Algorytm MovSTD – nowa metoda wyznaczania termokliny i halokliny dla rejonu Zatoki Gdańskiej

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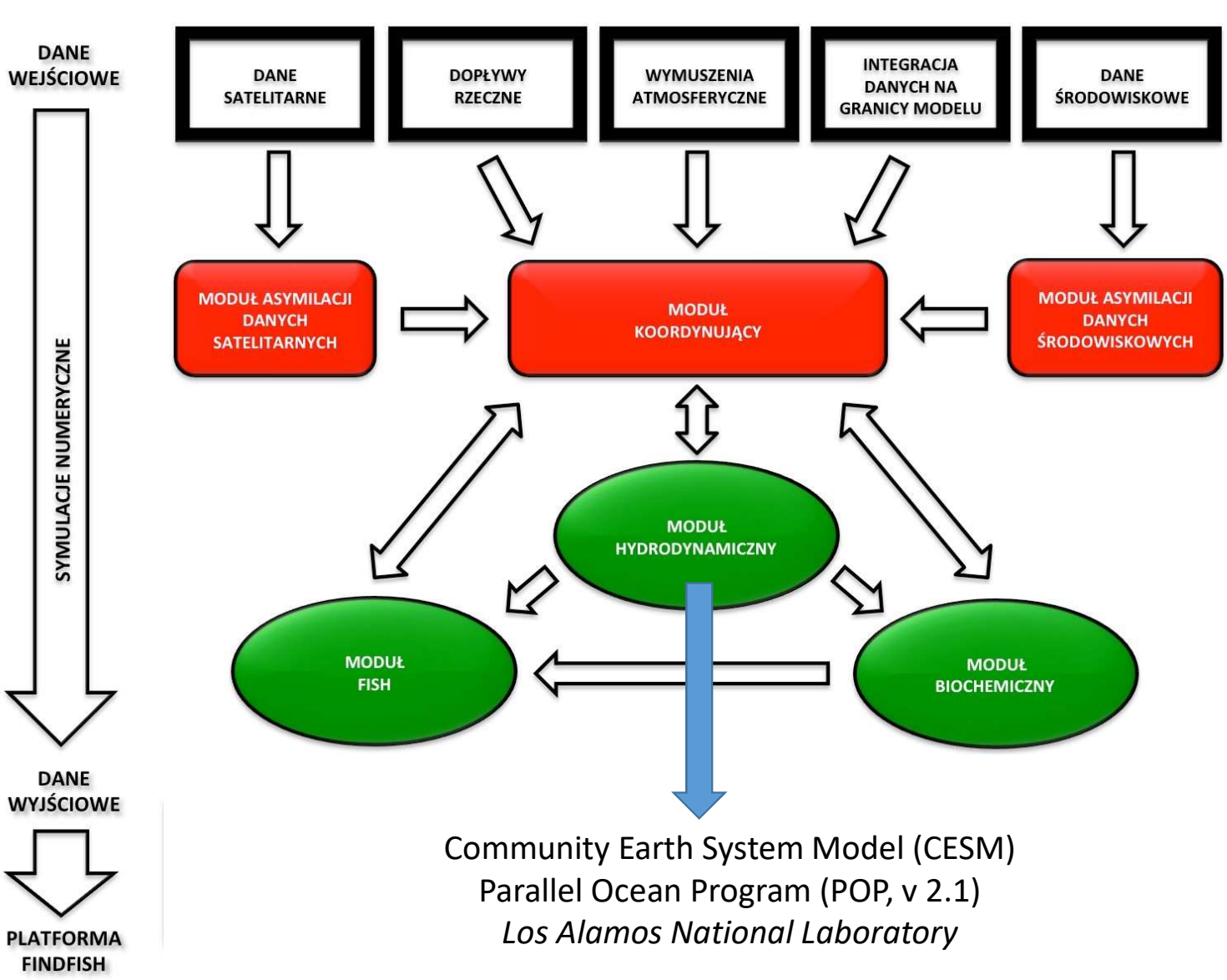
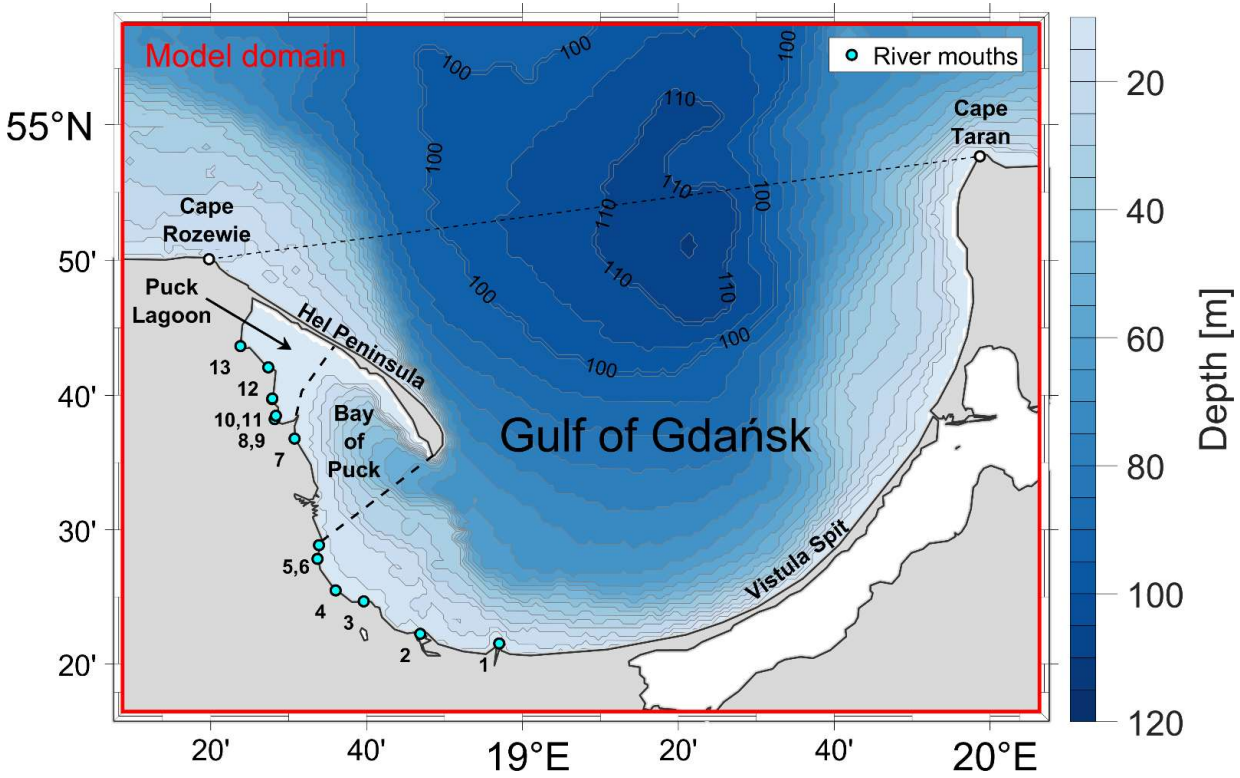
III Konferencja Naukowa Polskich Badaczy Morza
"Stan i trendy zmian środowiska morskiego"
7-8 czerwca 2022, Gdynia



