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

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Participants in the project and Acknowledgements

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<http://www.sintef.no/skjermttek>

Participants:



Funded by:



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Outline

- Introduction
- Location and measurement setup
- Results
- Conclusions

Finnkjerka

Korsnes

Introduction

Shielding skirts are the most important among the preventive measures

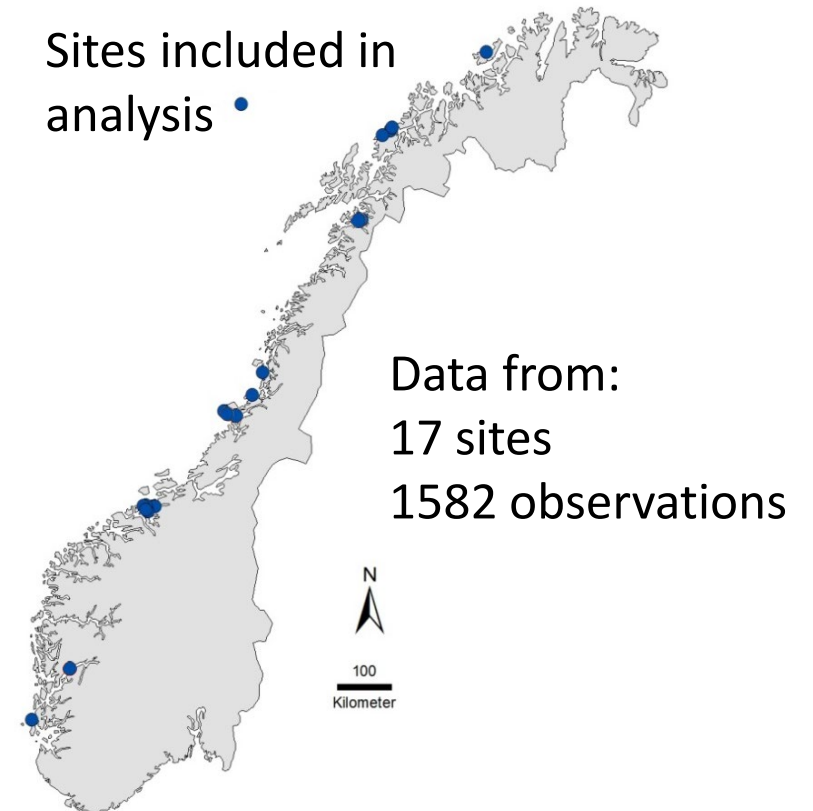
Shielding skirts reduce lice infestation

- 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?



Introduction

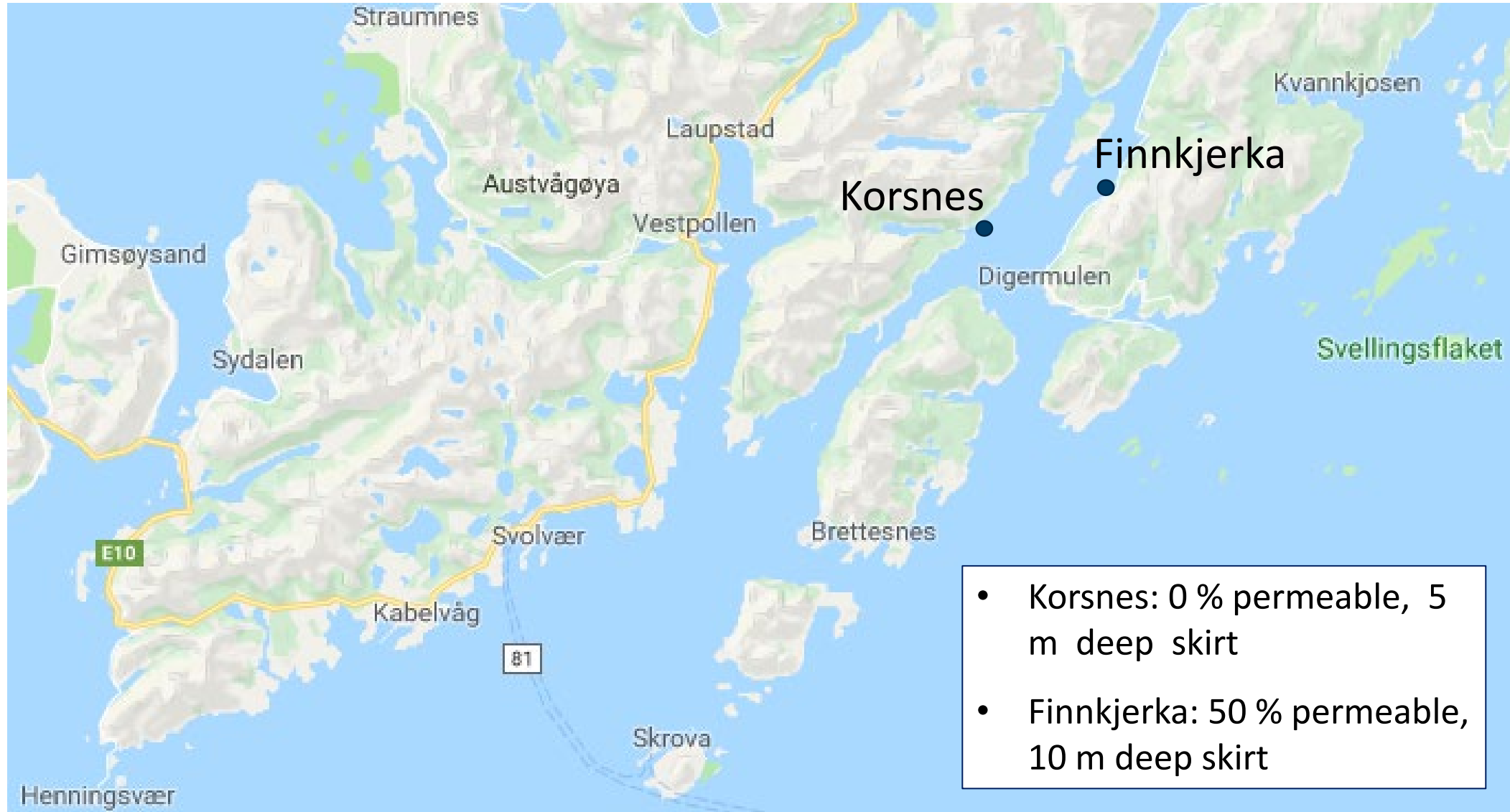
The main goal of the SKJERMTEK project is to investigate local conditions, as currents, waves, hydrography, dissolved oxygen (DO) and topography which can influence the shielding effect of the skirts, and maybe give an answer to why ...

