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Variation of dissolved oxygen (DO) in fish cages with shielding skirt for prevention of salmon lice (Lepeophtheirus Salmonis)

Z. Volent, B. Venås, J. Birkevold, L. M. Sunde
SINTEF Ocean, 7465 Trondheim, Norway
Tel.: +47 926 40 330. e-mail: Zsolt.volent@sintef.no

Participants in the project and Acknowledgements

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http://www.sintef.no/skjermtek

Participants:

Funded by:

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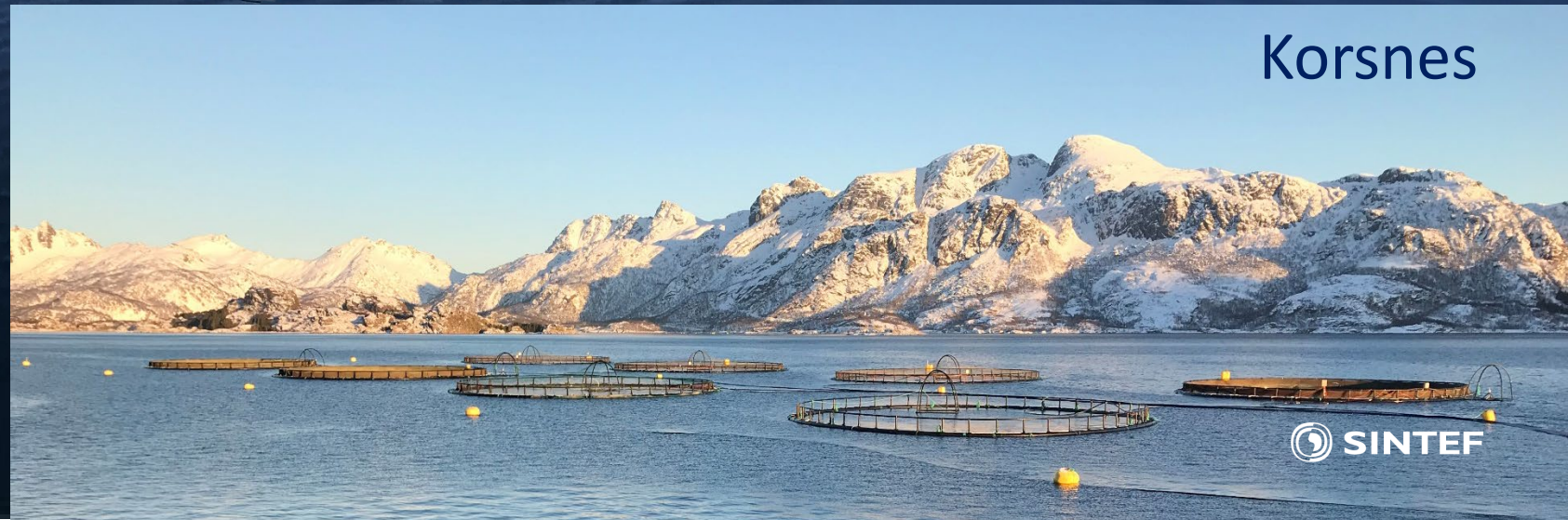
Outline

- Introduction
- Location and measurement setup
- Results
- Conclusions

Finnkjerka



Introduction

Shielding skirts are the most important among the preventive measures

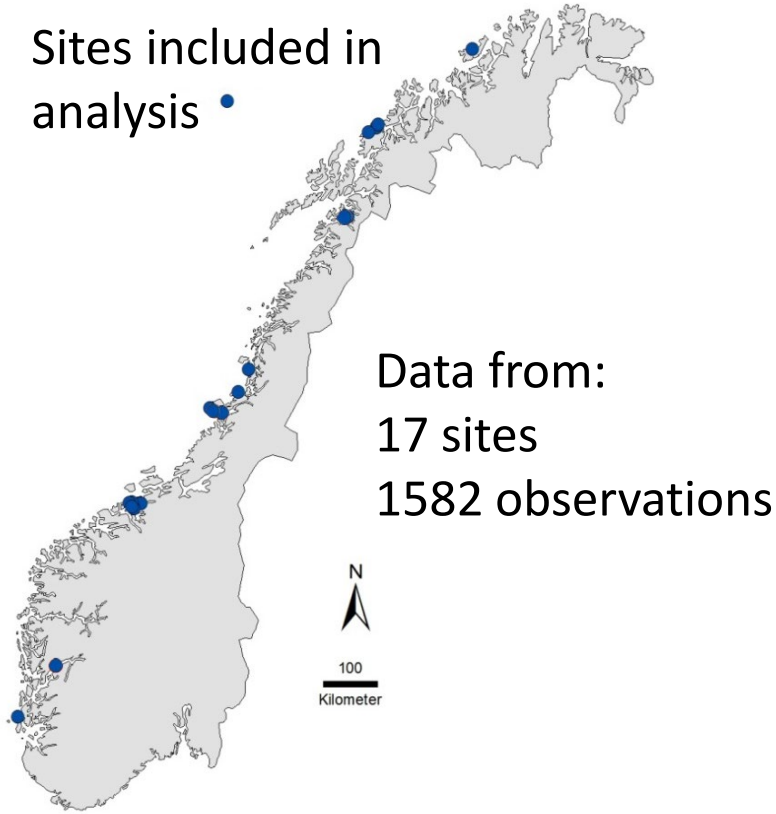
Shielding skirts reduce lice infestation

- Skirts reduced lice infestation with an average of 18 % on cage level
- On site level, reduction was on average 54 %

…but the effect varies from site to site

- Cage level: 6-28 %
- Site level: 0-80 %

…Why?



Grøntvedt and Kristoffersen, 2015

Introduction

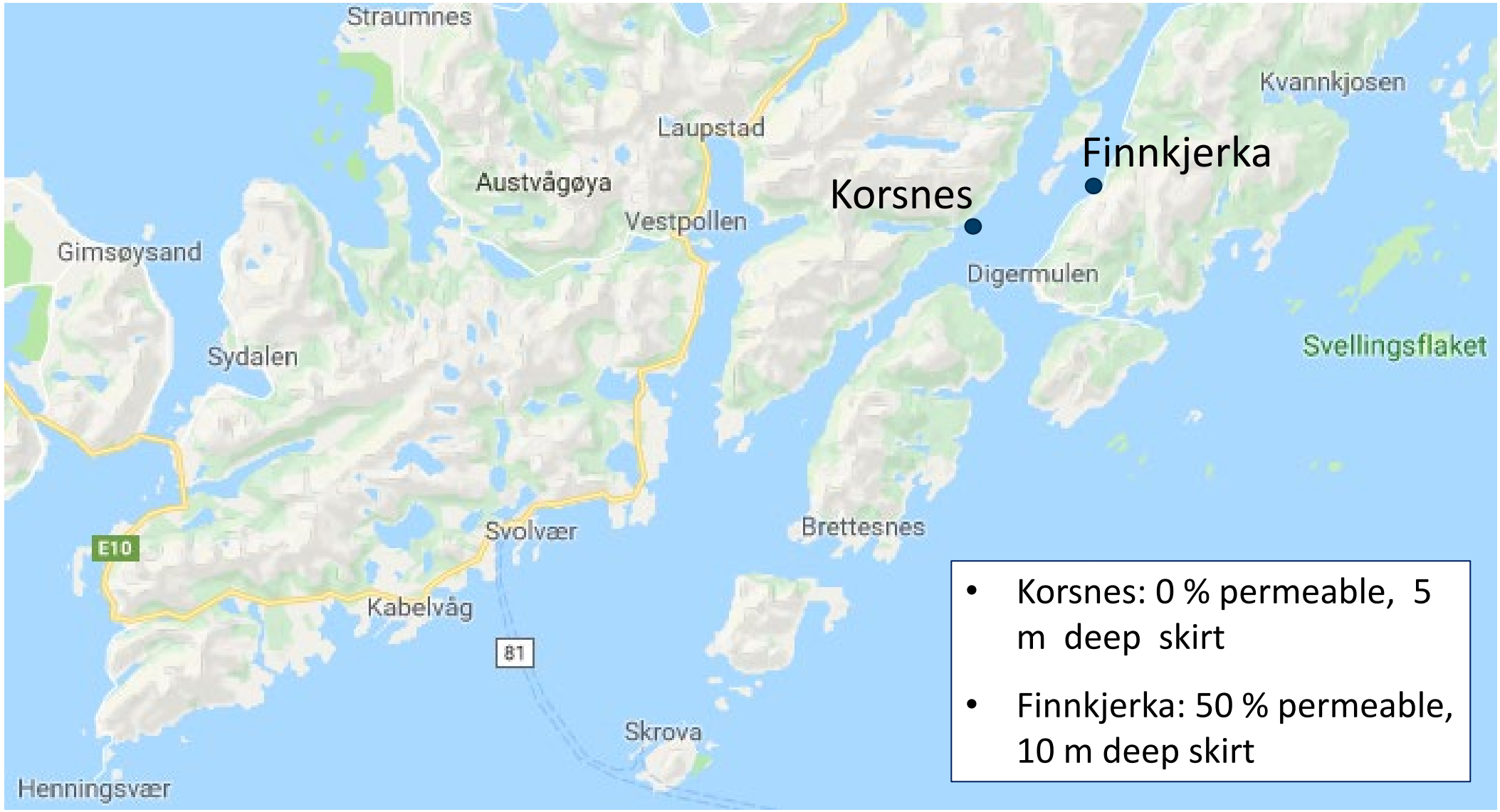
The main goal of the SKJERMTEK project is to investigate local conditions, as currents, waves, hydrography, dissolved oxygen (DO) and topography which can influence the shielding effect of the skirts, and maybe give an answer to why ...

