Master presentation:

Evaluation of two model versions of the Oslofjord with different grid resolutions

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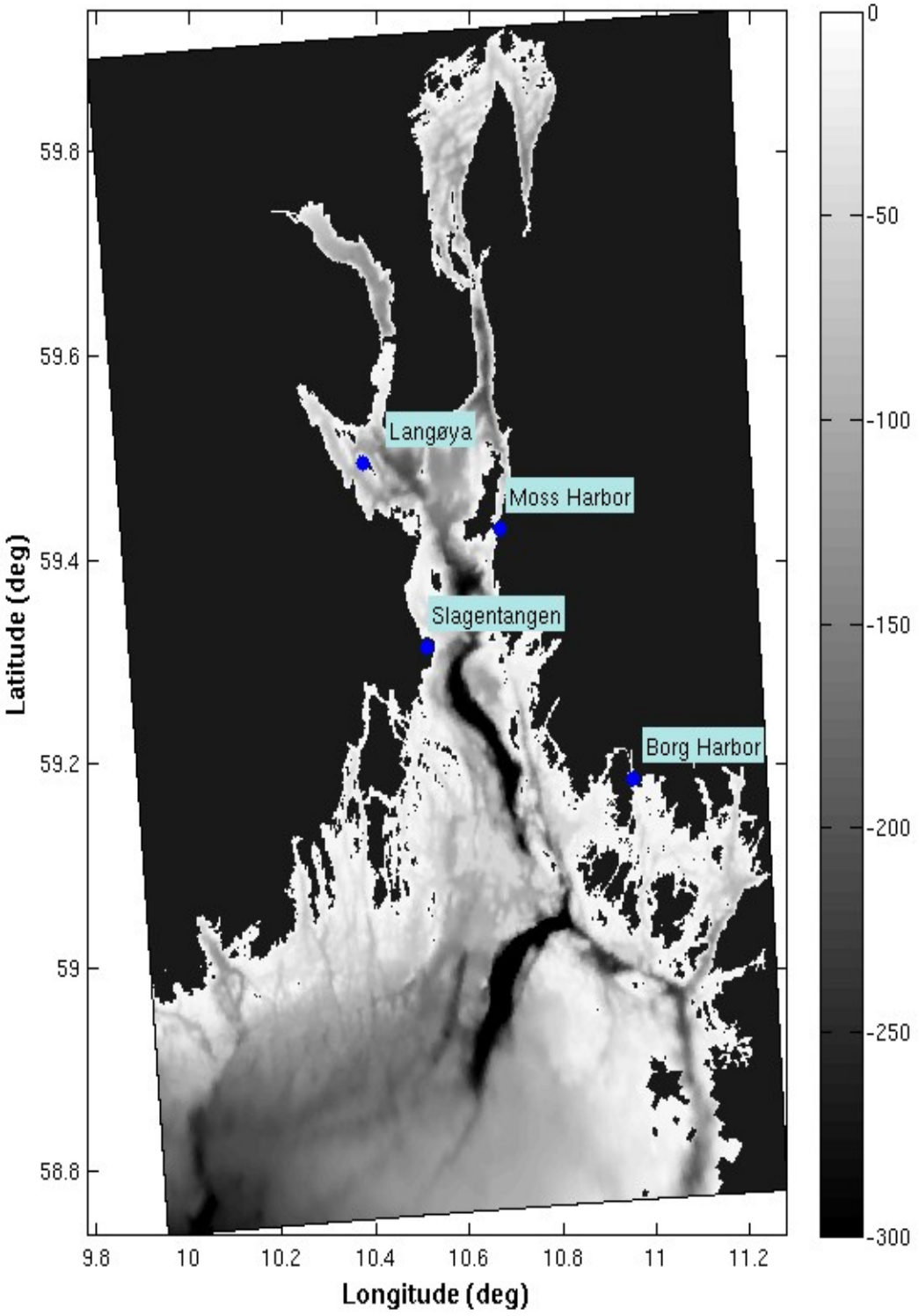
Outline

