be unnecessary and removed from list. Some not accomplished actions decided to include in the CDWG9 action list.

Remarks concerning some actions:

- Action 6: *Chair* has contacted BOOS chair by email without any response. Next BOOS annual meeting will be held in Copenhagen on 22-24 May. It was agreed that Thomas Hammarklint will discuss there with BOOS chair. **(Actions 1 and 2)**
- Action 8: Status of the implementation of Poland and Lithuania was asked by email and answer was got from Lithuania on 4 July 2016 (Mindaugas Zakarauskas, mindaugas.zakarauskas@msa.lt). *Chair* discussed in BSHC 21st Meeting with Polish delegate, but there was not any information available because chart datum matters are under responsibility of another agency not present at the meeting.
- Action 9: Poster of the Baltic Sea Chart Datum 2000 within FAMOS is not done, but presentations are given and thus desired information given as aimed.

Presentations concerning harmonizing of vertical datums in the Baltic Sea were given in following conferences:

- GGH2016 (Gravity, Geoid and Height Systems) symposium in Thessaloniki, Greece, on 19-23 September 2016: "On the definition and realisation of the Baltic Sea Chart Datum 2000"
- FAMOS Conference in Malmö, Sweden on 8-10 March 201

3. Outcome of the BSHC 21st Meeting

The minutes and action list of the BSHC 21st Meeting, Klaipeda Lithuania (27-29 September 2017), were not published at the time of the CDWG9 meeting.

Chair shortly reviewed discussions in BSHC 21st Meeting concerning CDWG work, but any official information could not be given because the final minutes was not published. *Chair* attended the BSHC 21st Meeting and presented CDWG report. Also *chair* presented CDWG answers to actions set by BSHC 20th Meeting, including the CDWG clarification of the use of the common name of Baltic sea harmonized Chart datum, Baltic Sea Chart Datum 2000.

CDWG proposal for showing chart datum name: Baltic Sea Chart Datum 2000 in paper charts:
Mean Sea Level (Baltic Sea Chart Datum 2000^{NATIONAL REALIZATION})

Also CDWG ToRs and Work Programme was reviewed in the BSHC 21st Meeting and asked to be approved.

In the BSHC 21st Meeting was raised up a question if an abbreviation is needed for the Baltic Sea Chart Datum 2000. It was agreed in the CDWG9 meeting that abbreviation is needed. Two abbreviations were proposed: *BSCD2000* and *BSCD*. During the discussion it was deemed that the most important matters are that abbreviation should refer directly to the name Baltic Sea Chart Datum 2000 and land uplift epoch shall be shown in the abbreviation. CDWG9 meeting agreed to propose abbreviation *BSCD2000* to be approved by BSHC 22nd Meeting. **(Action 3)**

4. Review the *national* implementation plans and the status of implementation

Questionnaire of the implementation status of each BSHC member states was sent to CDWG members. Answers to the questionnaire were received only from Finland, Germany, Latvia, the Russian Federation and Sweden.

Participants presented the national implementation status and plans.

Finland: Feasibility study of the implementation was done 2015-16 as a part of R&D-project Intelligent Fairway. Output was recommendations for transition procedures and technical transformation tools, preliminary timeframe and recourse estimations. In 2017 a transformation procedures and tools will be tested by transformation of chart number 55. Results will be ready during spring 2017. BSCD2000 implementation project kick-off meeting was held on 2 March 2017 and project organization was outlined. Finland is taking part in EU co-financed FAMOS-project (subactivity 2.5 Change of chart datum). Hydrographic surveys have been referred to N2000 (the realization of BSCD2000 in Finland) since 2013. Mareographs of the Finnish Meteorological Institute are connected to N2000/BSCD2000. [[CDWG Questionnaire of Implementation Status_FIN](#)]

Germany: EVRS realization is already used in practice by the adoption of height system DHHN 2016 together with the quasigeoid model GCG 2016. The new geoid model is planned to introduce after finalising FAMOS-project gravity surveys and geoid computation. The database refers to national height system (German realization of EVRS), hence there is no need for transformation. Almost all vertical positioning of hydrographic surveys is based on GNSS and geoid model. Gravity surveys are done and will be continuing within FAMOS to improve the geoid model. [[CDWG Questionnaire of Implementation Status_BSH](#)]

