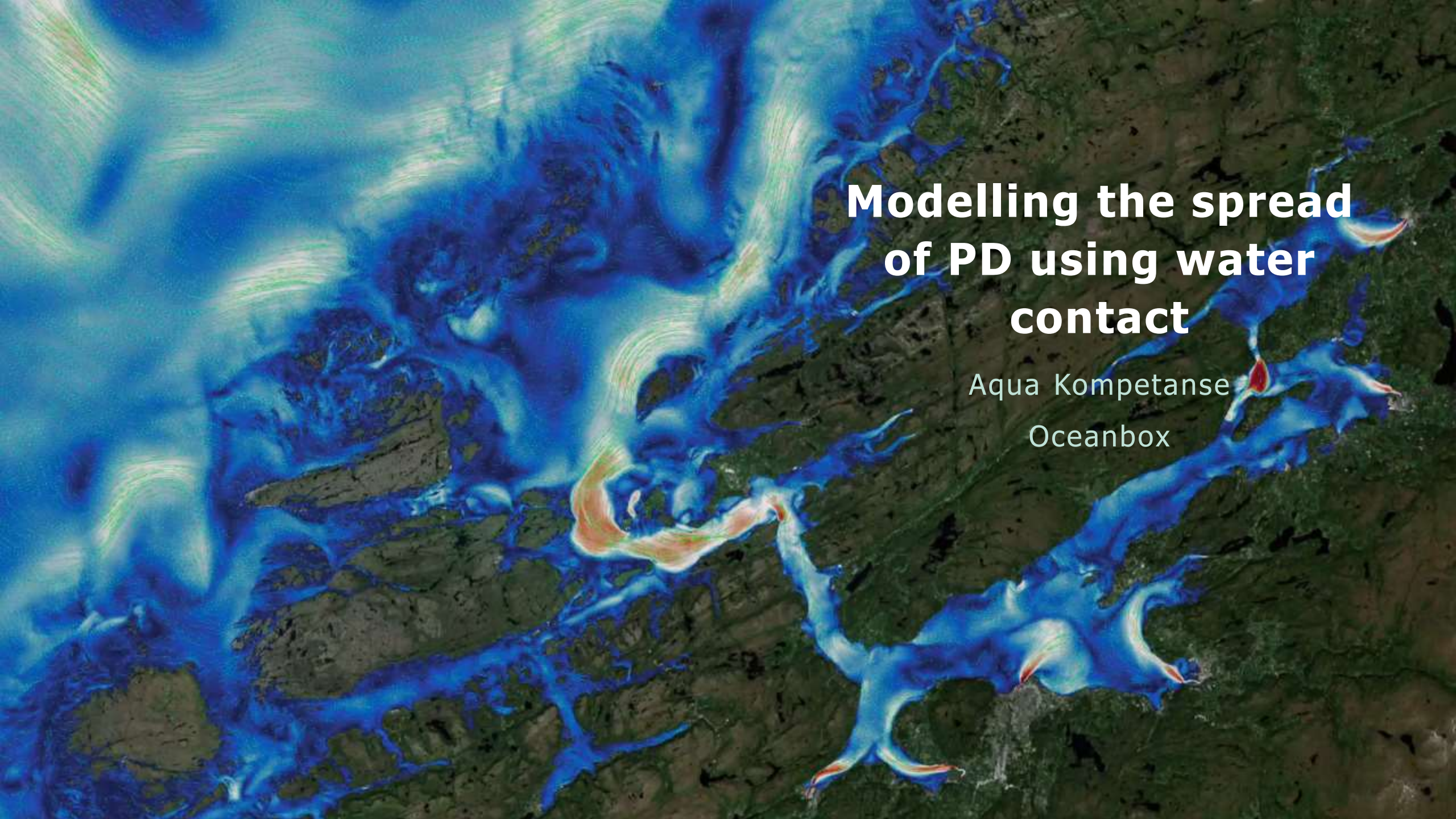


Modelling the spread of PD using water contact

Aqua Kompetanse

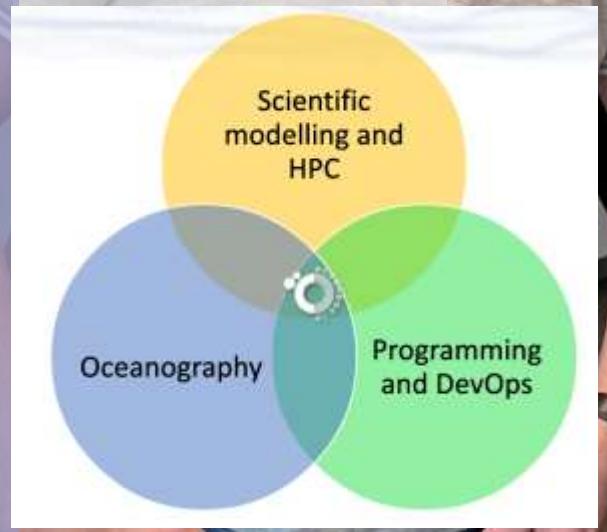
Oceanbox

THE OCEANBOX TEAM

Dr. Frank Gaardsted: (Akvaplan-niva) Oceanography, ecology, numerical computation and modelling

Dr. Stig Rune Jenssen: (UiT) Programming, HPC, GPU, numerical computation and modelling

Svenn Hanssen: (UiT, Notur, Serit) HPC, market, innovation, leadership, **CEO, Chairman**



Dr. Jonas Juselius: (UiT, Serit) Programming, DevOps, HPC, Kubernetes, numerical computation and modelling, **CTO**

Dr. Radovan Bast: (UiT, Serit), Programming, HPC, numerical computation and modelling

Dr. Ole Anders Nøst: (Norwegian Polar Institute, Akvaplan-niva) Oceanography, numerical computation and modelling, **CSO, Board member**

Simen Kirkvik: (Serit) Programming, visualization, DevOps, Kubernetes

Hilde Iversen: (Serit) Marketing, Sales, Business development, customer success, **CMO**