- Motivation
- Questions
- Our approach
- A brief discussion
- Results
- Summary



Motivation

- Densest populated in Norway
- Increasing commercial traffic
- Several high risk locations
- Note the complex topography and irregular coastal geometry

Grid acquired from André Staalstrøm (NIVA))

Our main questions

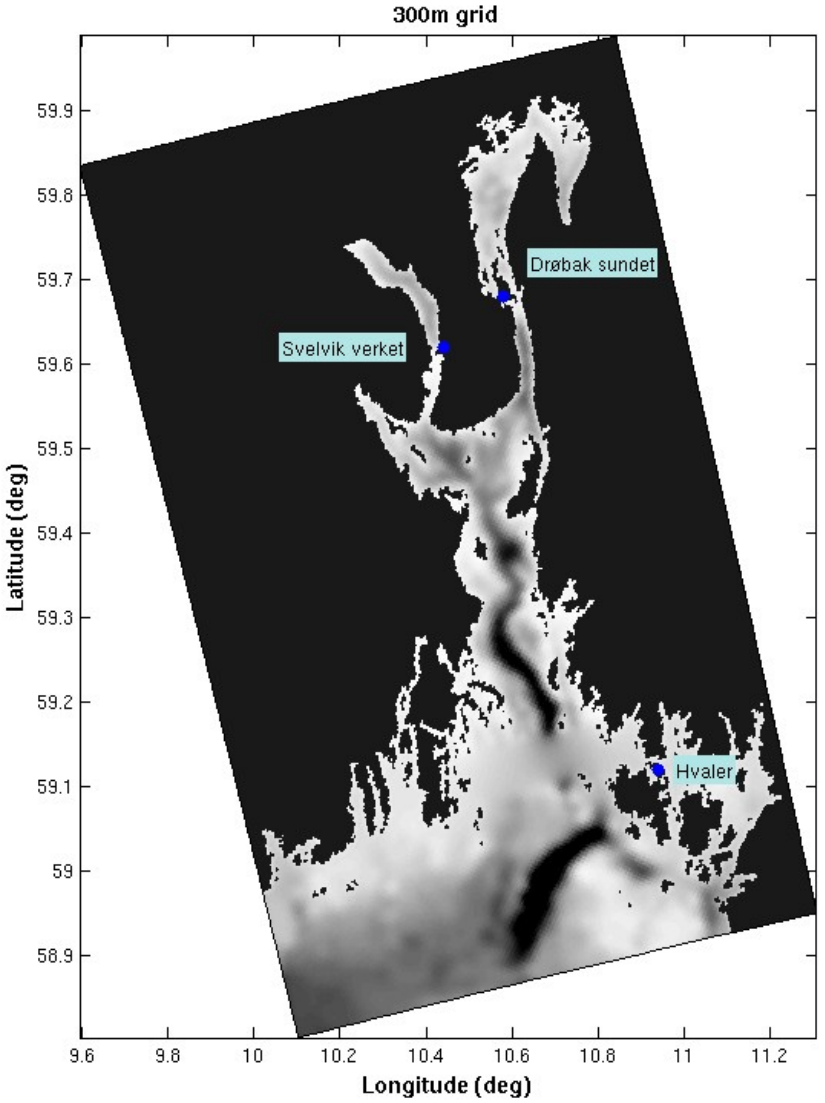
- How will a change in an ocean model grid resolution affect:
  - Current patterns?
  - Particle trajectories?