Latvia: In all nautical charts: Depth in metres, referred to Mean Sea Level (BHS-77). Since 2014 there are additional note on all nautical charts how to calculate depths to European Vertical Reference System (EVRS) realization in territory of Latvia (LAS-2000,5), values on chart should be reduced by 15 cm (cm are indicated according to place). Possibilities to recalculate depth database to EVRS has been studied. Decision how to implement of EVRS (BSCD2000) is planned to do after geoid model (FAMOS-project finalizing) at the Baltic Sea will be available. Future actions will be taken according the amount of changes. [[CDWG Questionnaire of Implementation Status_Latvia](#)]

The Russian Federation: In accordance with the latest documents of the Government of the Russian Federation in the field of State Coordinate Systems of the Russian Federation including vertical reference any decisions concerning transition to the harmonized vertical reference may be done not earlier than the end of 2020. A new State Coordinate System 2011 (GSK-2011) for consumers, navigation, geodesy and cartography was implemented on 1 January 2017. Current state coordinate systems SK42 and SK95 can be used until January 1, 2021 concerning tasks in relation to the data and documents created using them. GSK-2011 is a three-dimensional geocentric Equatorial coordinate system. The positions of the reference lines and planes in GSK-2011 are in accordance with the recommendations of International Earth Rotation and Reference System Service (IERS) and International Time Bureau (BIH). GSK-2011 is in good accordance with WGS84 and ITRS. The differences between coordinates in GSK-2011 and ITRF are around 1-3 cm. [[CDWG Questionnaire of Implementation Status RussianFederation](#)], [[Sergey.Reshetniak_GSK-2011_310317](#)]

Sweden: The transition to the Baltic Sea Chart Datum 2000 is part of the Chart Improvement project in the Swedish HO "Vision 2025". The vertical reference and coastline will be updated and referred to Baltic Sea Chart Datum 2000, Swedish realization is RH2000, in all Swedish charts, except those covering inland waters, before the end of 2021. Lakes covered of official charts will be taken care of in similar way before the end of 2022. Within EU co-financed FAMOS-projects Swedish Maritime Administration (SMA) and Swedish Meteorological and Hydrological Institute (SMHI) will

harmonize and upgrade the Swedish water level network (2017-18). All water level data will be presented in BSCD2000. All hydrographic surveys since 1 July 2013 refers to BSCD2000. Depth database is transformed to BSCD2000. Ten paper charts and equivalent ENCs has been updated to BSCD2000 in the northern part of the Bay of Bothnia. All involved water level stations are connected to the BSCD2000.

[CDWG Questionnaire of Implementation Status 2017 SMA]

Answers were not received from Denmark, Estonia, Lithuania and Poland to the CDWG questionnaire of the national implementation status and plans. In the CDWG meeting it was noted to be important to emphasize in the BSHC 22nd meeting the importance of contribution of all the member states at least by answering the CDWG questionnaire of the implementation status. If there is not information available it is not possible to follow up the progress of implementation on the Baltic Sea Chart Datum 2000 and execute it in harmonized way within different countries. (Action 4)

5. Review and update the *joint* road map, time line and communication plan

Chair reviewed the joint road map, time line and communication plan. It was agreed that no updates are needed. List of relevant meetings to CDWG was updated as a part of the communication plan.

It was agreed that the Baltic Sea Chart Datum 2000 is needed to get included as a vertical datum in the S-100 datum list. In the meeting the right procedure was not known, but two different ways were discussed, either to deliver proposal to IHO S-100 WG / S-101PT or to IHO registry. It was decided that Thomas Hammarklint contacts Hans Engberg to get information how the datum can be added to S-100 datum list. (Action 5)

6. Draft specification for Baltic Sea Chart Datum 2000

Jonas Ågren and Gunter Liebsch gave a presentation of the specification of the Baltic Sea Chart Datum 2000. *[Definition and realisation of BSCD2000 DRAFT version 2c]*

There are two main sections, definition and realization. Definition describes the conventions the Baltic Sea Chart Datum 2000 should follow. Realization describes how it can be applied nationally and what conditions national height systems should follow and what uncertainty level could be achieved. Also it gives guidelines for using GNSS-augmentation services.

