Deep submarine groundwater discharge indicated by chloride anomalies in the sediment pore water in the Gulf of Gdańsk, southern Baltic Sea.

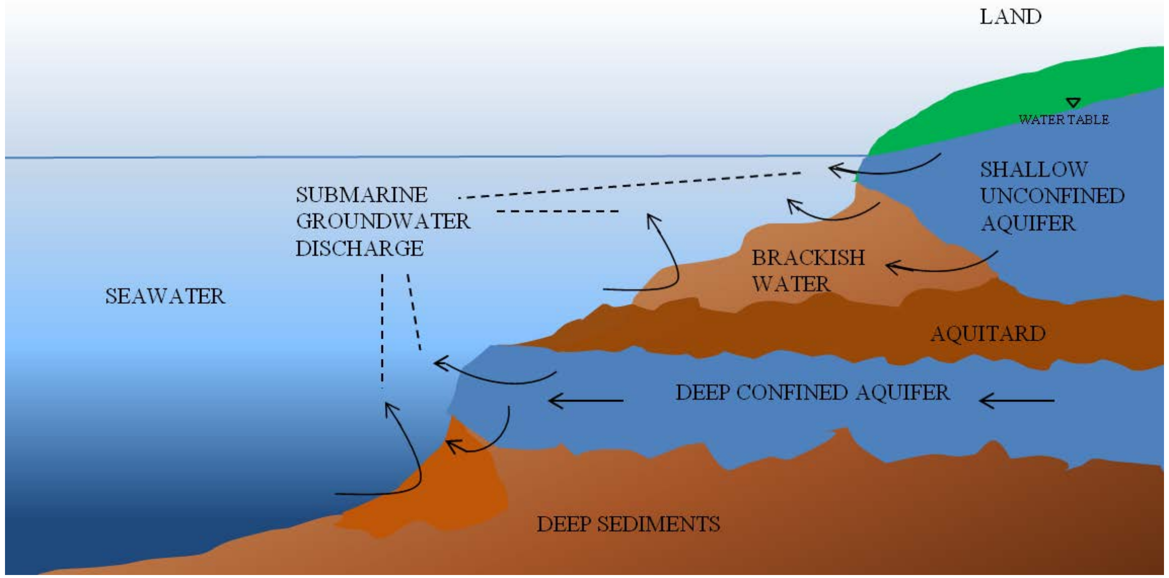
Beata Szymczycha, Żaneta Kłostowska, Karol Kuliński, Aleksandra Winogradow, Jaromir Jakacki, Zygmunt Klusek, Aleksandra Brodecka-Goluch, Bożena Graca, Marcin Stokowski, Katarzyna Koziorowska, Daniel Rak

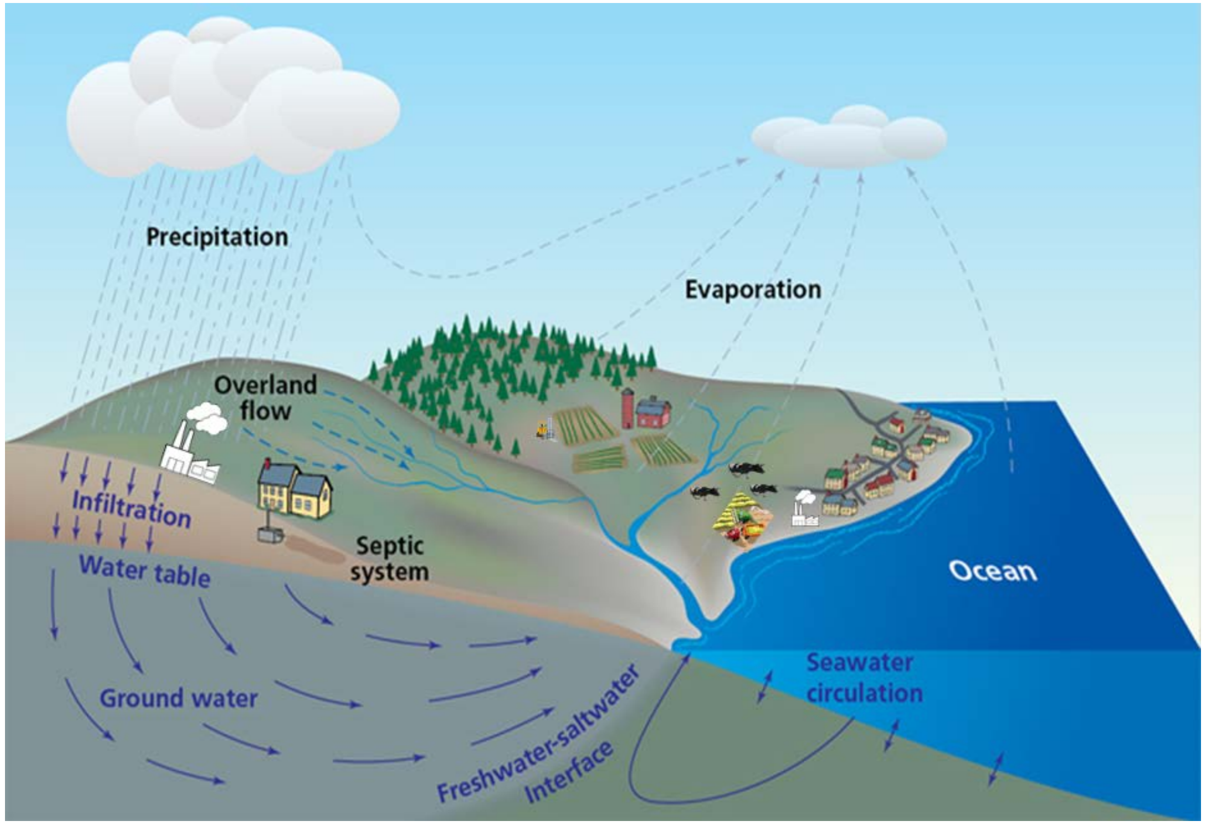
2nd Baltic Earth Conference

The Baltic Sea Region in Transition

Helsingor, Denmark, 11 to 15 June 2018

Submarine groundwater discharge (definition, sources, driving forces)





Hydrochemical characterization of SGD in the Bay of Puck, Southern Baltic Sea

Żaneta Kłostowska[1,2], Beata Szymczycha[1], Karol Kuliński[1], Monika Lengier[1] and Leszek Łęczyński[2]*

[1] Institute of Oceanology, Polish Academy of Sciences, Powstańców Warszawy 55, 81-712 Sopot, Poland
[2] Institute of Oceanography, University of Gdańsk, Marszałka Piłsudskiego 46, 81-378 Gdynia, Poland
* klost@iopan.pl

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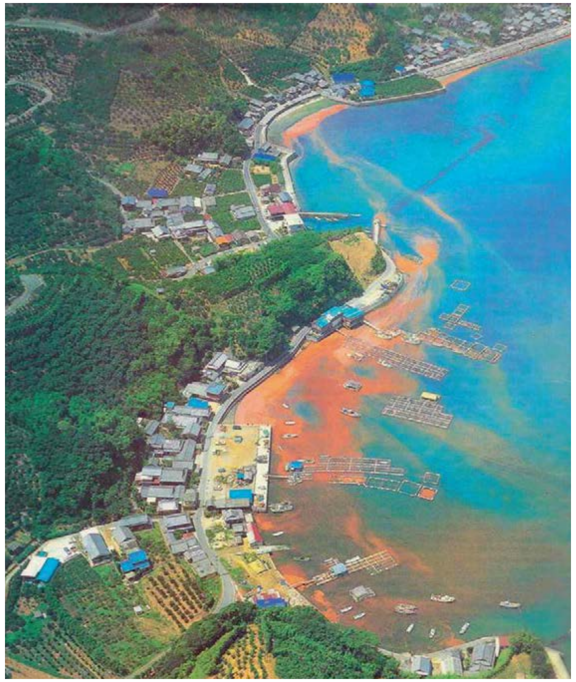
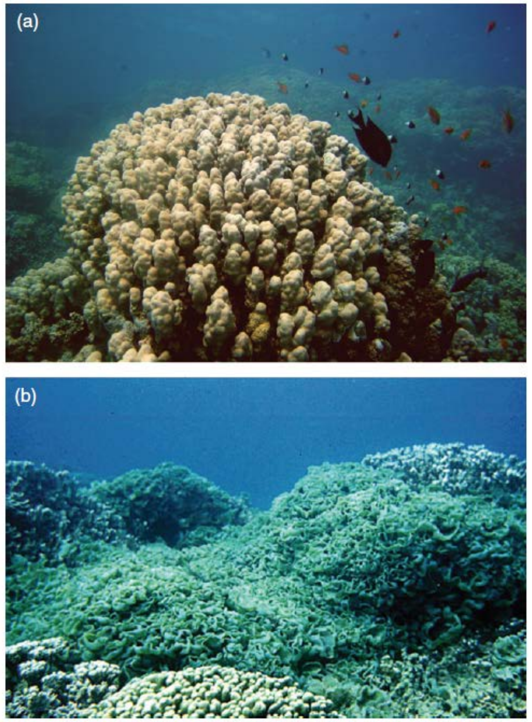
SGD is a source of:

1. Freshwater
2. Chemical substances (nutrients, dissolved carbon, metals, isotopes)



Knee i Payton, 2011



Parsons i in. 2008

Moosdorf and Oehler 2017

Burnett i in. 2003

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SGD impact on the Baltic Sea coastal sites:

GeoPlanet: Earth an

Beata Szymcz

Janusz Pempk

The Role of Subma Groundwater Disch as Material Source the Baltic Sea

Contents lists available at ScienceDirect

Marine Chemistry

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journal homepage: www.elsevier.com/locate/march

Submarine groundwater discharge at Forsmark, Gulf of Bothnia, provided by Ra isotopes

Lindsay Krall[a,b,c,*], Giada Trezzi[d], Jordi Garcia-Orellana[d], Valenti Rodel

Per Andersson[c]

[a] The Swedish Nuclear Fuel and Waste Management Company, Sweden

[b] Department of Geological Science, Stockholm University, Stockholm, Sweden

[c] Department of Geosciences, Swedish Museum of Natural History, Stockholm, Sweden

[d] Institut de Ciència I tecnologia Ambientals, Universitat Autònoma de Barcelona, Spain

[e] CEREGE, Aix-Marseille Université, Aix-en-Provence, France

Could submarine groundwater discharge a significant carbon sou to the southern Baltic Sea?*

Accepted Manuscript

ESTUARINE COASTAL AND SHELF SCIENCE

Biogeochemical impact of submarine ground water discharge on coastal surface sands of the southern Baltic Sea

Daphne Donis, Felix Janssen, Bo Liu, Frank Wenzhöfer, Olaf Dellwig, Peter Escher, Alejandro Spitzy, Michael E. Böttcher

Science of the Total Environment 438 (2012) 86–93

Contents lists available at SciVerse ScienceDirect

Science of the Total Environment

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journal homepage: www.elsevier.com/locate/scitotenv

Nutrient fluxes via submarine groundwater discharge to the Bay of Puck, southern Baltic Sea

Beata Szymczycha [a], Susanna Vogler [b], Janusz Pempkowiak [a,c,*]

Institute of Oceanology, 2014.

KEYWORDS

Bay of Puck

Seepage water

Dissolved organic carbon

Dissolved inorganic carbon

Carbon loads

Carbon budget

Baltic Sea

World Ocean

Limnol. Oceanogr., 49(1), 2004, 157–167

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Spatial distribution and budget for submarine groundw Bay (Western Baltic Sea)

Michael Schlüter[1] *and Eberhard J. Sauter*

Alfred-Wegener-Institut, Am Handelshafen, D-27515 Bremerhaven, German

Claus E. Andersen and Henning Dahlgaard

Risø National Laboratory, Frederiksborgvej 399, P.O. Box 49, DK-4000 Ro

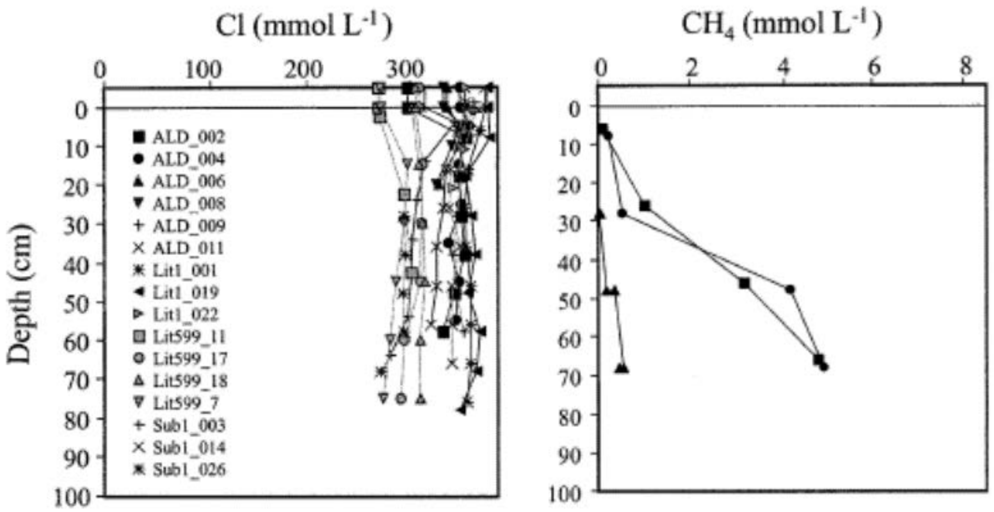
Paul R. Dando

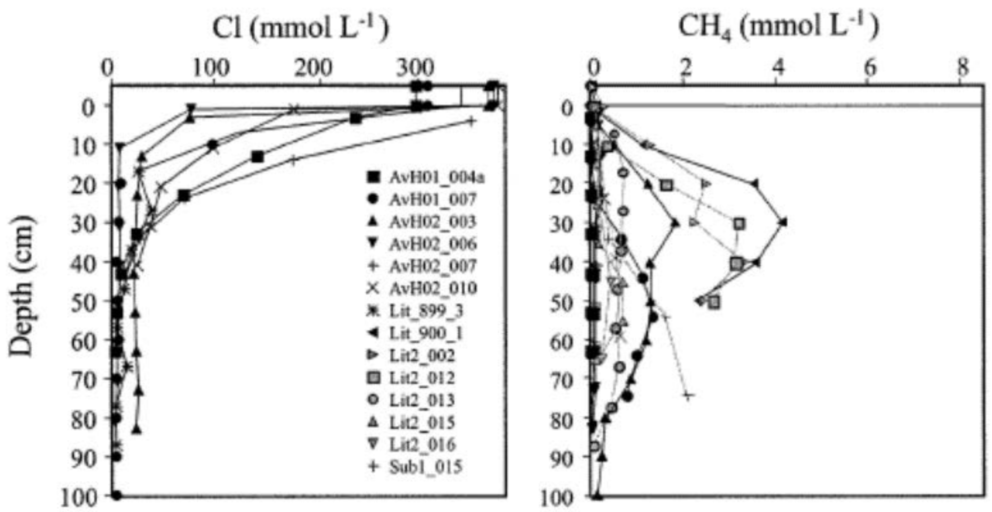
School of Ocean Sciences, University of Wales-Bangor, Isle of Anglesey LL59 5AB, Great Britain

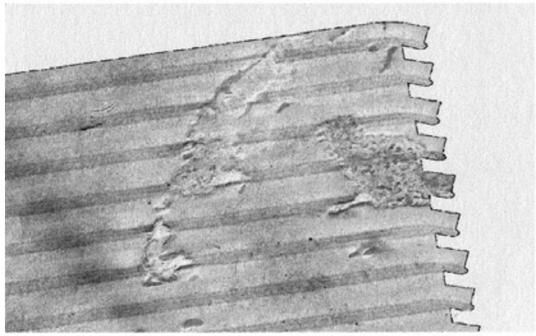
Direct Groundwater Inflow to the Baltic Sea

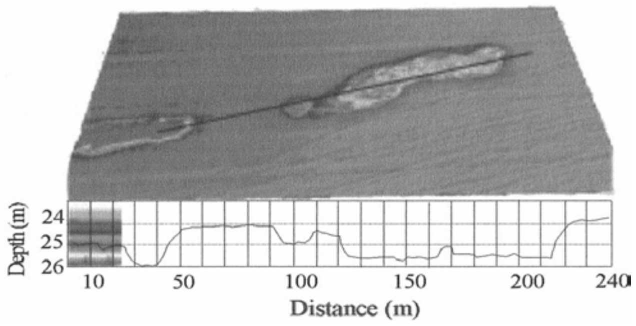
TemaNordEnvironment

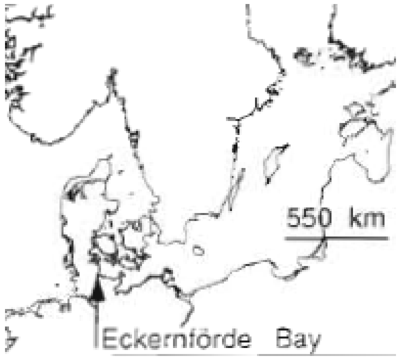
SGD impact on coastal sites:





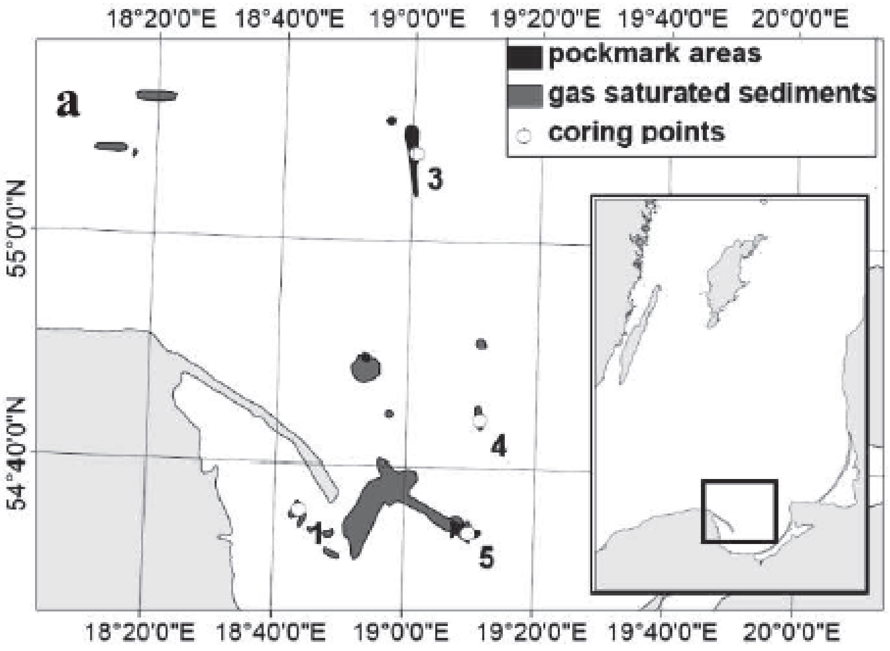


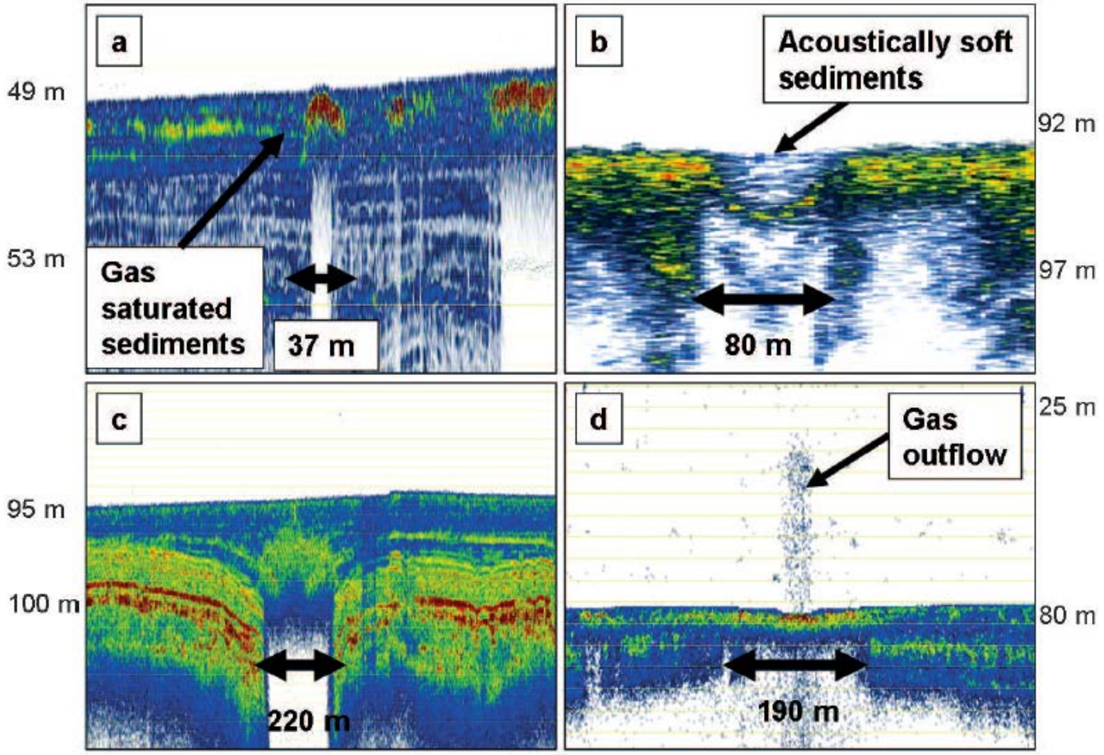




Schlüter et al. 2004

Methane occurence in Baltic Sea Sediments





Brodecka et al. 2013

Coastal seas may account for more than 75 % of global oceanic methane emissions and in case of the Baltic Sea even more !!!!!

Characterization of the area

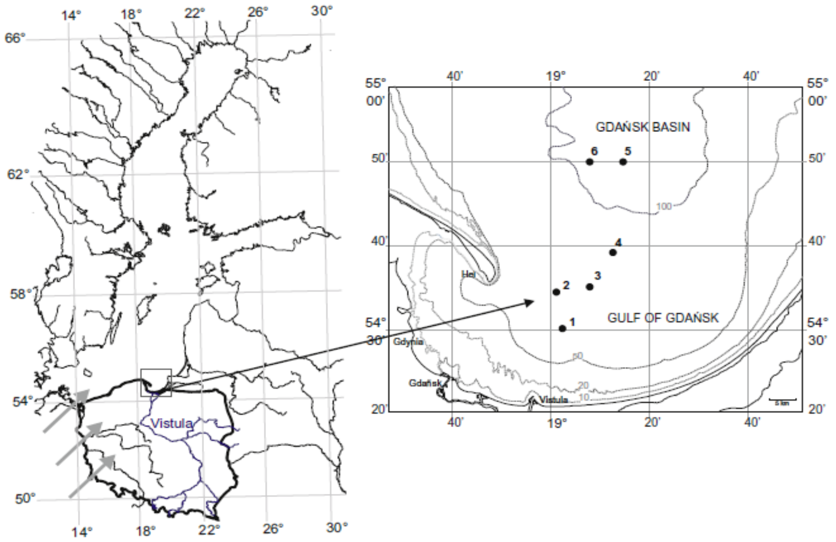


Table 1

Table contains data on the sampling station region, station coordinates, depth (m), oxygen concentration in the bottom overlying water (mg dm^{-3}) and sediment moisture (%), organic matter content (%), linear sediment accumulation rate: LAR (mm year^{-1}), mass sediment accumulation rate (gm^2 year^{-1}) and $^{210}Pb_{ex}$ inventory (Bq m^{-2}).

Station	Region	Coordinates	Depth (m)	Bottom water oxygen (mg dm^{-3})	Sediment moisture (%)	Organic matter (%)	LAR (mm year^{-1})	SAR (gm^2 year^{-1})	$^{210}Pb_{ex}$ inventory (Bq m^{-2})
1	Gulf of Gdańsk	54°30′ 19°03′	68	1.09	54.1–86.2	5.2–20.3	3.8 (r^2 = 0.81)	1424 (r^2 = 0.88)	1.03
2	Gulf of Gdańsk	54°36′ 19°01′	81	9.15	59.3–93.2	7.4–24.5	5.5 (r^2 = 0.96)	1502 (r^2 = 0.96)	2.31
3	Gulf of Gdańsk	54°37′ 19°08′	84	3.20	64.3–89.2	9.5–24.3	3.3 (r^2 = 0.92)	883 (r^2 = 0.94)	1.41
4	Gulf of Gdańsk	54°39′ 19°13′	92	1.36	71.5–89.1	12.2–21.9	3.1 (r^2 = 0.90)	536 (r^2 = 0.97)	0.64
5	Gdańsk Basin	54°50′ 19°15′	112	0.58	73.2–90.1	10.2–27.4	1.9 (r^2 = 0.94)	272 (r^2 = 0.96)	0.69
6	Gdańsk Basin	54°50′ 19°07′	110	0.62	65.1–81.7	10.1–18.1	0.72 ± 0.06 (r^2 = 0.98)	153 ± 14 (r^2 = 0.99)	0.46

Zaborska 2014

Could SGD be a driving force for methane release from sediments?