FVCOM Model Setup

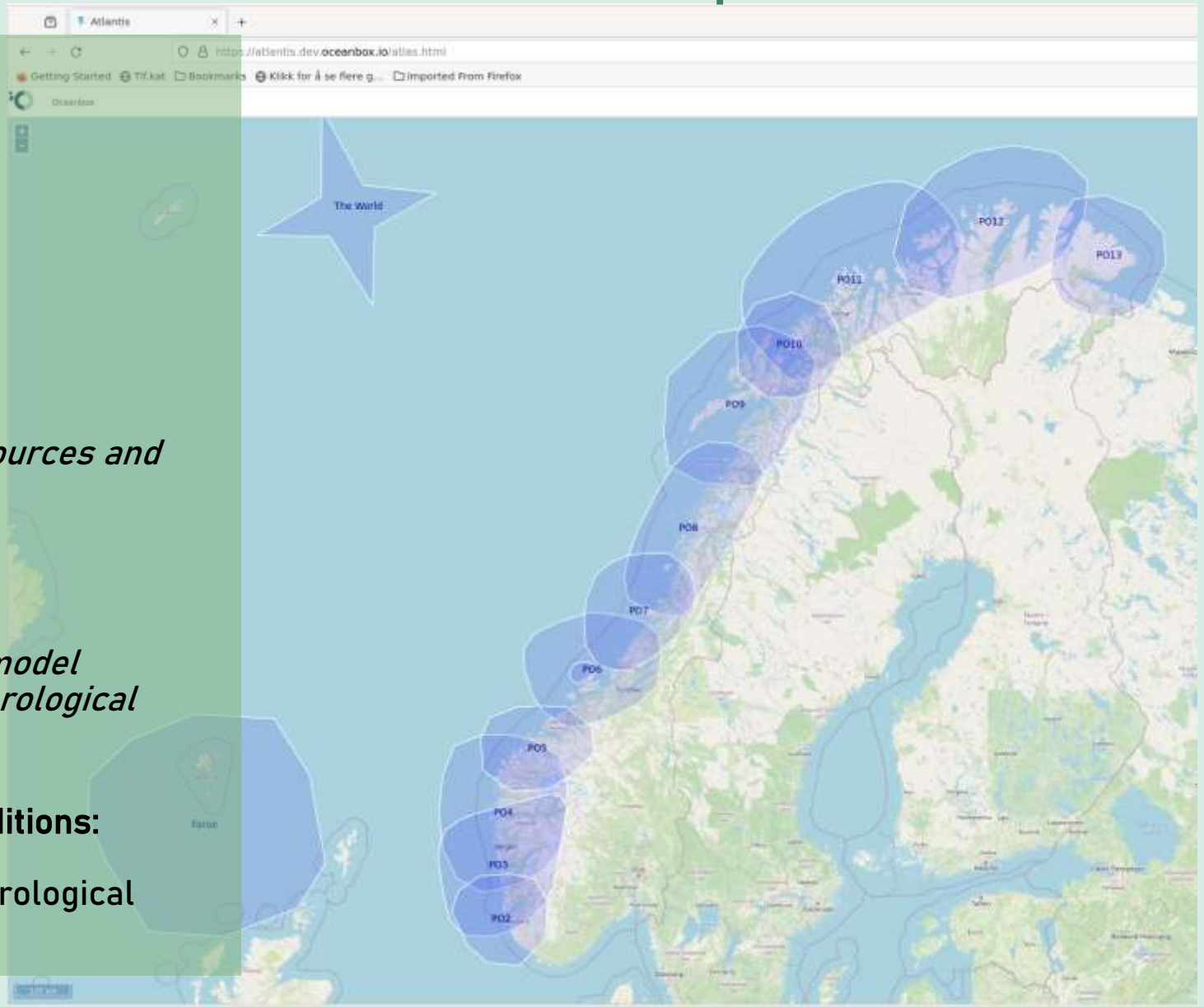
Horizontal resolution:
20 - 800 meter

35 Vertical Layers

River runoff:
The Norwegian Water Resources and Energy Directorate

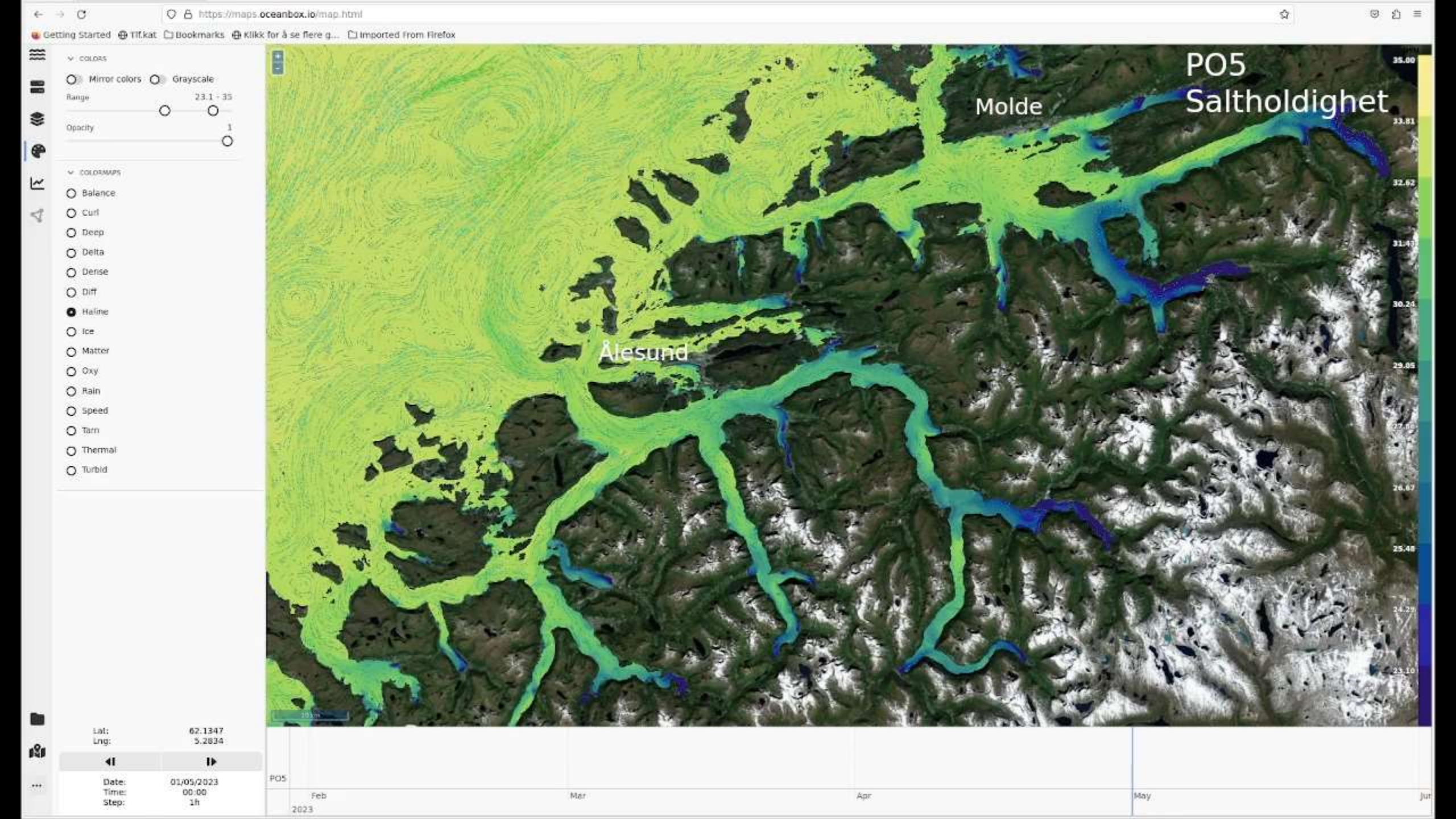
Winds, air temperature, precipitaion, radiation:
Arome MetCoop weather model from the Norwegian Meteorological Institute

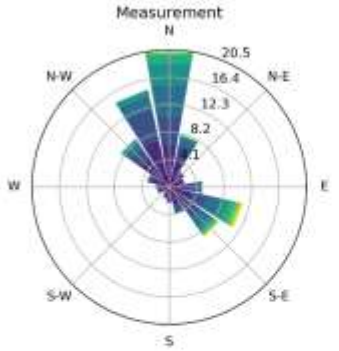
Open ocean boundary conditions:
NorShelf Ocean model
from the Norwegian Meteorological Institute

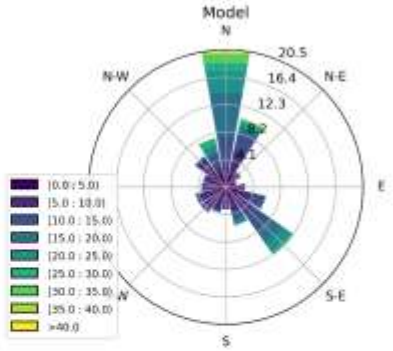


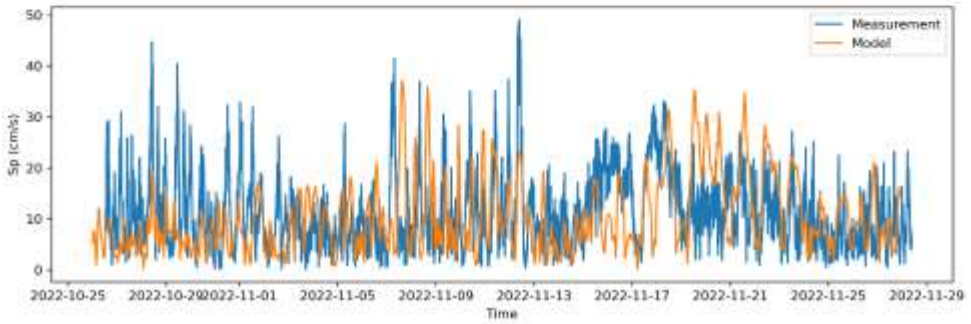
Online Map Solution

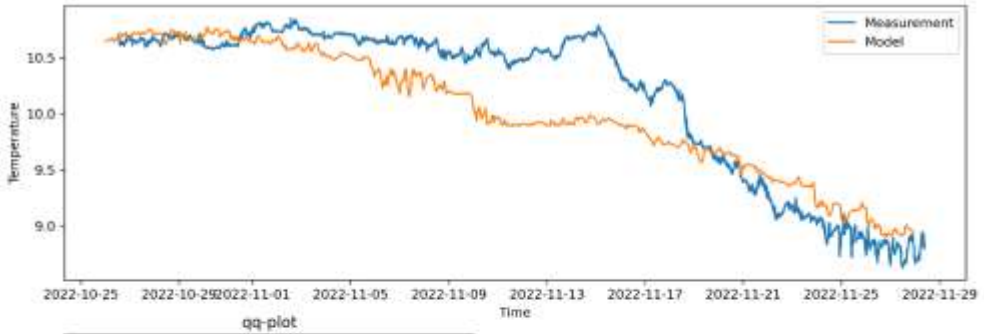
Select a Production Area!