The goal is that the geodetic infrastructure for the realization of the Baltic Sea Chart Datum 2000 shall provide a standard uncertainty better than 5 cm in the Baltic Sea including coastal areas. The goal is possible to achieve, but it requires that gravity data will be available all over the Baltic Sea area and new gravity surveys planned to be carried out within FAMOS-project can be finalized as planned. At this moment there are not available geodetic data in the eastern end of the Gulf of Finland, in Russian waters. (Action 6) Also there are still wide areas to be covered with new shipborne gravity campaigns in the middle of the Baltic Sea.

Russian delegate noted that there is not taken into account in a sufficient way the possibility of realization of the Baltic Sea Chart Datum 2000 in connection to the new Russian State Coordinate System 2011. It was agreed that recommendations for this connection, which can be applied by using the appropriate corrections for transformation, will be included in the specification document. It can be applied also for other respective situations. (Action 7)

It was agreed that all the member states provides the differences of mean sea level and the Baltic Sea Chart Datum 2000 (or it's national realization). The data is already provided by Finland, Germany and Sweden. The data will be needed for composing a

map attached to the specification showing the differences around the Baltic Sea. (Actions 8 and 9)

It was agreed that the specification of the Baltic Sea Chart Datum 2000 will be presented to BSHC when the final geoid model is ready. The final FAMOS geoid model and the geoid model documentation will be included as appendix to the specification.

The importance of a good geoid model shall be emphasized in the BSHC meeting and at the same time underline that new gravity surveys are needed and financing for them has to be guaranteed e.g. member states should to commit FAMOS activity 2 continuation in the future, until 2020. Otherwise the desired uncertainty level can be guaranteed and all the benefits of the Baltic Sea Chart Datum 2000 can't be achieved.

7. Cooperation and communication with BOOS (Baltic Operational Oceanographic System)

Thomas Hammarklint gave a review of BOOS activities and cooperation with BOOS. [*Pres_BOOS-News_CDWG-Rostock_2017-04-04*]

Swedish Maritime Administration will be partner of BOOS 2017. The water level information in the BOOS web-pages are not at the common vertical datum, thus implementation of the Baltic Sea Chart Datum 2000 would benefit also BOOS and users of water level information. The cooperation with BOOS gives also connection to EuroGOOS and especially Tide Gauge Task Team concerning vertical reference systems.

Web-link to BOOS stations:

<http://www.boos.org/boos-stations>

Boos sealevels:

<http://www.boos.org/index.php?id=190>

It was agreed that CDWG will propose that in BOOS web-pages will be included water level (MSL) information in respect to the Baltic Sea Chart datum 2000. Also all data should include information of datum.

Thomas Hammarklint will participate BOOS annual meeting in Copenhagen on 22-24 May 2017 and he will give a presentation of CDWG-work. He will also contact BOOS chair to discuss possible ways of cooperation between CDWG and BOOS.

8. Cooperation with FAMOS

Jonas Ågren gave a presentation of FAMOS (Finalising Surveys for the Baltic Motorways of the Sea: <http://www.famosproject.eu/>), activity 2 vessel navigation for the future. Especially subactivities 2.1 Shipborne gravimetry measurements and data processing, 2.2 Gravity databases, data analysis and geoid computations, 2.3 Mean Sea Surface modelling and water level control and 2.5 Change of chart datum are closely related to CDWG work. Also gravity surveys and survey plans were discussed. The important matter is to get all needed shipborne gravity measurements done, geoid computations and reporting finalized. There are large areas not covered adequately with gravity data, e.g. areas in the Gulf of Finland and central part of the Baltic Sea. There are also obstacles of the usage of existing gravity data, e.g. Polish data can be used for NKG but not FAMOS geoid modelling. FAMOS provides co-financing from EU and this funding has turned out to be essential to carry out the work.

[*FAMOS_act2_achievements_and_outlook_at_conference_Agren_Malmö2017_Jonas*]

Jonas Ågren and Gunter Liebsch gave a presentation of geoid model validation, FAMOS interim geoid models. New shipborne gravity measurements have improved geoid model, but still needed to collect more data to cover the whole Baltic Sea area. Geoid model at

sea will be fitted in coastal zone existing geoid model at land to get seamless geoid model fulfilling the uncertainty goal.

