Envisioned set-up of reference data base for DMQC

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Marginal Seas Argo DMQC workshop, Sopot, Poland 18.04.2023-19.04.2023

The reference data set for dmqc in the Baltic

In Argo the quality control of the float data in the deep ocean is achieved by comparison to reference data collected for the DMQC operators for use in the OWC software. These historical salinities profiles are only those of high quality and are transformed into a common data format.

Updates to the reference data are made available to the DMQC operators from a password protected ftp server. Data delivered to the server can only be used for DMQC, all other use is prohibited.


CTD – DMQC ARGO 2018V01
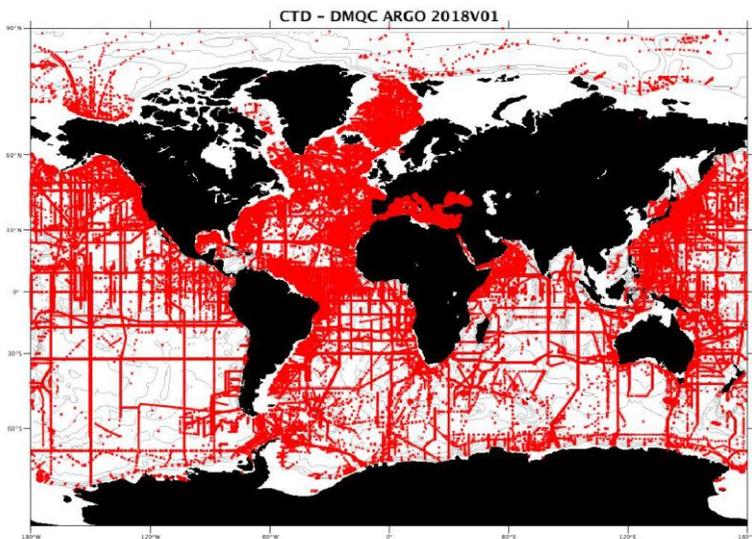
In the OWC software two sources of reference data are made available: CTD data from ship hydrography and good float data

Source: DMQC Cookbook for Core Argo parameters https://archimer.ifremer.fr/doc/00678/78994/
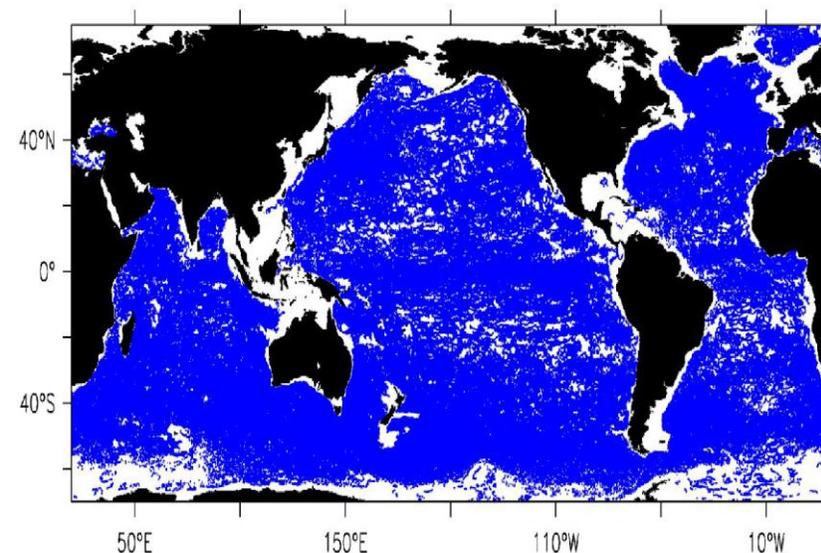
# Reference data for the dmqc of floats in the Baltic

To mimic the structure used in the DMQC of floats from the deep ocean, the collection of reference material is organized on an ftp server.

Subdirectories are established for BSH, FMI and IOPAN to exchange CTD data, statistics and scripts.

Sitzung

Übertragungsprotokoll:	Verschlüsselung:
FTP	Keine Verschlüsselung
Rechnername:	Portnummer:
ftp.fmi.fi	21
Benutzername:	Kennwort:
ear_dmqc	

Bearbeiten   Erweitert...

Password secured ftp server established for dmqc purposes (request password from Simo-Matti Siiriä (FMI) Simo-Matti.Siiria@fmi.fi if needed

Name	Besitzer	Größe	Geändert	Rechte
..				
IOPAN	ear_d...		21.06.2022 14:20:01	rwxr-x---
BSH	ear_d...		03.05.2022 16:51:21	rwxr-x---
FMI	ear_d...		17.01.2022 09:10:27	rwxr-x---

/

Reference data for the dmqc of floats

FMI is updating the reference data available from ICES and provides statistics for the Bothnian Sea and Baltic proper


Latest update in 2022, procedure for updates: will be downloaded annually by FMI

Reference data for the dmqc of floats

In the regular OWC setup
*reference data are exchanged
as CTD_xxxx.mat
Where xxxx is a four digit code
from WMO to point to a
10x10 ° box*