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

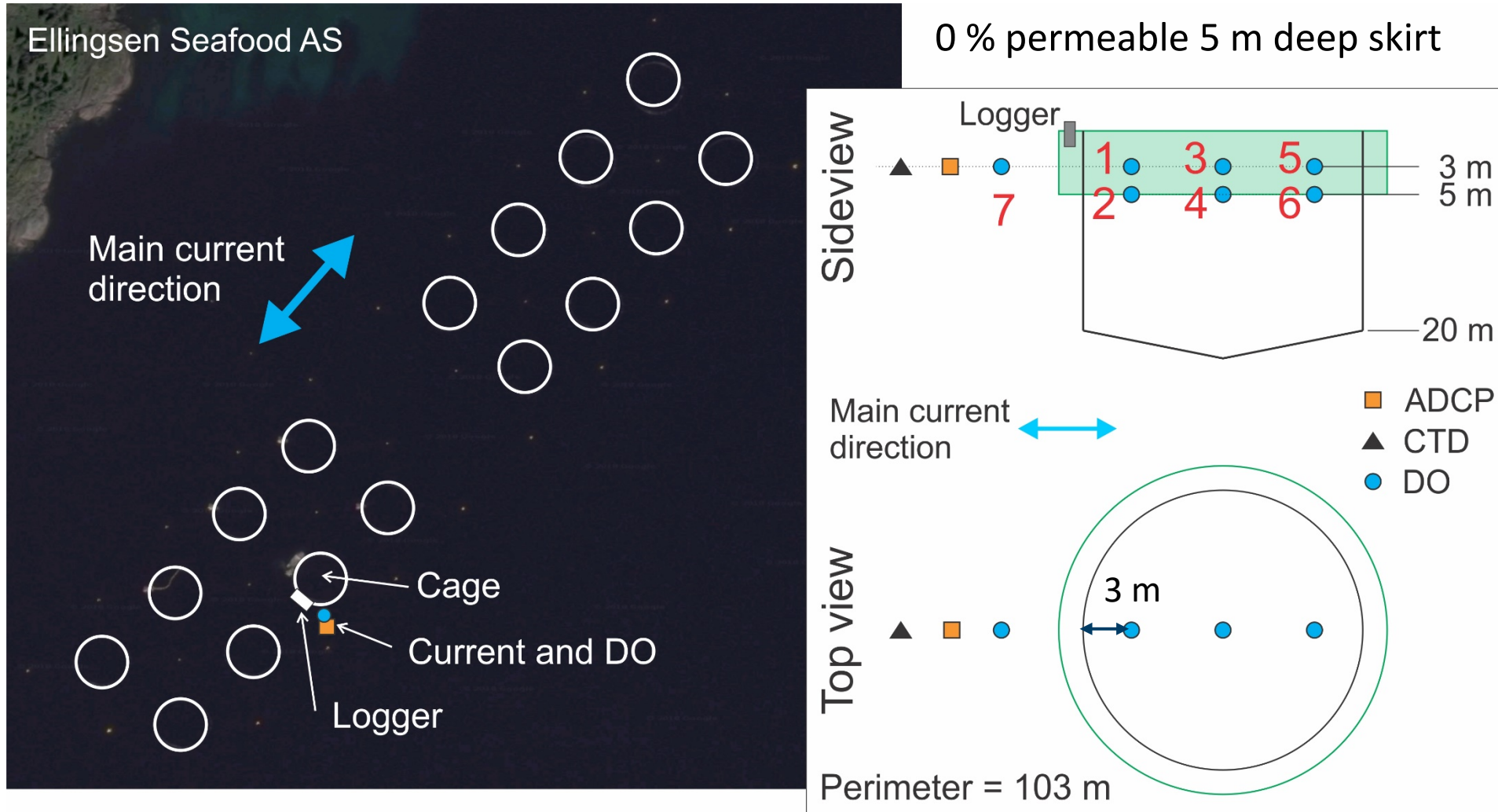
As a consequence of using skirt as prevention against sea lice, prevents also water circulation and the supply of oxygen within the skirt.