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Marine Chemistry 122 (2010) 51–58

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Marine Chemistry

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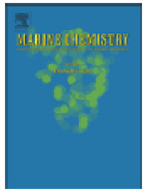

Deep submarine groundwater discharge indicated by tracers of oxygen, strontium isotopes and barium content in the Pingtung coastal zone, southern Taiwan

In-Tian Lin [a,*], Chung-Ho Wang [b], Chen-Feng You [c], Saulwood Lin [d], Kuo-Fang Huang [c], Yue-Gau Chen [a]

[a] Department of Geosciences, National Taiwan University, Taipei, Taiwan, ROC
[b] Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan, ROC
[c] Department of Earth Sciences, National Cheng Kung University, Tainan, Taiwan, ROC

WATER RESOURCES RESEARCH, VOL. 41, W02016, doi:10.1029/2004WR003399, 2005

Fresh and saline groundwater discharge to the ocean: A regional perspective

Alicia M. Wilson

Department of Geological Sciences, University of South Carolina, Columbia, South Carolina, USA

Received 7 June 2004; revised 2 November 2004; accepted 13 December 2004; published 16 February 2005.

[1] Studies of groundwater flow in coastal aquifers often focus strongly on freshwater and investigate flow in a narrow (<5 km) zone surrounding the coastline. This work was designed to place coastal flow in a regional context and to compare fresh and saline submarine groundwater discharge (SGD) for regional flow systems. Numerical flow and transport models were developed to estimate SGD associated with topography-driven flow, seawater recirculation, and geothermal convection in a passive margin setting. Simulations were based on two cross sections of North Carolina, and sensitivity studies were used to explore the impact of varying hydraulic and transport parameters. Results suggest that saline flow associated with seawater recirculation and geothermal convection should be considered in studies of SGD. Studies limited to shallow topography-driven flow may be justified in using small study areas, but flow systems contributing to SGD may span at least 20 km surrounding the coast and continental slope.

Citation: Wilson, A. M. (2005), Fresh and saline groundwater discharge to the ocean: A regional perspective, *Water Resour. Res.*, *41*, W02016, doi:10.1029/2004WR003399.

GEOPHYSICAL RESEARCH LETTERS, VOL. 30, NO. 18, 1917, doi:10.1029/2003GL017924, 2003

Periodical changes of submarine fluid discharge from a deep seafloor, Suiyo Sea Mountain, Japan

Makoto Taniguchi[1], Shingo Uchida[2], and Masataka Kinoshita[3]

Received 9 June 2003; revised 21 July 2003; accepted 5 August 2003; published 16 September 2003.

Geophysical Research Abstracts
Vol. 19, EGU2017-2992, 2017
EGU General Assembly 2017

EGU

Understanding steady-state Deep Submarine Groundwater Discharge: a case study in Northern Israel

Anner Paldor (1,2), Einat Aharonov (1), and Oded Katz (2)
(1) Hebrew University, Jerusalem, Israel., (2) Geological Survey of Israel.

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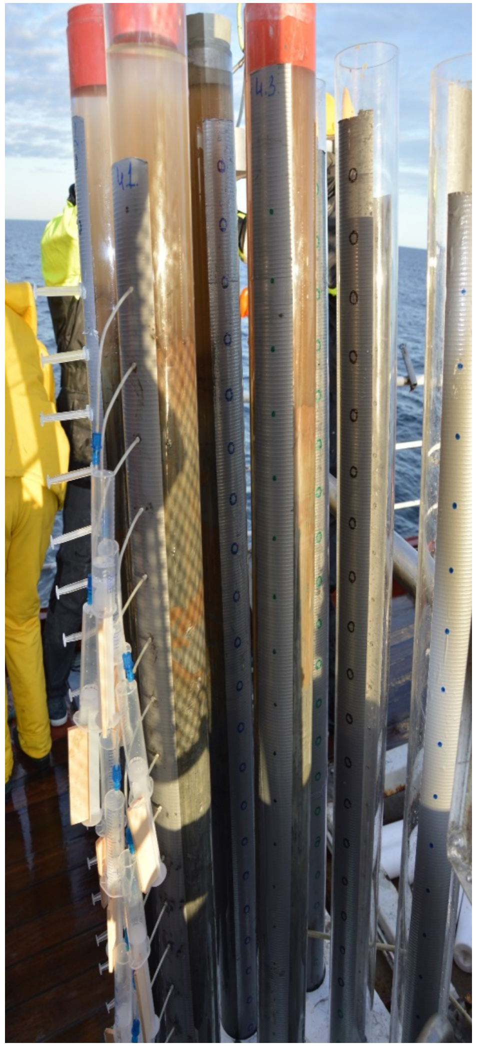
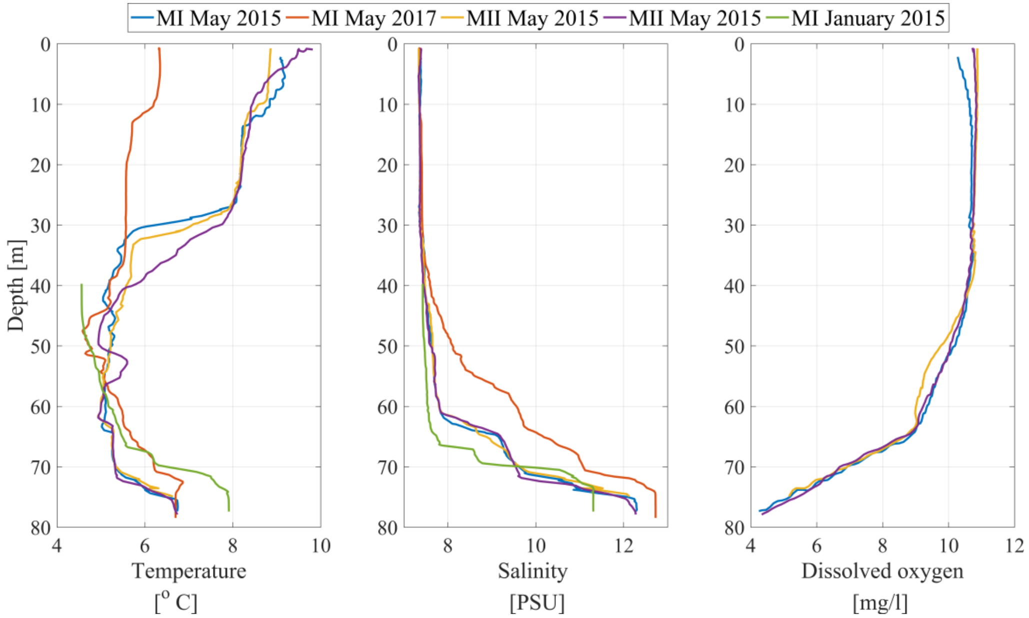
Sampling





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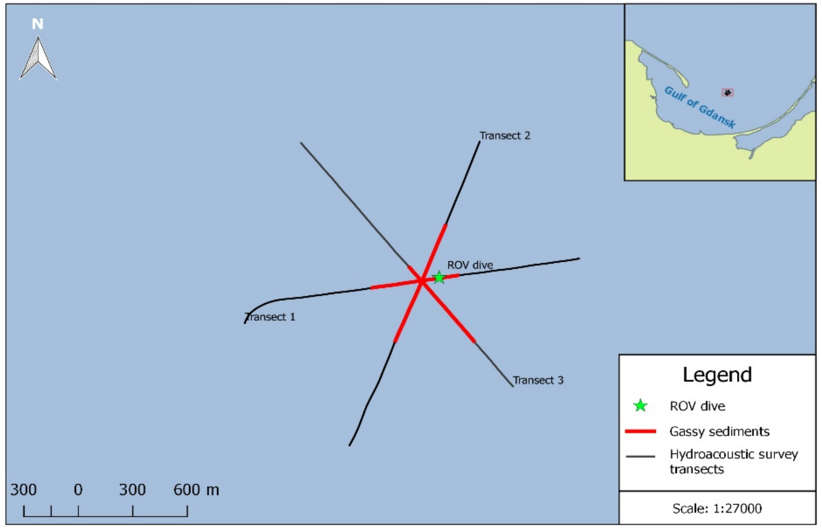