BSH is creating the normally used CTD_xxxx.mat files for the dmqc from the ICES reference data under the FMI_wmo_matfiles_beforeQC folder and for the polish data from the IOPAN folder
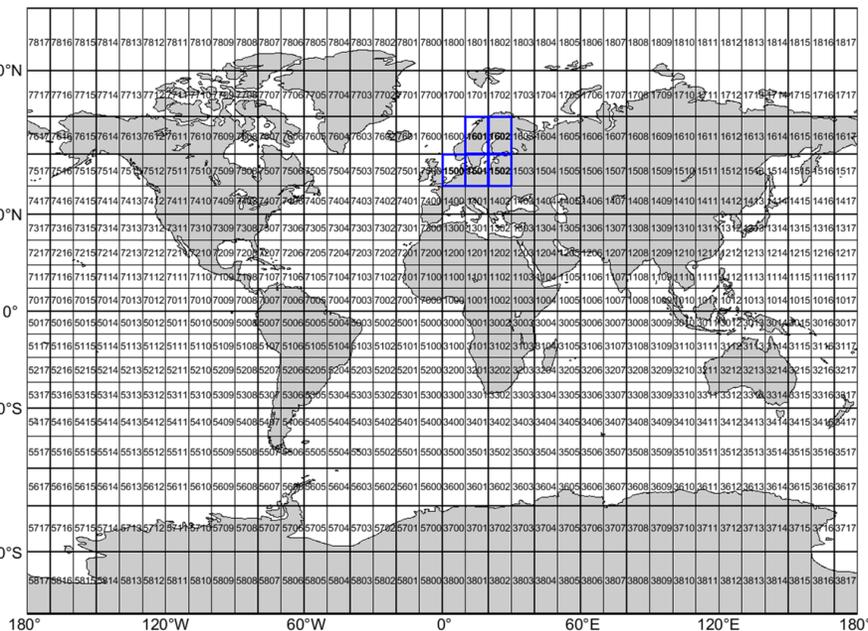
/BSH/				
Name	Besitzer	Größe	Geändert	Rechte
⌂ []				
📁 IOPAN	ear_d...		03.05.2022 16:55:21	rwxr-x---
📁 FMI_wmo_matfiles_beforeQC	ear_d...		03.05.2022 13:13:10	rwxr-x---
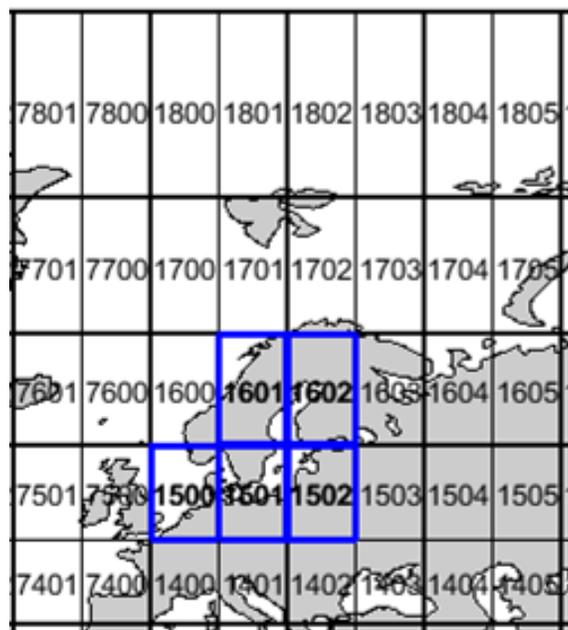
5 Boxes are available for Baltic (normally not contained in regular releases for the global ocean):
1500, 1501, 1502
1601, 1602

BSH has sorted present version the ICES data into the wmo_boxes

ICES station from 2000/03/08-2021/04/08, converted to ctd-xxxx.mat files
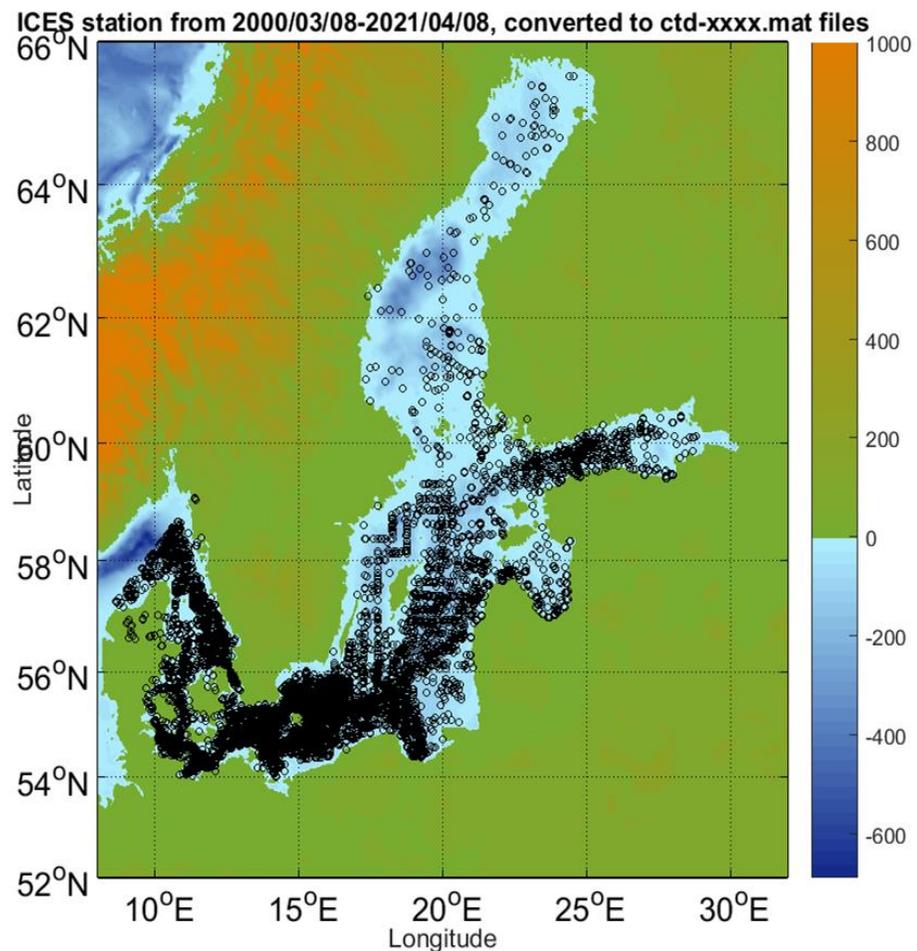
/BSH/FMI_wmo_matfiles_beforeQC/