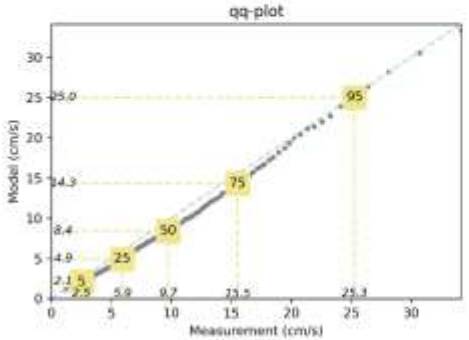

https://maps.oceanbox.io/map.html
Getting Started
Tif.kat
Bookmarks
Klikk for å se flere g...
Imported From Firefox
COLORS
Mirror colors
Grayscale
Range
23.1 - 35
Opacity
1
COLORMAPS
Balance
Curl
Deep
Delta
Dense
Diff
Haline
Ice
Matter
Oxy
Rain
Speed
Tarn
Thermal
Turbid
PO5
Saltholdighet
Molde
Ålesund
35.00
33.81
32.62
31.43
30.24
29.05
26.67
25.48
24.29
23.10
Lat:
62.1347
Lng:
5.2834
Date:
01/05/2023
Time:
00:00
Step:
1h
PO5
Feb
Mar
Apr
May
2023