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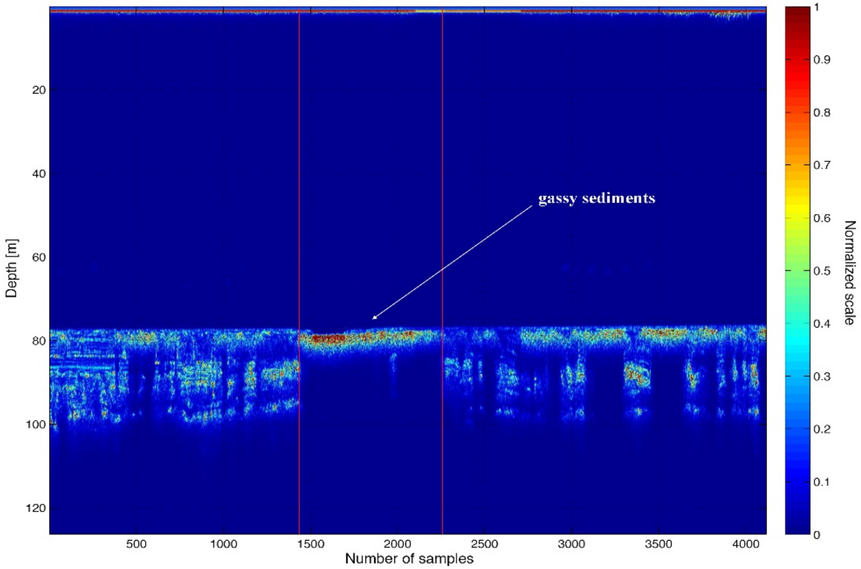
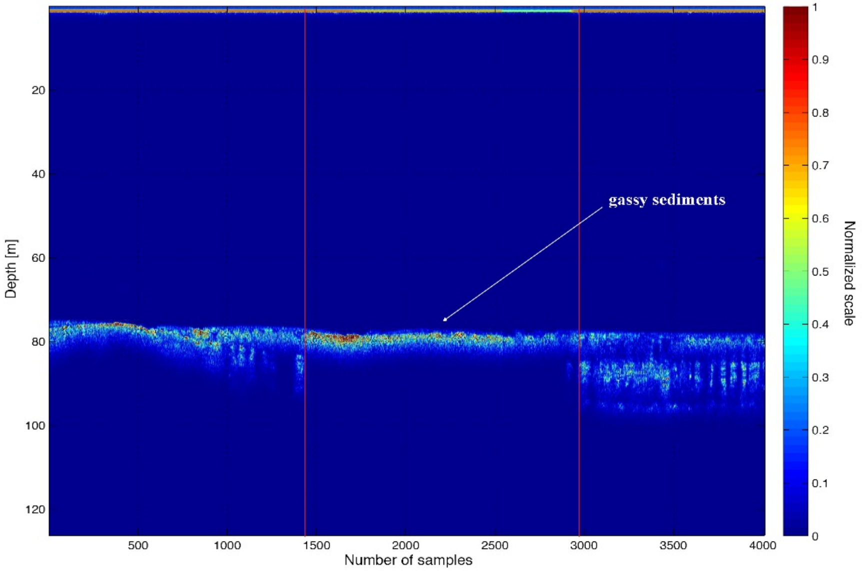
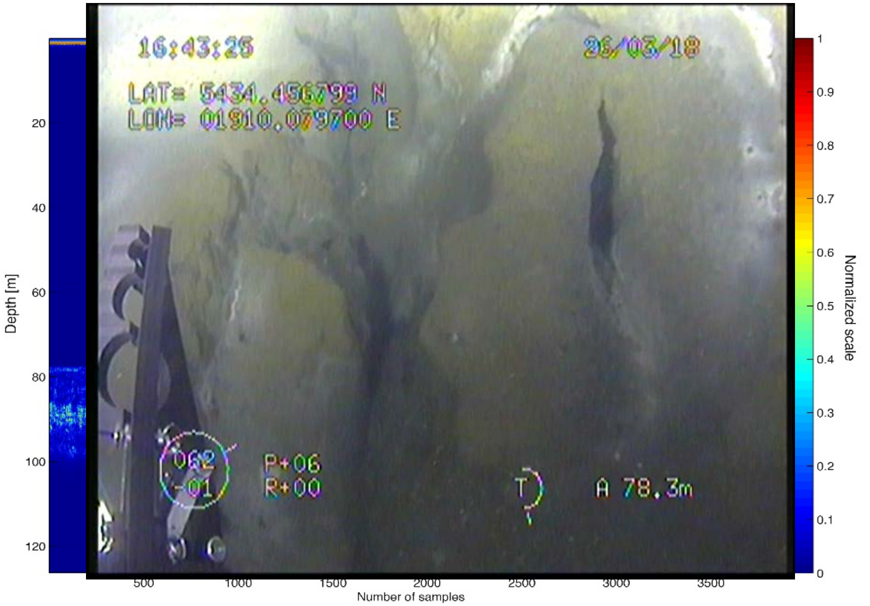