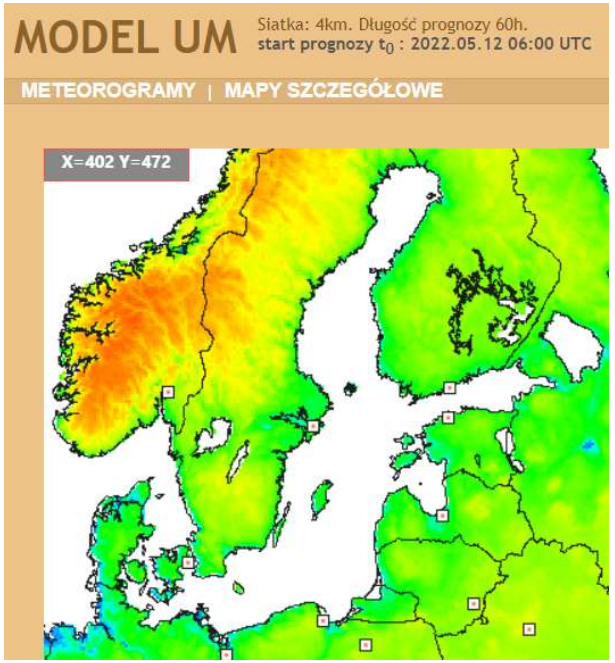
Model EcoFish

Community Earth System Model (CESM)
Parallel Ocean Program (POP, v 2.1)
Los Alamos National Laboratory



Rozdzielczość pozioma: **575 m**

Rozdzielczość pionowa: **5 m** (26 poziomów)
z-formulation



UNIWERSYTET WARSZAWSKI

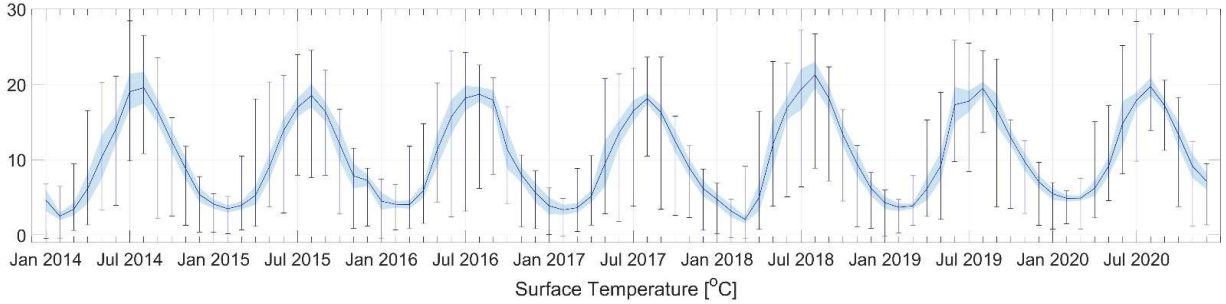
icm

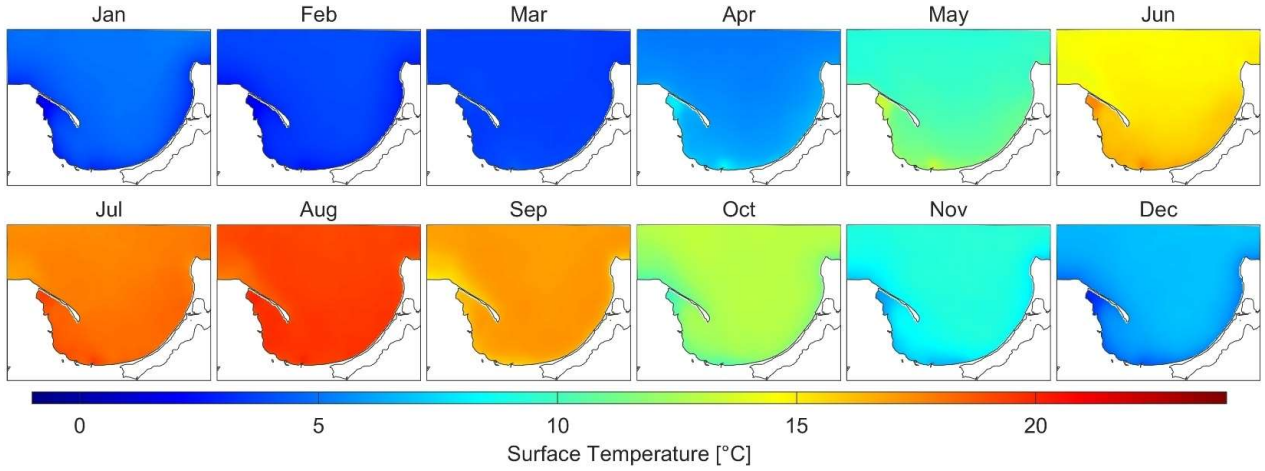
- wiatr na wysokości 10 m
- temperatura powietrza
- wilgotność właściwa
- temperatura punktu rosy na wysokości 1.5 m
- ciśnienie atmosferyczne na poziomie morza
- opady deszczu oraz śniegu.
- składowe krótkofalowe i długofalowe promieniowania odgórnego

Rzeki

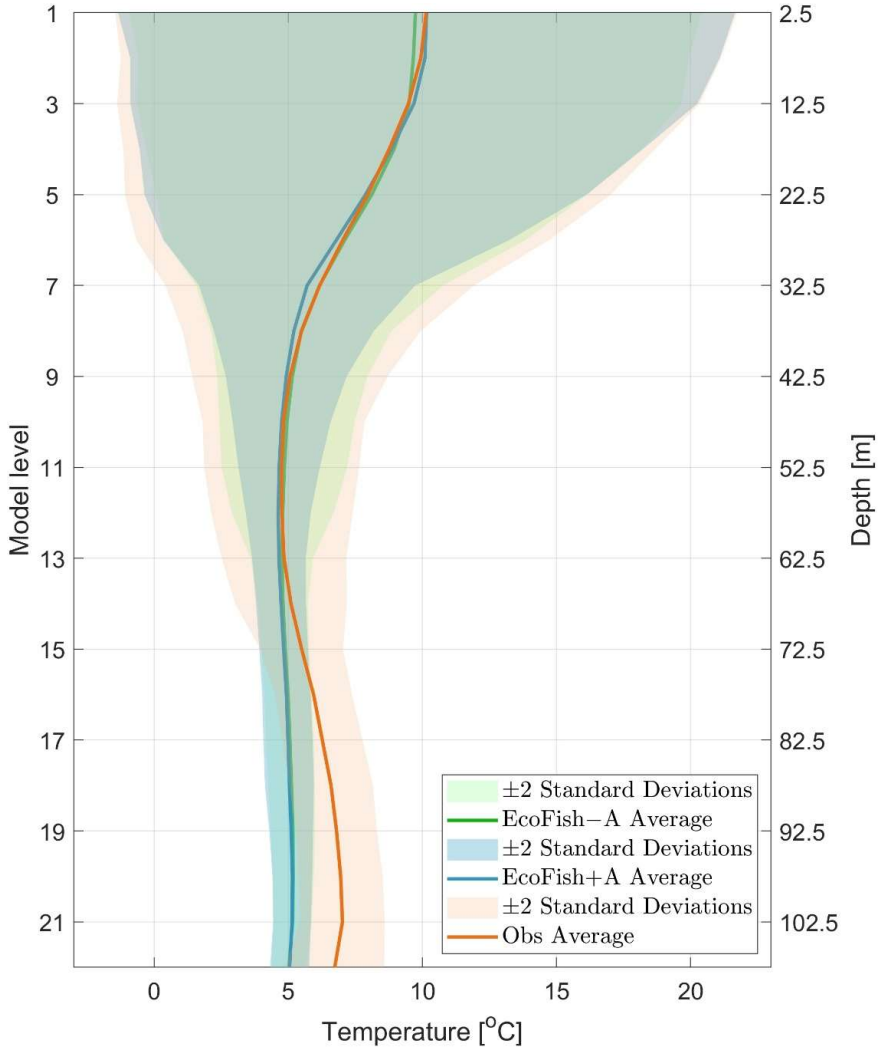
	Source	River	Longitude	Latitude	Mean Runoff [m^3/s]
1	HYPE	Vistula	18.95	54.35	1064
2	HYPE	Bold Vistula	18.78	54.37	2.05
3	HYPE	Still Vistula	18.66	54.41	6.06
4	HYPE	Oliwski Stream	18.60	54.42	0.31
5	HYPE	Kamienny Stream	18.56	54.46	0.45
6	HYPE	Kacza	18.56	54.48	0.29
7	HYPE	Ściekowy Canal	18.51	54.61	0.21
8	SWAT	Zagórska Stream	18.47	54.63	0.11
9	SWAT	Reda	18.47	54.64	0.48
10	SWAT	Mrzezino Canal	18.46	54.66	0.20
11	SWAT	Gizdepka	18.46	54.66	0.30
12	SWAT	Żelistrzewo Canal	18.45	54.70	0.17
13	SWAT	Płutnica	18.39	54.72	0.91