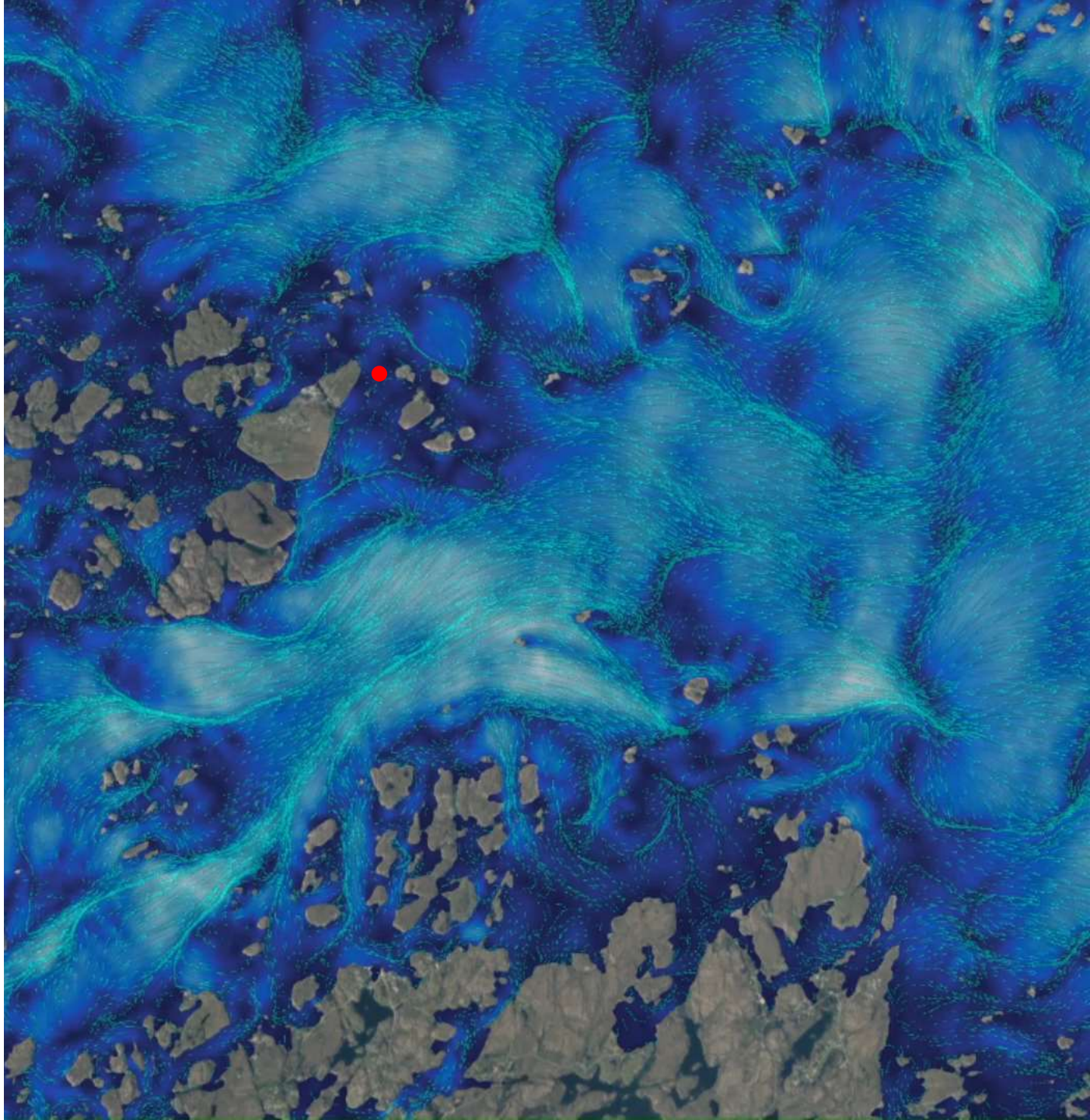






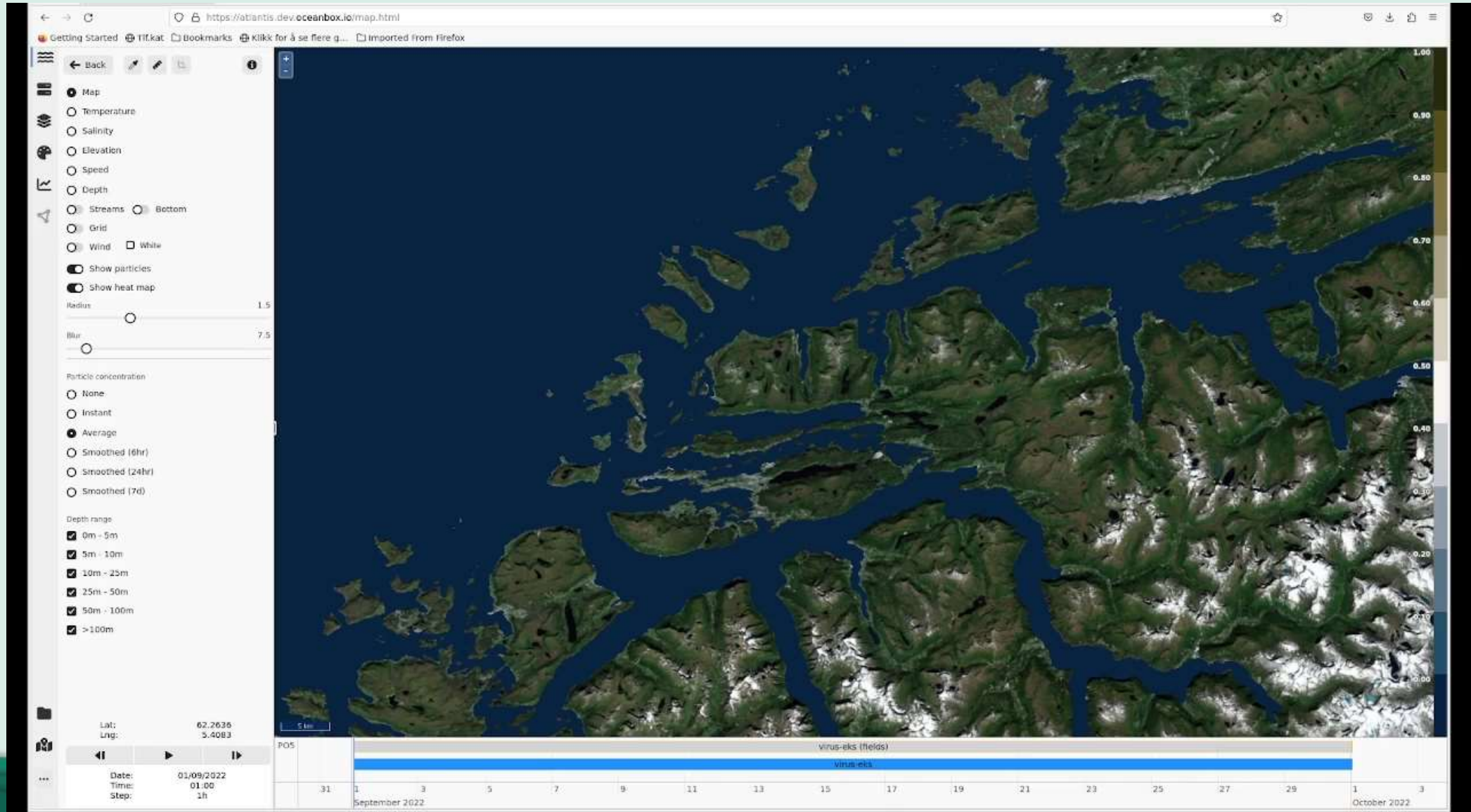


	Measurement	Model
N	4733	792
Mean (cm/s)	11.4	10.4
Max (cm/s)	49.0	37.0
Min (cm/s)	0.0	0.0
0-1 cm/s (%)	0.007	0.008
1-3 cm/s (%)	0.061	0.098
Std (cm/s)	7.3	7.3
Var (cm/s)	53.2	52.9
p90 (cm/s)	21.3	21.2
p95 (cm/s)	25.3	25.0



Dispersion modeling Example 1

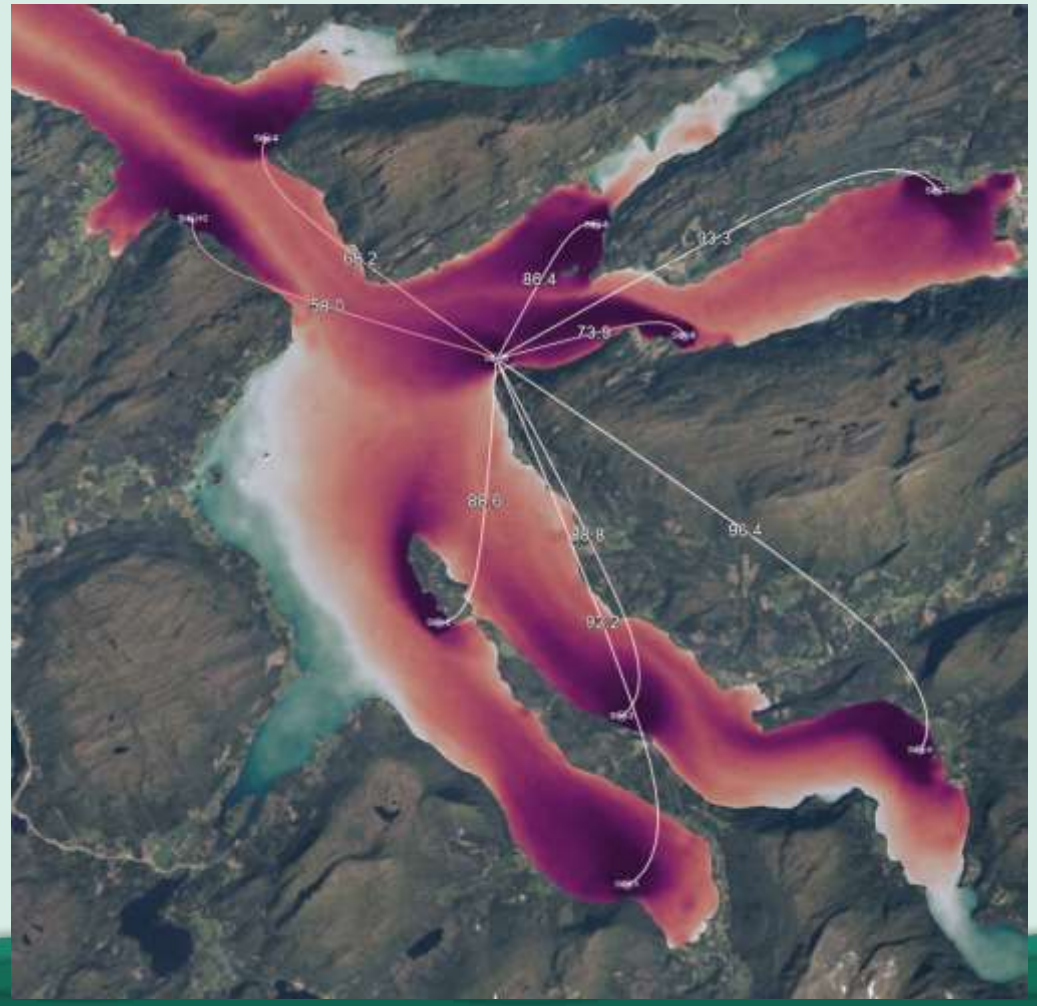
Virus/Lice from a farm in PO5



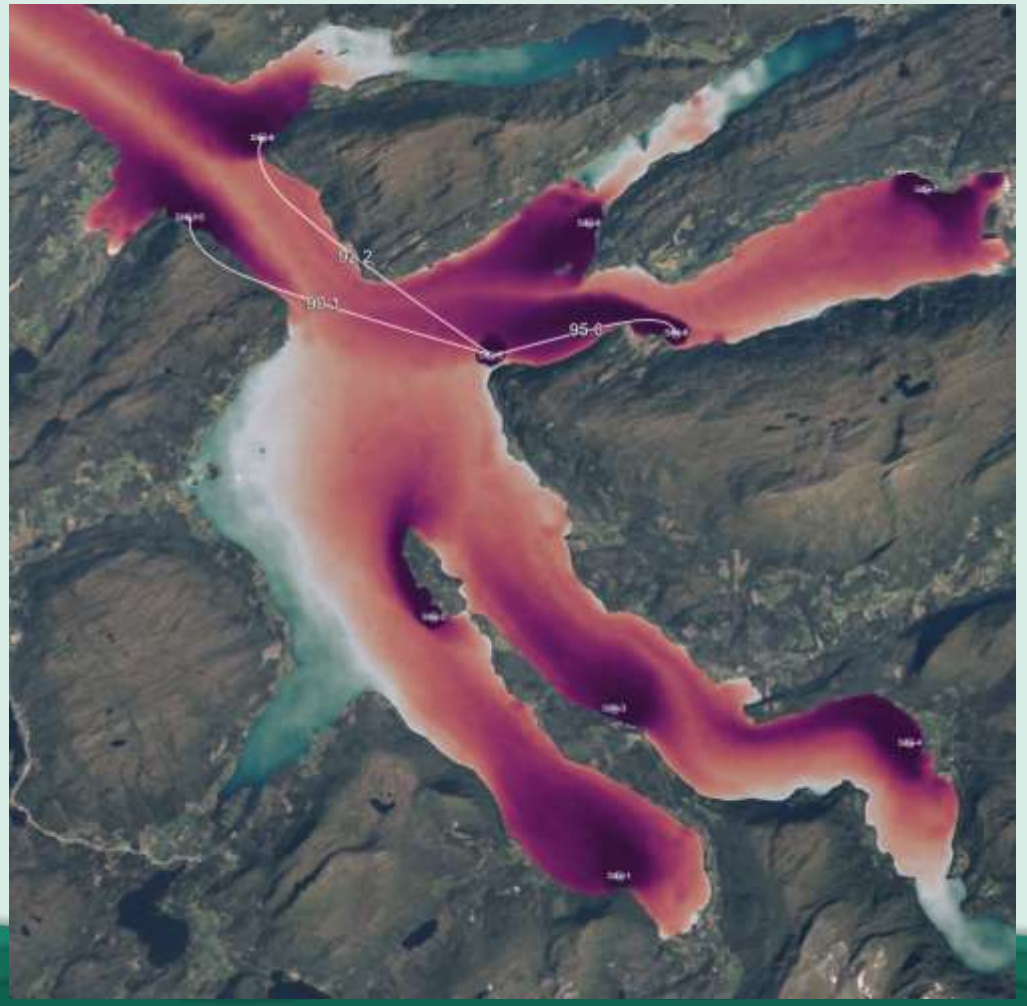
Water Contact
Lowered Cage vs. traditional Cage

