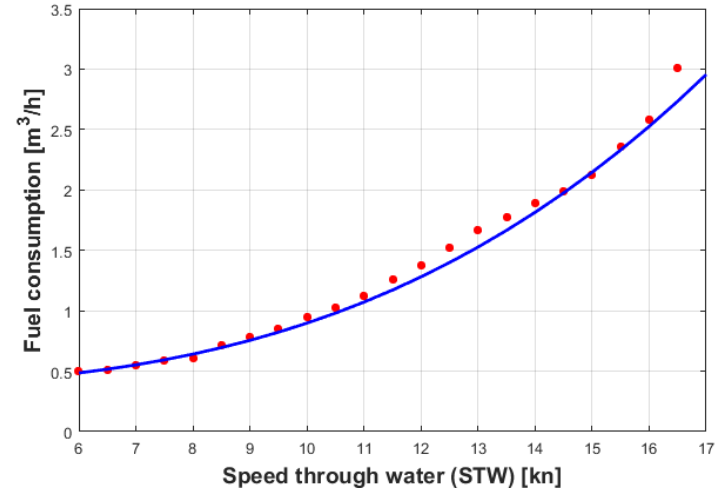


Fuel saving in coastal areas

Karina Hjelmervik
Svend Nordby

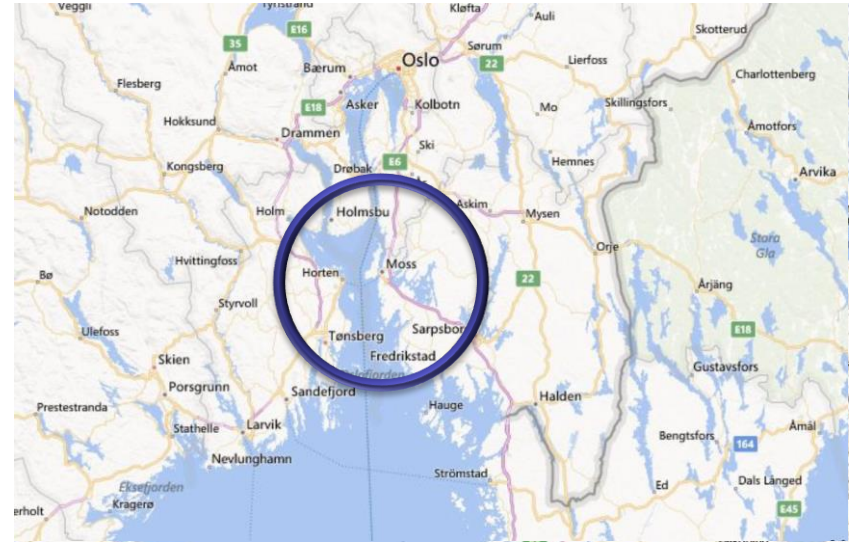
Motivation

- 90% of goods are transported by sea
(Smith et al. 2016)
- Maritime transport emits around 1000 million tonnes of CO₂ annually
(IMO)
- Consumption per time travelled is estimated by a cubic function of speed through water
(Ronen 1982, Fagerholt 2010)



Area of interest: Oslofjord

- Prior studies imply that the currents can be more exploited in this area (Hjelmervik and Schøyen 2015)
- 150 km long
- Tidal currents of 0.5 to 2 knots
- Complex flow patterns
- Detailed currents available from numerical studies (Røed et. al 2016)