Walidacja: **Temperatura**

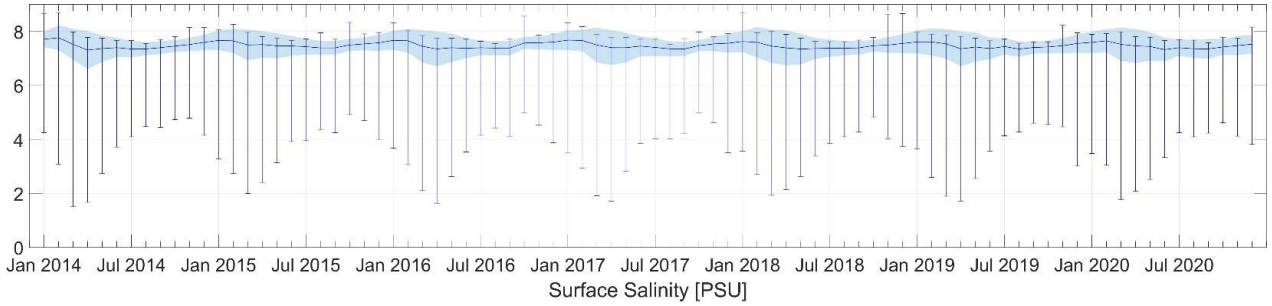


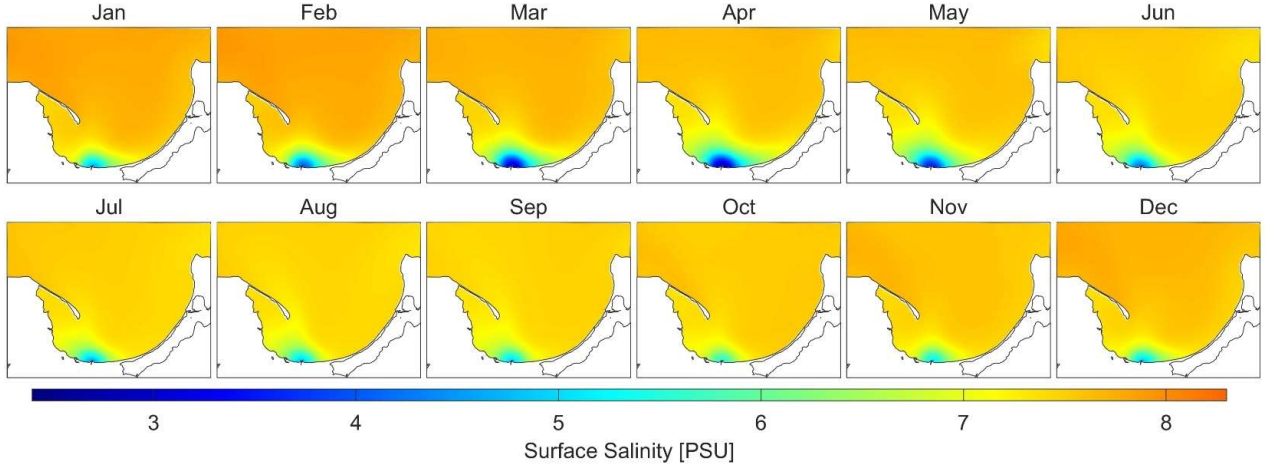


Database	Pearson's r	RMSE [°C]	STD [°C]	Bias [°C]
ICES (EcoFish+A)	0.94	1.33	3.66	−0.36
ICES (EcoFish−A)	0.95	1.22	3.52	−0.28
MIDAS CTD (EcoFish+A)	0.87	1.83	3.57	−0.34
MIDAS CTD (EcoFish−A)	0.85	2.03	3.84	−0.25

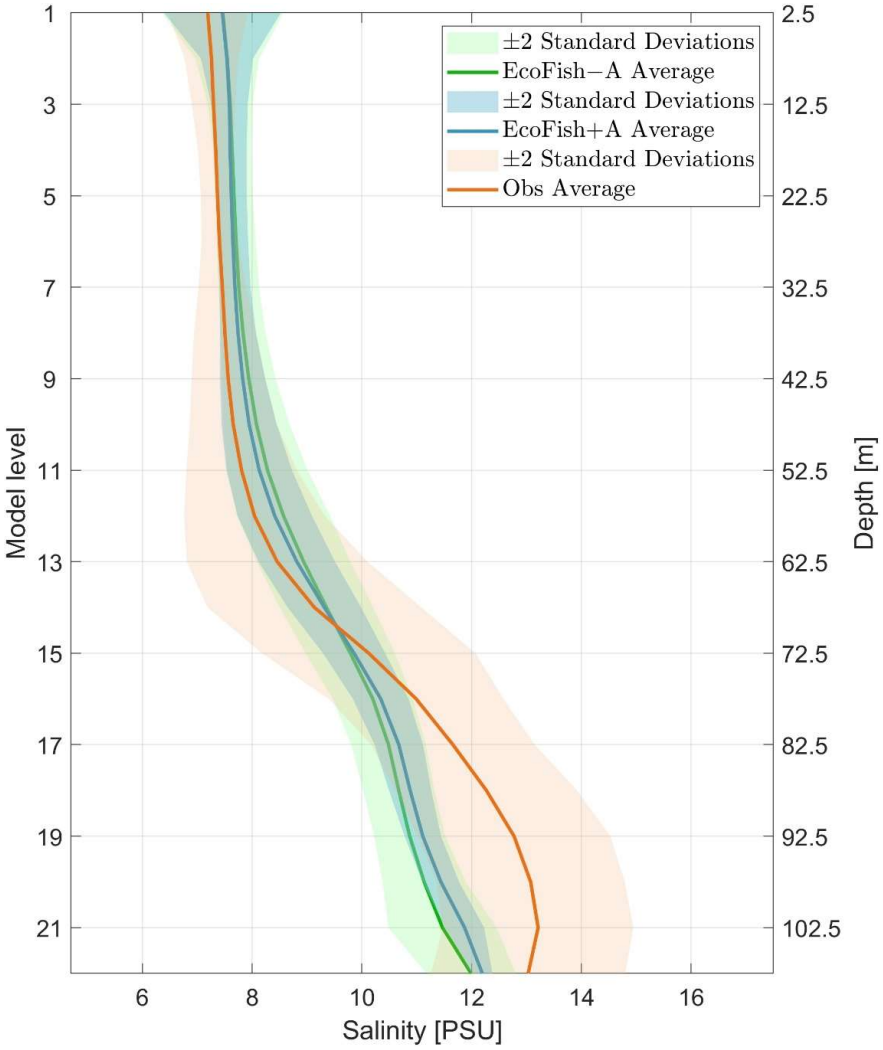


Walidacja: **Zasolenie**





Database	Pearson's r	RMSE [PSU]	STD [PSU]	Bias [PSU]
ICES (EcoFish+A)	0.94	0.80	1.27	−0.01
ICES (EcoFish−A)	0.92	0.91	1.20	0.01