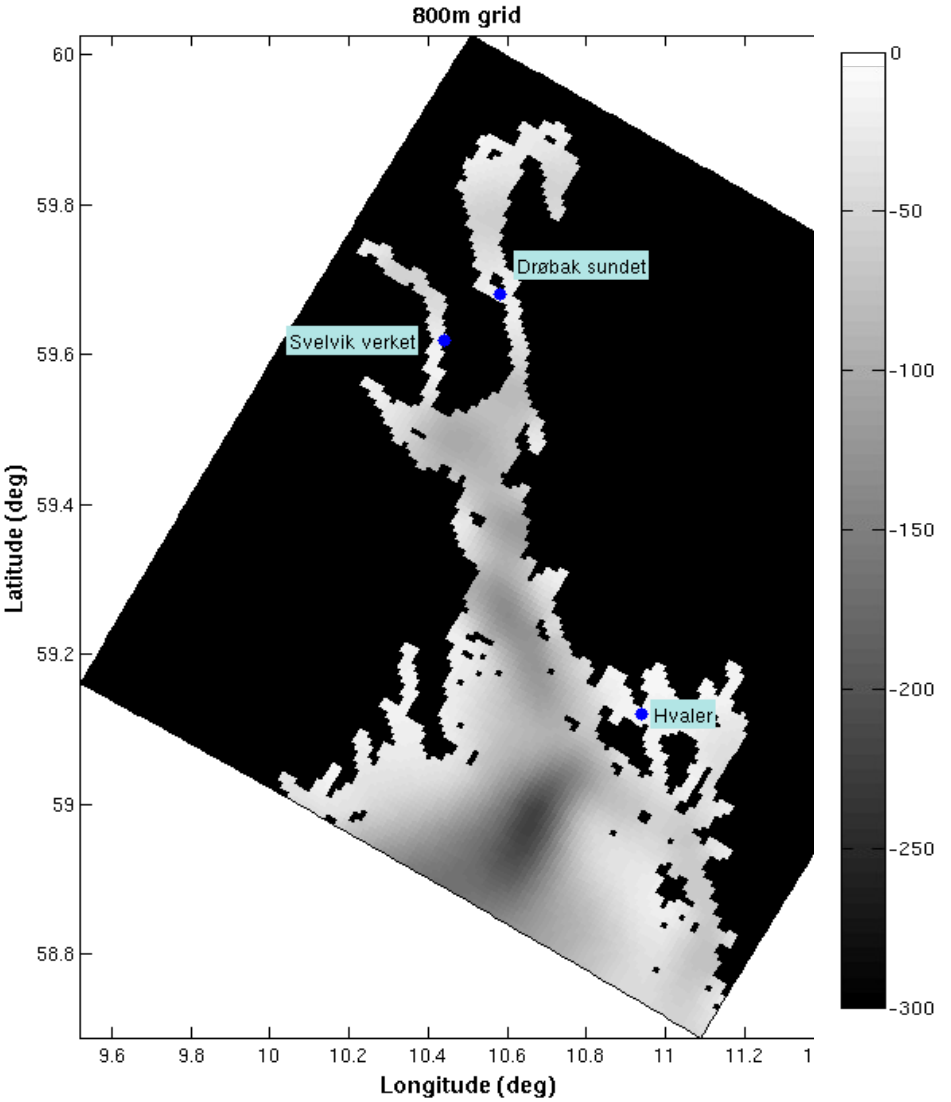
Our approach

Two versions of ROMS

300 meter resolution

800 meter resolution



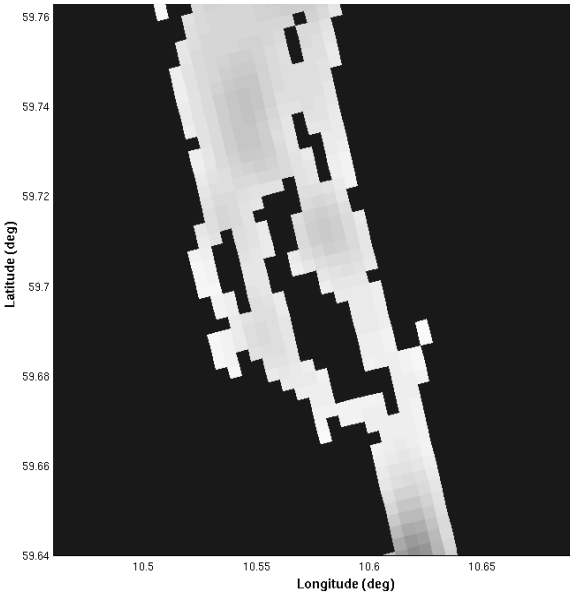


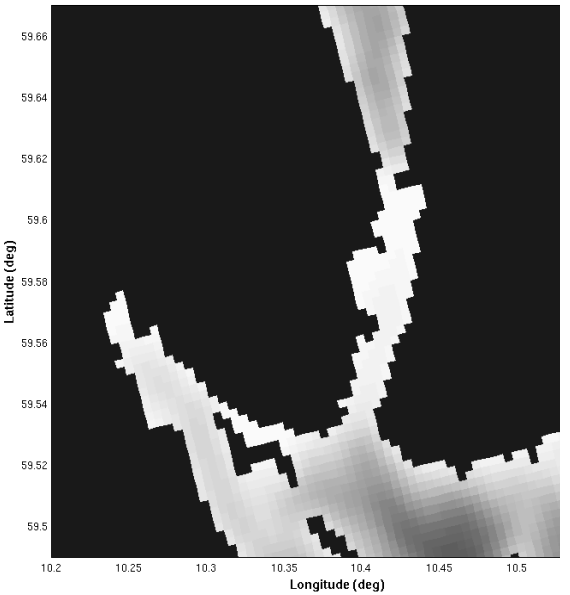
Drøbak

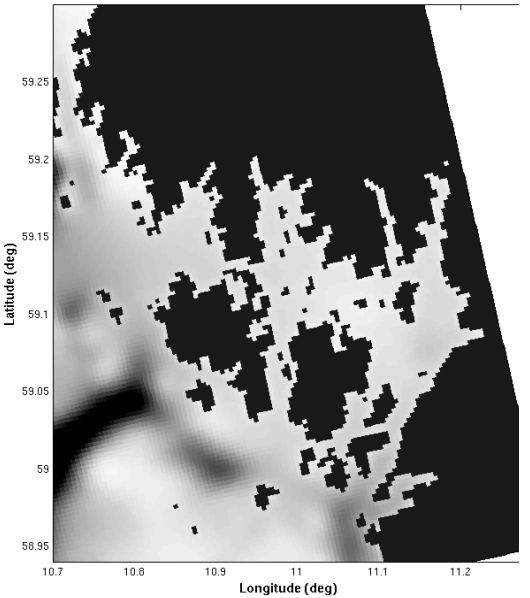