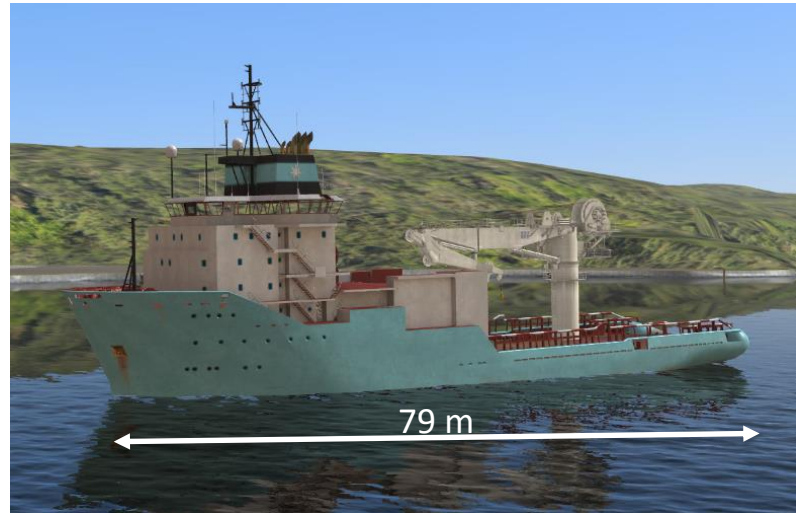
Experiment

- K-Sim Navigation bridge and machine room simulators from Kongsberg Digital



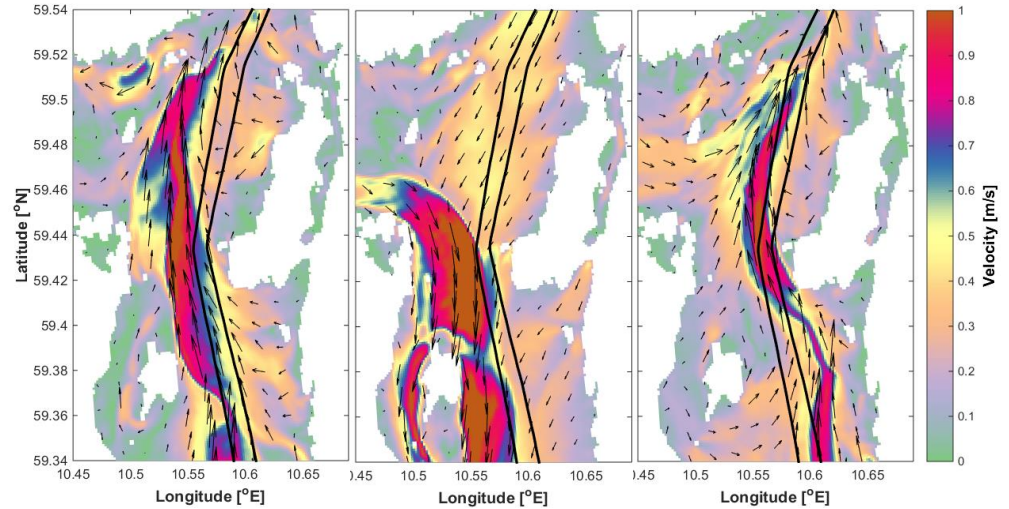
Experiment

- K-Sim Navigation bridge and machine room simulators from Kongsberg Digital
- Anchor handler vessel



Experiment

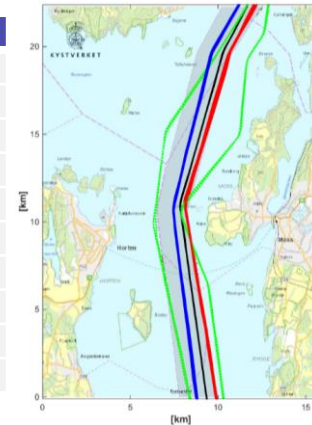
- K-Sim Navigation bridge and machine room simulators from Kongsberg Digital
- Anchor handler vessel
- Three current fields
- Northbound TSS



Experiment

- K-Sim Navigation bridge and machine room simulators from Kongsberg Digital
- Anchor handler vessel
- Three current fields
- Northbound TSS
- 10 setups, each run twice
- 4 bachelor students

ID	Current field	STW [kn]	Choice of route
1	No current	16.7	Middle of TSS
2	Field 1, co-current	16.7	Western route within TSS
3	Field 1, co-current	16.7	Eastern route within TSS
4	Field 1, co-current	16.7	No TSS restrictions
5	Field 1, co-current	15.7	Eastern route within TSS
6	Field 2, countercurrent	16.7	Western route within TSS
7	Field 2, countercurrent	16.7	Eastern route within TSS
8	Field 2, countercurrent	16.7	No TSS restrictions
9	Field 3, co-current	16.7	Western route within TSS
10	Field 3, co-current	16.7	Eastern route within TSS