Name	Besitzer	Größe	Geändert	Rechte
plots	ear_d...		03.05.2022 13:14:32	rwxr-x---
ctd_1602.mat	ear_d...	1.188 KB	28.04.2022 10:17:13	rw-r-----
ctd_1601.mat	ear_d...	678 KB	28.04.2022 10:17:12	rw-r-----
ctd_1502.mat	ear_d...	5.946 KB	28.04.2022 10:17:12	rw-r-----
ctd_1501.mat	ear_d...	31.716 ...	28.04.2022 10:17:07	rw-r-----
ctd_1500.mat	ear_d...	1.085 KB	28.04.2022 10:16:12	rw-r-----

Profiles per year

Profiles per month
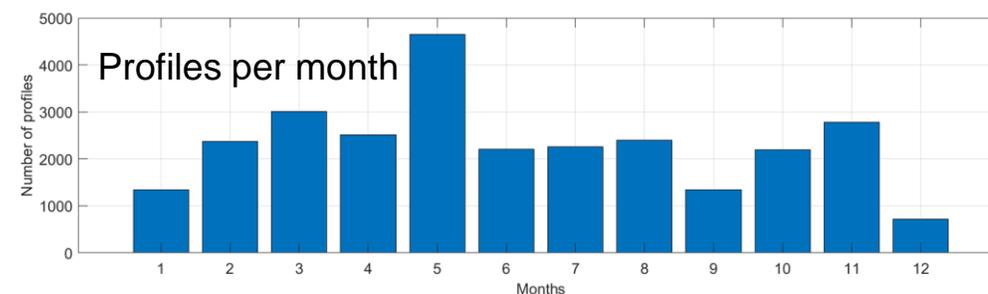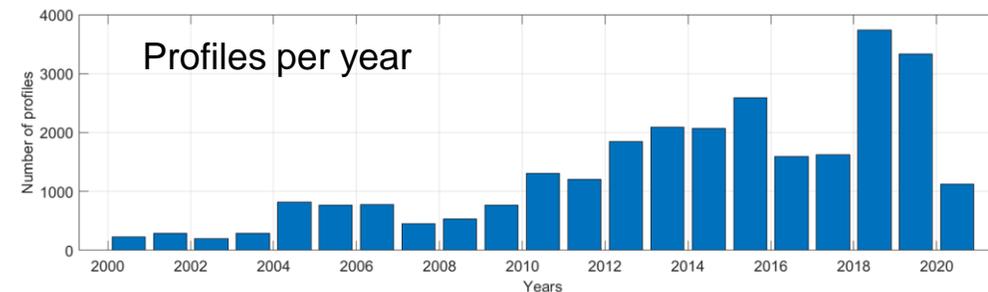
Reference data for the dmqc of floats

IOPAN data from the monitoring cruises are not available through ICEs. -> IOPAN is providing these data from the polish research cruises on the ftp server.
IOPAN also provides min/max statistics for the three southern basins (Slupsk, Gdansk, Bornholm)

Latest update on data from Poland is 2022 and updates are intended annually
Data are sorted into wmo_boxes in the BSH folder on the ftp server and have the same format there as the ICES data