The plan is to investigate the condition at 4 different locations for a period of 2 – 3 months.

As a consequence of using skirt as prevention against sea lice, prevents also water circulation and the supply of oxygen within the skirt.

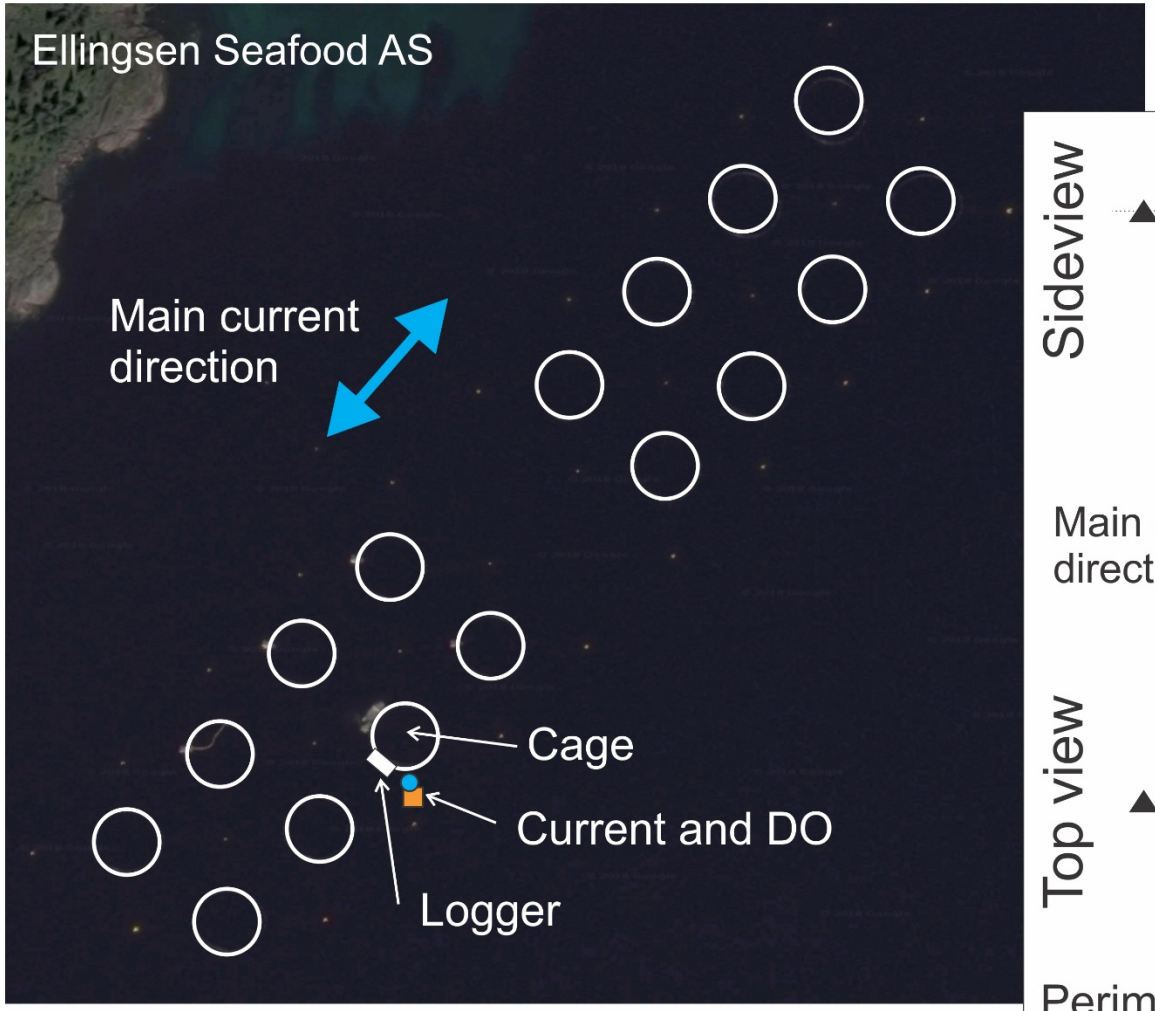
- To get a clear picture of the oxygen distribution you need at least 11 DO sensors for each location.
- To be able to reduce the amount of DO sensors, an investigation has been undertaken to try to find a place within the skirts, which can characterize the worst case situation regards to oxygen and water quality,

Locations

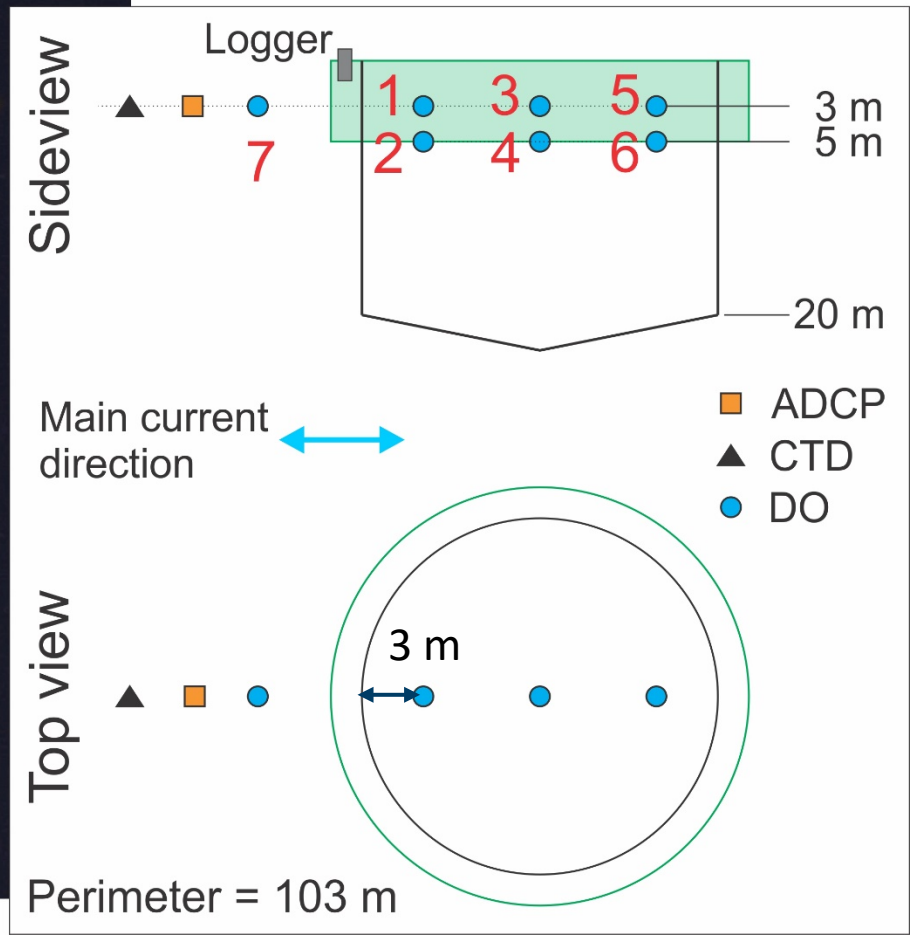


- Korsnes: 0 % permeable, 5 m deep skirt
- Finnkjerka: 50 % permeable, 10 m deep skirt