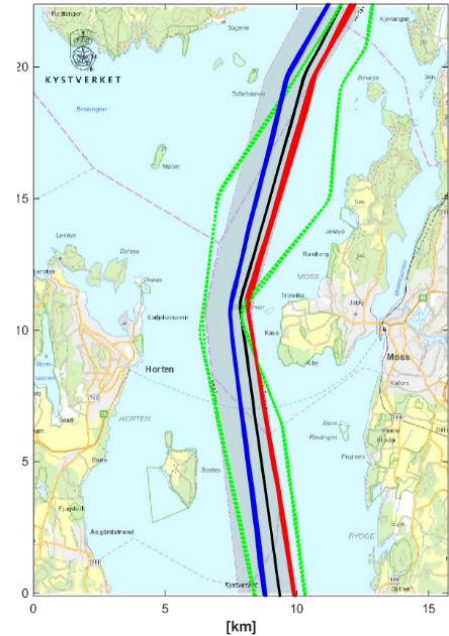
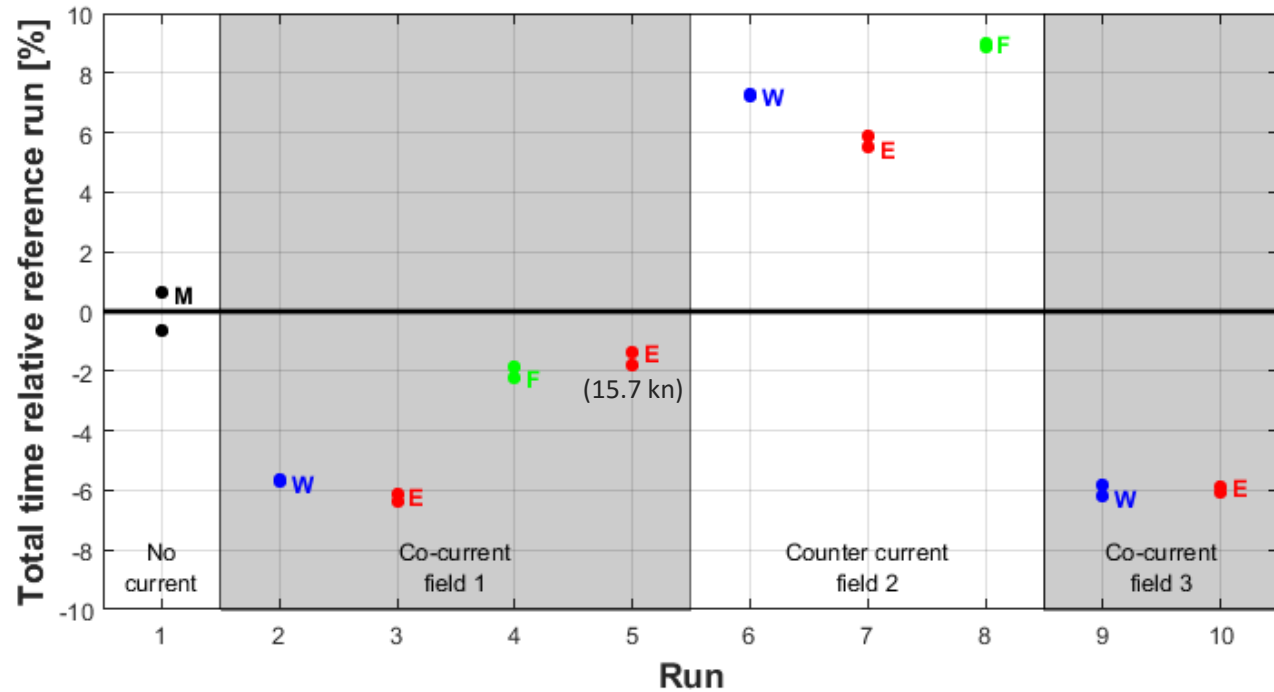