/IOPAN/				
Name	Besitzer	Größe	Geändert	Rechte
T_Statistic_Slupsk.xls	ear_d...	37 KB	21.06.2022 14:20:01	rw-r-----
T_Statistic_Gdansk.xls	ear_d...	41 KB	21.06.2022 14:20:01	rw-r-----
T_Statistic_Bornholm.xls	ear_d...	38 KB	21.06.2022 14:20:01	rw-r-----
SouthernBaltic_Temp_IOPAS.png	ear_d...	658 KB	21.06.2022 14:20:00	rw-r-----
SouthernBaltic_Sal_IOPAS.png	ear_d...	682 KB	21.06.2022 14:20:00	rw-r-----
S_Statistic_Slupsk.xls	ear_d...	37 KB	21.06.2022 14:19:59	rw-r-----
S_Statistic_Gdansk.xls	ear_d...	42 KB	21.06.2022 14:19:59	rw-r-----
S_Statistic_Bornholm.xls	ear_d...	39 KB	21.06.2022 14:19:58	rw-r-----
Baltic_DMQC.mat	ear_d...	6.159 KB	04.05.2022 15:11:40	rw-r-----
3902133salinity.png	ear_d...	118 KB	28.04.2022 13:09:01	rw-r-----
3902109salinity.png	ear_d...	145 KB	28.04.2022 13:09:00	rw-r-----
3902106salinity.png	ear_d...	152 KB	28.04.2022 13:08:48	rw-r-----
3902104salinity.png	ear_d...	123 KB	28.04.2022 13:08:47	rw-r-----
3902101salinity.png	ear_d...	137 KB	28.04.2022 13:08:47	rw-r-----
3901941salinity.png	ear_d...	129 KB	28.04.2022 13:08:46	rw-r-----
3901940salinity.png	ear_d...	109 KB	28.04.2022 13:08:46	rw-r-----
3902115salinity.png	ear_d...	127 KB	28.04.2022 13:07:48	rw-r-----
3902110salinity.png	ear_d...	133 KB	28.04.2022 13:07:47	rw-r-----
mean_of_physicochemical_properties.pptx	ear_d...	293 KB	18.03.2022 15:47:06	rw-r-----

Sorting of IOPAN data into the wmo_box CTD_1501.mat

IOPAN station from 2016/01/025-2019/11/13, converted to ctd-xxxx.mat files

/BSH/IOPAN/wmo_boxes/
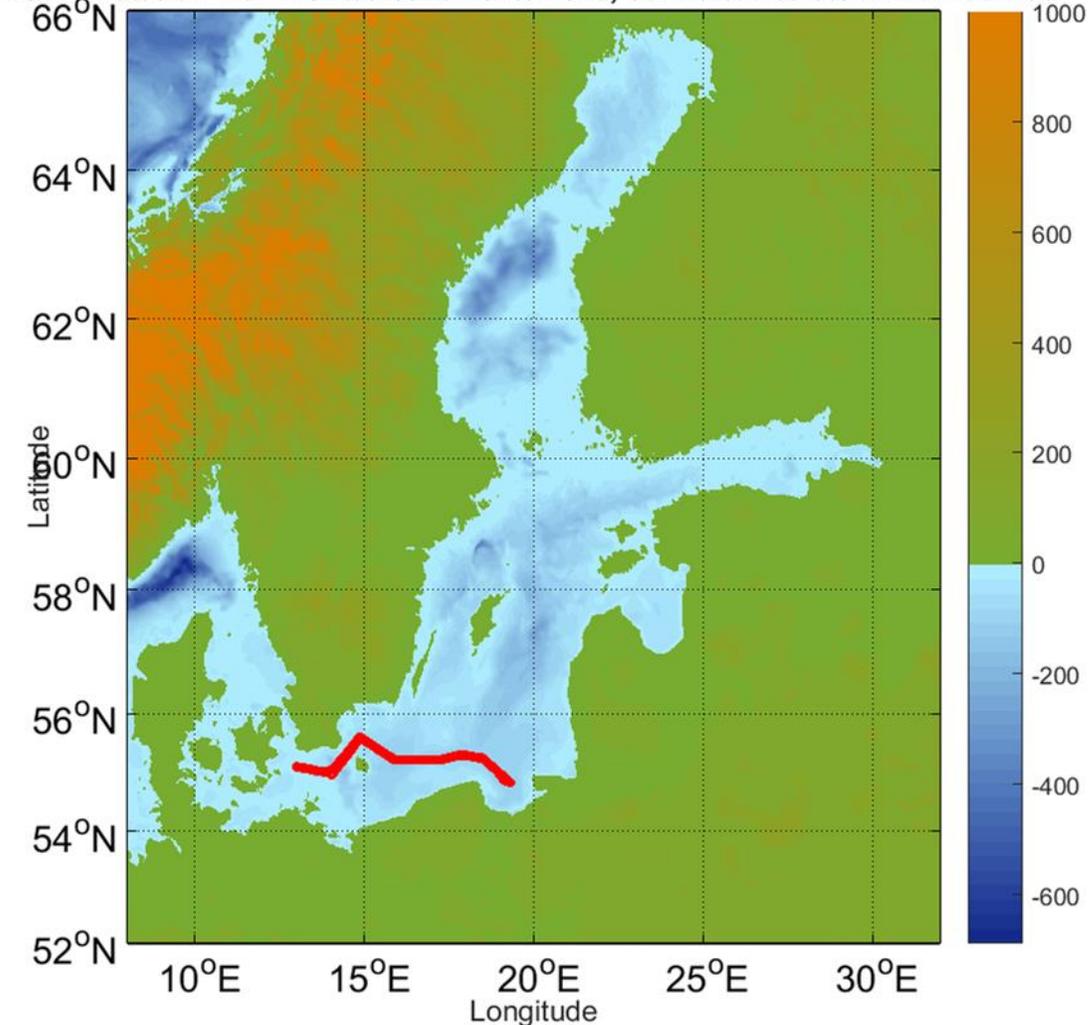
Name	Besitzer	Größe	Geändert	Rechte
RD_CTD4MarginalSeas_Baltic_IOPAN__chist3_mrp.png	ear_d...	28 KB	03.05.2022 17:09:51	rw-r-----
RD_CTD4MarginalSeas_Baltic_IOPAN__chist2_month.png	ear_d...	23 KB	03.05.2022 17:09:50	rw-r-----
RD_CTD4MarginalSeas_Baltic_IOPAN__chist1_year.png	ear_d...	23 KB	03.05.2022 17:09:49	rw-r-----
RD_CTD4MarginalSeas_Baltic_IOPAN__bpointmap3_NMIP.png	ear_d...	196 KB	03.05.2022 17:09:46	rw-r-----
RD_CTD4MarginalSeas_Baltic_IOPAN__bpointmap2_MRP.png	ear_d...	198 KB	03.05.2022 17:09:20	rw-r-----
RD_CTD4MarginalSeas_Baltic_IOPAN__bpointmap1_YEAR.png	ear_d...	200 KB	03.05.2022 17:08:48	rw-r-----
RD_CTD4MarginalSeas_Baltic_IOPAN__agridmap2_LATEST.png	ear_d...	162 KB	03.05.2022 17:08:17	rw-r-----
RD_CTD4MarginalSeas_Baltic_IOPAN__agridmap1_PROFN.png	ear_d...	160 KB	03.05.2022 17:07:47	rw-r-----
ctd_1501.mat	ear_d...	20.393 ...	03.05.2022 16:42:59	rw-r-----