Measurement setup at Korsnes



0 % permeable 5 m deep skirt



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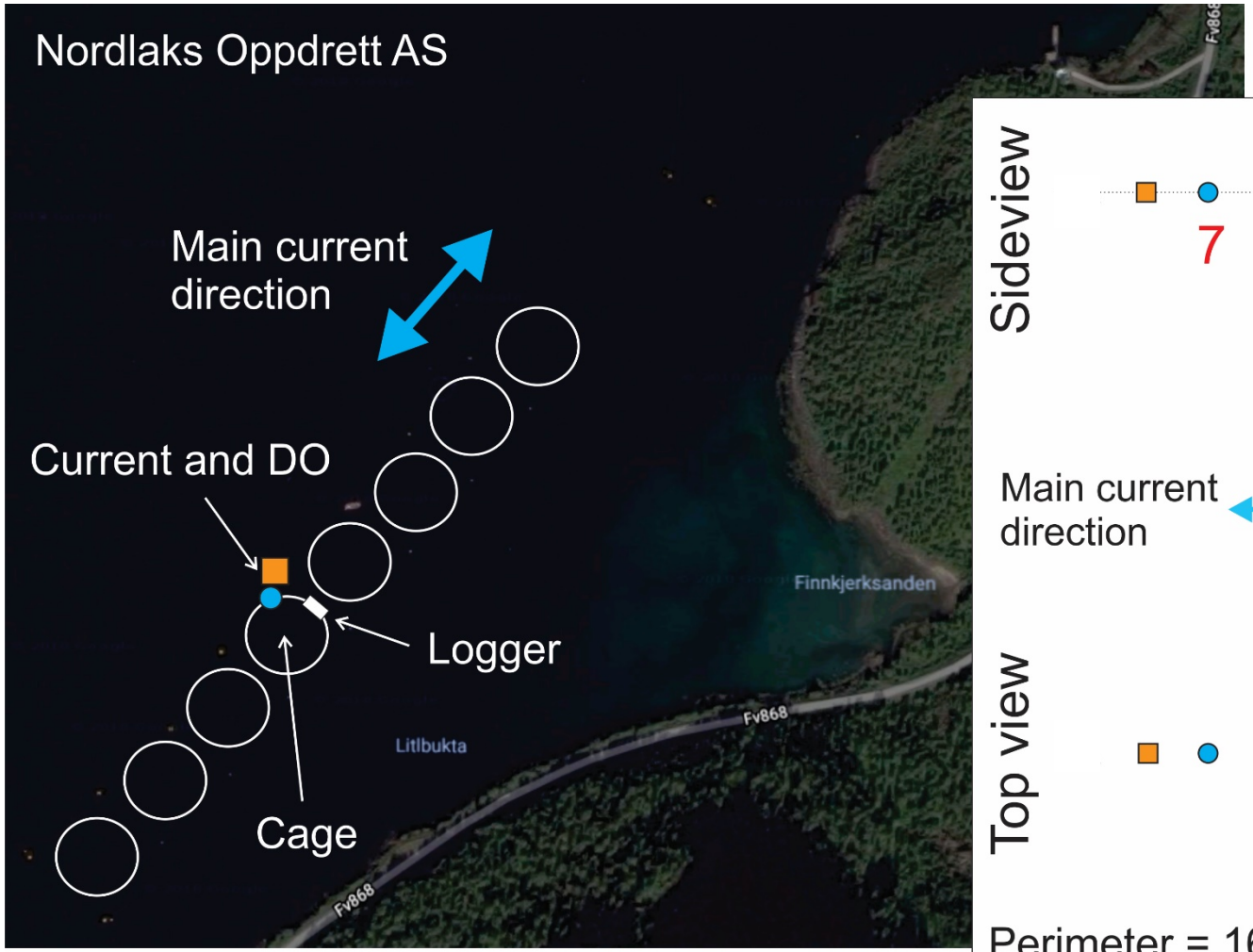
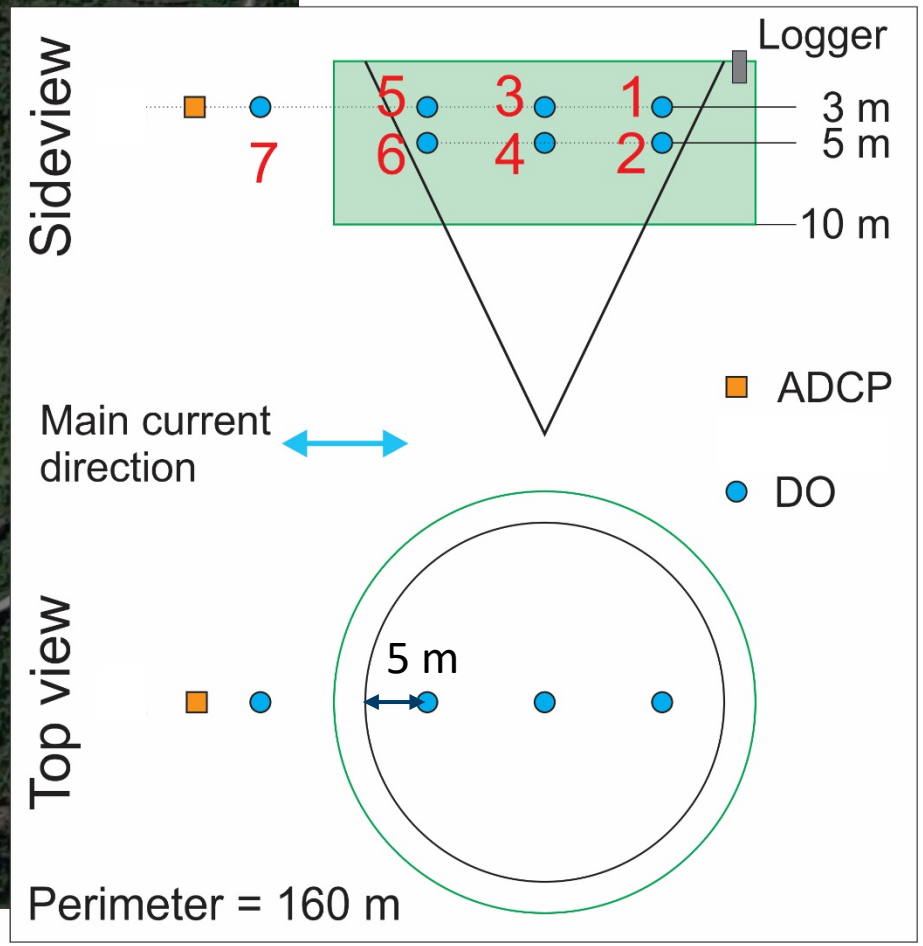
Measurement setup at Finnkjerka



50 % permeable 10 m deep skirt



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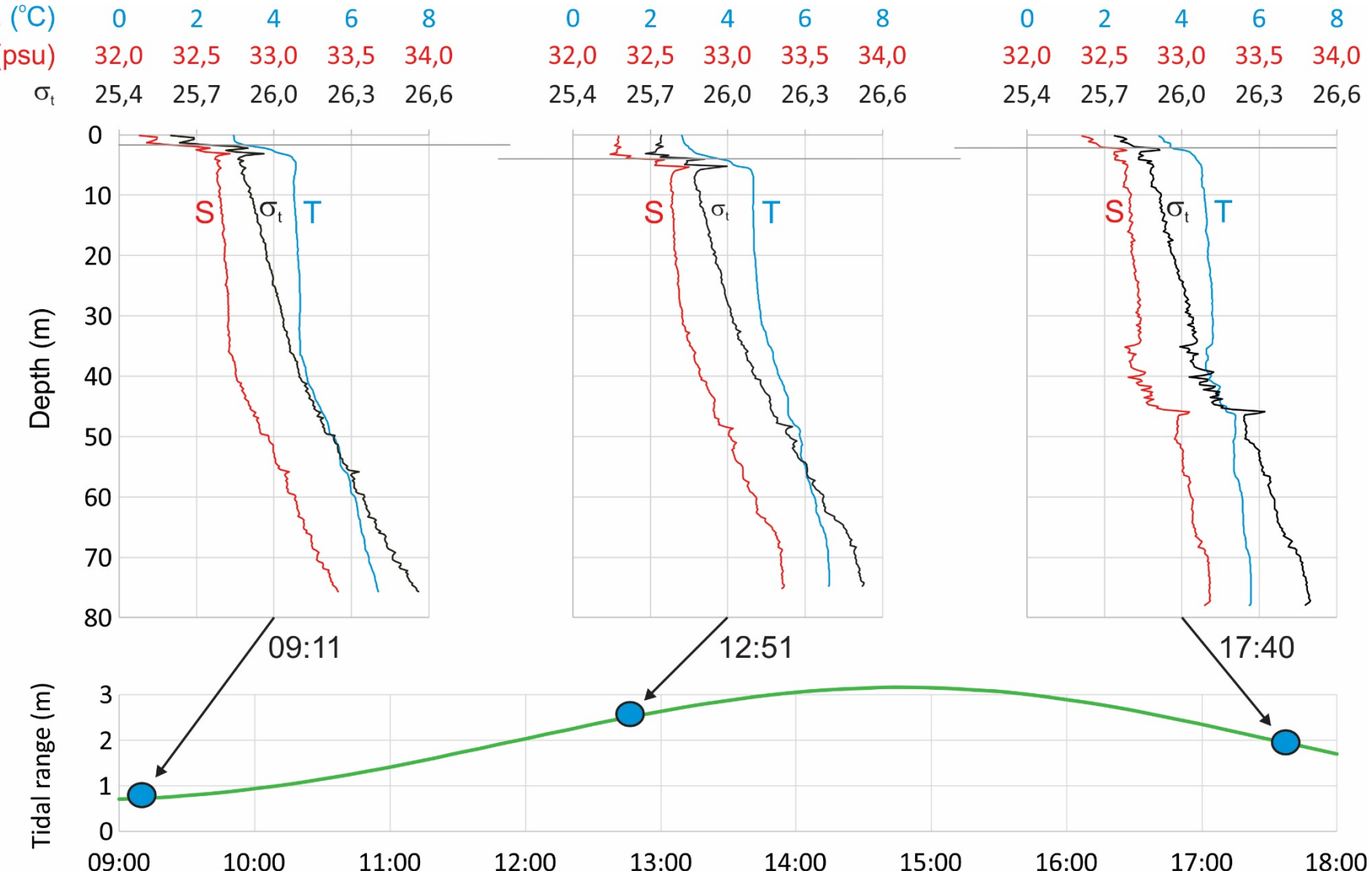
Hydrography at Korsnes 19.02.2018