- 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,

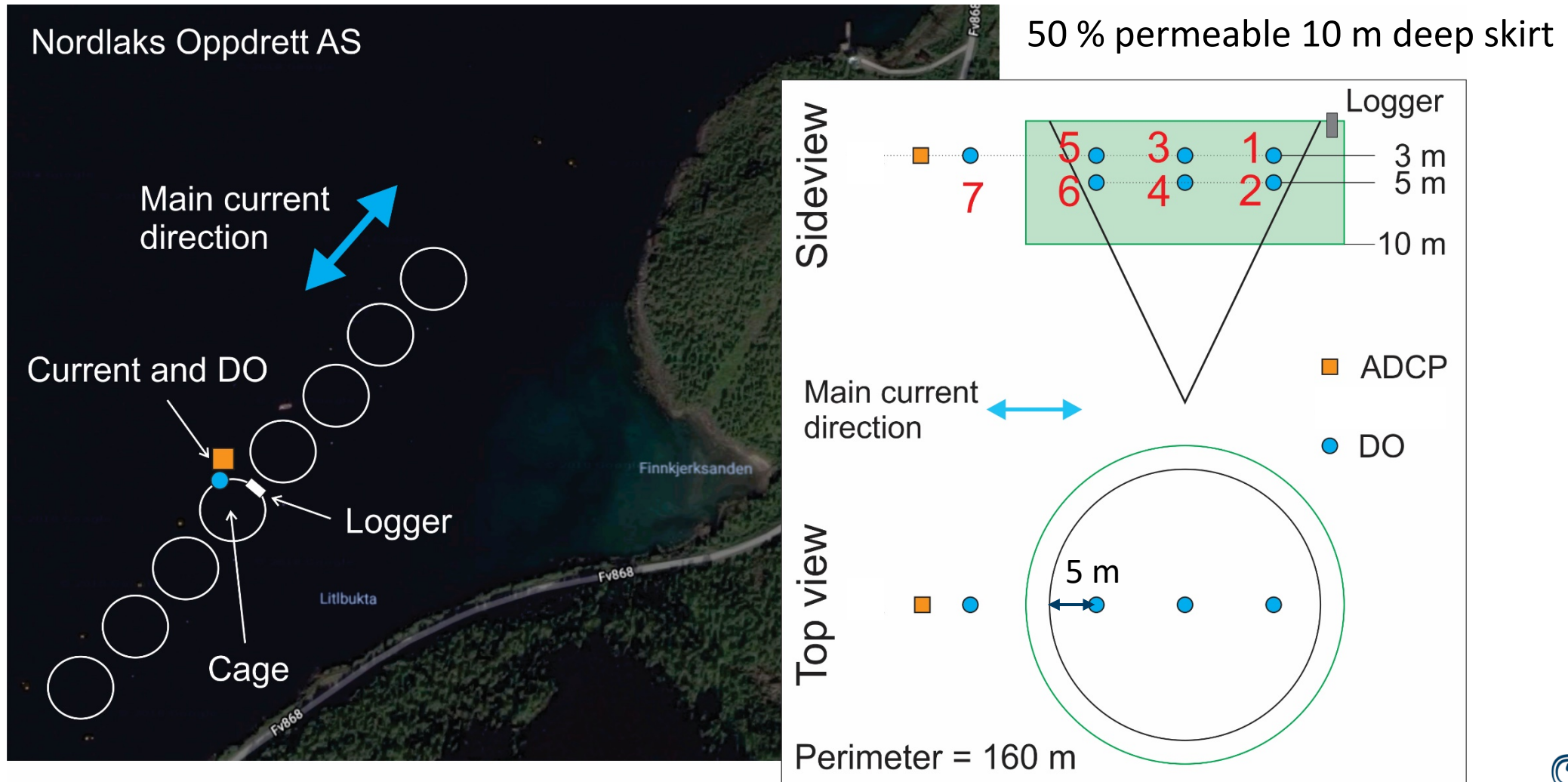
Locations



Measurement setup at Korsnes

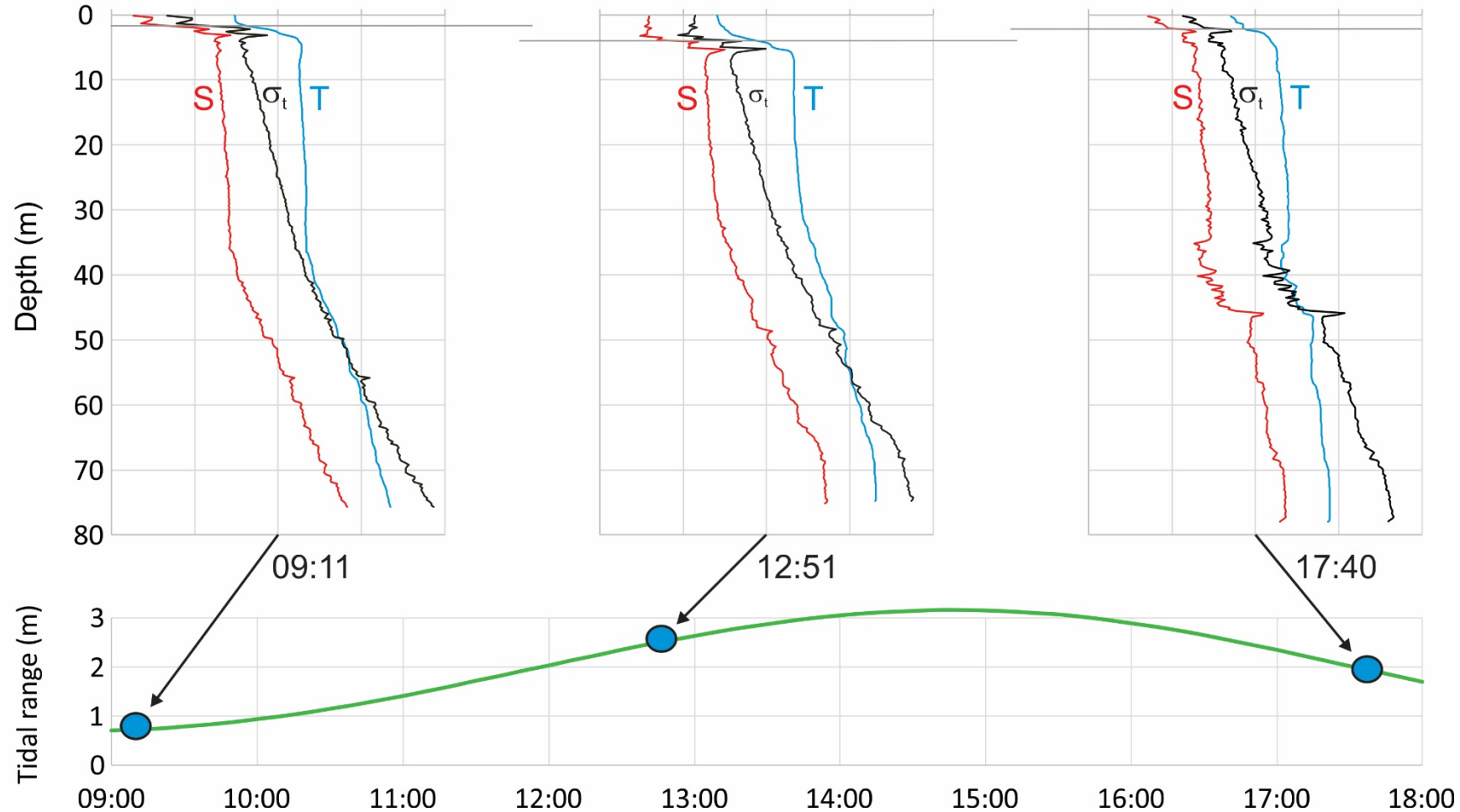


Measurement setup at Finnkjerka



Hydrography at Korsnes 19.02.2018

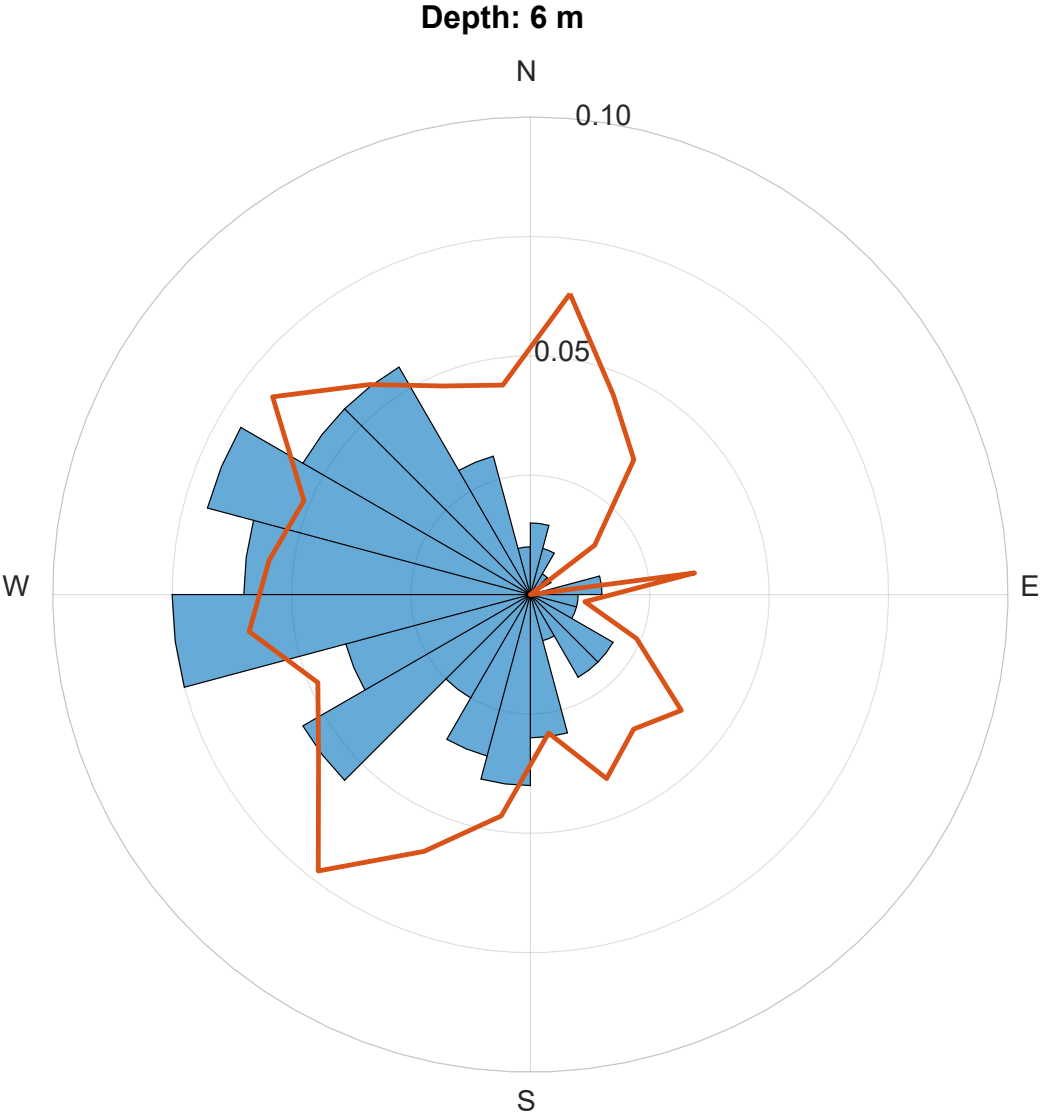
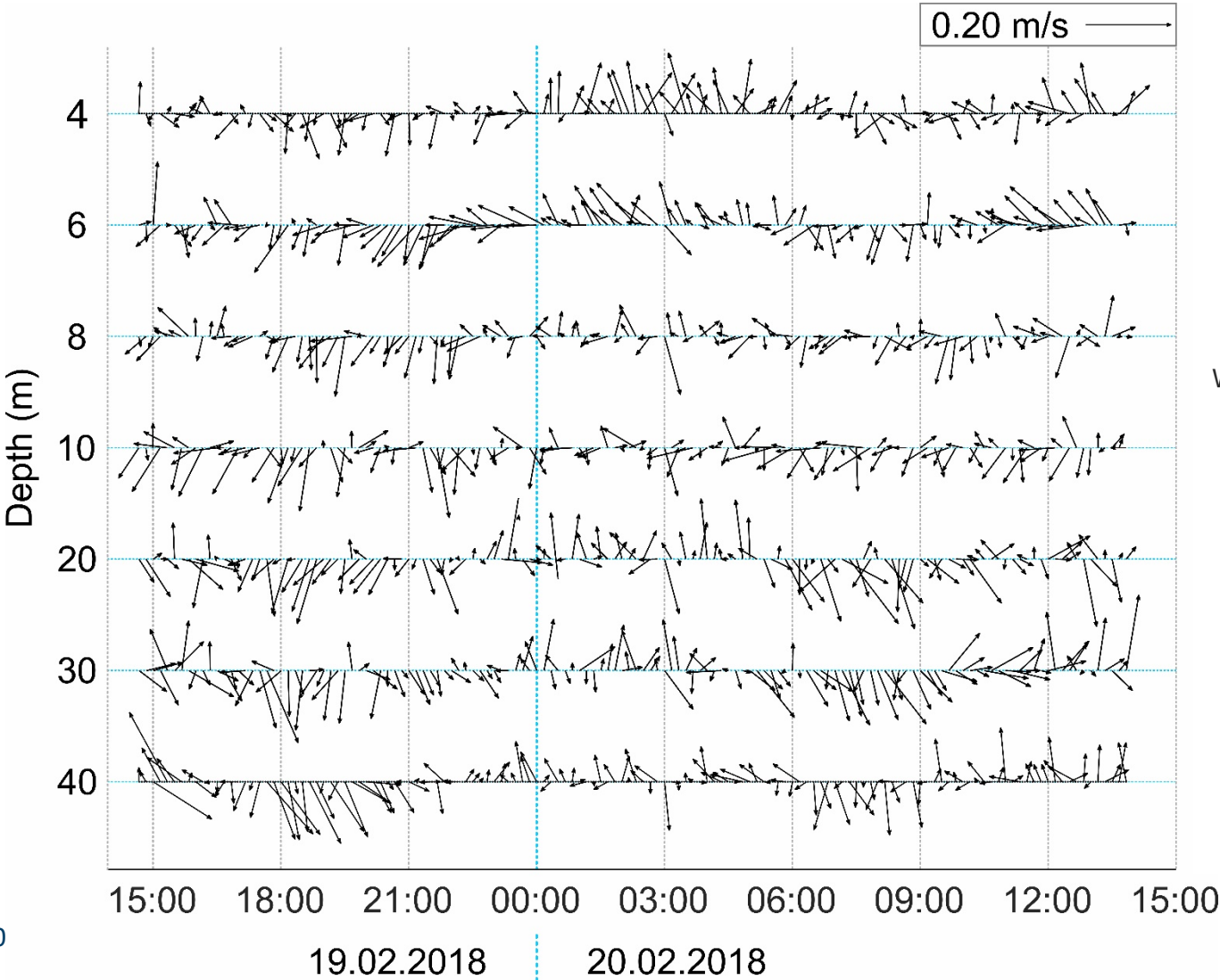
Temp. (°C)	0	2	4	6	8	0	2	4	6	8	0	2	4	6	8
Salinity (psu)	32,0	32,5	33,0	33,5	34,0	32,0	32,5	33,0	33,5	34,0	32,0	32,5	33,0	33,5	34,0
σ_t	25,4	25,7	26,0	26,3	26,6	25,4	25,7	26,0	26,3	26,6	25,4	25,7	26,0	26,3	26,6