Outgoing from site 5

Traditional



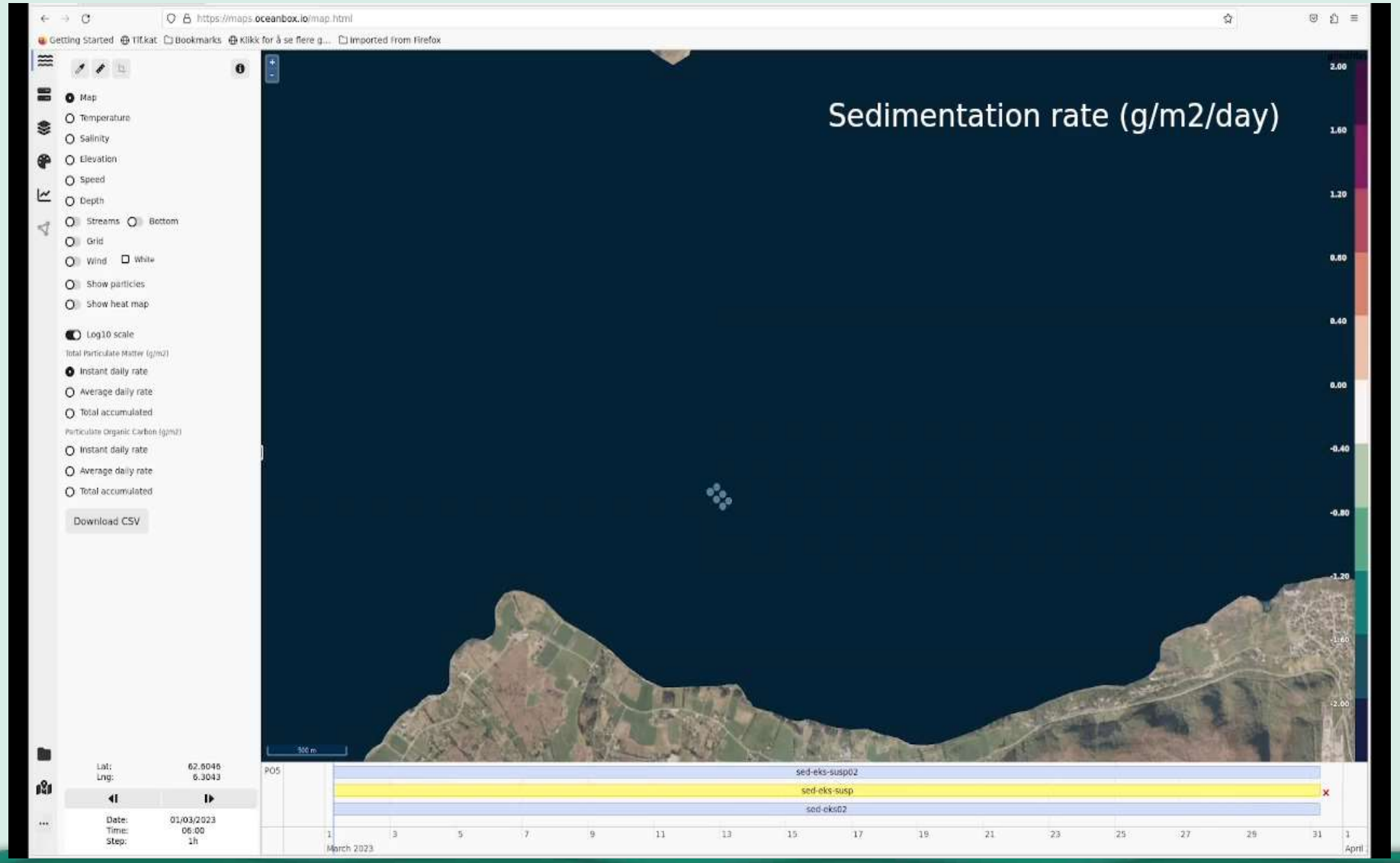
Lowered



DISPERSION MODELING EXAMPLE 2

Sedimentation:

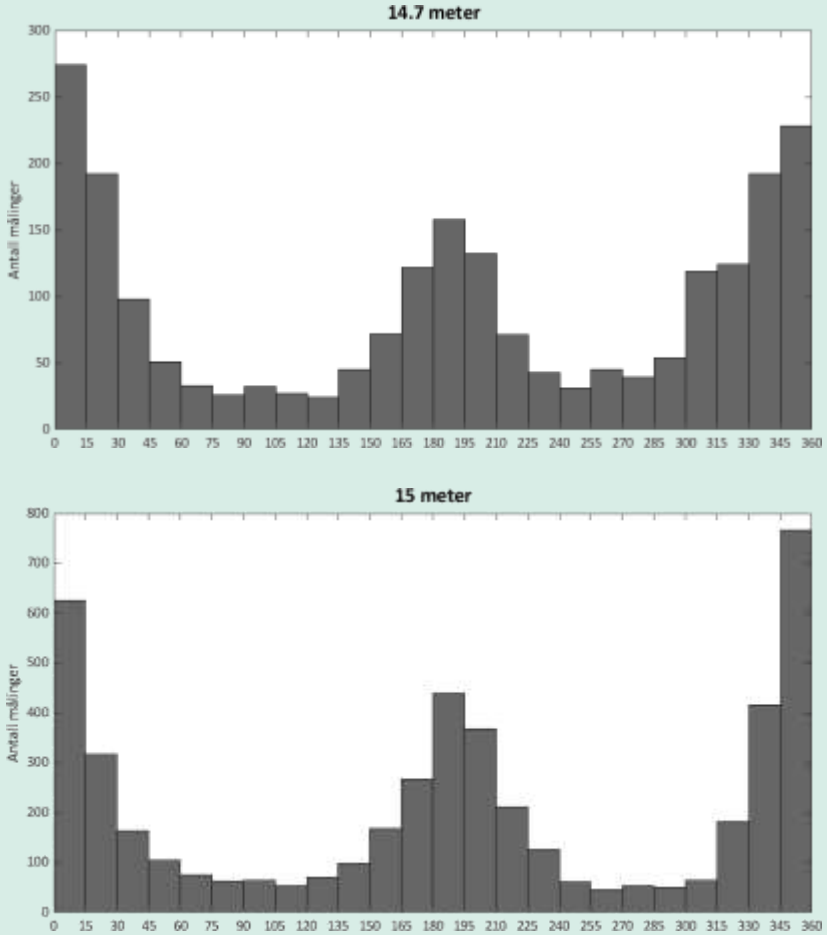
Feed Spill and Faeces



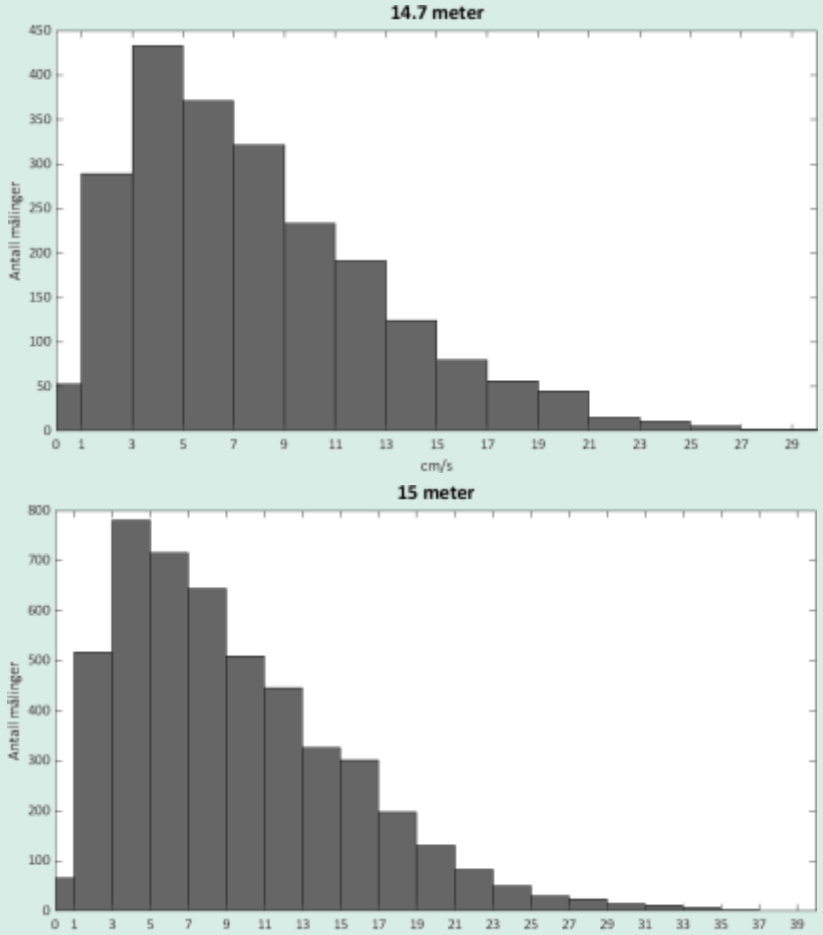
Applying Oceanbox for a specific case

- From September-November 2023 three sites got PD in production area 8 (mid-Norway).
- 55 days from first to second suspicion.
- Alternating weather in the actual time period, with changing water currents.
- Modelling the water contact reveals potential spread of infection through waterflow.
- Modelling results of the outbreak depends on the modelling period.

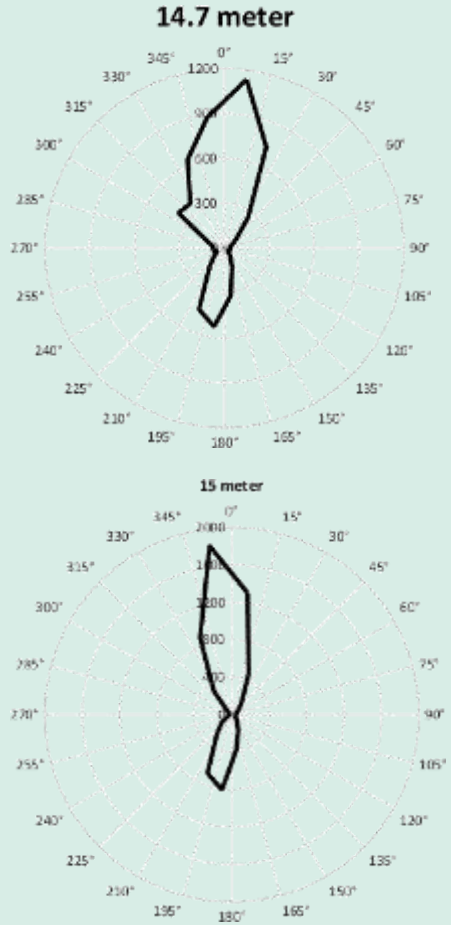
Validation



Modelled (top panel) og measured (below) current direction in the period 15.11.2022-15.02.2023.



Modelled (top panel) og measured (below) current speed (cm/s) in the period 15.11.2022-15.02.2023.



Modelled (top panel) og measured (below) water flux ($\frac{m^3}{\frac{m^2}{dag}}$).

Modelled water contact

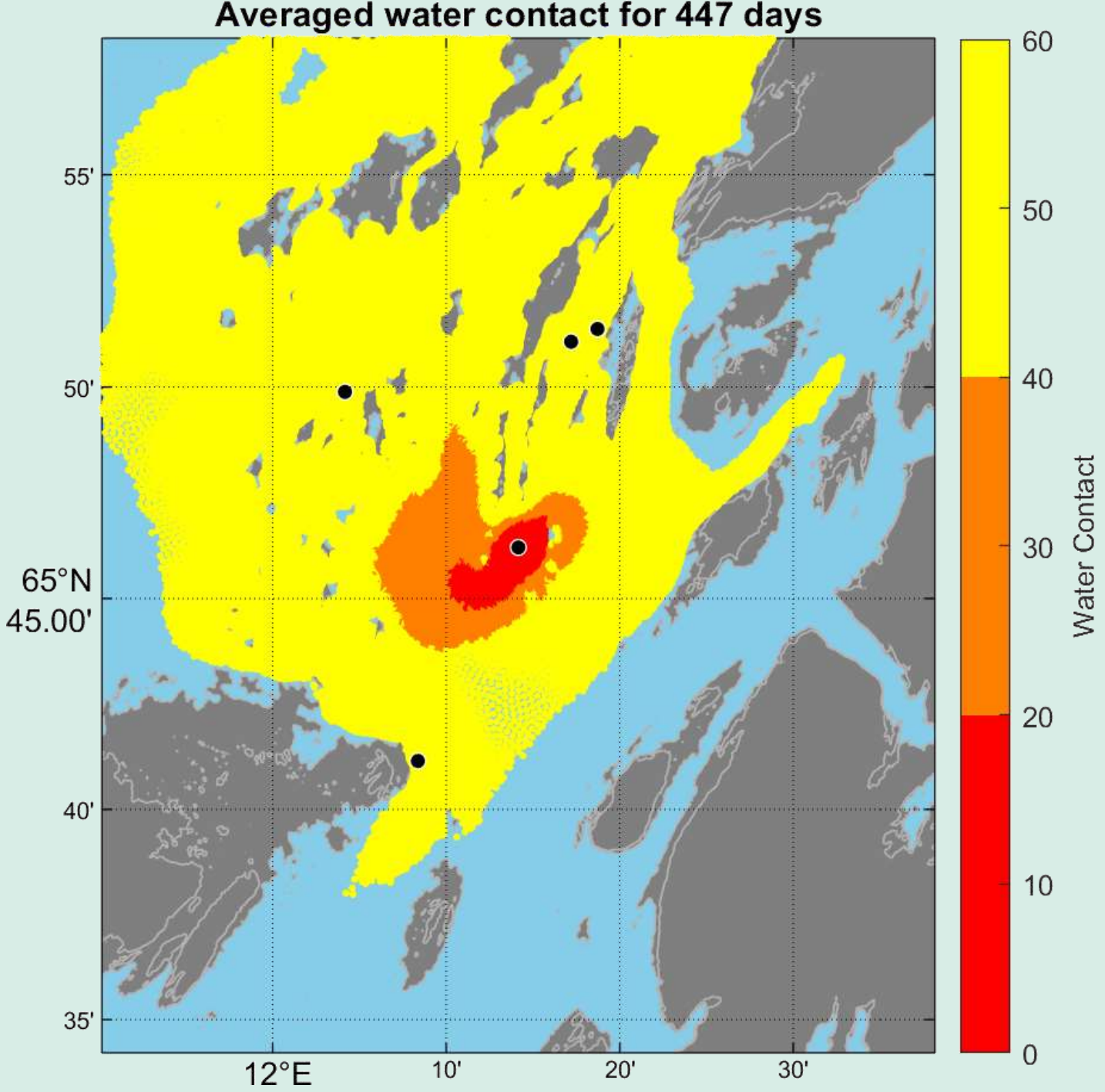
- Show the parameter *P=P(T,A)* with scaling from 0-100:
  - T is the time of the fastest particle released to reach the receiving site.
  - A is the integrated concentration at the receiving site.
- In the article of Urke (et al., 2021) the table is scaled for PD.
- The parameter P is plotted on a map for a given case.