Svelvik

Hvaler

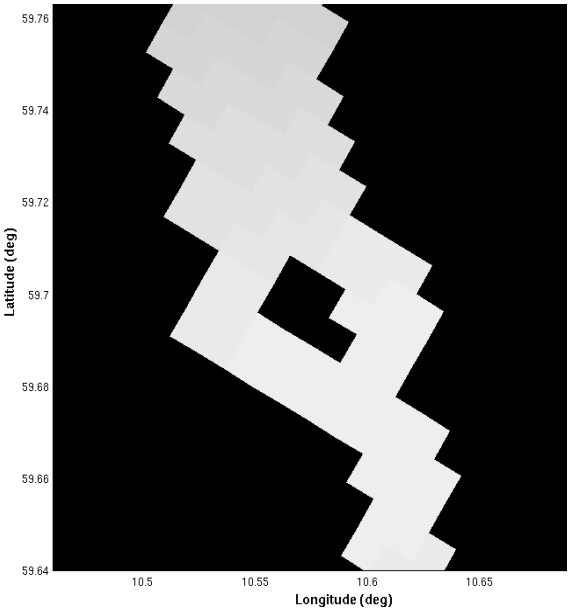
300-meter

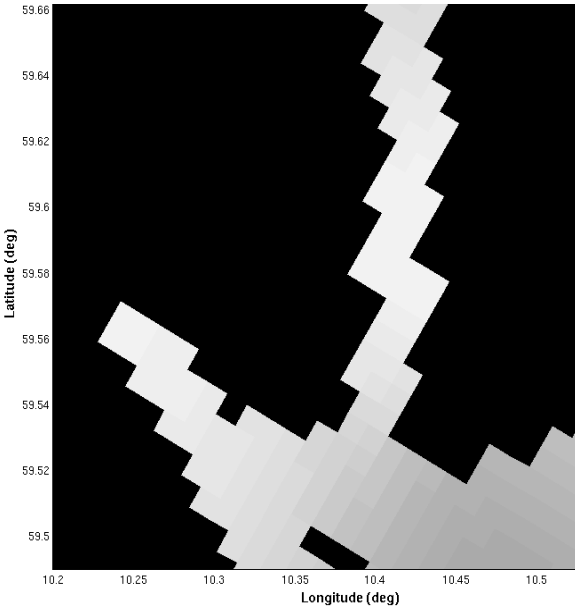


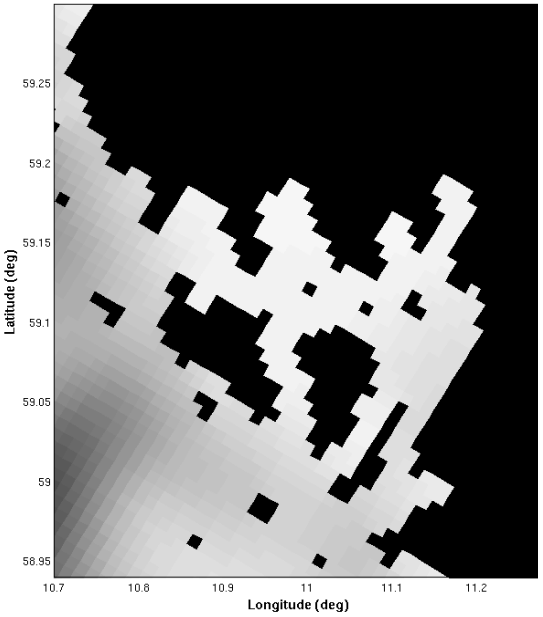




800-meter





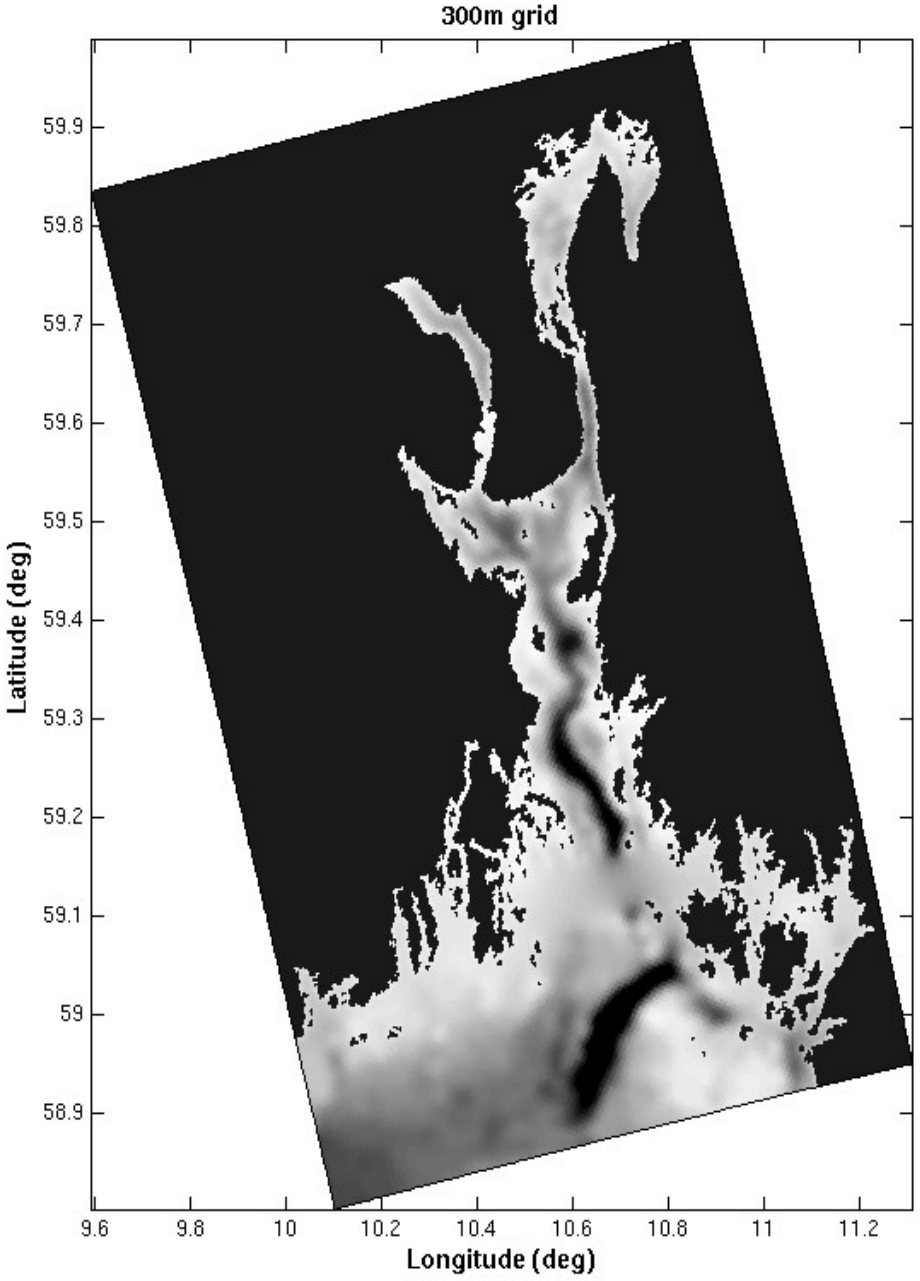


A brief discussion

- Kinetic energy analysis
  - Mean (MKE) vs eddy kinetic energy (EKE)
  - Submesoscale vs mesoscale
    - Increased resolution causes an increase in EKE
    - Mesoscale eddies: transfer of energy from PE to EKE (baroclinic instability)
    - Submesoscale eddies: transfer of energy from MKE to EKE (barotropic instability)
- Assessment of particle trajectories
  - *Island wakes; increased vorticity/enstrophy*

Gill et al. (1974), Capet et al. (2008), Böning and Budich (1992), Røed and Albretsen (2010), Dong and McWilliams (2007)