Fundusze Europejskie Program Regionalny

URZĄD MARSZAŁKOWSKI WOJEWÓDZTWA POMORSKIEGO

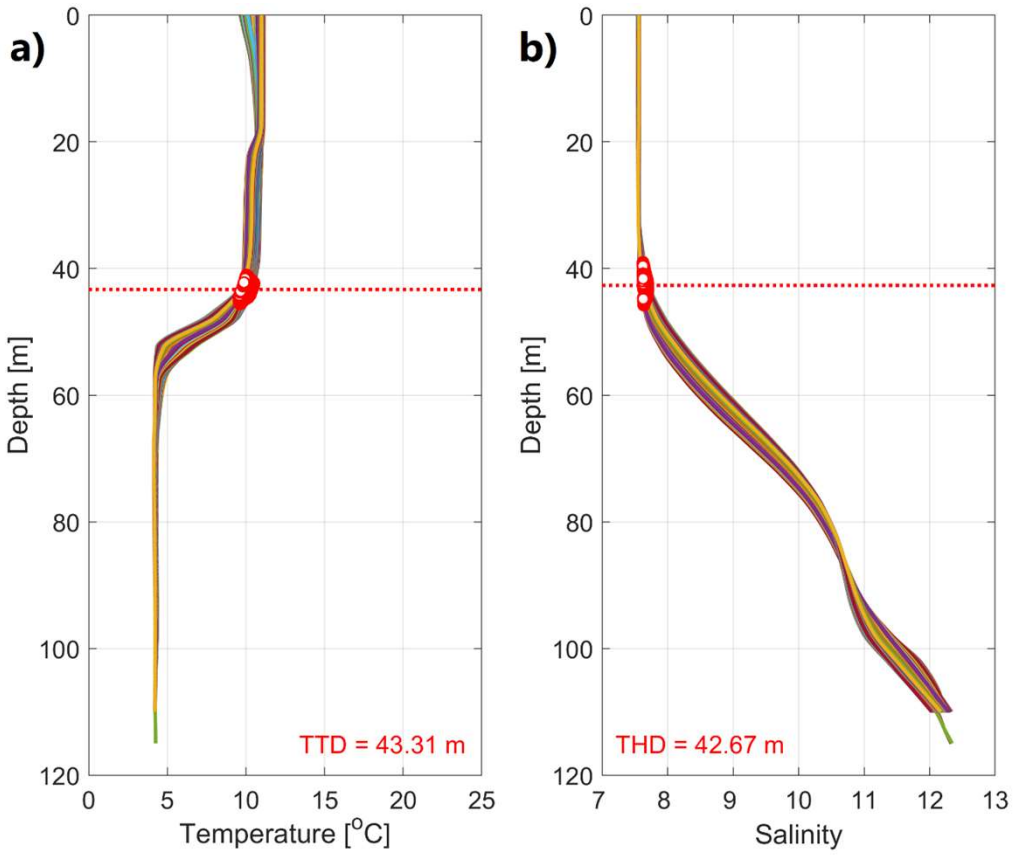
FindFISH

Unia Europejska Europejski Fundusz Rozwoju Regionalnego

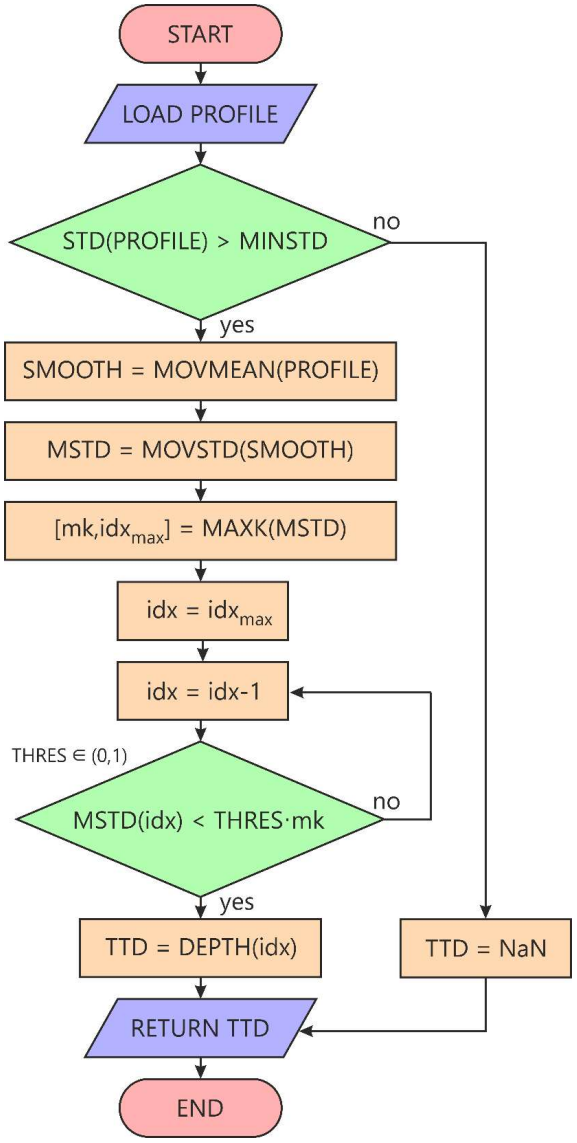
Algorytm MovSTD

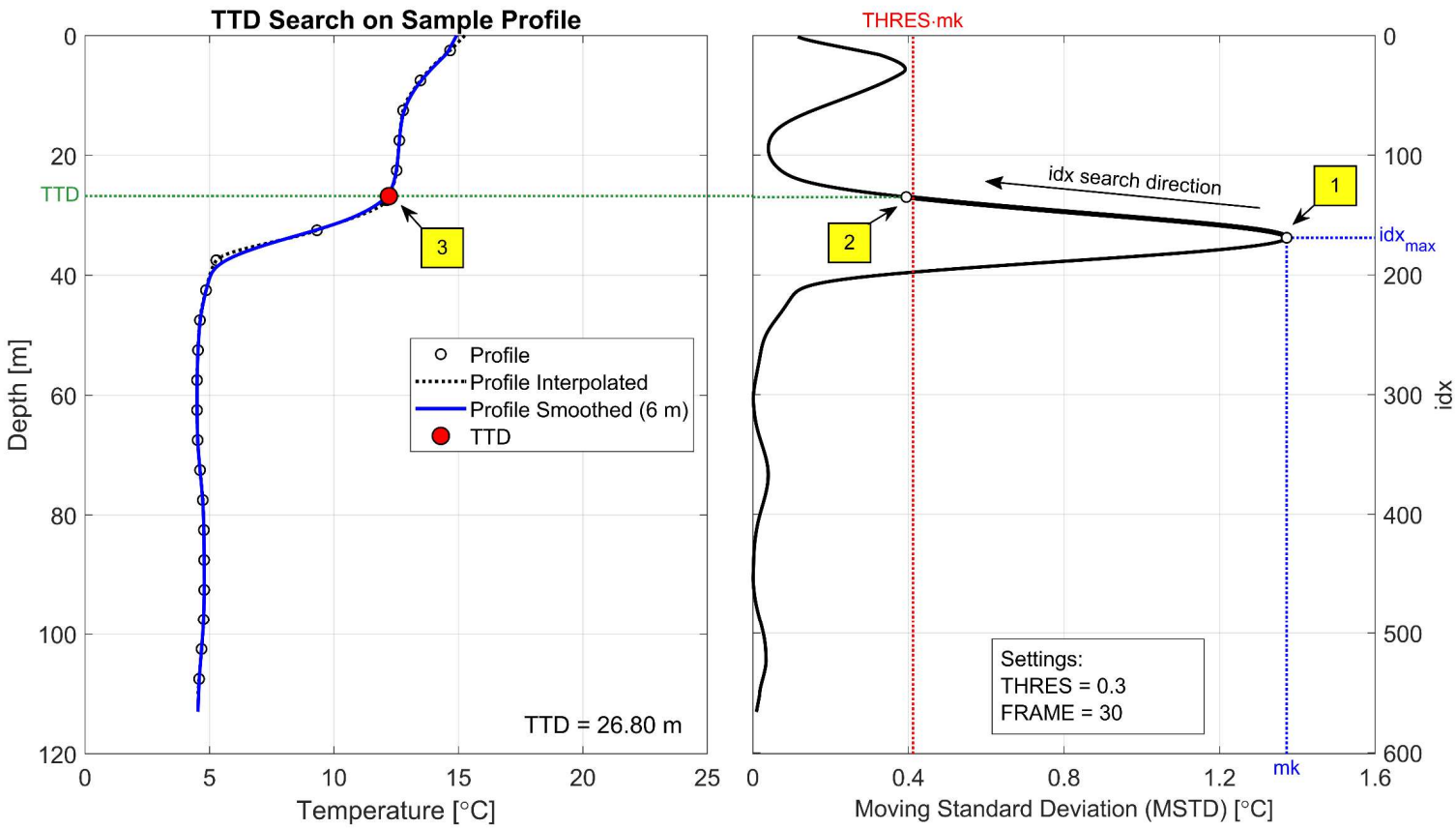
Nowa metoda wyznaczania (szczytu) termokliny i hakokliny