Profiles per year

Profiles per month
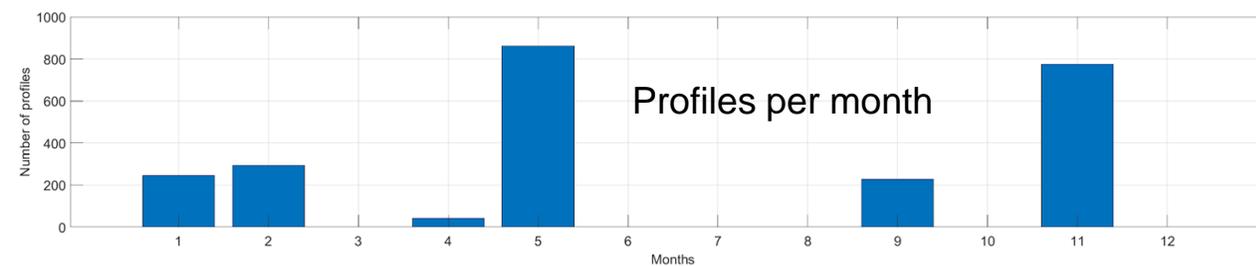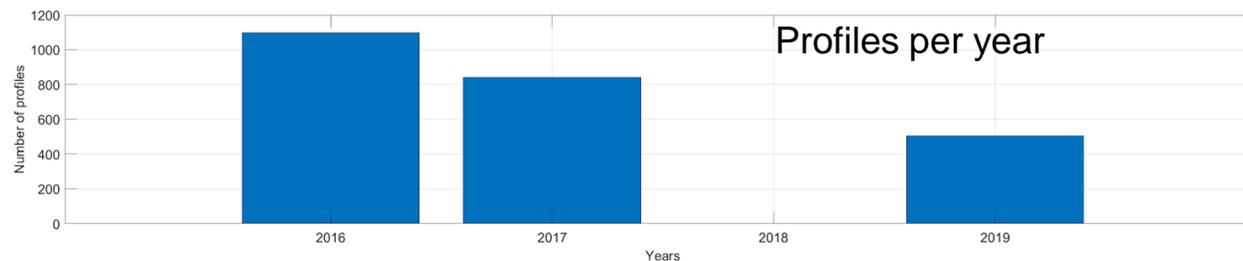
Structure of reference data in wmo_boxes

Content of mat file ctd_1501.mat created from IOPAN data

|		
dates	1x2445	Date
lat	1x2445	Latitude of profiles
long	1x2445	Longitude of profiles
pres	533x2445	Pressure array (nlevel x nprofiles)
ptmp	533x2445	Pot. Temperature array (nlevel x nprofiles
qclevel	1x2445	Information on origin/quality of data
sal	533x2445	Salinity array (nlevel x nprofiles)
source	1x2445	Information on origin of data
temp	533x2445	Temperature array (nlevel x nprofile)