Transect 2





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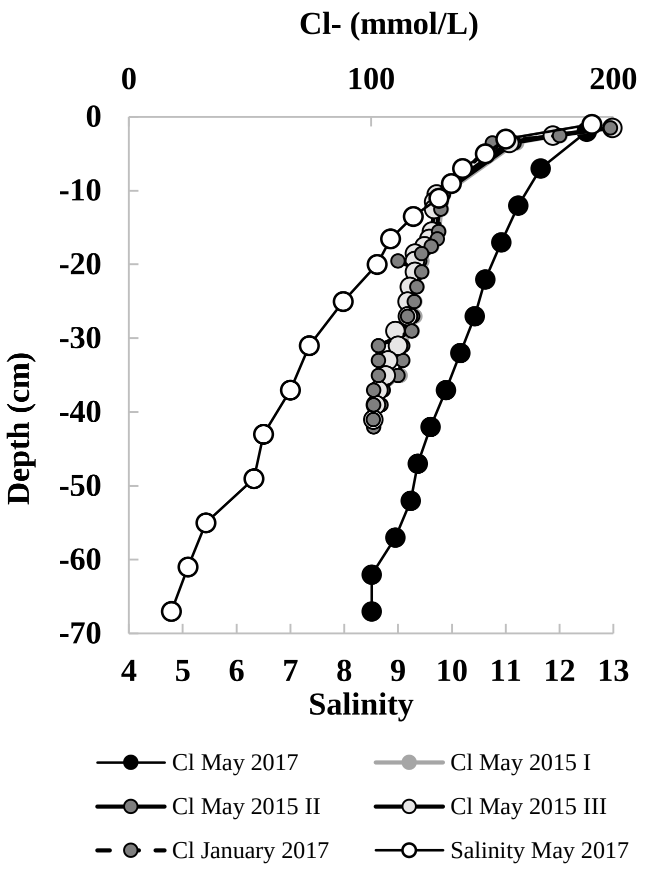
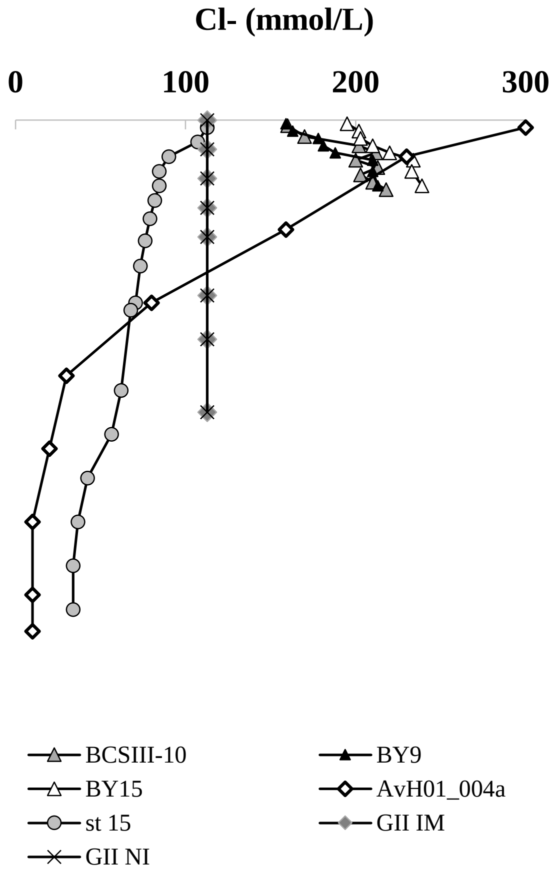
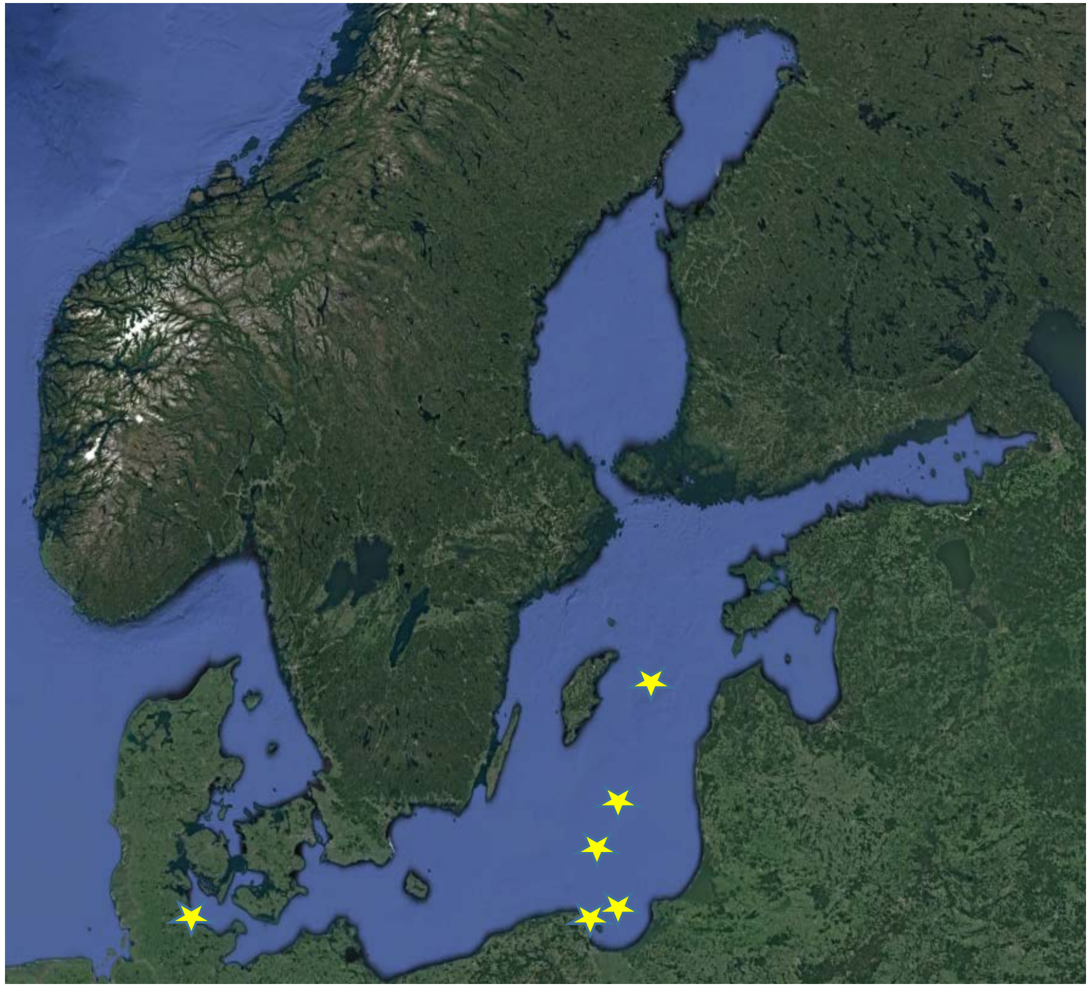
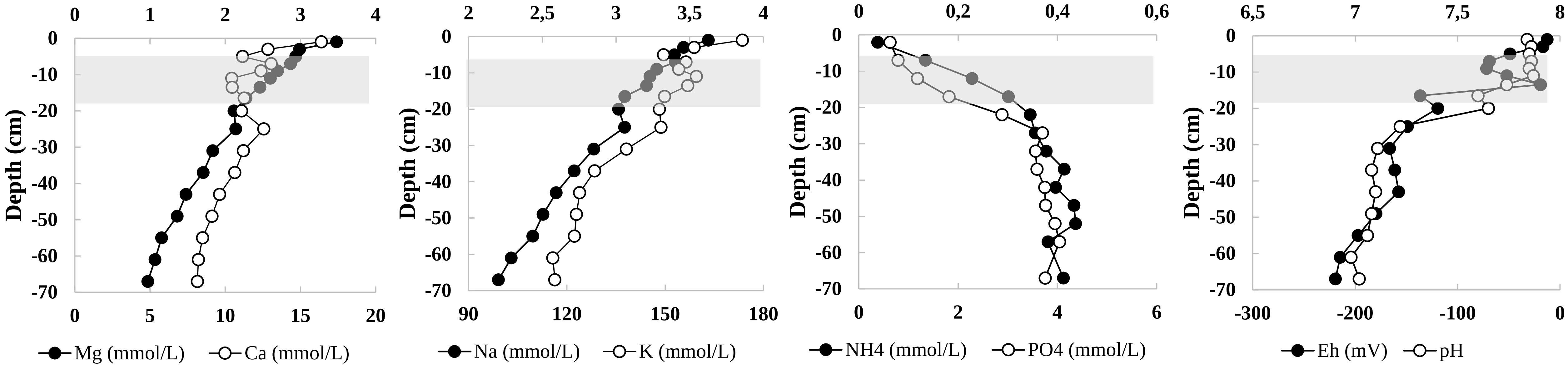






SGD 0.5 L m^{-2} yr^{-1}



Depth (cm)
Mg (mmol/L)
Ca (mmol/L)
Na (mmol/L)
K (mmol/L)
NH4 (mmol/L)
PO4 (mmol/L)
Eh (mV)
pH