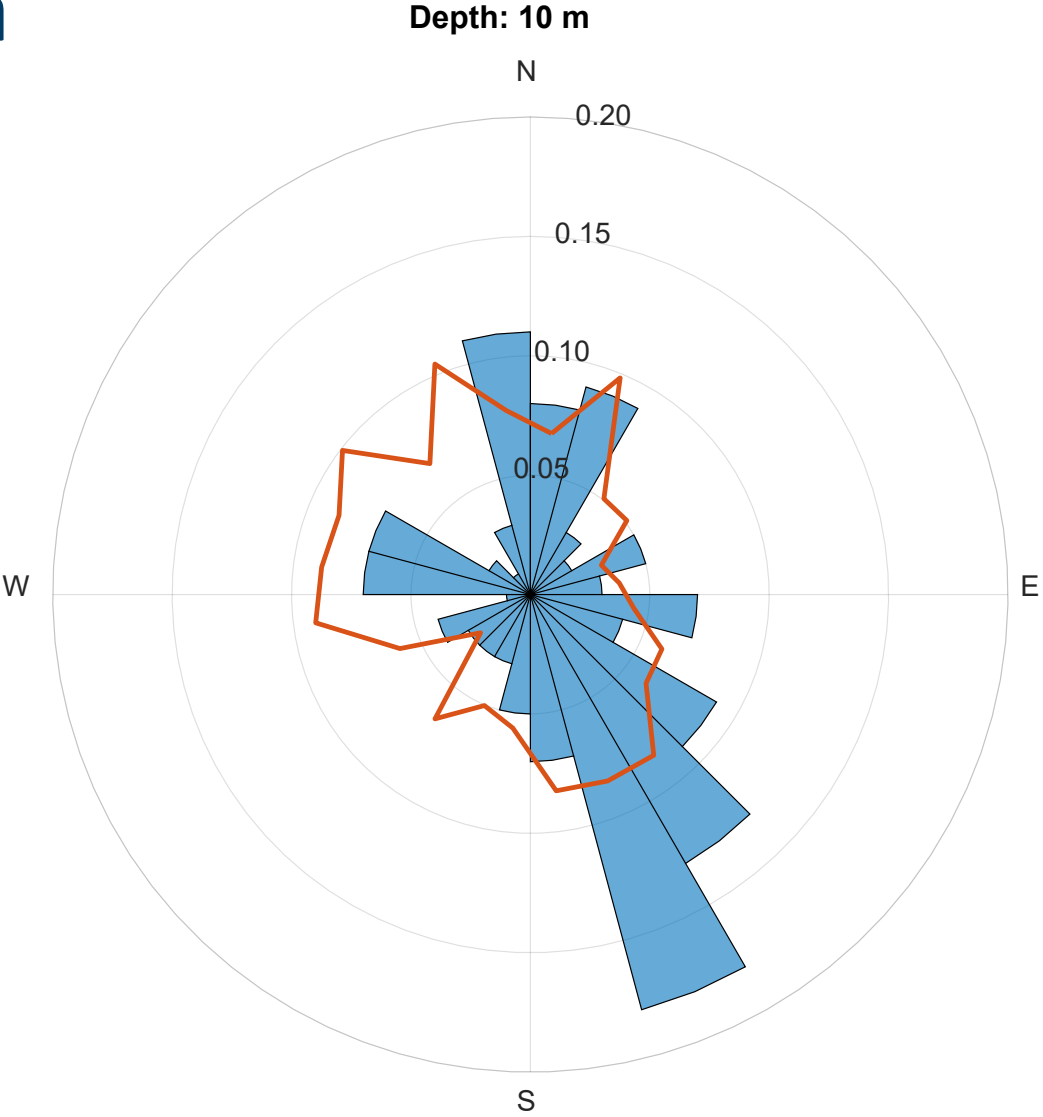
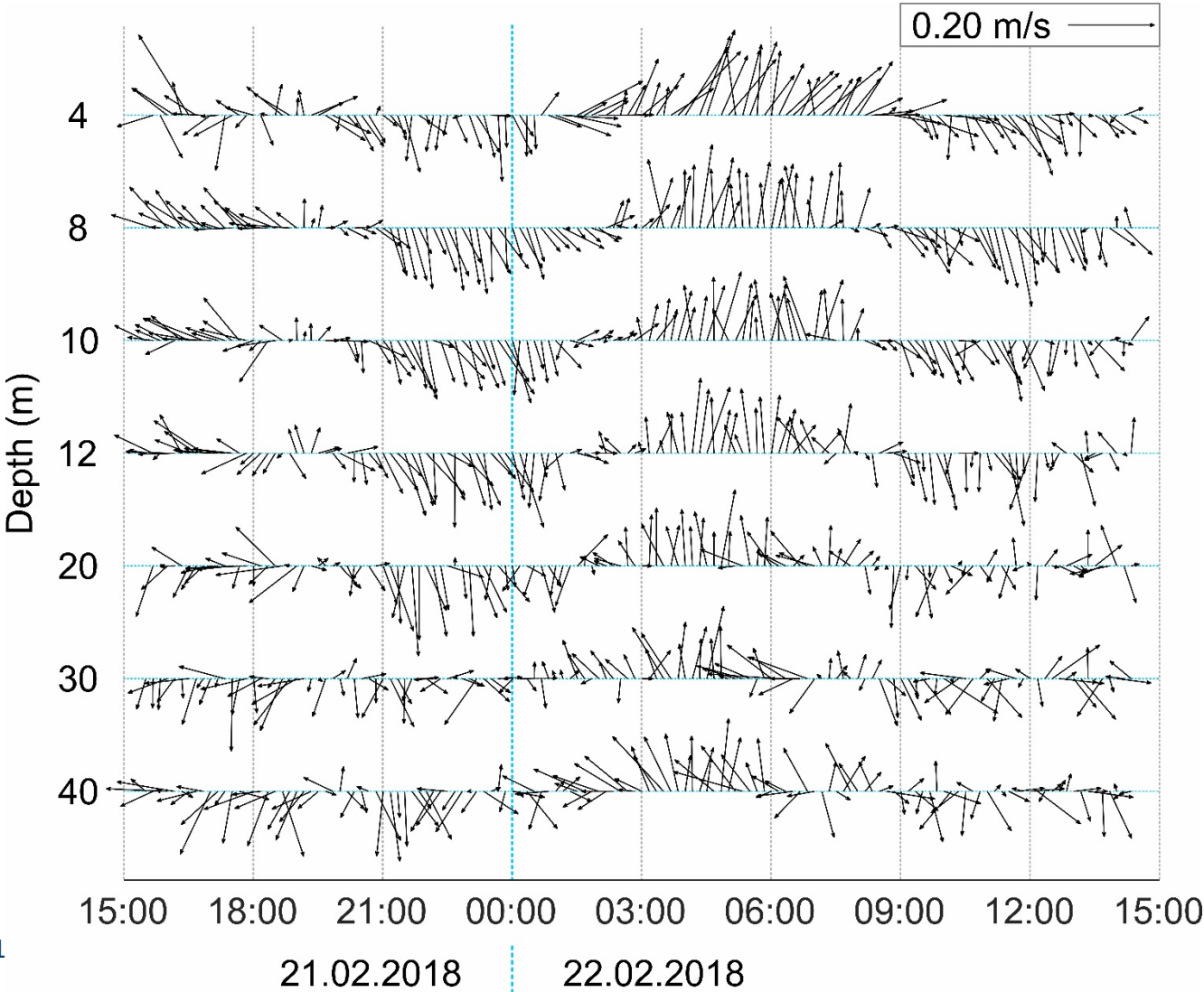
pycnocline