*Problemy z metodą progową (threshold method)



Algorytm MovSTD





Problem:

„Bimodalna” dystrybucja

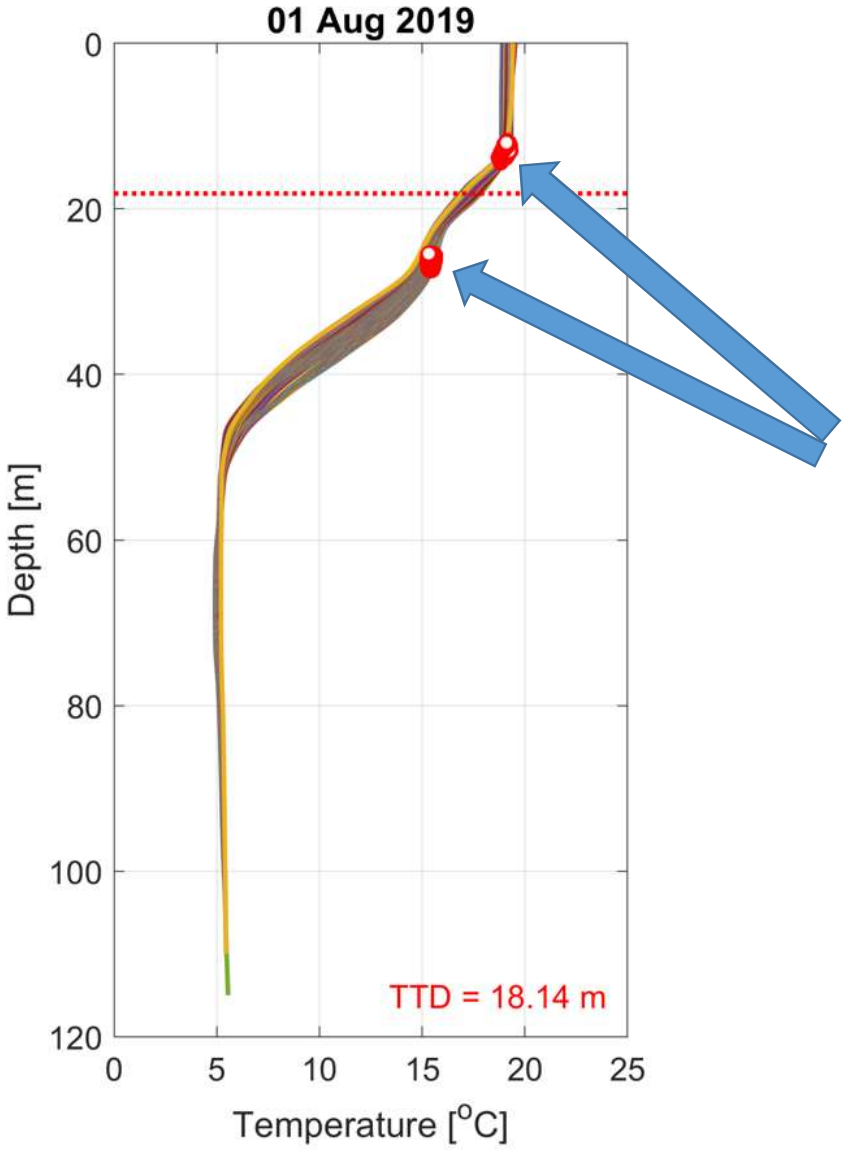
Rozwiązanie: Kalibracja

Szczyt termokliny (Top of the Thermocline Depth – TTD)

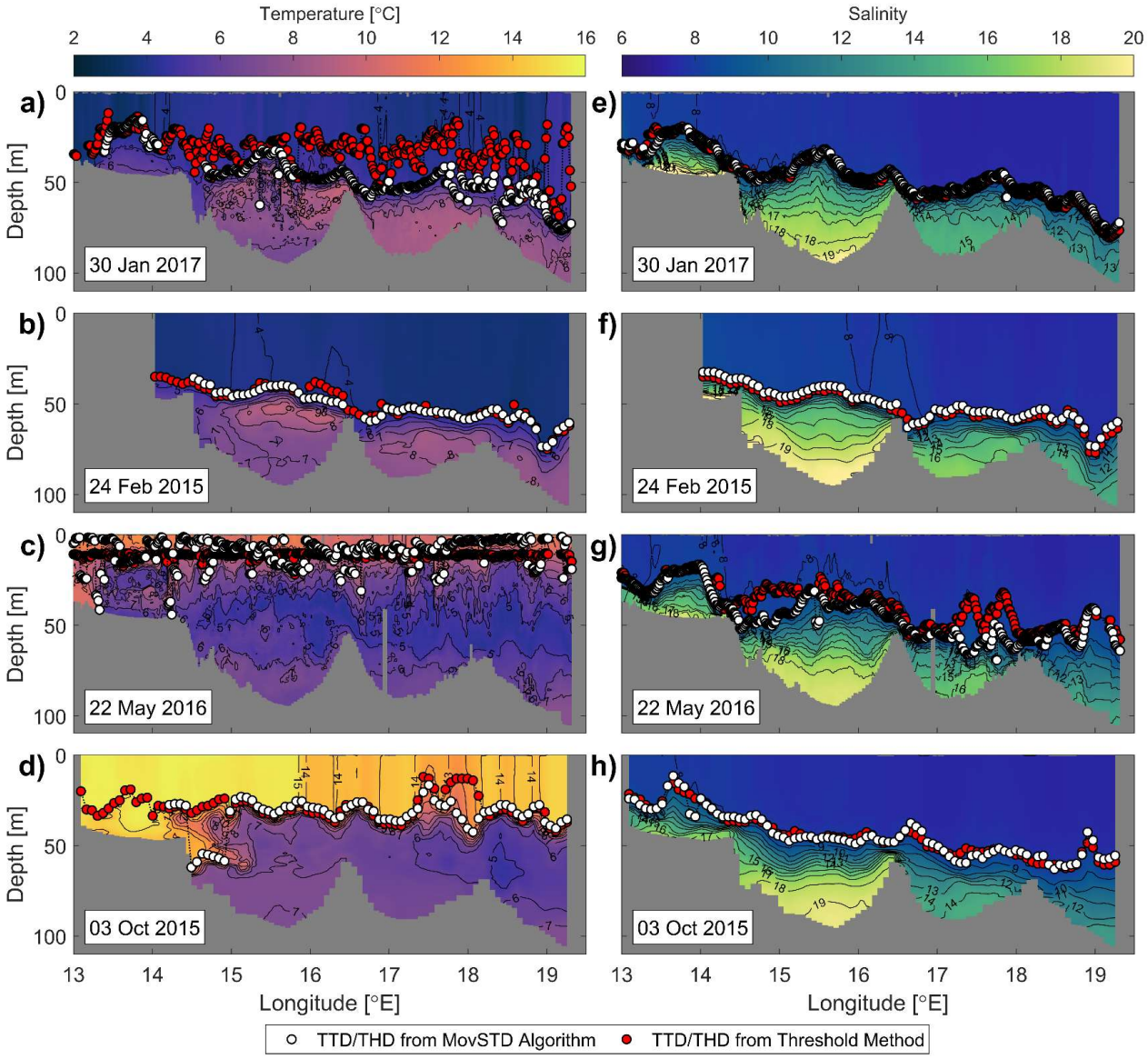
- FRAME: 30 (6 metrów)
- THRES: 0.3
- MINSTD: 0.7°C