Results



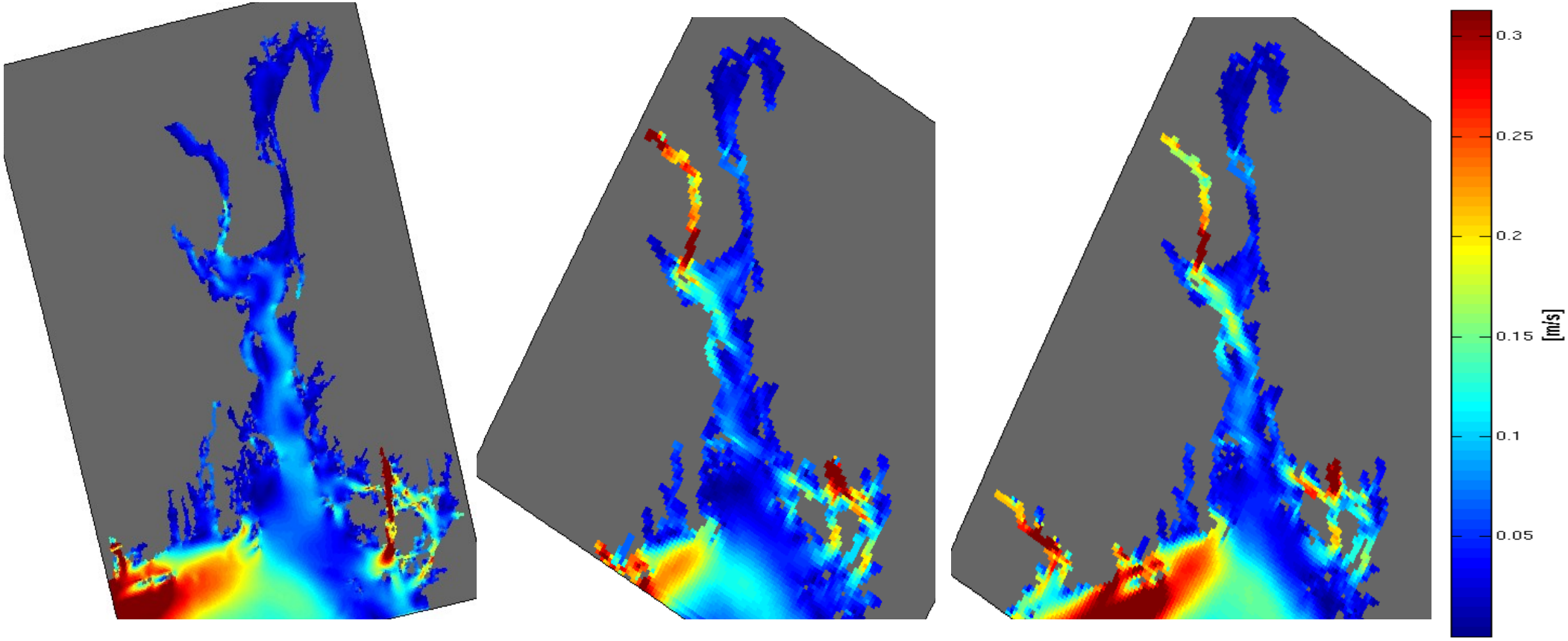
- 1 year simulation
  - 31 Okt. 2010 - 30 Okt. 2011
- Forcing
  - Atmospheric input from UM4km
  - Lateral boundary forcing from external model
  - Initial conditions from external model
  - Rivers
  - Tides