CTD1501, from IOPAN data, 2445 stations

CTD1501, from ICES data, 21664 stations, 13332 in Baltic
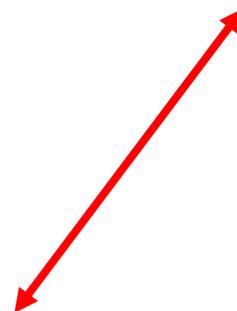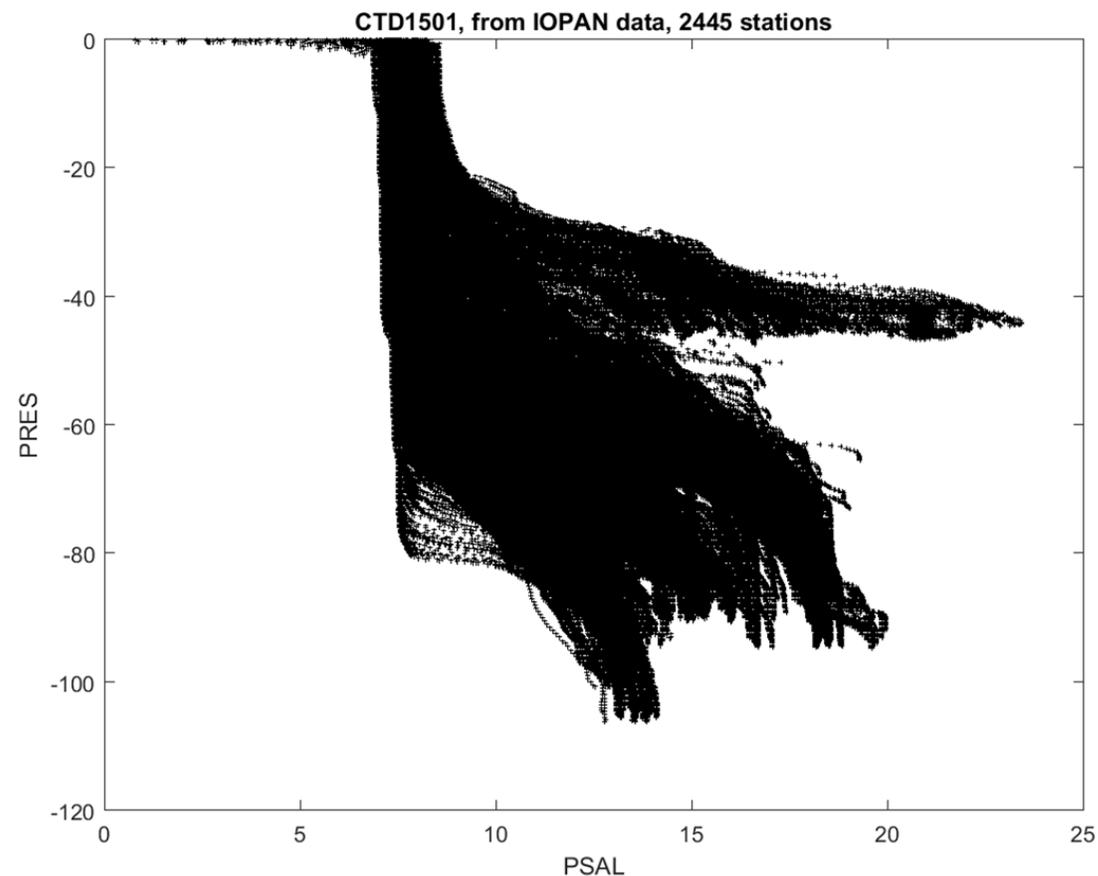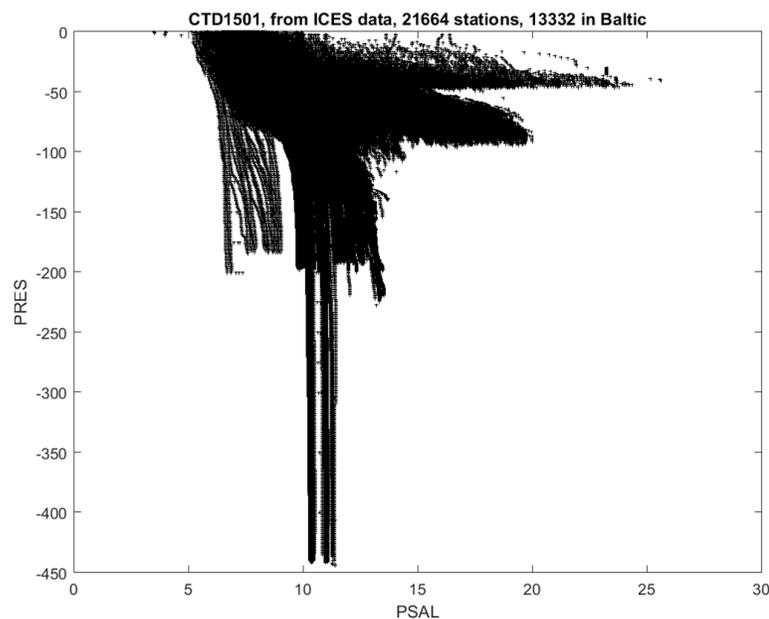
Comparison of CTD Box 1501 from IOPAN data vs ICES data