pycnocline

$\sigma_t = \rho\ (kg\ m^{-3}) - 1000$

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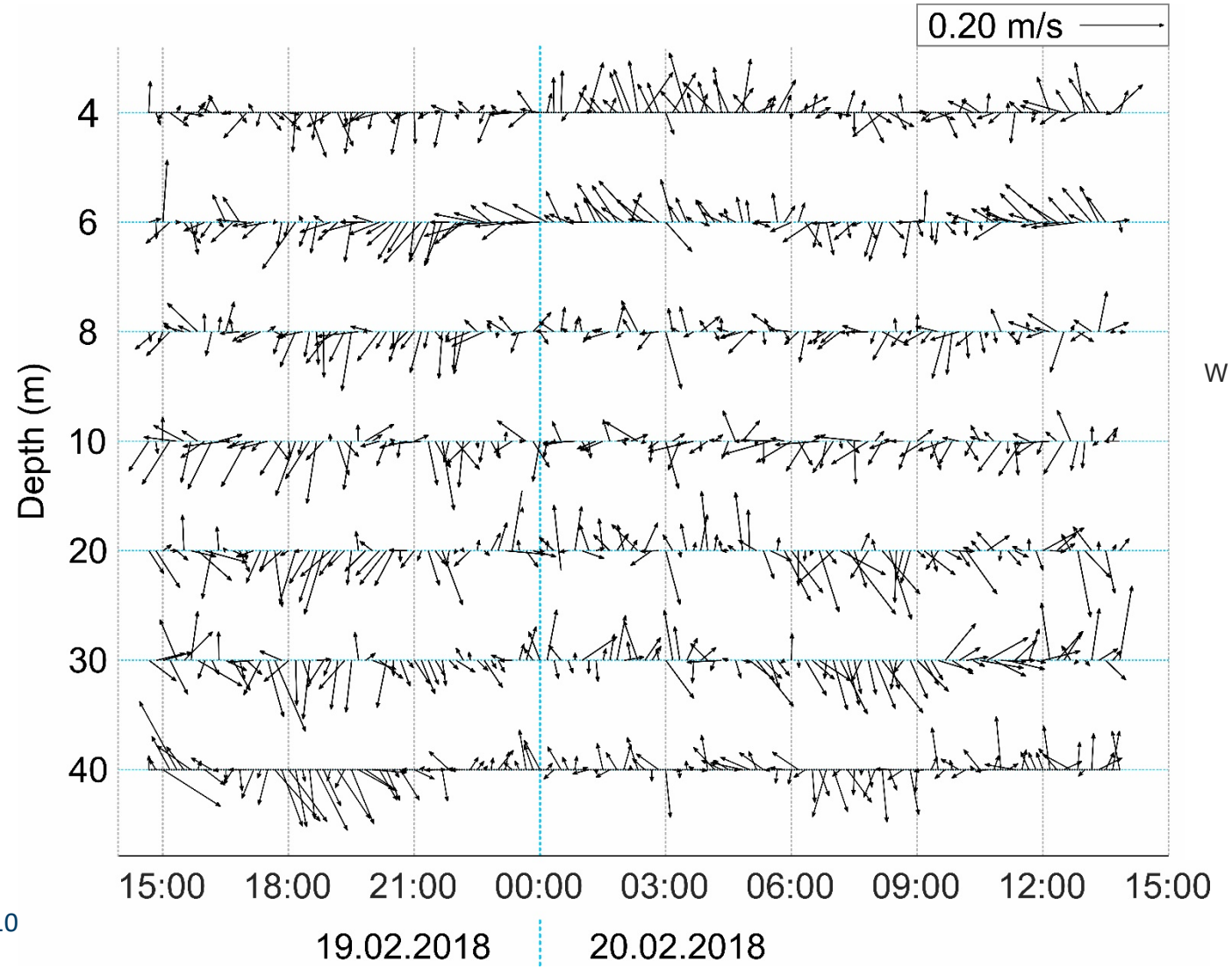
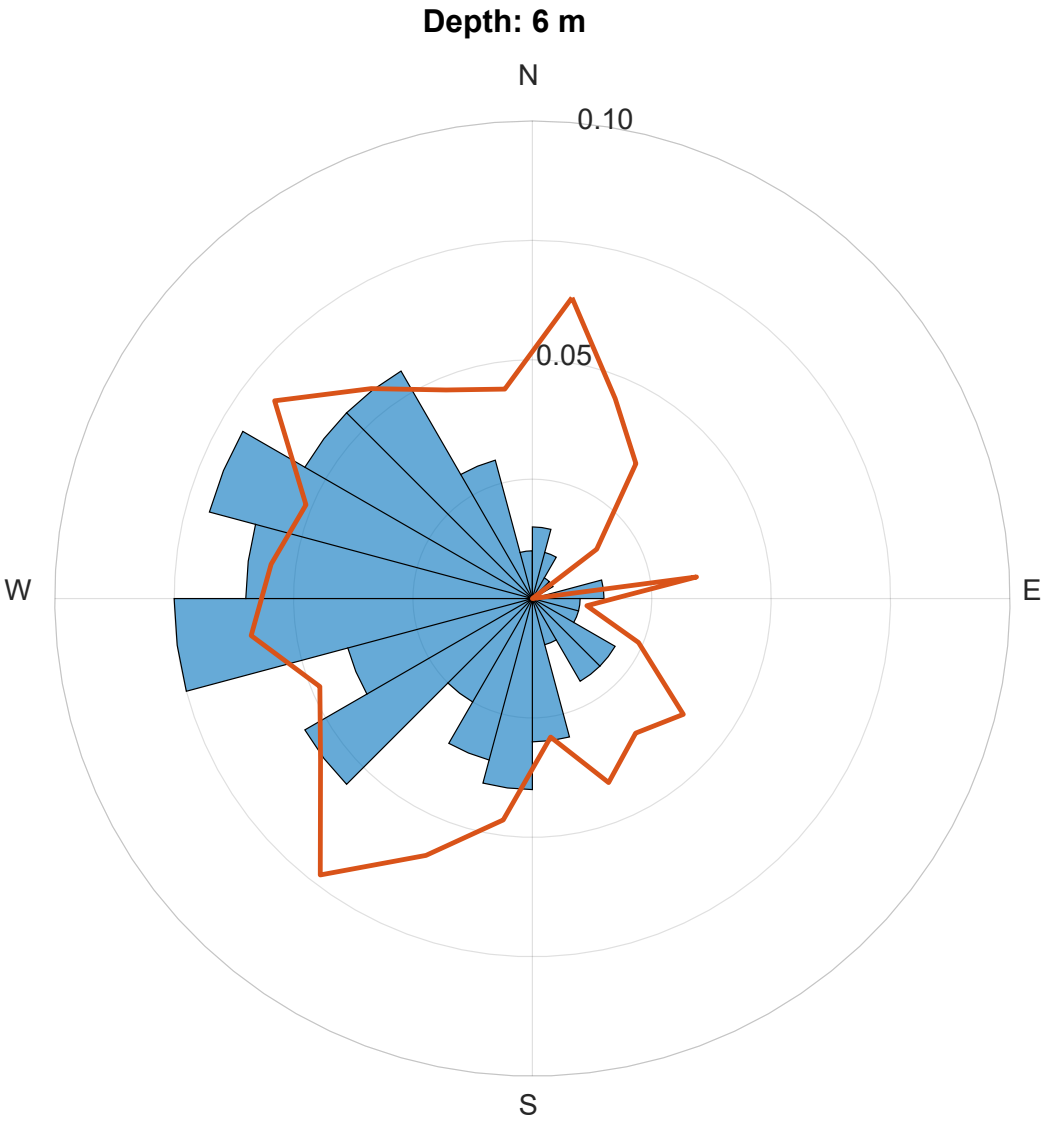
Current measurements - Korsnes