[\[Initial_geoid_validation_Milestone8B_internal_170221\]](#)[\[FAMOS_Geoid_validation_CDWG_2017_JonasGunter\]](#)

Thomas Hammarklint presented harmonization of Swedish tide gauge network which is included in the FAMOS Odin subactivity 2.3. The work includes installation of new sensors for 53 stations and levelling of tide gauges which has not yet been connected to precision levelling network and also check the stability of levelled tide gauges during 2016-2018.

[\[Presentation_SHIP_FAMOS-Malmö_2017-03-08\]](#)

Jyrki Mononen gave a presentation of GNSS-geoid study for FAMOS Freja, subactivity 2.4 (2015-16). Study was done in cooperation with the Finnish Transport Agency and National Land Survey / Finnish Geospatial Research Institute. Shipborne GNSS-data was used in order to study the possibilities for validating the geoid models at sea. Two geoid models were used comparing the resulting GNSS geoid heights, FIN2005N00 and NKG2015. Result indicates that it is possible to recover geoid heights from GNSS-observations at sea and validate geoid models. Also it can be anticipated based on the study that desired uncertainties are achievable in the final geoid model if all planned gravity measurements can be carried out and the final geoid model for the Baltic Sea can be calculated. [\[2.4_FGI_FTA_GNSS-geoid_study\]](#)[\[FAMOS_Freja_GNSS-geoid_report\]](#)

9. CDWG TORs

It was agreed that changes are not needed. [\[ChartDatumWG TORs 5 April 2017\]](#)

10. CDWG **work programme for 2017-2018 and future work**

It was agreed that changes are not needed. [\[CDWG WorkProgramme_2017-2018 5April2017\]](#)

11. Election of the new CDWG chairman

Chair proposed Thomas Hammarklint as a new chairman of CDWG. He was unanimously supported to be the new chair. It was decided that BSHC 22nd meeting will be requested to approve Thomas Hammarklint as the new chair of CDWG.

12. Any other business

Jyrki Mononen promised to act as a CDWG secretary for the next meeting.

IHO resolution 3/1919 is adopted (Last amended IHO CL 10/2017). The resolution allows the use of well-defined geodetic datum as reference level like the Baltic Sea Chart Datum 2000 (EVRS-based reference level).

Norwegians (Sven Roemer) has contacted Jonas Ågren after "Geodesi- og Hydrografidagene" in Stavanger concerning Norwegian project "Felles Referens Ramme" (FRR). FRR aims at connecting the reference levels for heights on land and depths at sea and it is thus related CDWG especially in border between Sweden and Norway. It was decided that Jonas Ågren arranges meeting with Norwegians to find out possible common goals and contact points.

Member list was updated. Member from the Finnish Meteorological Institute (FMI) and Norway have retired. Proposals for new members were made, FMI/Katri Leinonen and Norway/Aksel Voldsund. **(Action 10)**

13. Review of actions and unresolved issues of this meeting

See the list of actions. [[CDWG9_List of Actions](#)]

No unresolved issues.

14. Report to BSHC 22nd Meeting

BSHC 22nd Meeting will take place in Rostock, Germany, September 2017.

At least following matters will be reported in the BSHC 22nd Meeting: (Actions 12, 13 and 14)

- Importance of finalizing all needed gravity measurements and geoid calculations and documentation by supporting to continue FAMOS activity 2 to get sufficient financing until 2020.
- Emphasize to all member states the importance of the reporting the implementation status of the Baltic Sea Chart Datum 2000.
- Importance of attending CDWG meetings.

Actions requested from BSHC 22nd Meeting:

- To note the CDWG report
- To approve abbreviation: *BSCD2000*
- To approve Thomas Hammarklint as a chair of CDWG
- To approve CDWG TORs
- To Approve CDWG Work Programme
- To give CDWG further guidance as seen appropriate

15. Next meeting

Sweden proposed next meeting to be held in Norrköping on week 6 (5-9 February), 2018. Proposed meeting days were Tuesday to Wednesday.

16. Closing the meeting

Chair thanked all participants for their active contribution in the meeting.

Chair and participants thanked warmly Dr Wilfried Ellmer on his long and noteworthy contribution to the CDWG, because this was his last meeting due to retirement in the end of 2017.

Chair closed the meeting at 3:00 p.m.