Climatologies, Min/Max per area
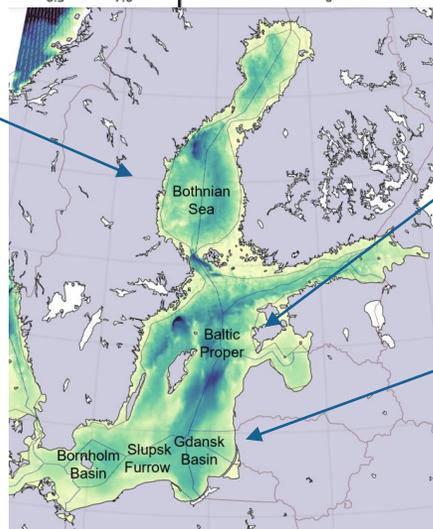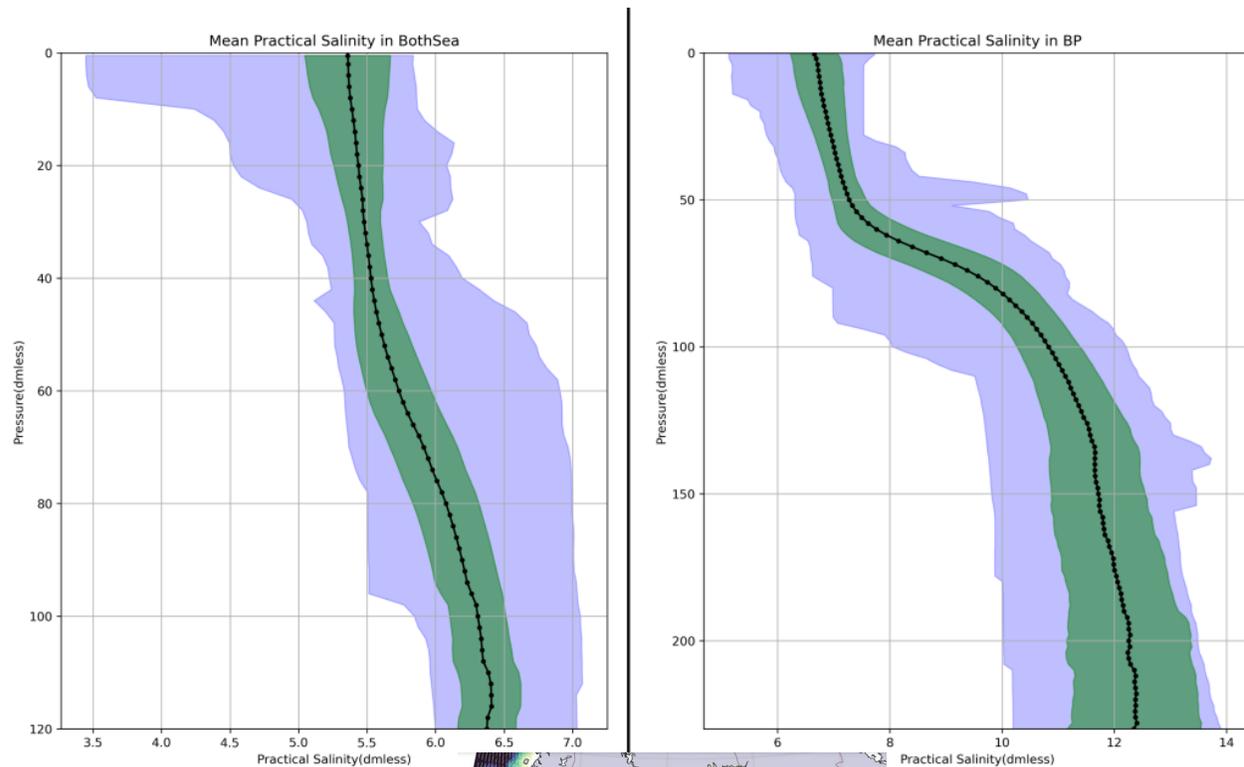
Min/Max/Mean climatological values for each area

- Gives idea of expected range of values
- Calculated from Ship CTD
- Can be used to spot out of range values
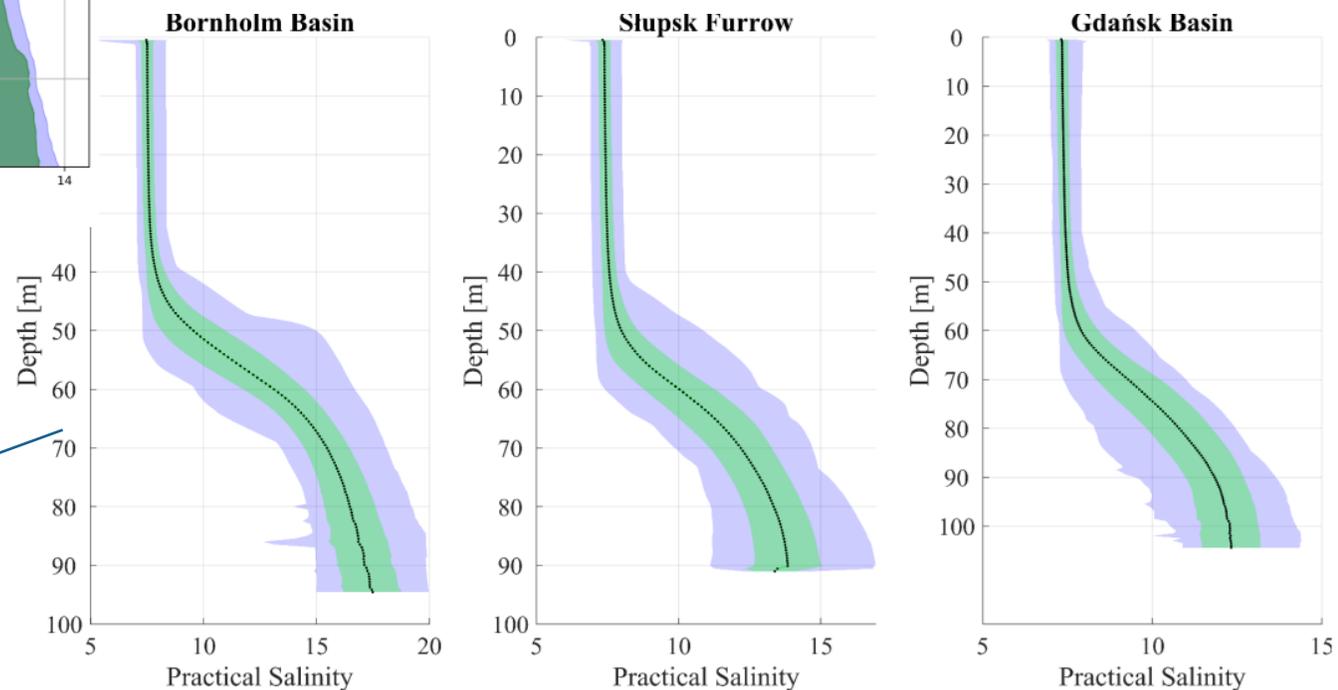
SENSOR SERIAL NUMBER: 4793
CALIBRATION DATE: 27-Mar-13