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

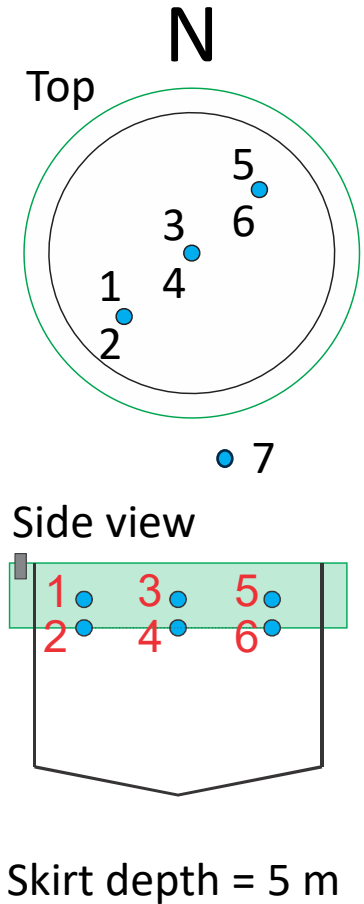
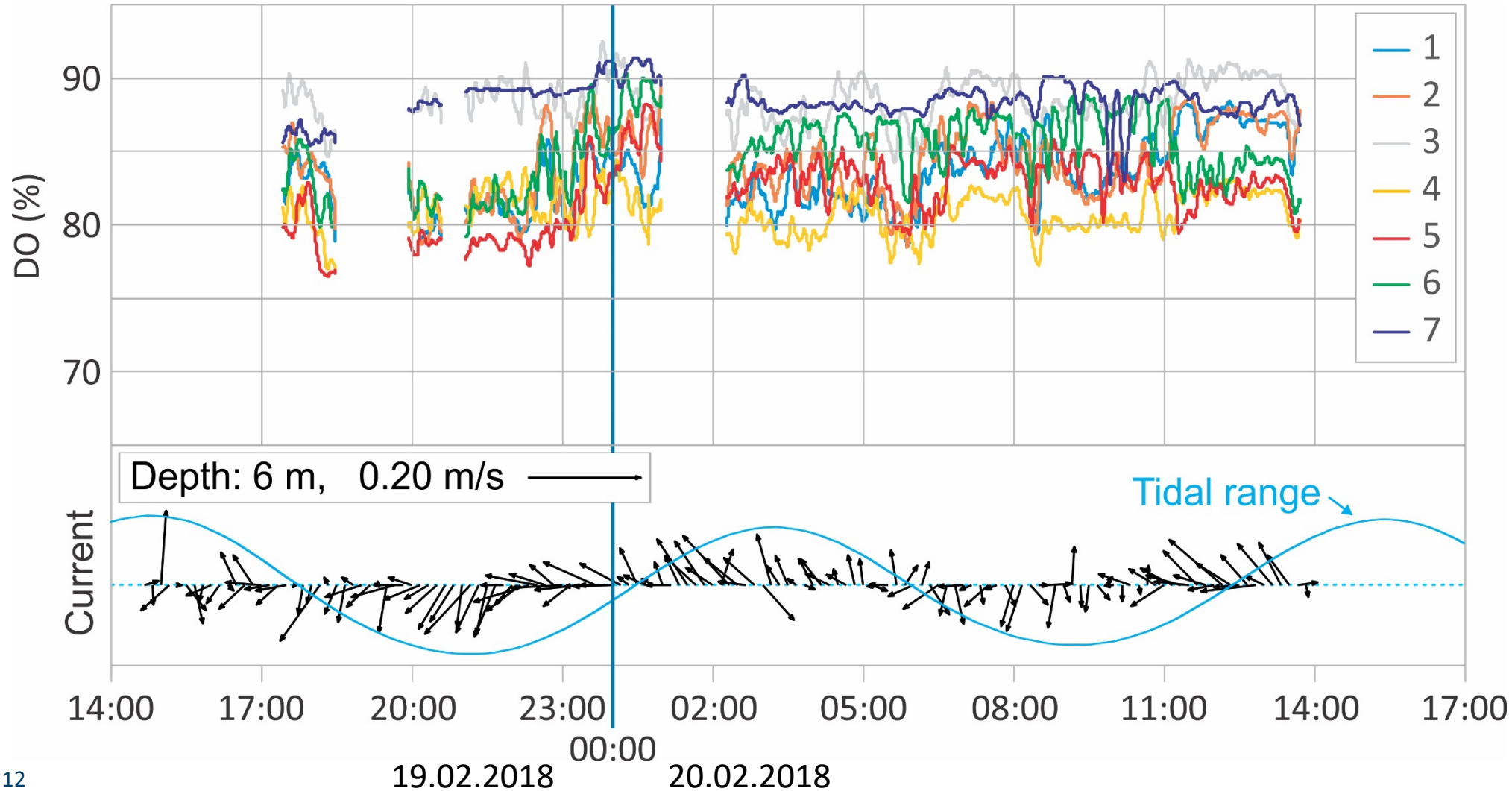
Current measurements - Korsnes