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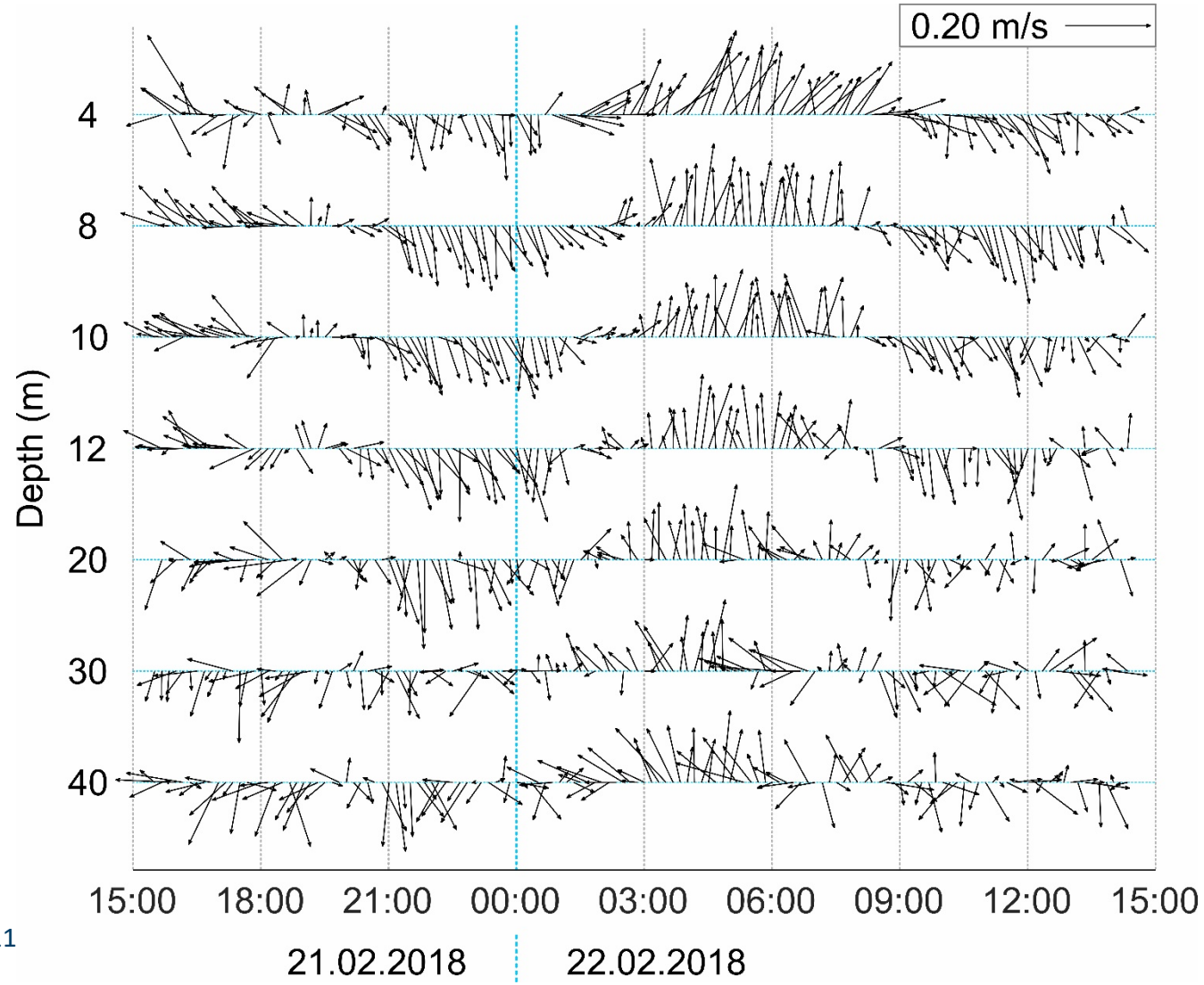
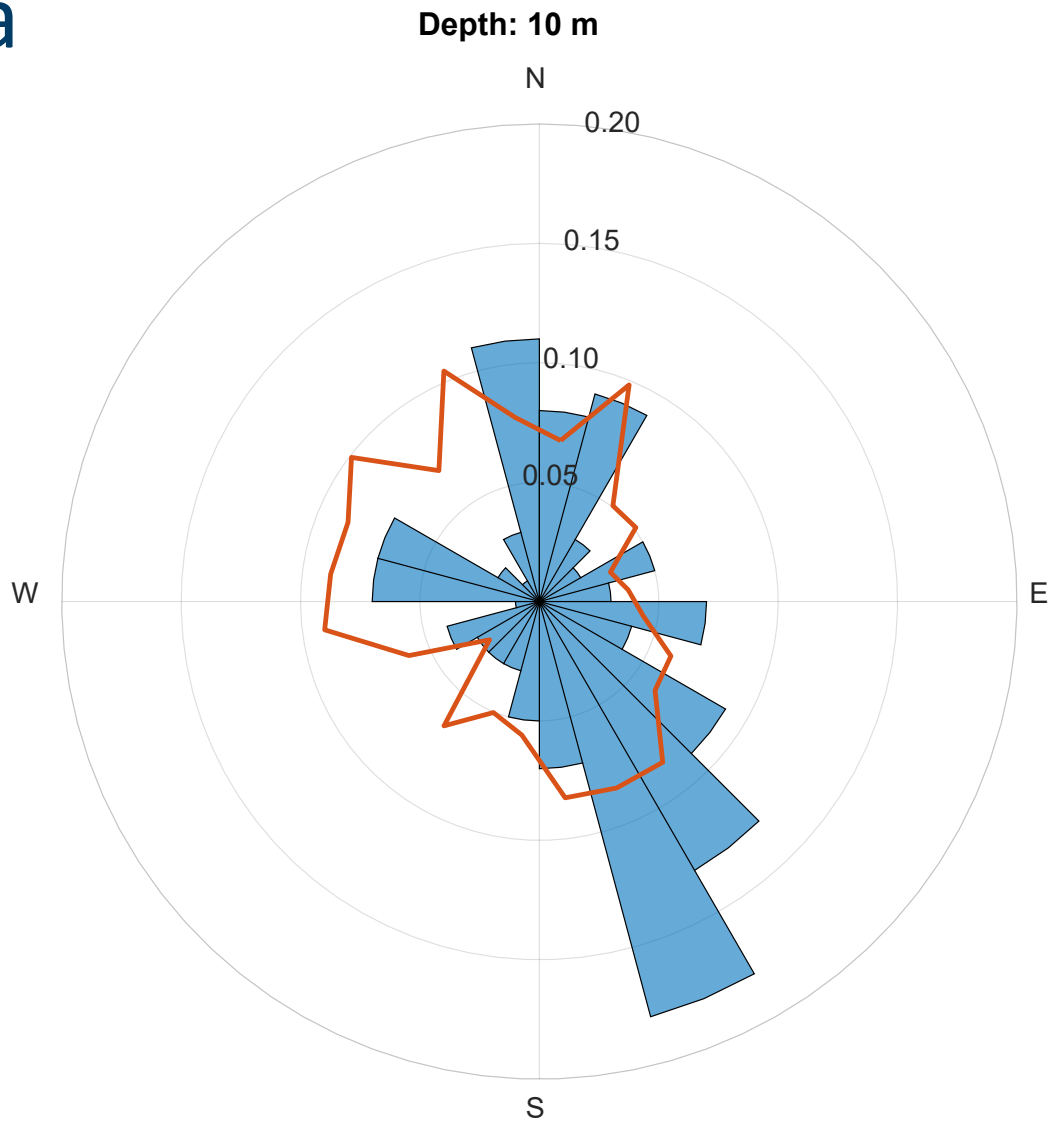
Current measurements - Finnkjerka





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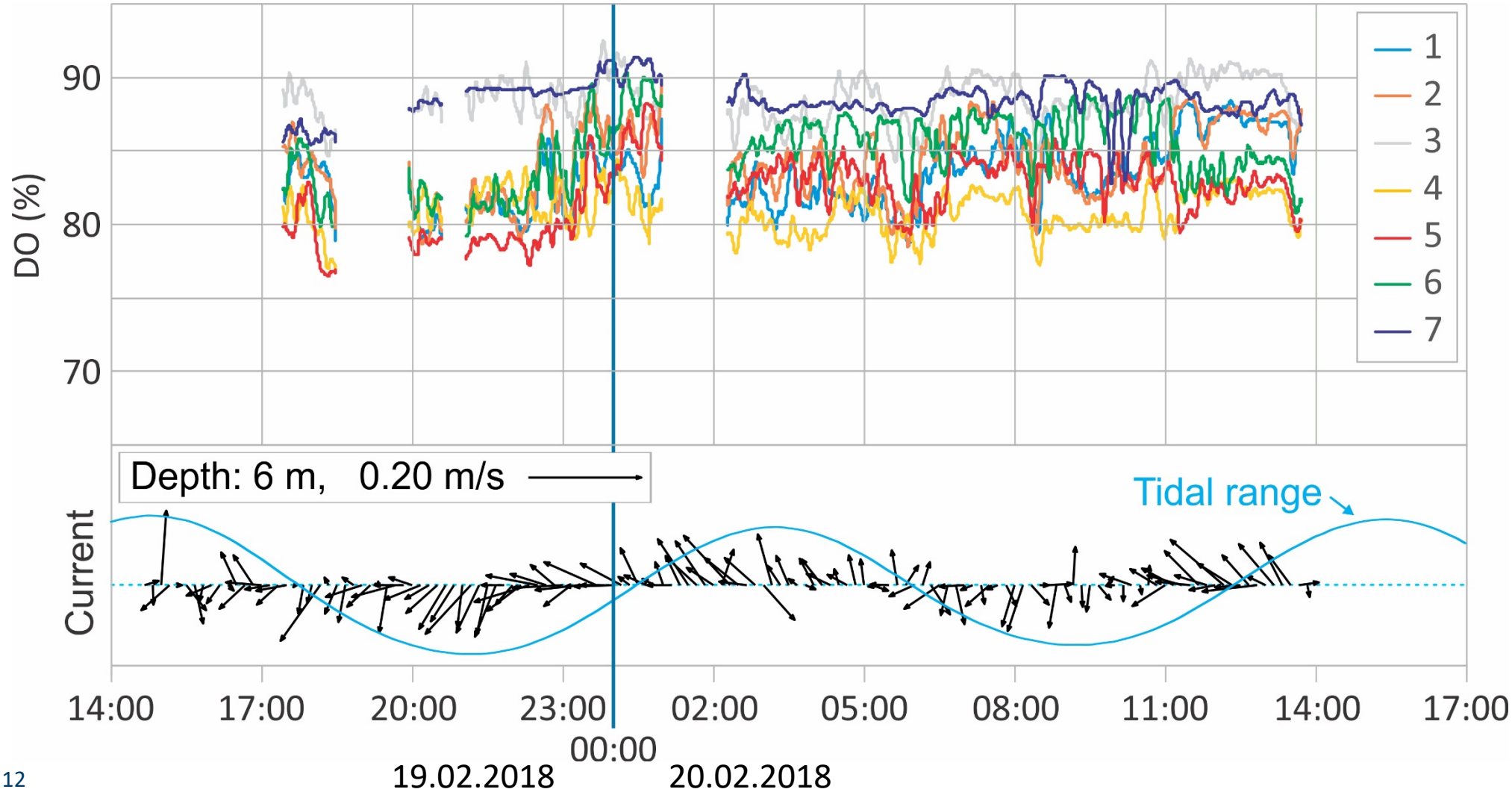
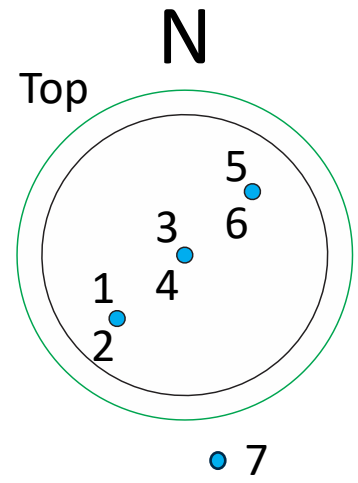
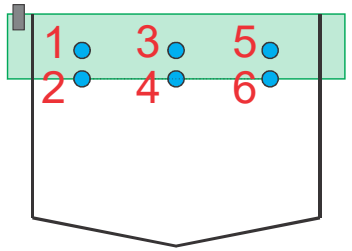
DO at Korsnes - 19. to 20.02.2018