Table 1
Classification of water contact.

Color and *P*-value	Description
80-100	Little or no water contact
60-80	Some water contact
40-60	Moderate water contact
20-40	High water contact
1-20	Very high water contact

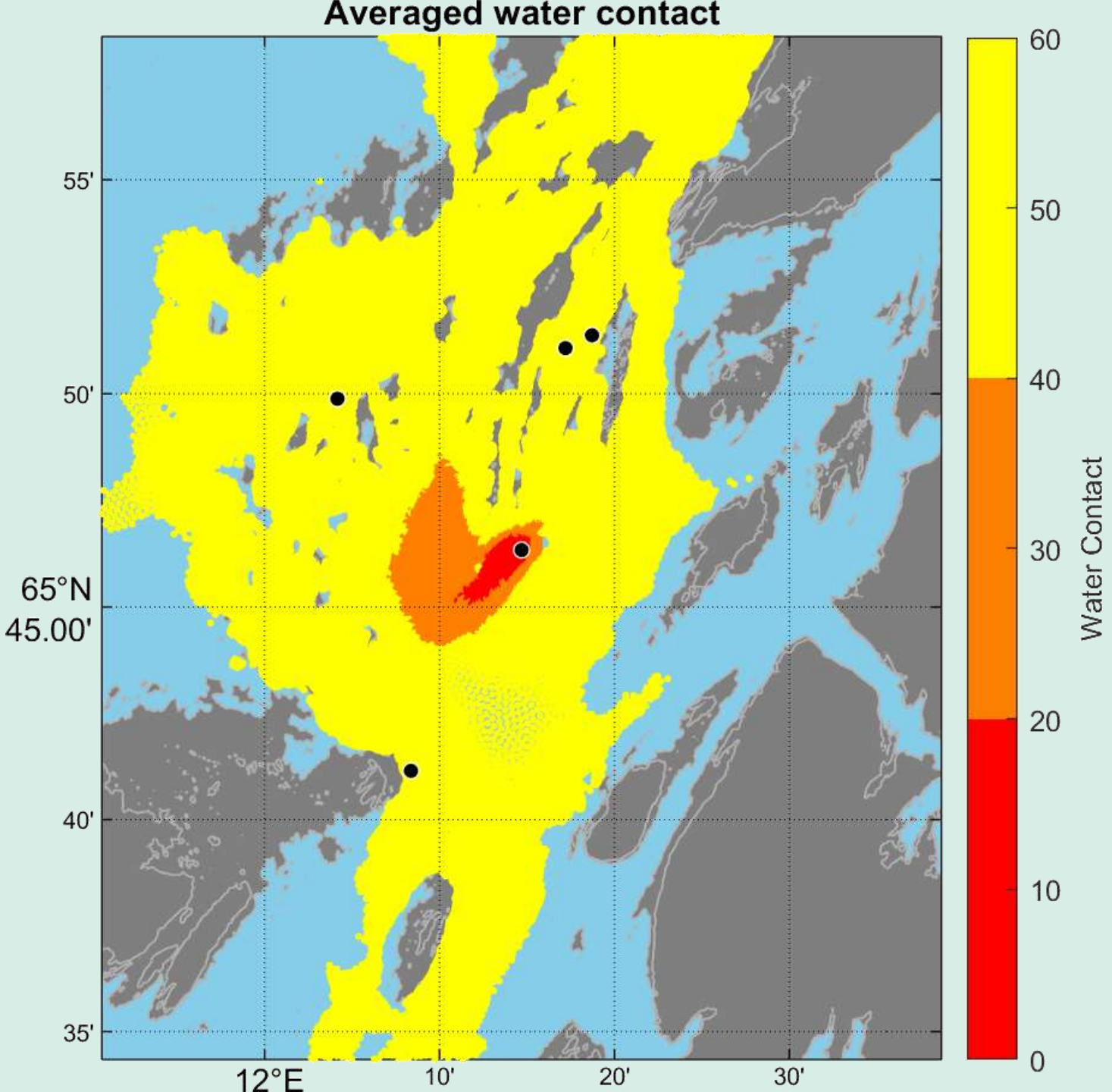
$$P = 38 + 10ln\left(\frac{T}{A}\right)$$

(Urke et.al. 2021)



Average water contact for 447 days

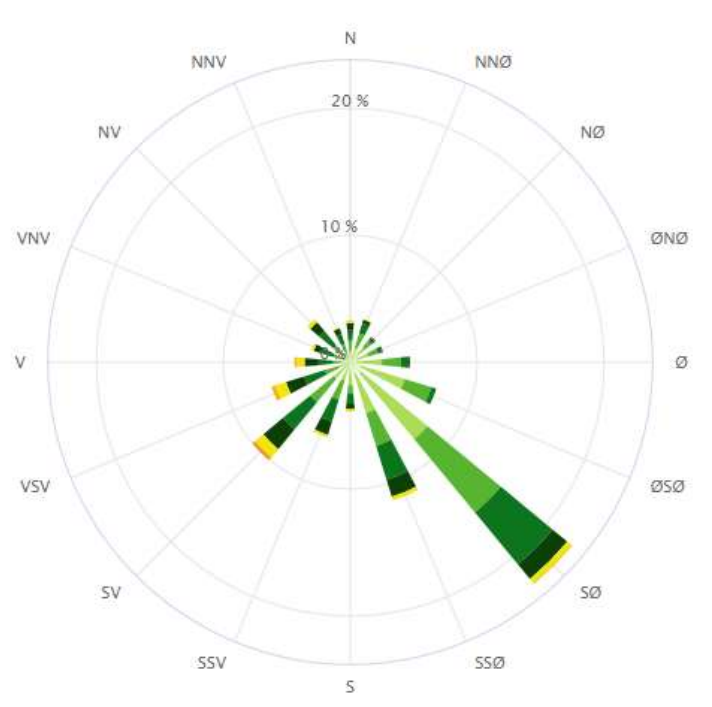
- Shows the averaged water contact from mid/end 2022 and 2023.
- The logarithmic function for water contact explains the area of water contact.



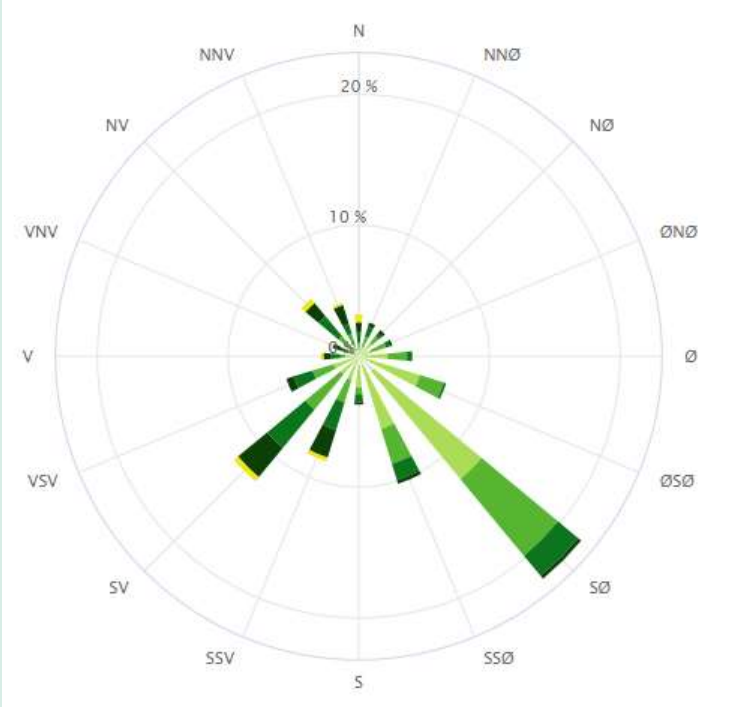
Average water contact for September and October

- Shows the averaged water contact from September and October 2023.
- Some of the same trends as the longer timeperiod.