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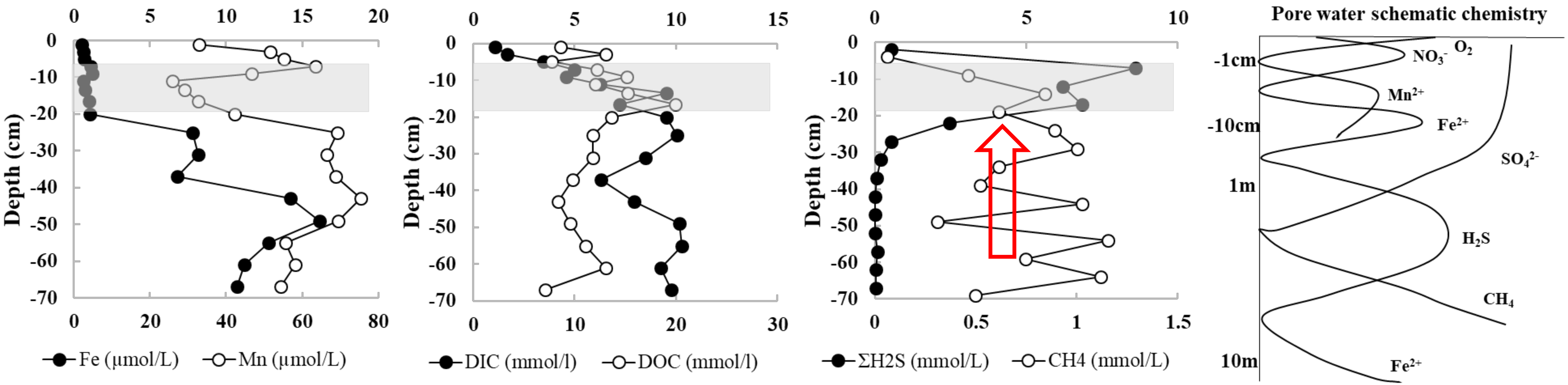
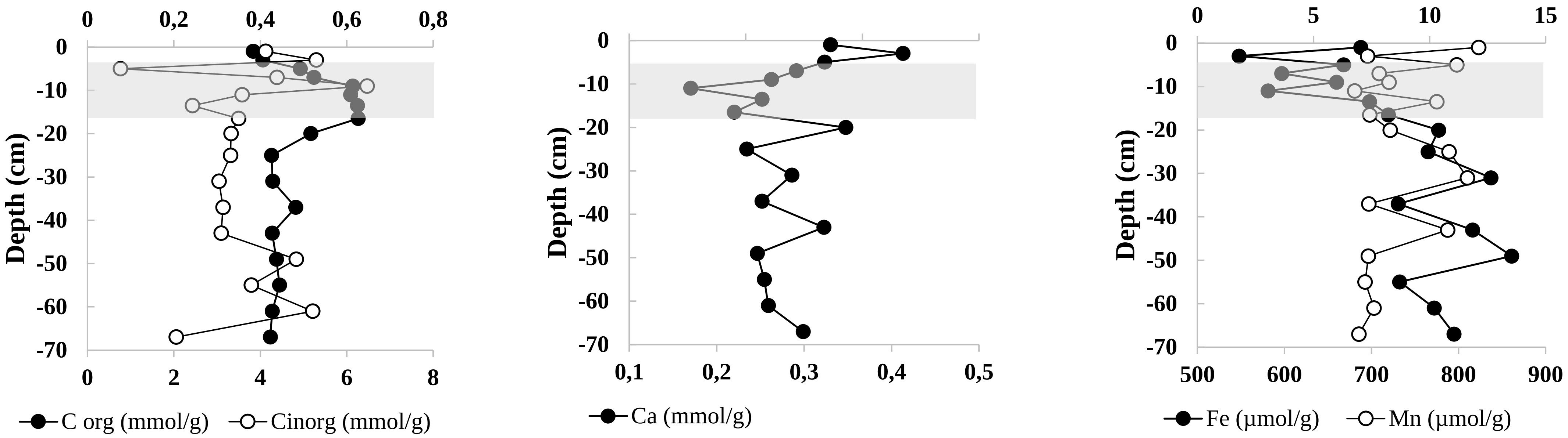
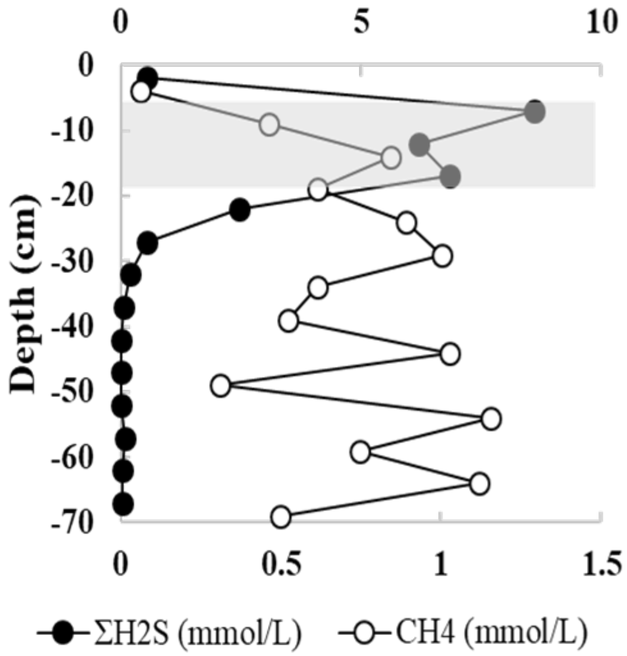
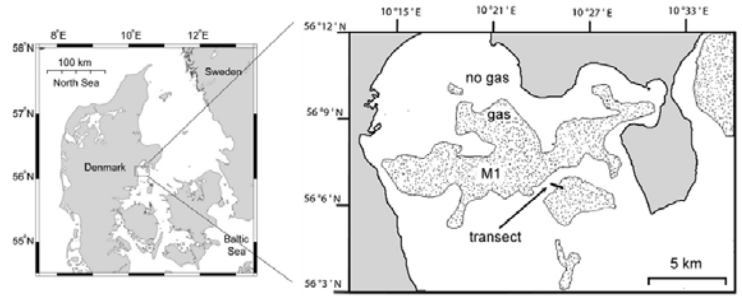
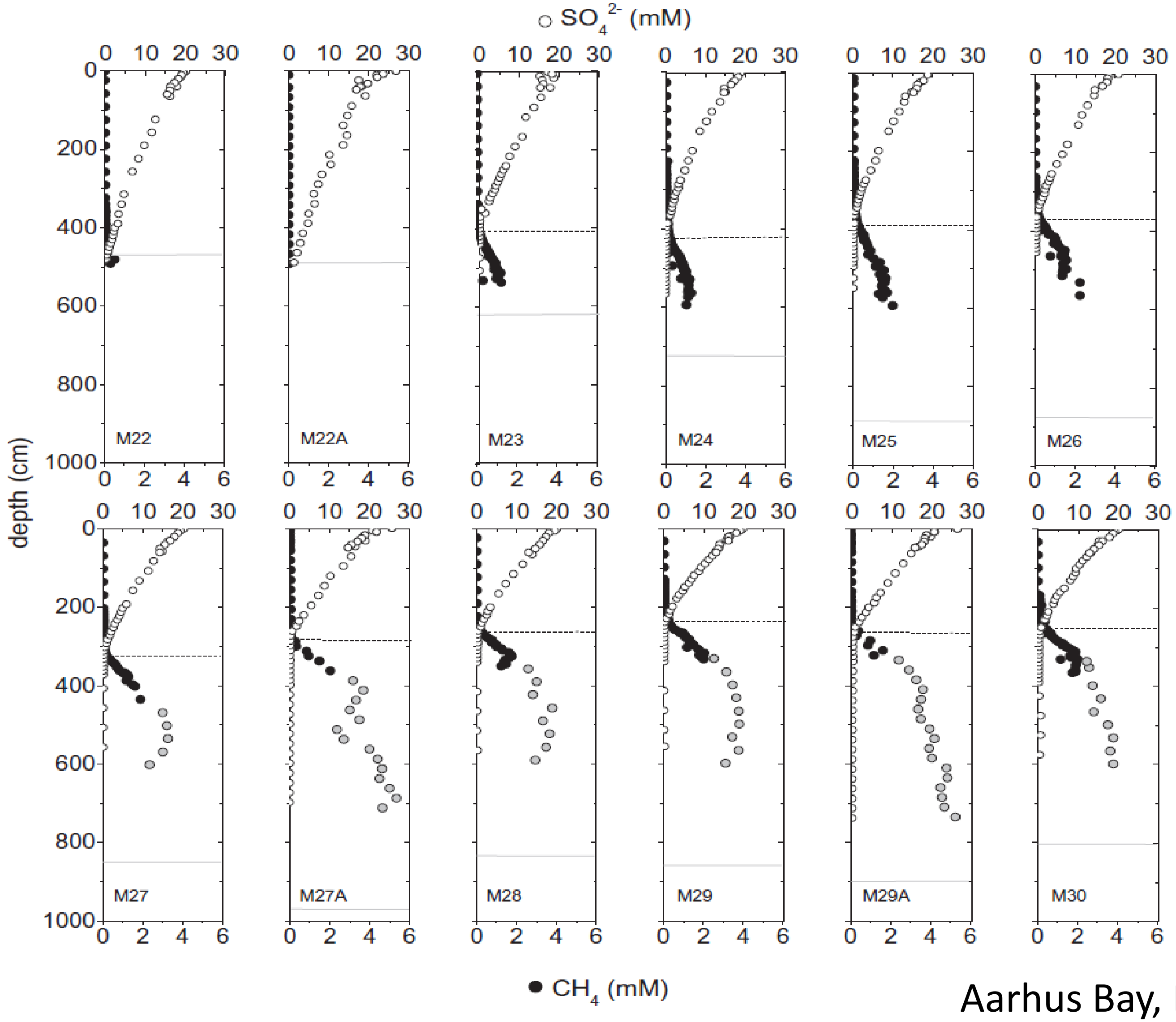


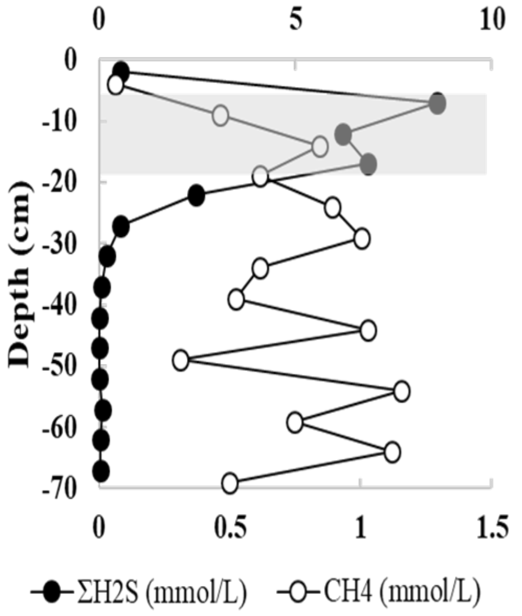

0
0,2
0,4
0,6
0,8
Depth (cm)
0
-10
-20
-30
-40
-50
-60
-70
0
2
4
6
8
C org (mmol/g)
Cinorg (mmol/g)
Depth (cm)
0,1
0,2
0,3
0,4
0,5
Ca (mmol/g)
0
5
10
15
Depth (cm)
500
600
700
800
900
Fe (µmol/g)
Mn (µmol/g)