COEFFICIENTS:

$g = -9.821290e-001$
$h = 1.423607e-001$
$i = -3.273814e-004$
$j = 4.338152e-005$

SENSOR SERIAL NUMBER: 4793
CALIBRATION DATE: 29-Mar-15

COEFFICIENTS:

$g = -9.821266e-001$
$h = 1.423310e-001$
$i = -3.134470e-004$
$j = 4.250802e-005$

SENSOR SERIAL NUMBER: 4793
CALIBRATION DATE: 24-Jan-17

COEFFICIENTS:

$g = -9.836474e-001$
$h = 1.427120e-001$
$i = -4.180454e-004$
$j = 5.025814e-005$

WMO number	Float serial. No	CTD serial no.	Float type	Country/ Programme	Deployment date
6901901	5397	3511	APEX	Argo Finland	17.05.2012
6902013	5396	3503	APEX	Argo Finland	13.06.2013
6902014	6711	4793	APEX	Argo Finland	14.08.2013
6902017	5397	3511	APEX	Argo Finland	31.05.2014
6902018	6710	5051	APEX	Argo Finland	31.05.2014
6902019	7191	5699	APEX	Argo Finland	21.08.2014
6902020	6711	4793	APEX	Argo Finland	05.08.2015
6902021	6710	5051	APEX	Argo Finland	22.09.2015
6902022	5396	3503	APEX	Argo Finland	13.05.2016
6902023	5397	3511	APEX	Argo Finland	13.07.2016
6902024	7191	5699	APEX	Argo Finland	03.08.2016
6902036	7507	7248	APEX	Argo Poland	29.11.2016
6902025	7958	8893	APEX	Argo Finland	09.05.2017
6902026	7959	8894	APEX	Argo Finland	06.06.2017
6902027	6711	4793	APEX	Argo Finland	15.06.2017
6902028	6710	5051	APEX	Argo Finland	06.08.2017

Recovery of floats is practised routinely in the Baltic.
Floats are redeployment many times (example SN4793) and drift can be calculated from SBE's laboratory analysis

Conductivity $(S/m) = (g + h * f^2 + i * f^3 + j * f^4) / 10 (1 + \delta * t + \varepsilon * p)$

Float Recovery and calibration sheets

- Recovered floats are maintained and calibrated
  - Difference with previous calibration sheets can be used to evaluate sensor drift

- DMQC operators can use calibration sheets to calculate sensor drift rates
  - Limit where mission data validity questionable?

- Central directory in Argo data management for calibration sheets?
  - might be good idea
  - systematic format between different manufacturers?

- Python script for making the evaluation in works.
  - Could be converted for matlab if need be

Sea-Bird Electronics, Inc.
13431 NE 20th Street, Bellevue, WA 98005-20
Phone: (+1) 425-643-9866 Fax (+1) 425-643-9954 Email: seab

SENSOR SERIAL NUMBER: 3503   SBE 41cp CONDUCTIVITY
CALIBRATION DATE: 19-Jun-15   PSS 1978: C(35,15,0) = 4.2

COEFFICIENTS:
g = -1.028007e+000   CPcor = -9.5700e-008
h = 1.495265e-001   CTcor = 3.2500e-006
i = -3.432114e-004   WBOTC = -4.2500e-007
j = 4.724081e-005

BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RE (Sie
22.0000	0.0000	0.00000	2627.11	0.00000	0.
1.0000	34.8628	2.97956	5185.88	2.97956	-0.
4.4999	34.8431	3.28699	5380.60	3.28699	-0.
15.0000	34.8003	4.26986	5959.86	4.26986	0.
18.5000	34.7912	4.61540	6150.29	4.61542	0.
23.9940	34.7814	5.17339	6445.61	5.17337	-0.
29.0000	34.7763	5.69650	6710.37	5.69648	-0.
32.5000	34.7735	6.06937	6892.70	6.06939	0.

$f = \text{INST FREQ} \times \sqrt{1.0 + \text{WBOTC} \times t} / 1000.0$

$\text{Conductivity} = (g + h \times f^2 + i \times f^3 + j \times f^4) / (1 + \delta \times t + \varepsilon \times p)$ Siemens / meter