Meteorology



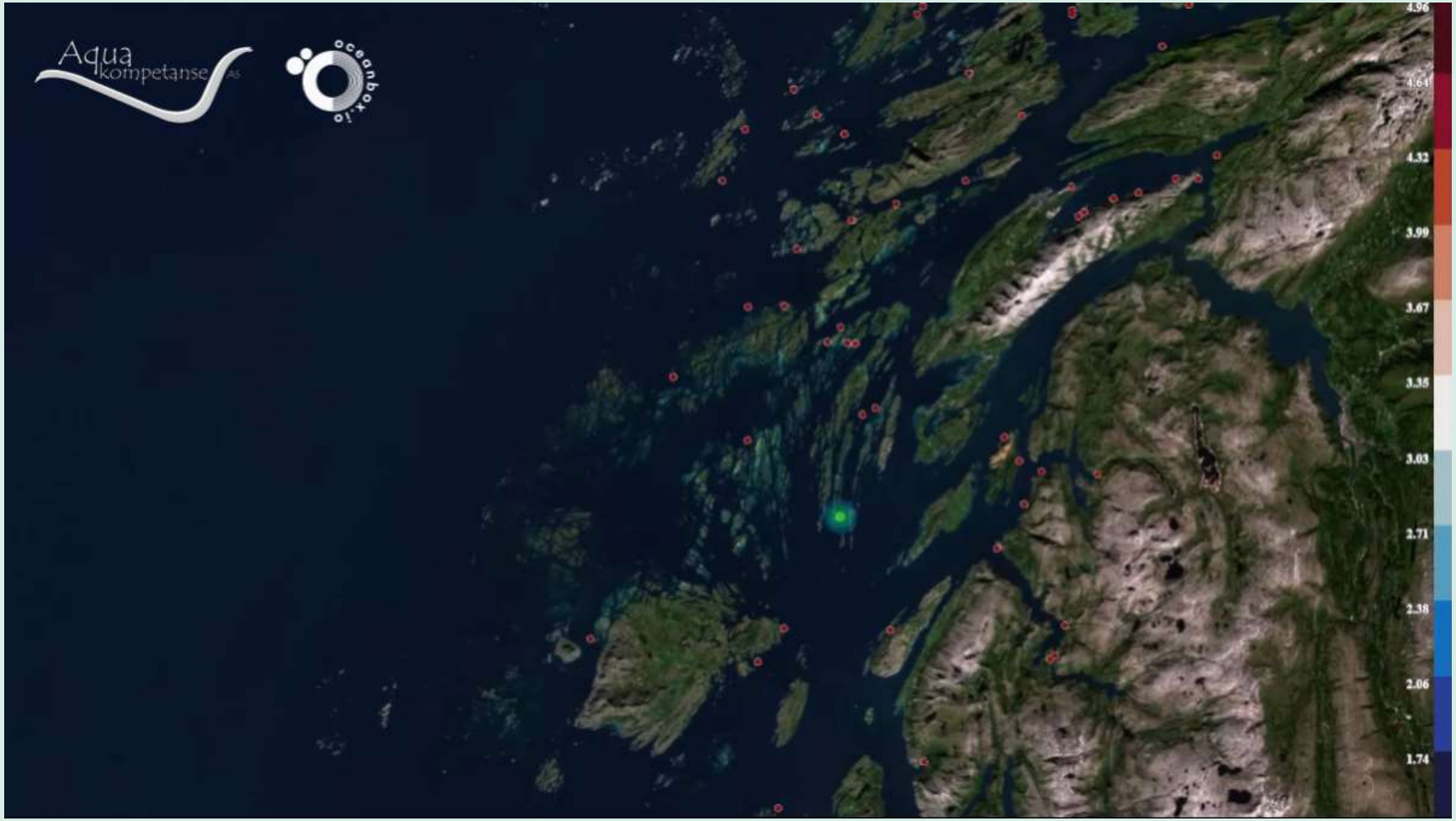
2014-2024: September-October.

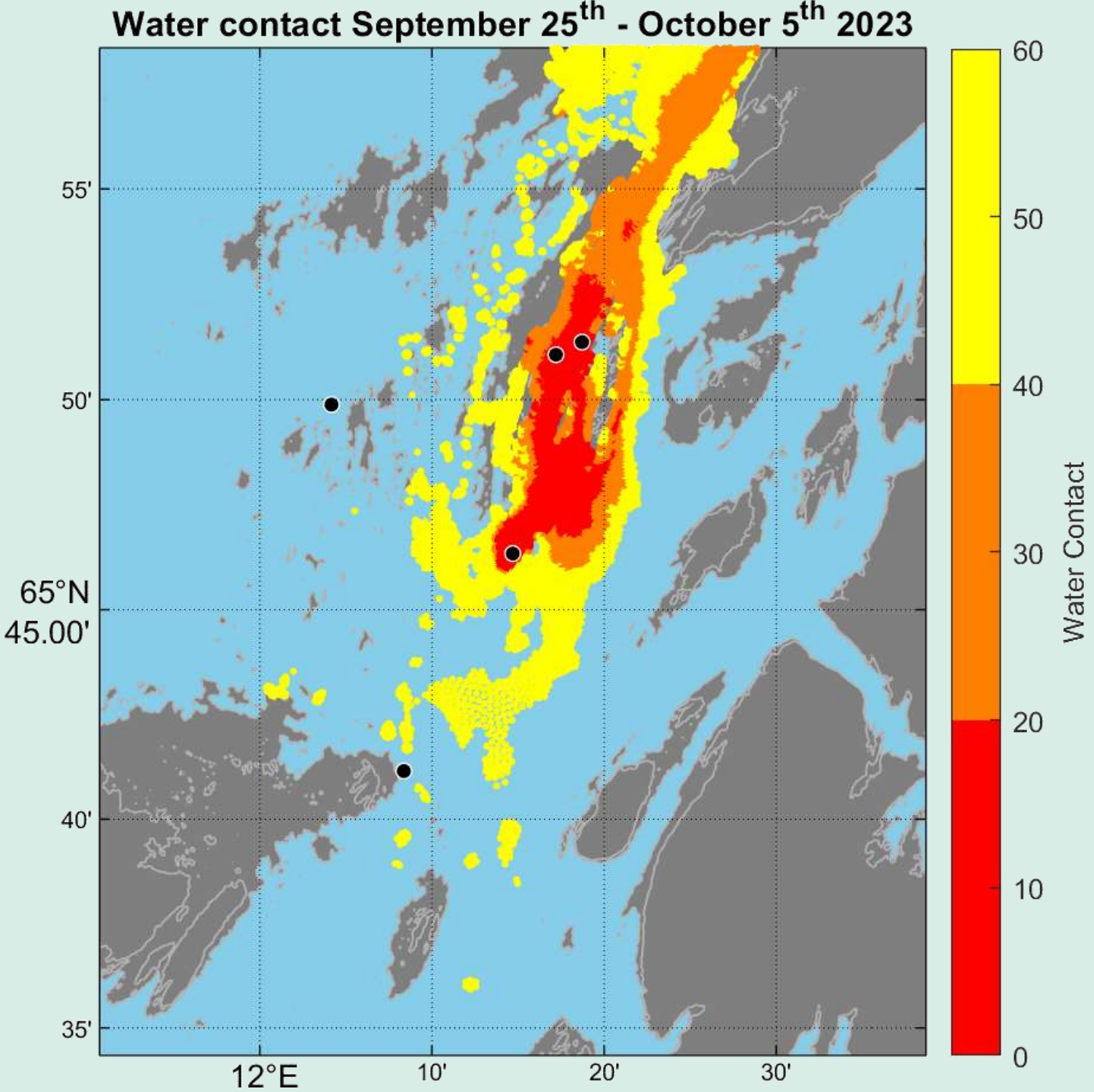


2023: September-October.

- Windroses averaged over the last 10 years for September and October (left panel) are similar to the windrose from the actual time period (right panel).
- There is still some variance in direction and speed.

Heat map visualizing the wind effect





Water contact tracked for 10 days

- The water contact from a release of particles September 25th and tracked for 10 days.
- Shows a different picture of water contact.

Questions?

- Frank Gaardsted: frank.gaardsted@oceanbox.io
- Erlend Mundal: erlend.mundal@aqua-kompetanse.no