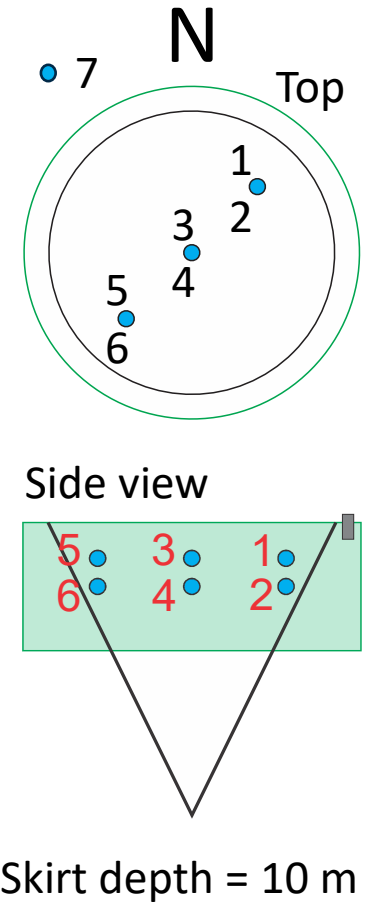
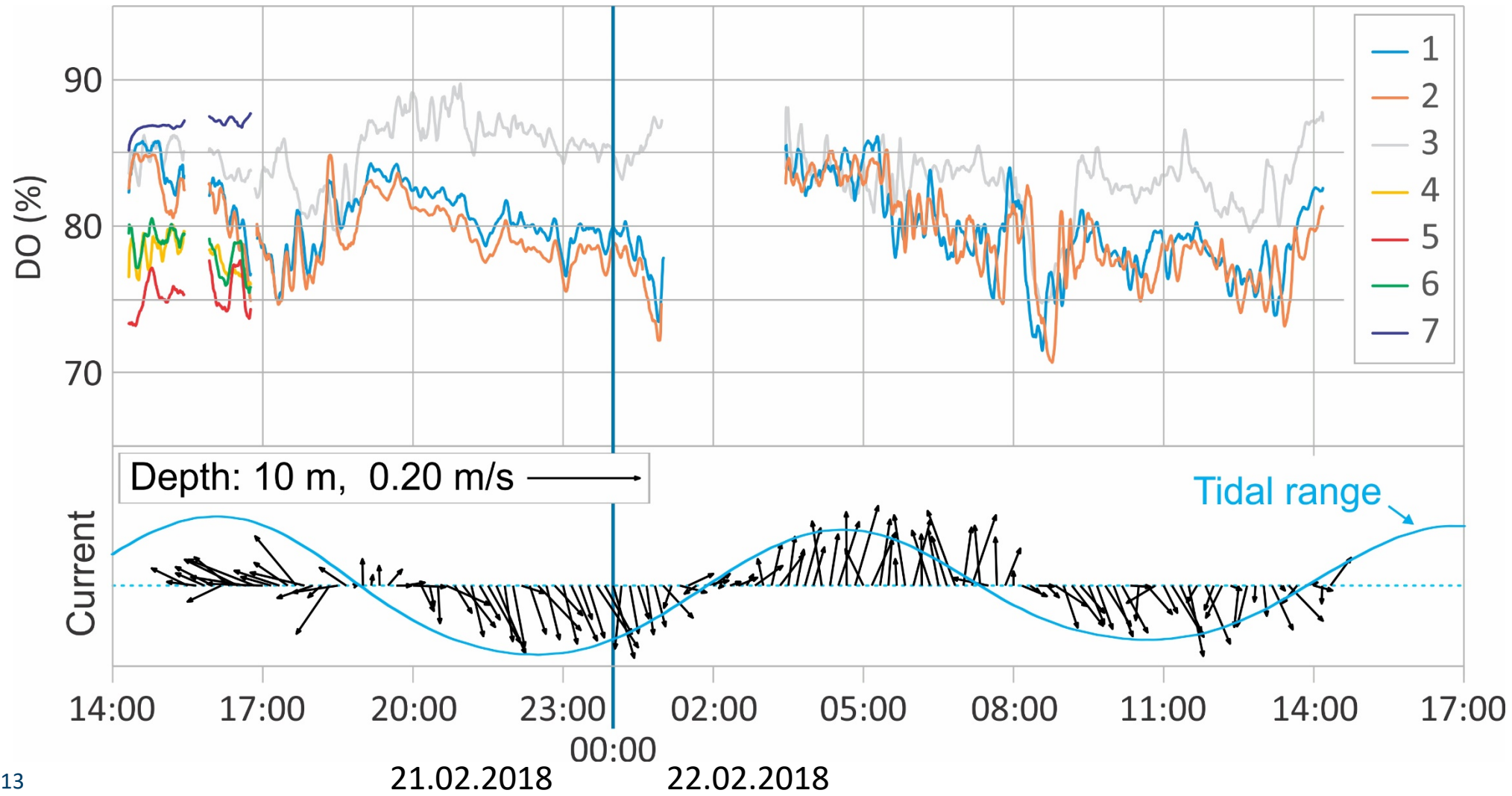
Current measurements - Finnkjerka