Limitations

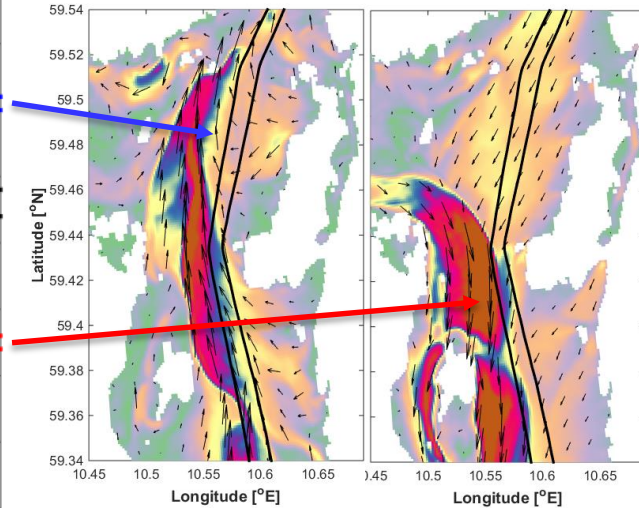
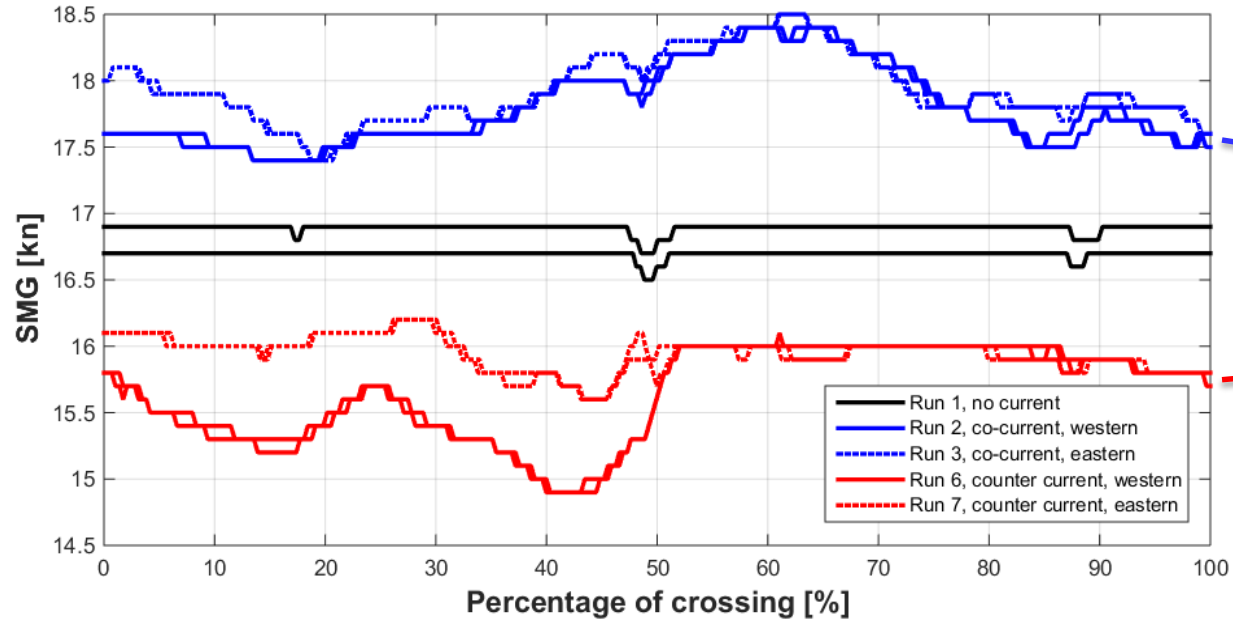
- Only effects from currents are considered
- The experiments include only a short passage
- The experiments are only performed only on one vessel

Further studies are needed to generalize the results

Results



Results



Conclusion

- 6% reduced crossing time on co-currents compared with reference runs

Alternatively: 15 % reduced fuel consumption (reduced speed, same time of arrival)

- 12-13% reduced crossing time on co-currents compared with counter currents
- Due to complex flow patterns position inside TSS has an impact
- Detailed current forecasts are needed to fully exploit the currents



Thank you