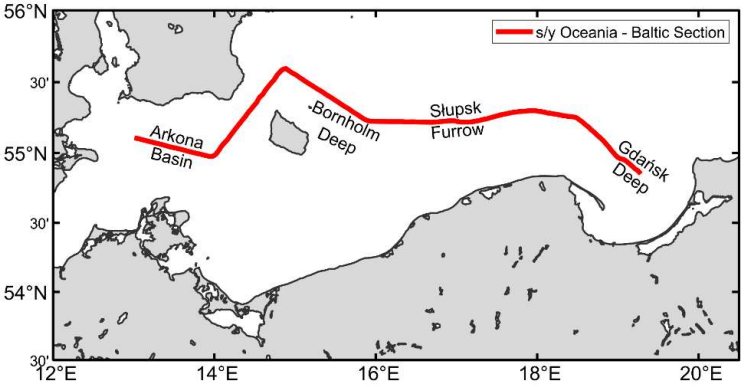
Szczyt halokliny (Top of the Halocline Depth – THD)

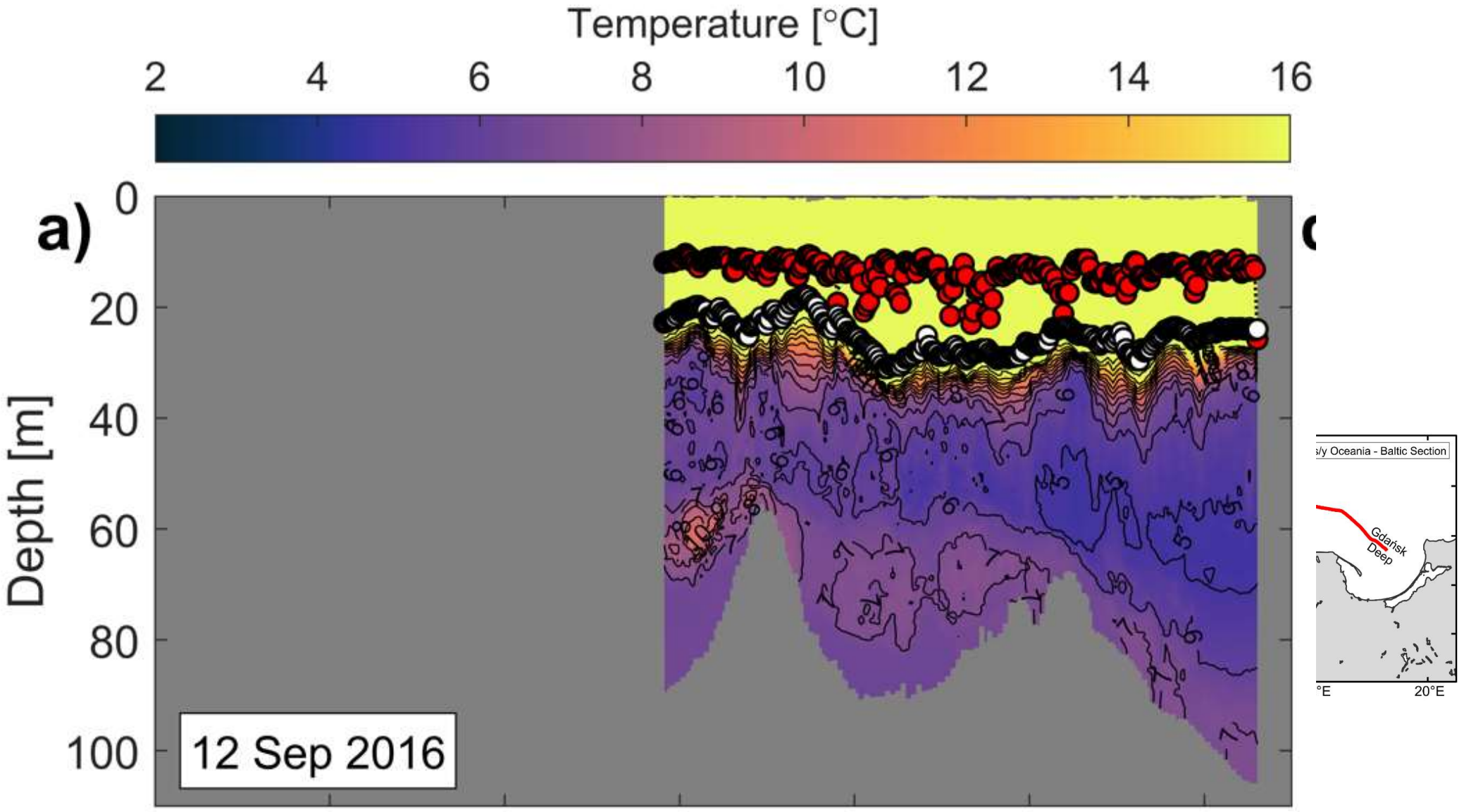
- FRAME: 30 (6 metrów)
- THRES: 0.2
- MINSTD: 0.6