DO at Korsnes - 19. to 20.02.2018

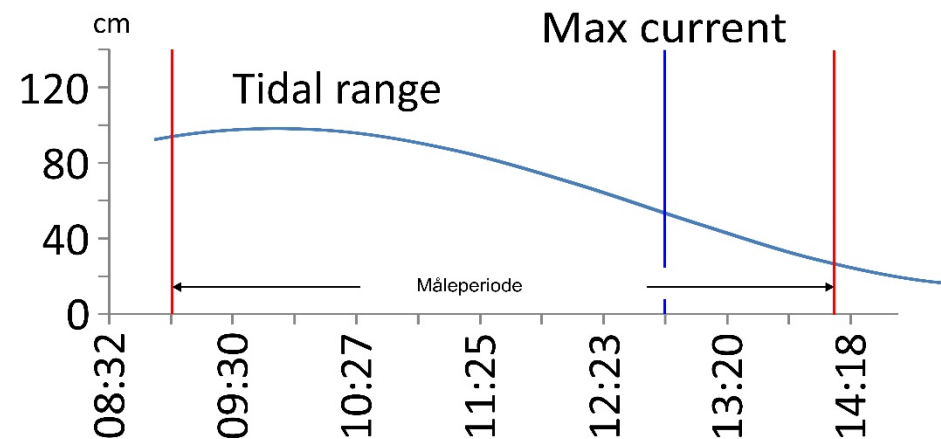
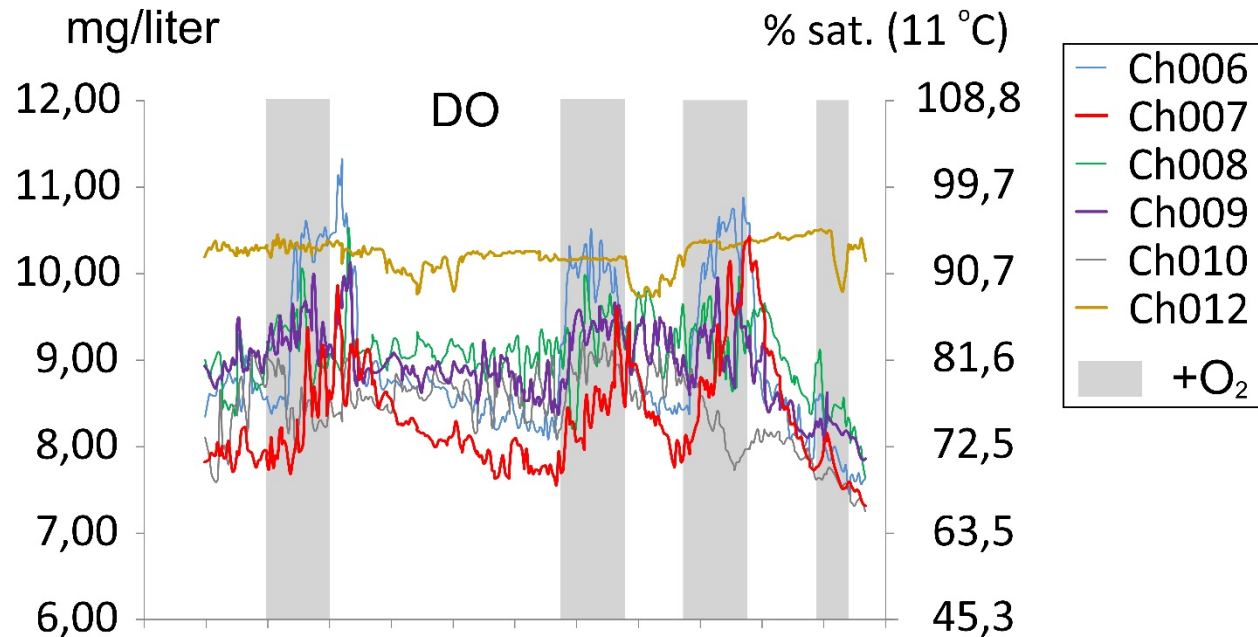
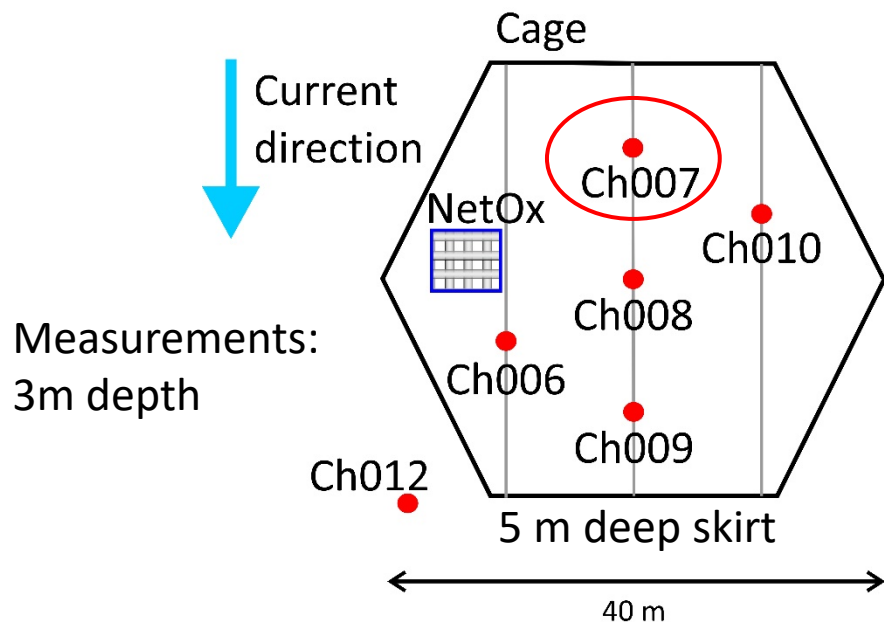


DO at Finnkjerka - 21. to 22.02.2018



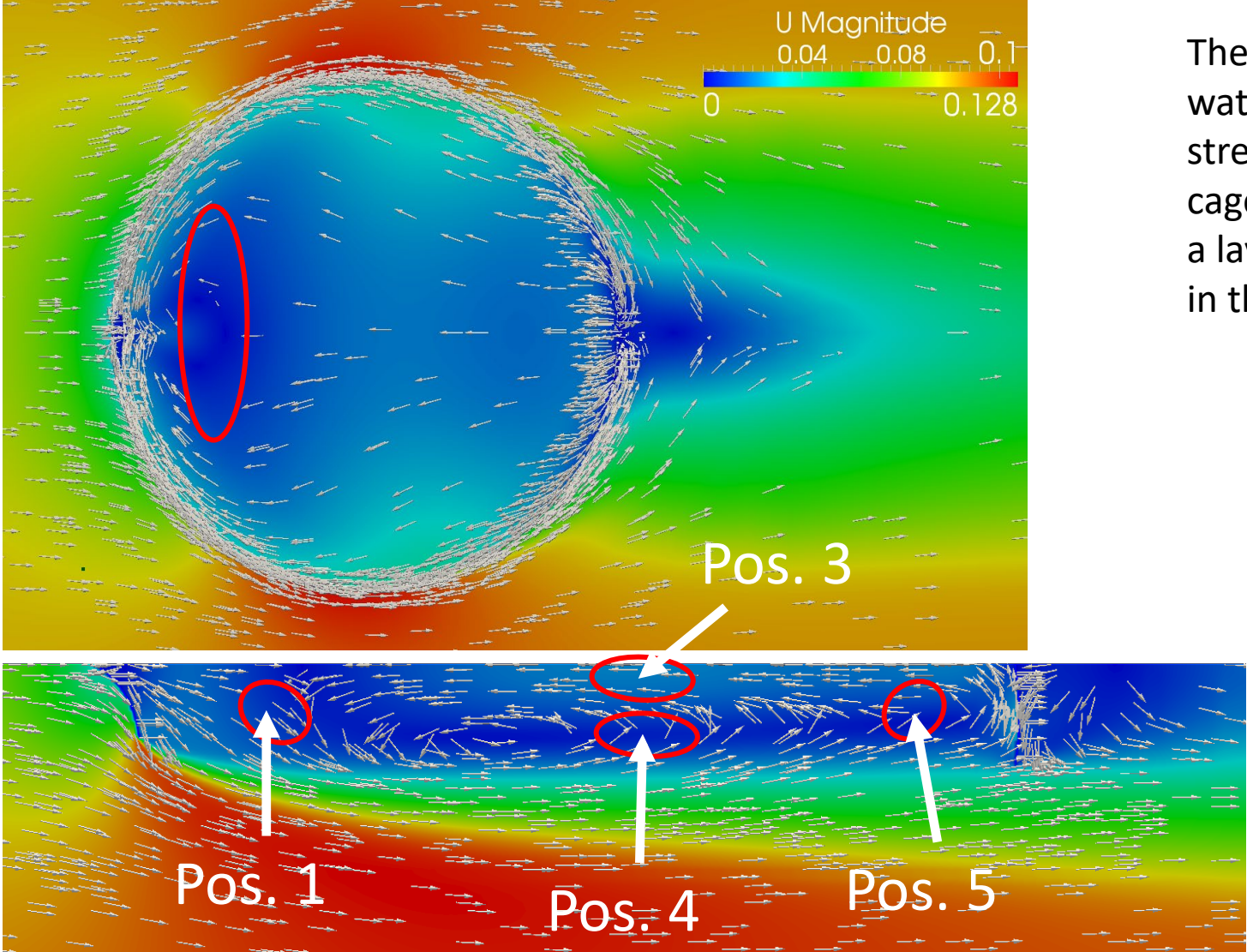
DO at Saltkjelen, Hardanger – 20.11.2014, as a comparison

Results from FHF prosjekt no. 900711 (Permaskjørt)