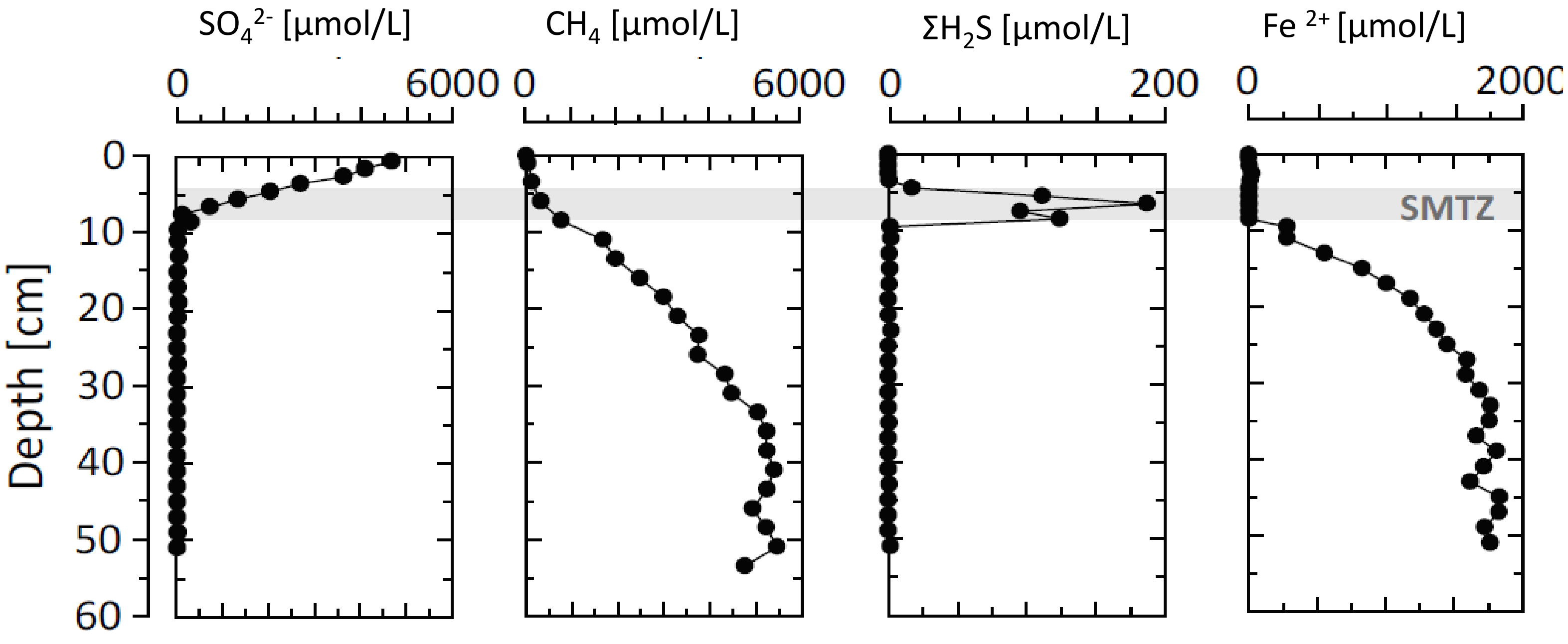




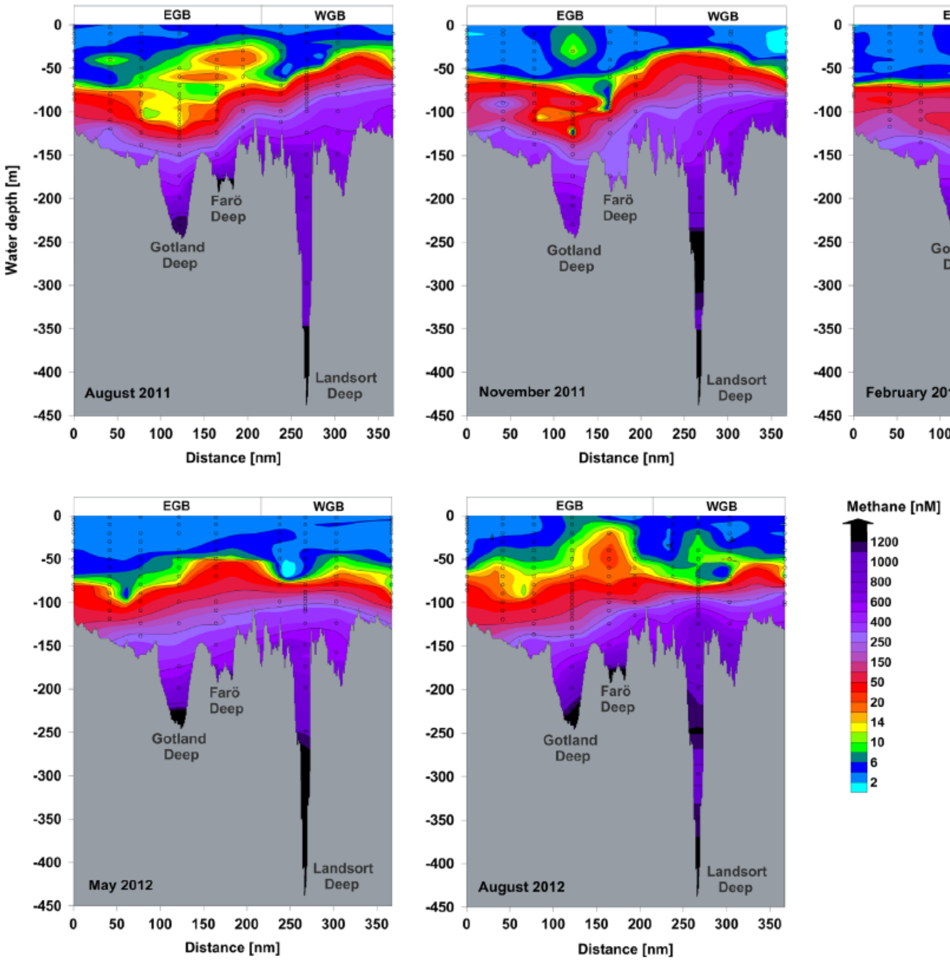


Aarhus Bay, Baltic Sea
Flury et al.2016

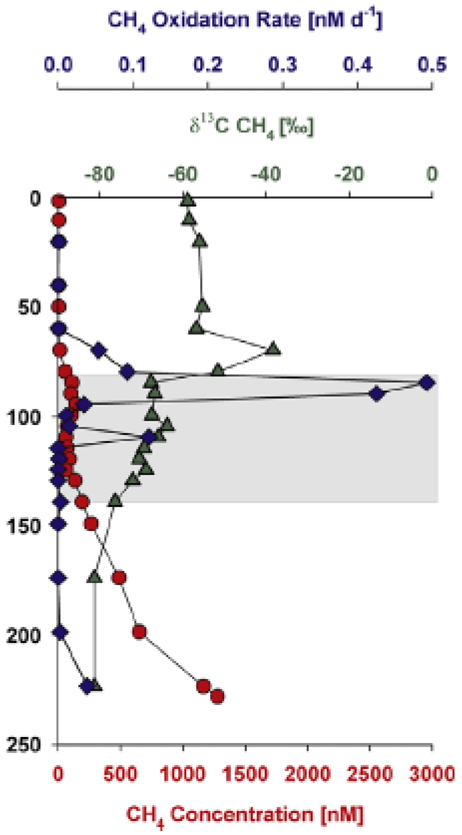




US5B, Bothnian Sea at 214 m
Egger et al.2015



February 2012



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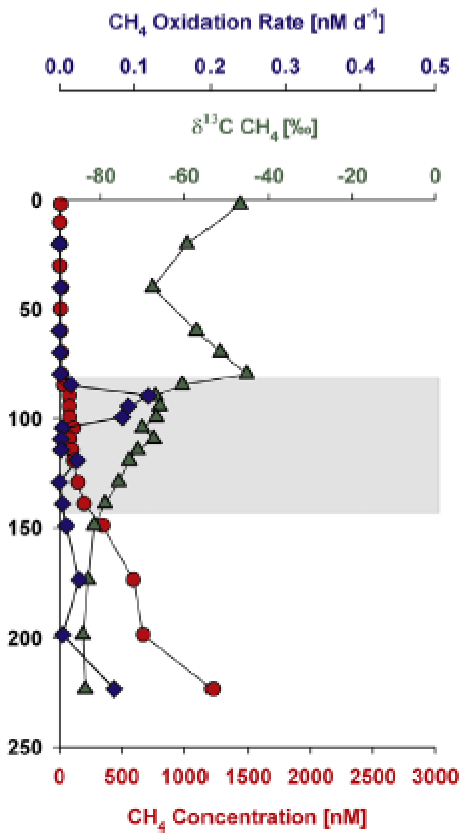

This study: bottom water 18000 [nM] CH_4

Jakobs et al.2014

Next steps:

- Return fluxes of chemical substances (C, N, P)

What do we miss?

- SO_4^{2-}
- alkalinity
- CH_4 water column concentrations

Sediments of the Baltic Sea as a source of C, N, P

Monika Lengier[1], Beata Szymczycha[1], Karol Kuliński[1], Aleksandra Brodecka – Goluch[2], Żaneta Kłostowska[1,2]*

Does CH_4 reach surface?

Is the CH_4 flux here significantly higher than in other sites?

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