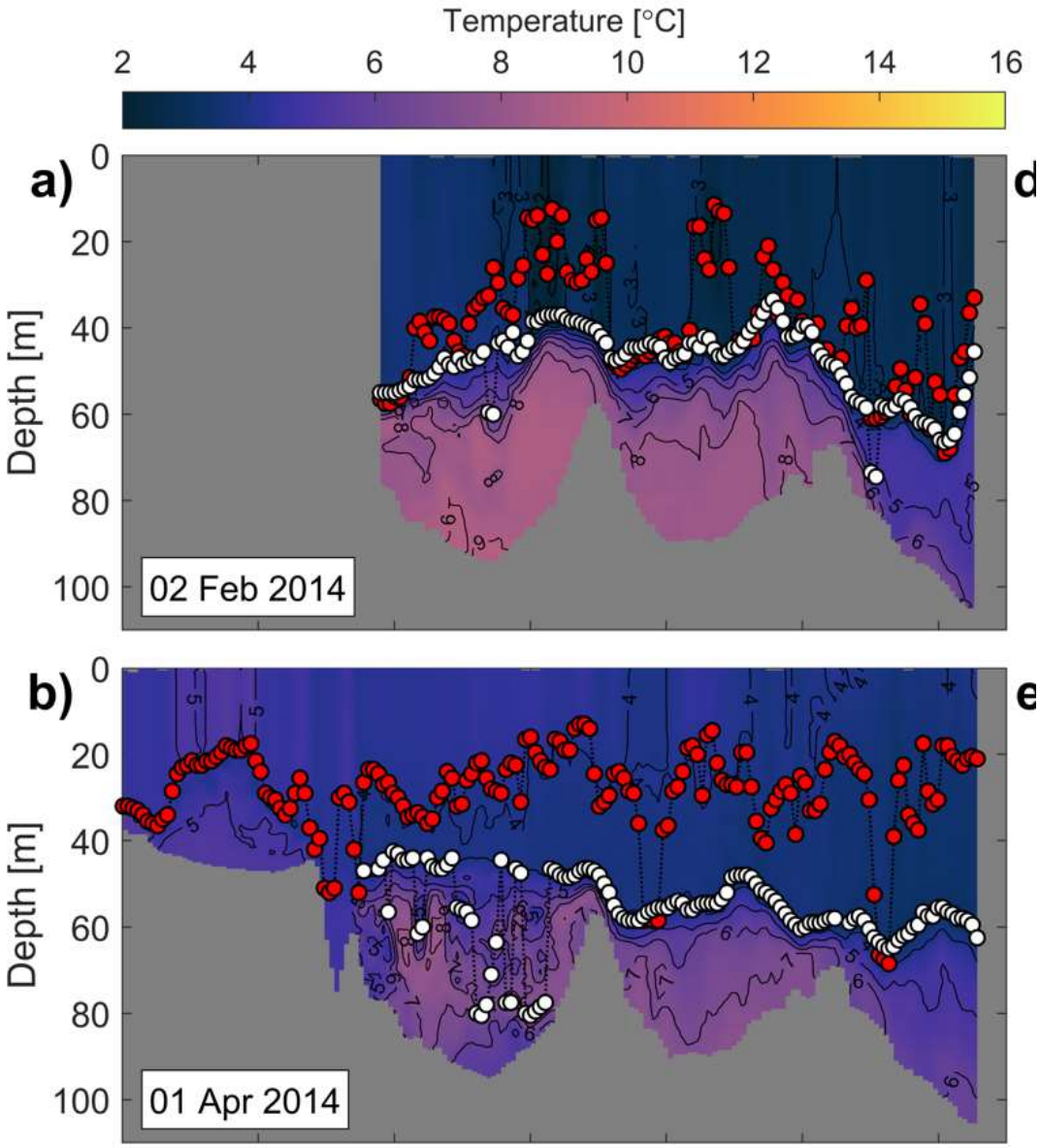
Algorytm MovSTD

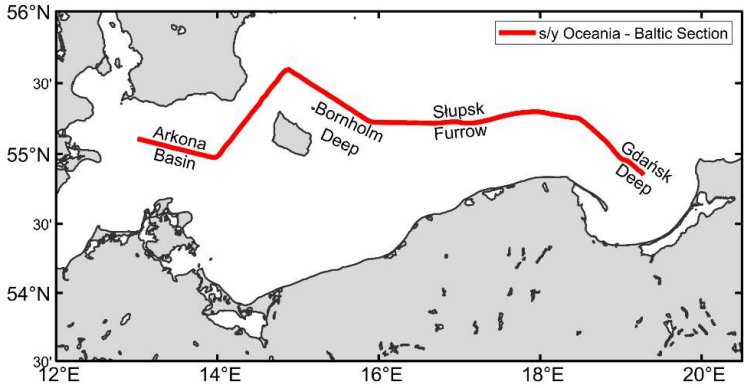


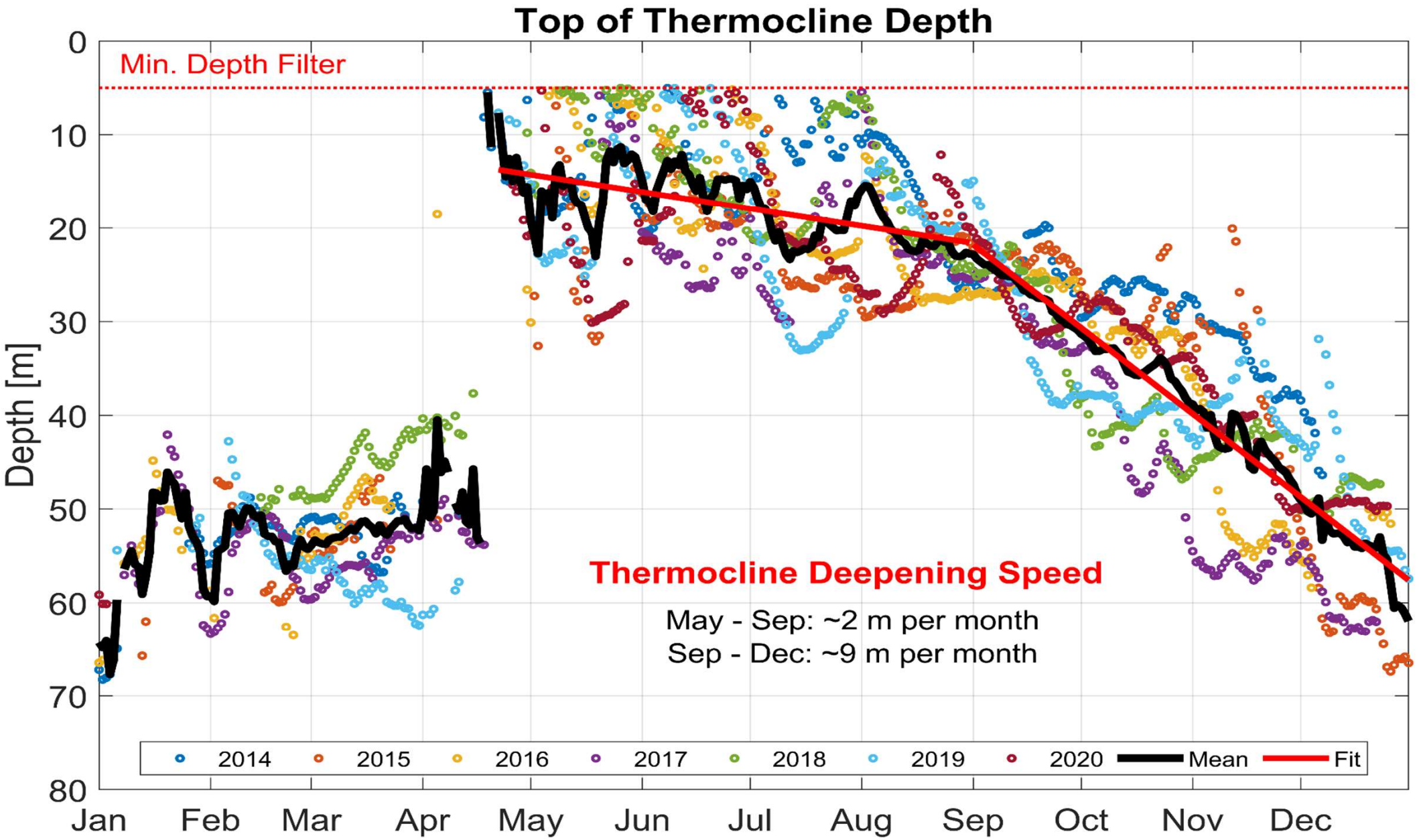



Temperature [°C]
2
4
6
8
10
12
14
16
a)
Depth [m]
0
20
40
60
80
100
12 Sep 2016
Gdańsk Deep
20°E