Side view



Skirt depth = 5 m

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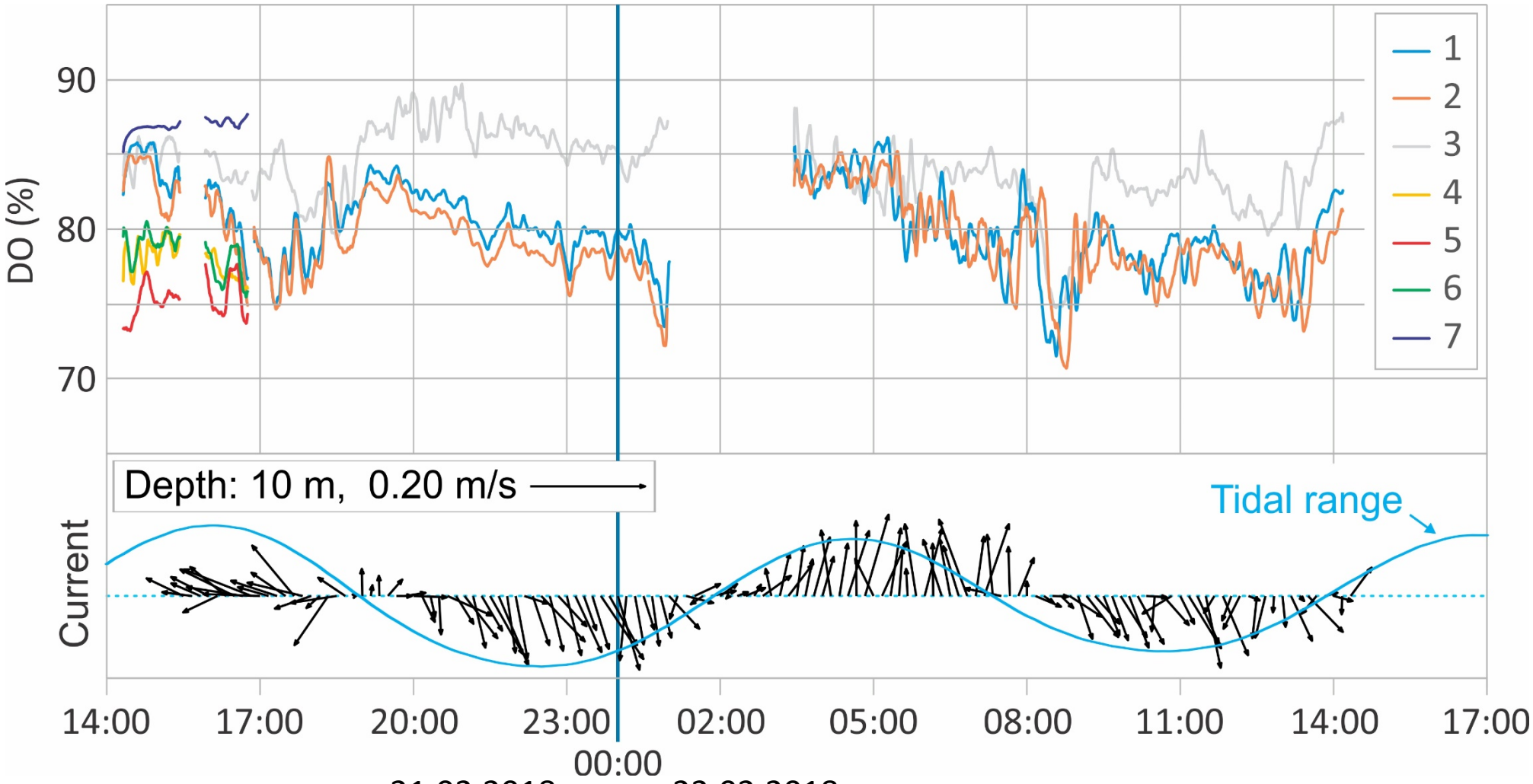
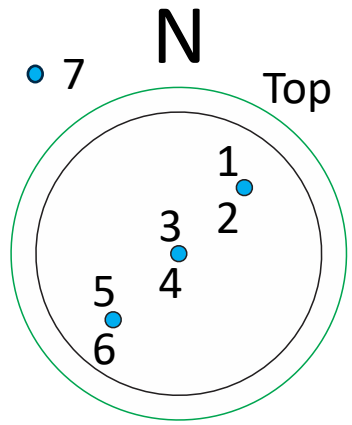
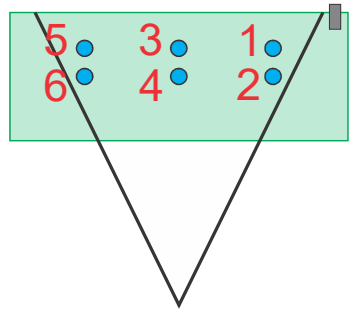
DO at Finnkjerka - 21. to 22.02.2018





Side view



Skirt depth = 10 m

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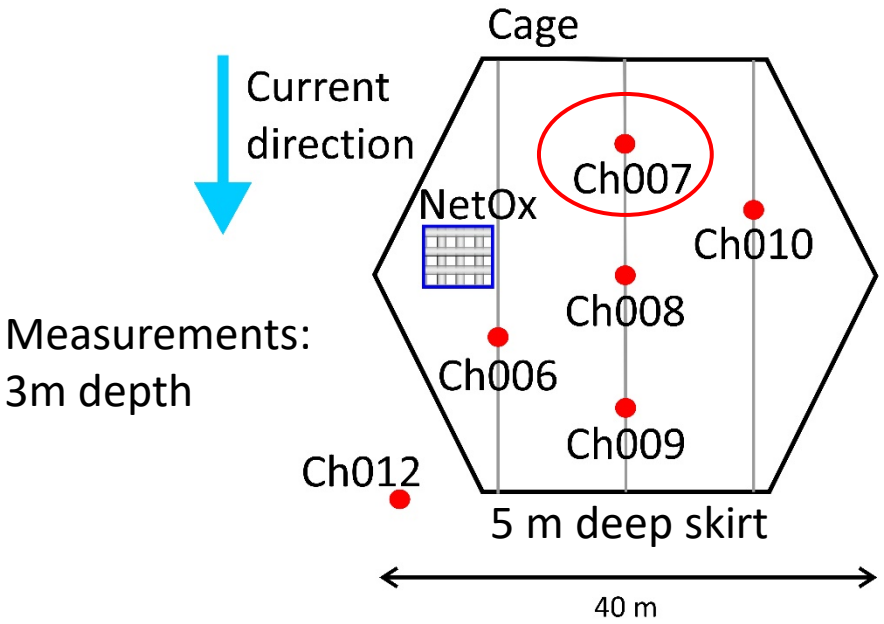
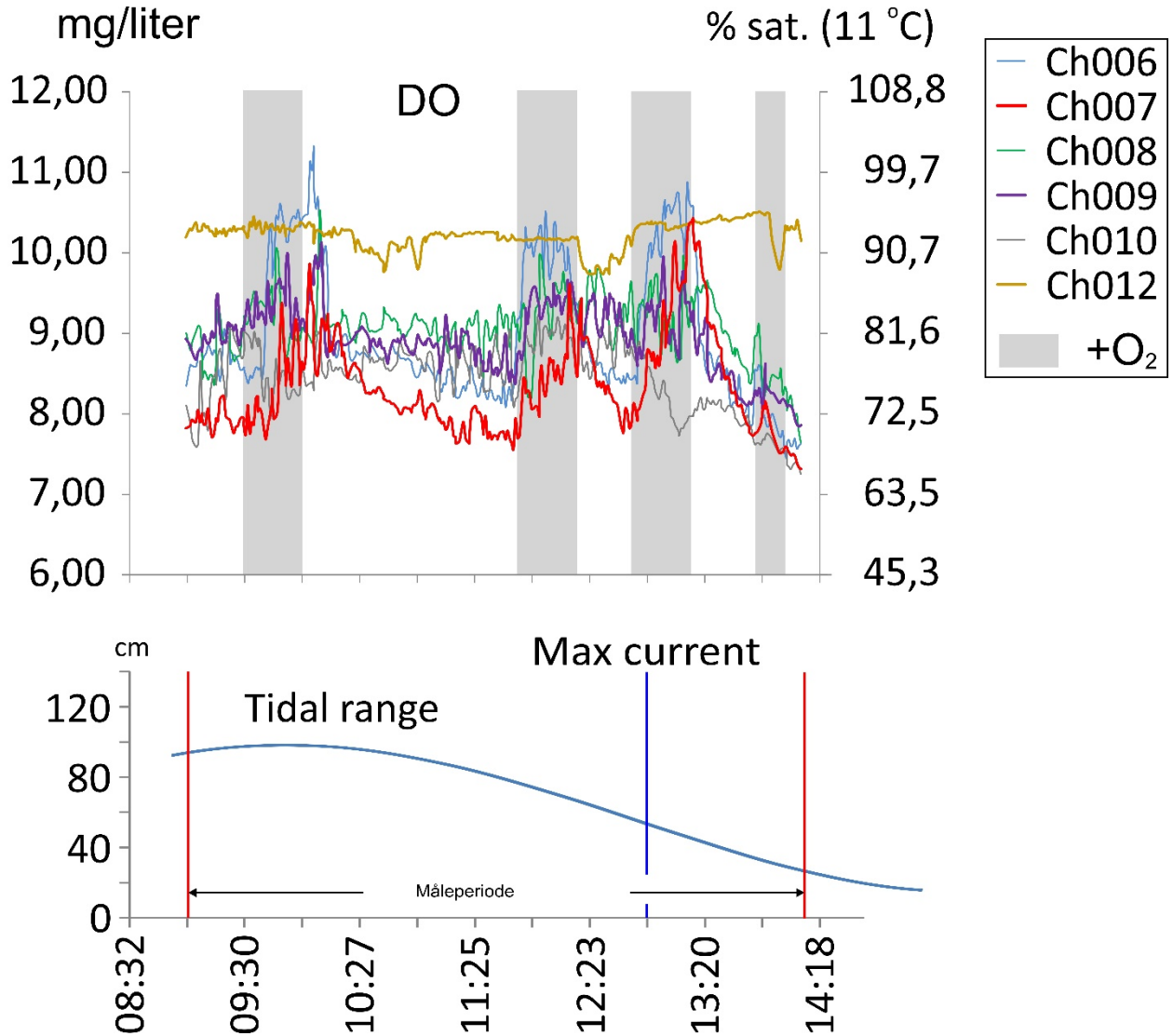
DO at Saltkjelen, Hardanger – 20.11.2014, as a comparison