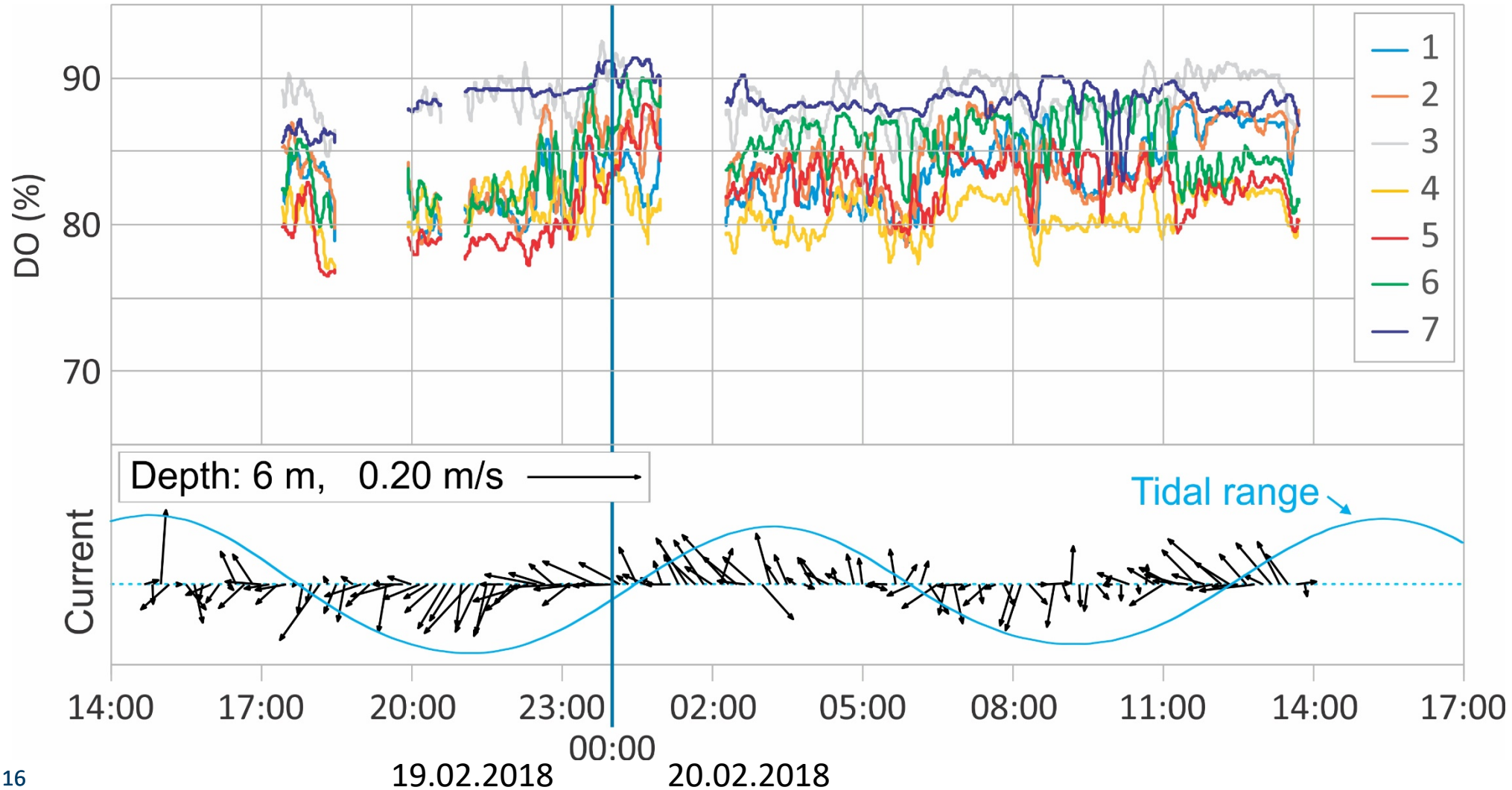
CFD analysis of a cage with 5 m deep skirt

Current direction →



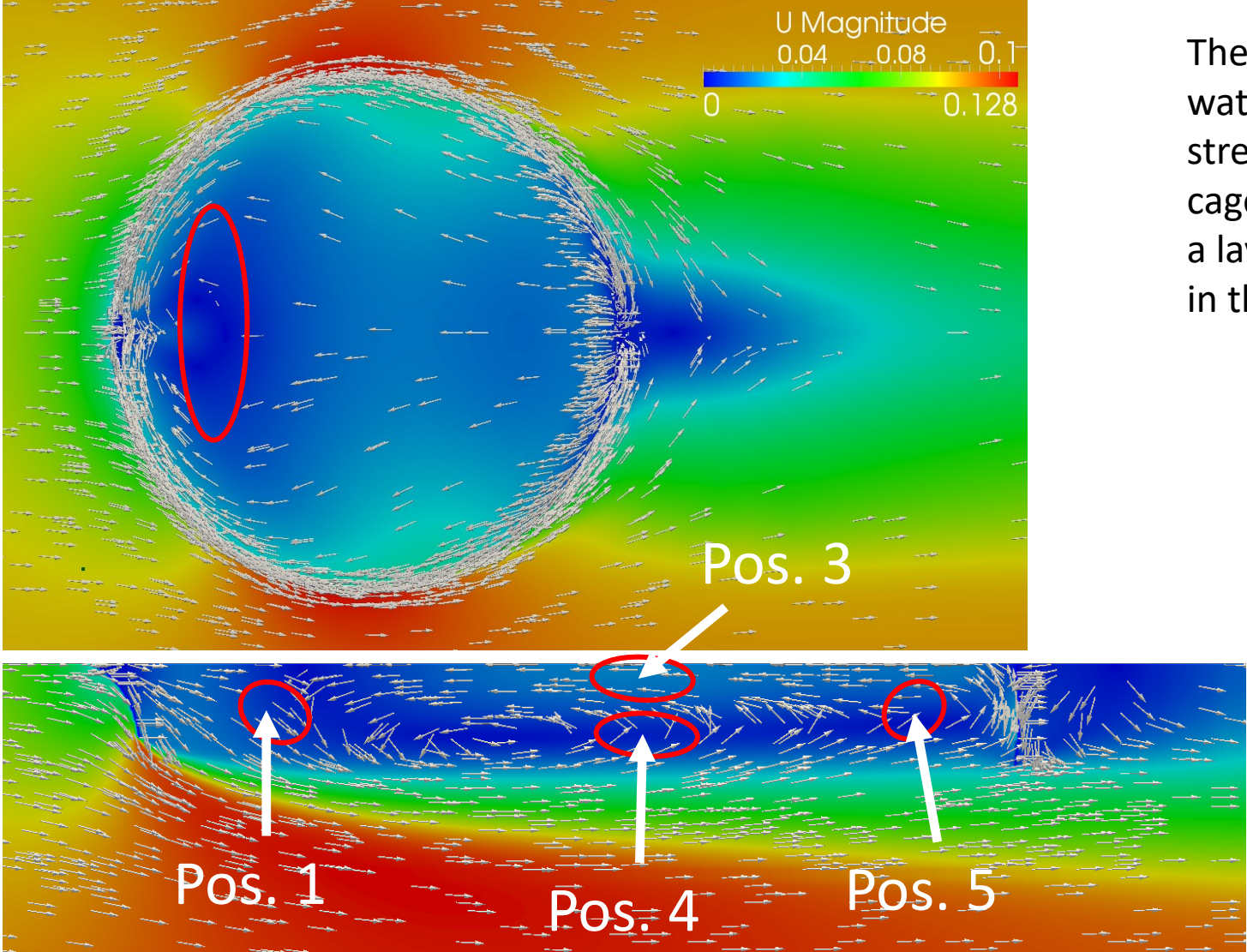
The worst conditions with stagnant water is in the front of the cage up streams (pos. 1), at the rear of the cage down streams (pos. 5), and in a layer around the depth of the skirt in the middle (pos. 4).

DO at Korsnes 19. - 20.02.2018



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).

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.