Algorytm MovSTD



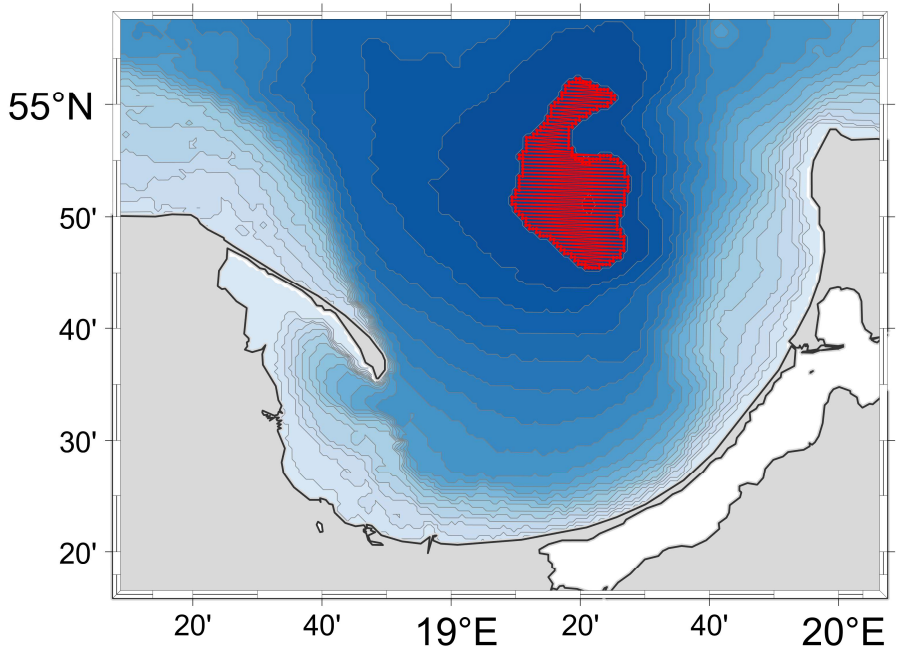


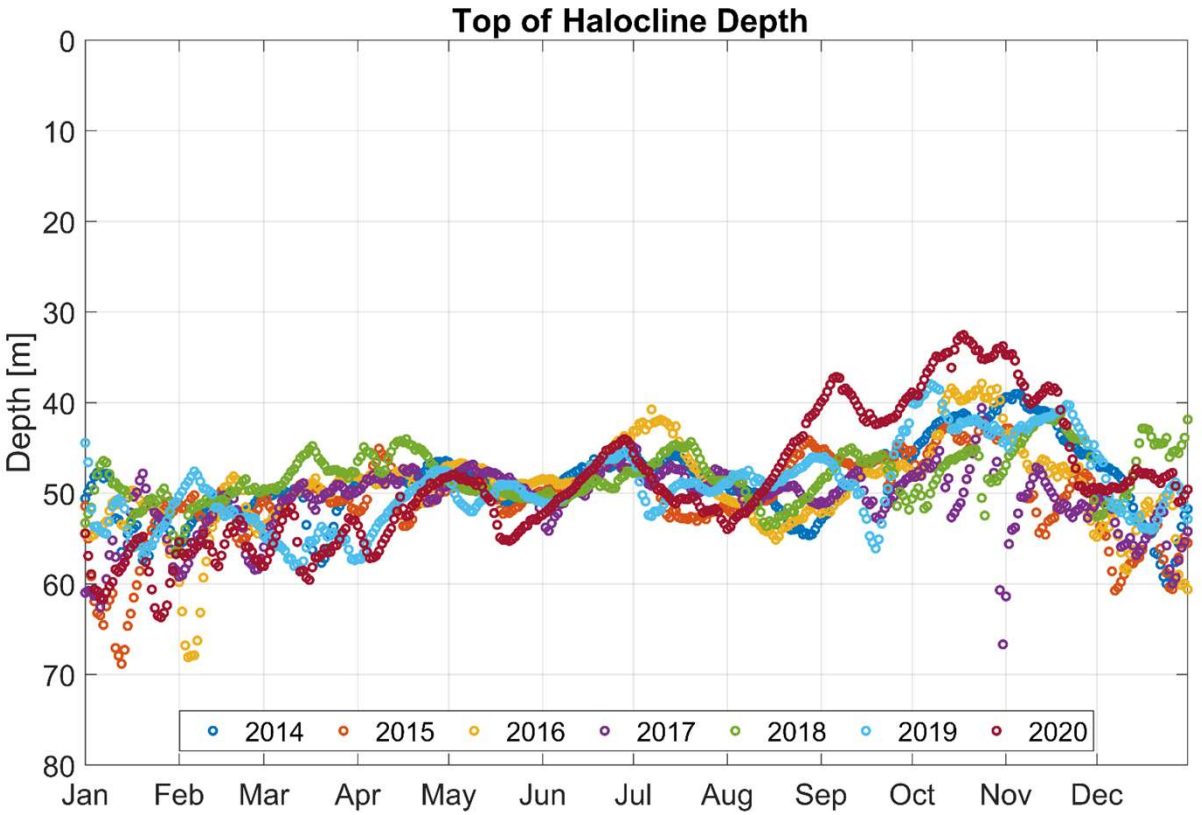

Top of Thermocline Depth
Min. Depth Filter
Depth [m]
0
10
20
30
40
50
60
70
80
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Thermocline Deepening Speed
May - Sep: ~2 m per month
Sep - Dec: ~9 m per month
2014
2015
2016
2017
2018
2019
2020
Mean
Fit

Rejon Głębii Gdańskiej

Haloklina

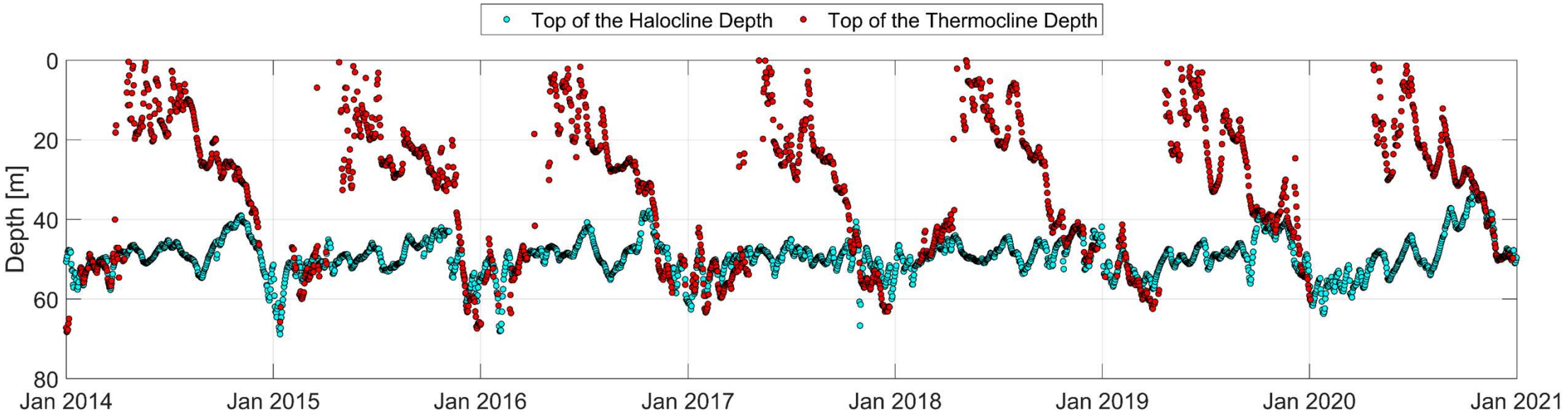
Algorytm MovSTD





Algorytm MovSTD

Seria czasowa – termolkina i haloklina
dla rejonu Głębii Gdańskiej



Journal of Physical Oceanography

Article Type: Research Article

A New Method for Thermocline and Halocline Depth Determination at Shallow Seas

Maciej Janecki[1], Dawid Dybowski[1], Daniel Rak[2], and Lidia Dzierzbicka-Glowacka[1]

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Abstract

This paper introduces a new method for finding the top of thermocline (TTD) and halocline (THD) depths that may become a powerful tool for applications in shallow marine basins around the world. The method calculates the moving average of the ocean vertical profile's short-scale spatial variability (standard deviation) and then processes it to determine the potential depth at which temperature or salinity rapidly changes. The method has been calibrated using an extensive set of data from the ecohydrodynamic model EcoFish. As a result of the calibration, the values of the input parameters that allowed the correct determination of TTD and THD were established. It was confirmed by the validation carried out on the in situ profiles collected by s/y Oceania during statutory cruises in the southern Baltic Sea. The MovSTD algorithm was then used to analyze the seasonal variability of the vertical structure of the waters in Gdańsk Deep for temperature and salinity. The thermocline deepening speed was also estimated in the region analyzed.

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Dziękuję za uwagę!

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