Results from FHF prosjekt no. 900711 (Permaskjørt)



Measurements:
3m depth



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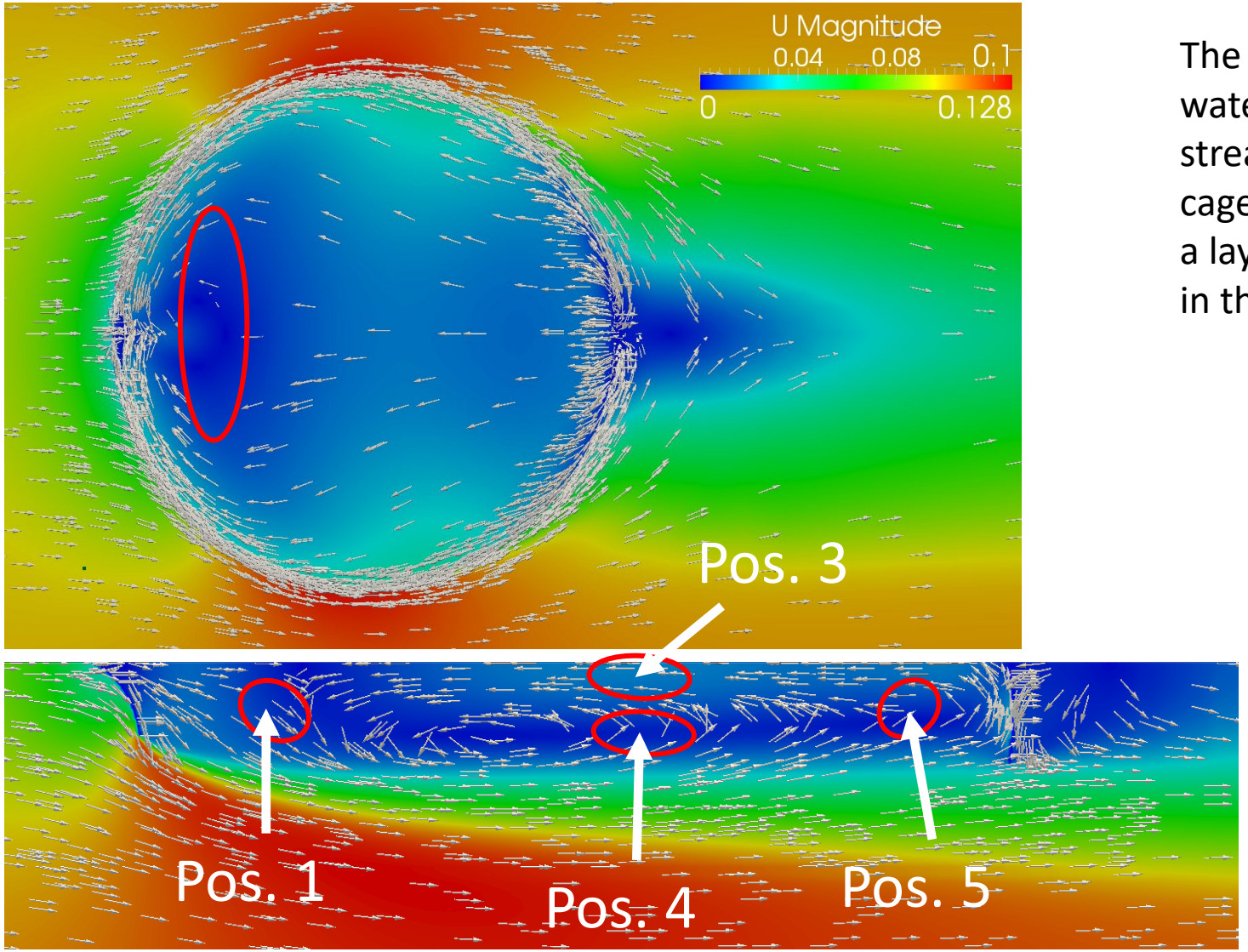
CFD analysis of a cage with 5 m deep skirt

Current direction



The worst conditions with stagnant water is in the front of the cage up streams (pos. 1), at the rear of the cage down streams (pos. 5), and in a layer around the depth of the skirt in the middle (pos. 4).

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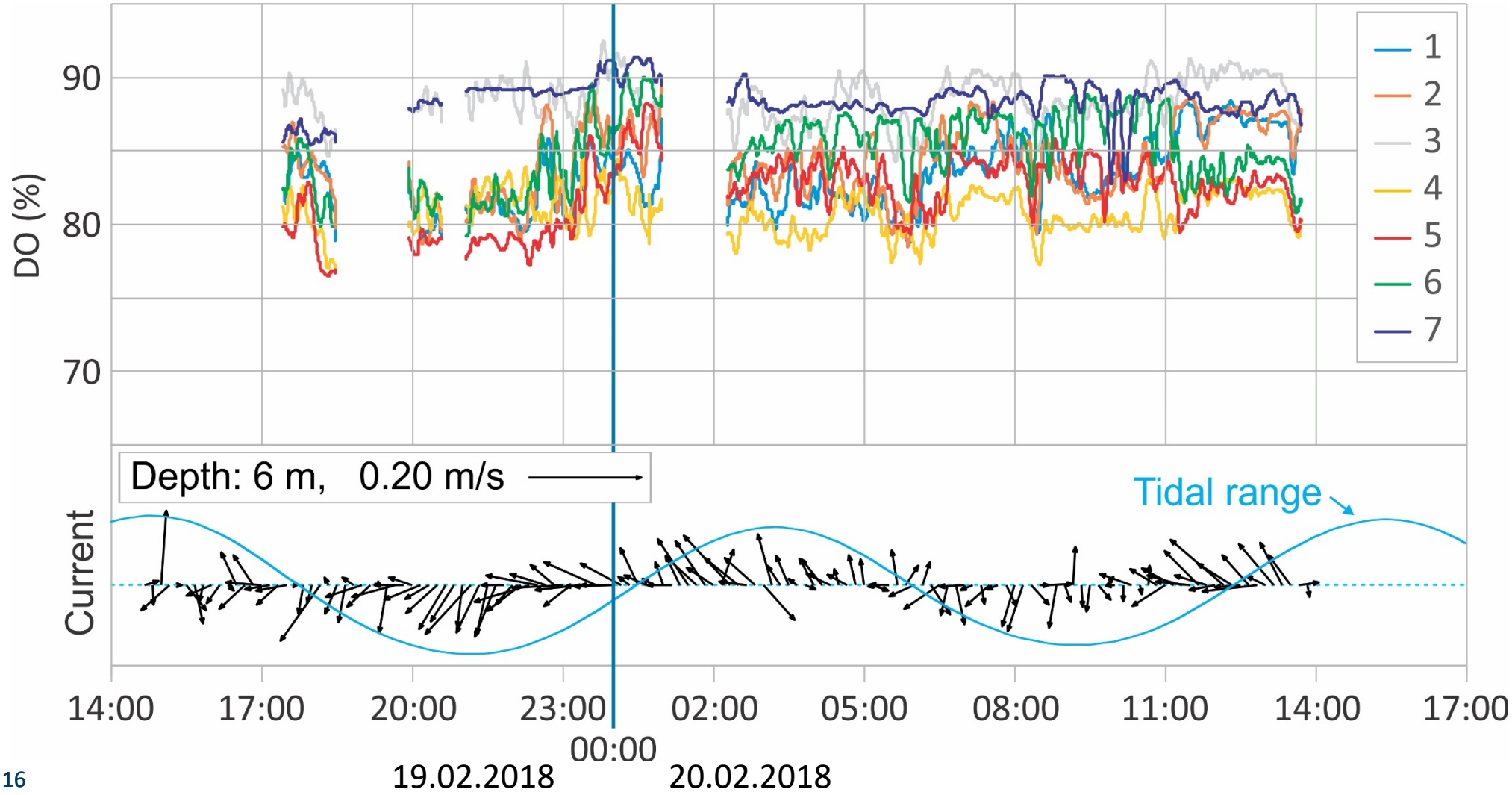
DO at Korsnes 19. - 20.02.2018



CFD analysis of a cage with 5 m deep skirt

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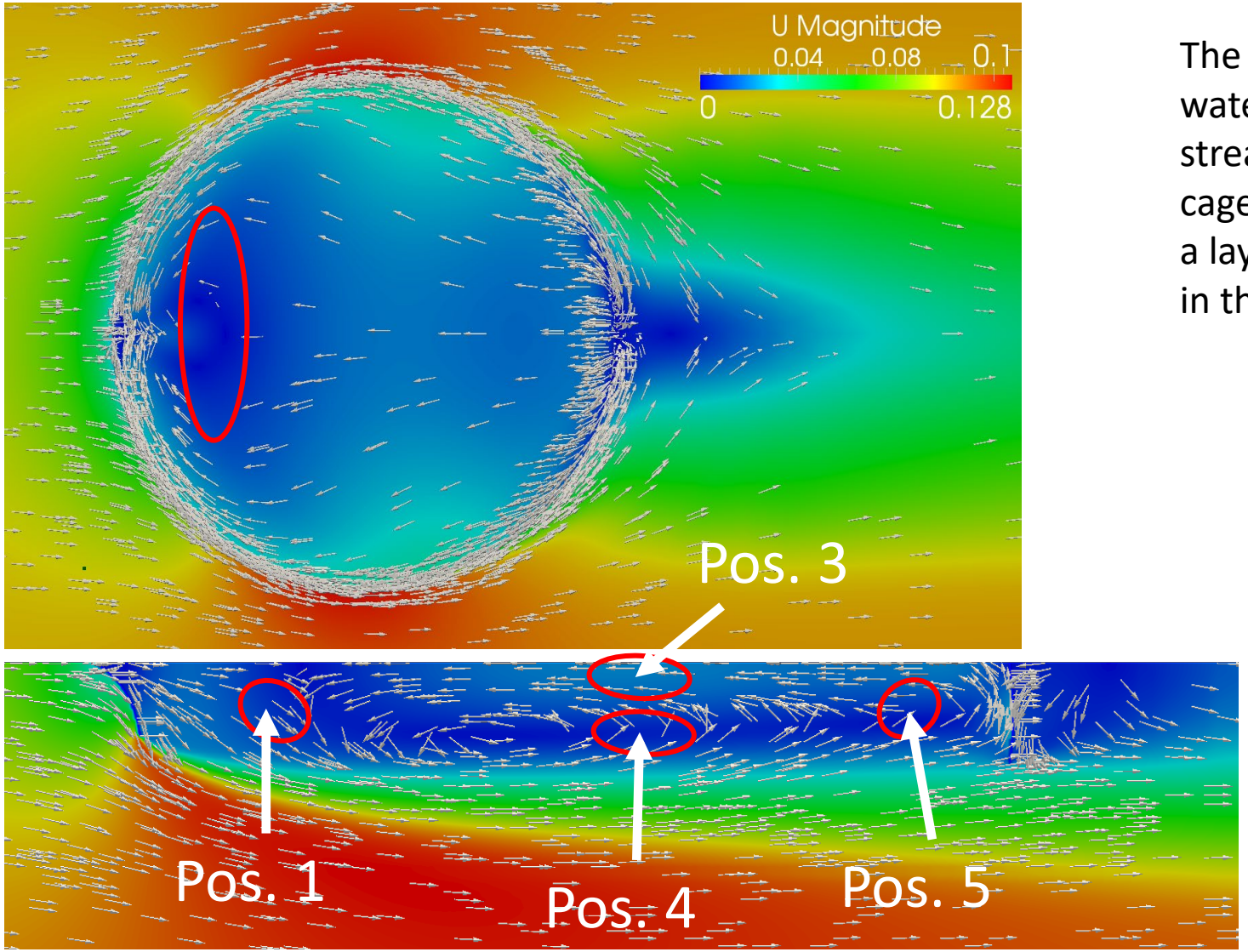

The worst conditions with stagnant water is in the front of the cage up streams (pos. 1), at the rear of the cage down streams (pos. 5), and in a layer around the depth of the skirt in the middle (pos. 4).

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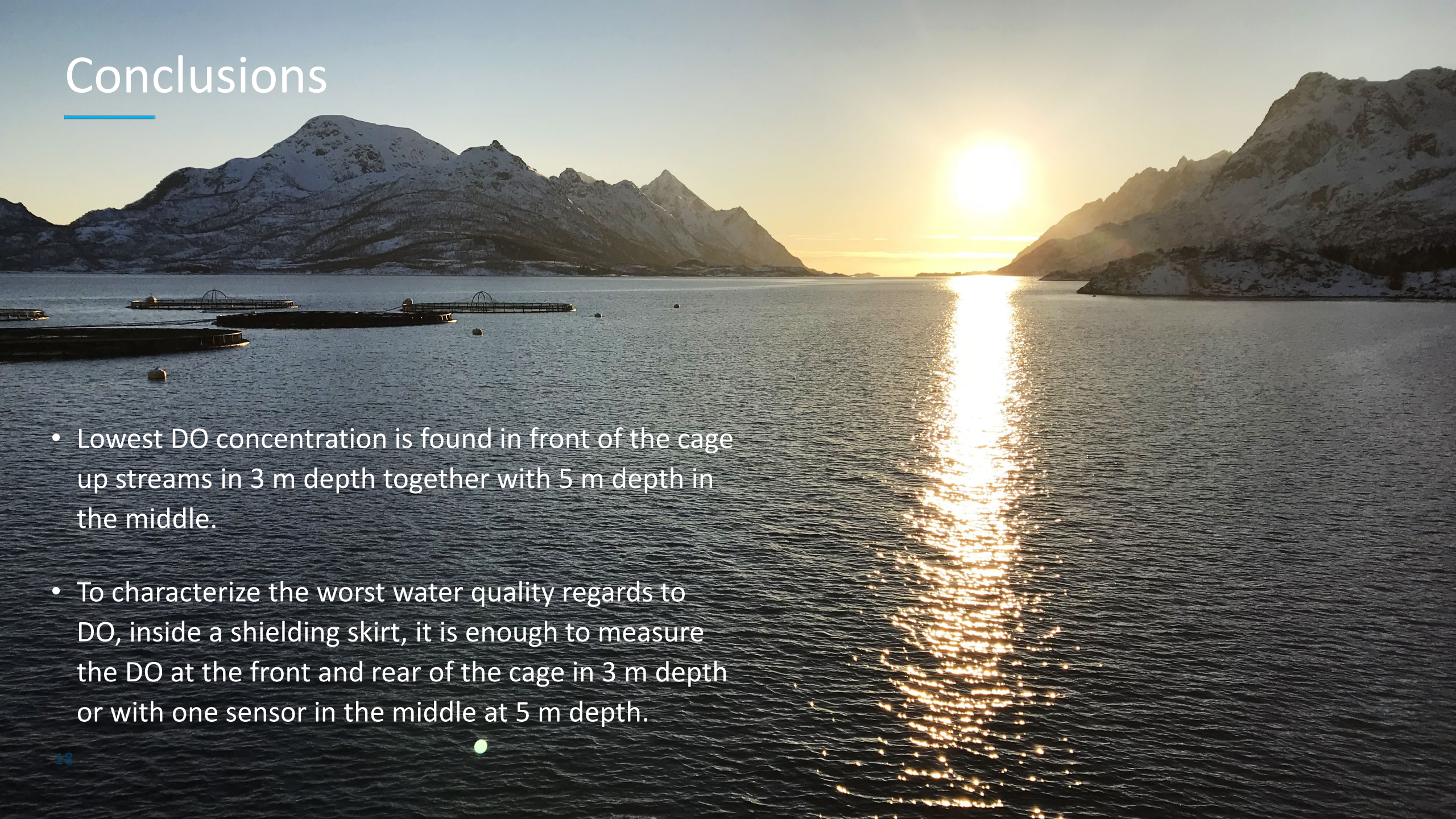
Conclusions



- Lowest DO concentration is found in front of the cage up streams in 3 m depth together with 5 m depth in the middle.

- To characterize the worst water quality regards to DO, inside a shielding skirt, it is enough to measure the DO at the front and rear of the cage in 3 m depth or with one sensor in the middle at 5 m depth.