Verification; currents

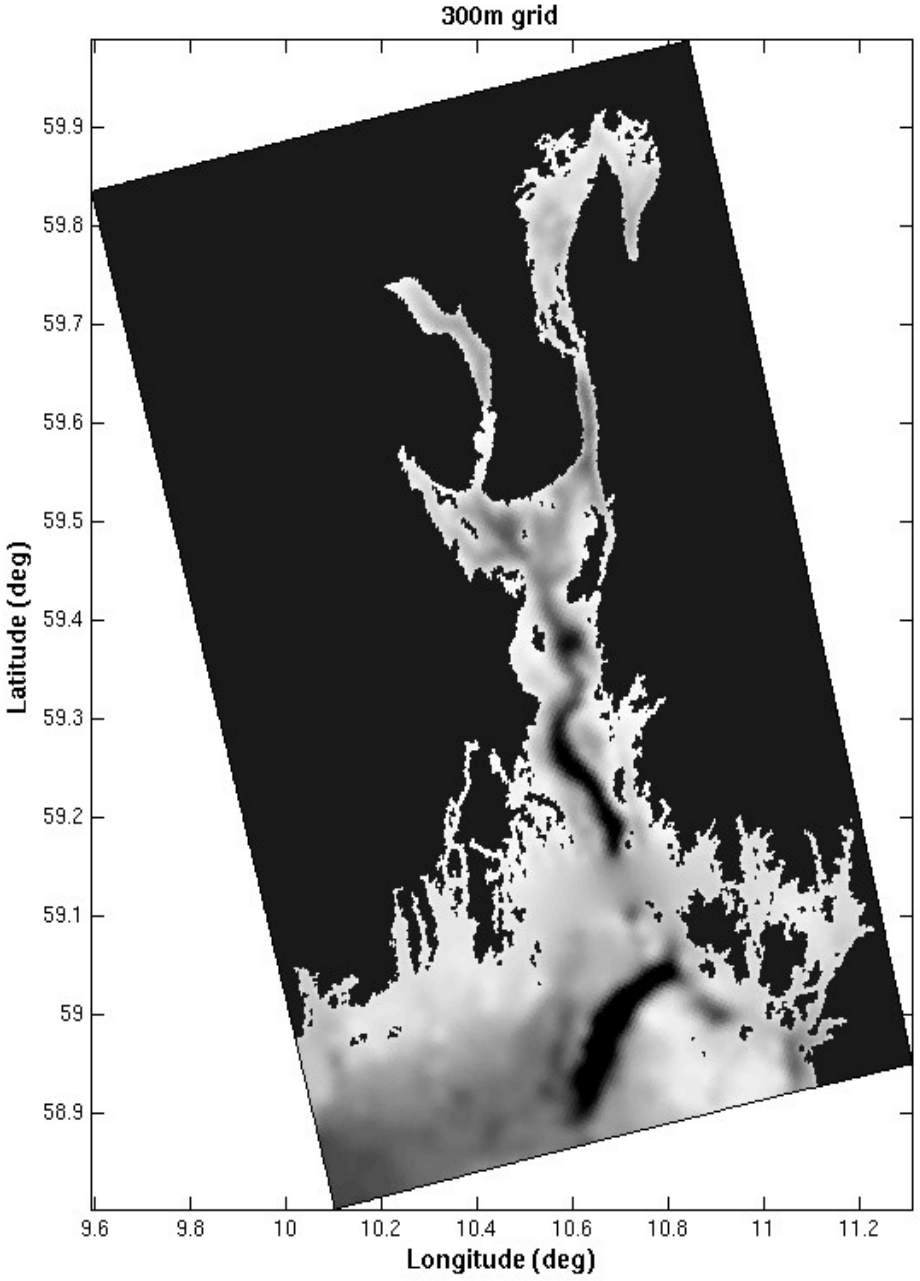
300 meter

800 meter

Nonocur



Regimes



1: Open ocean areas

Small impact from differences in coastal geometry

Similar trajectories

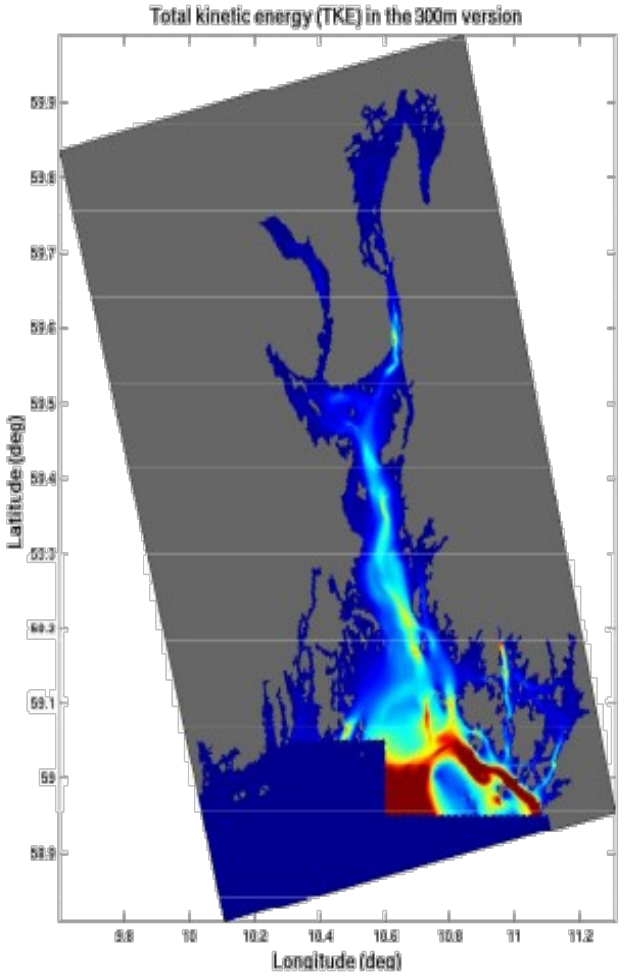
2: Inner fjord

Coast/Islands irregularities affect current patterns

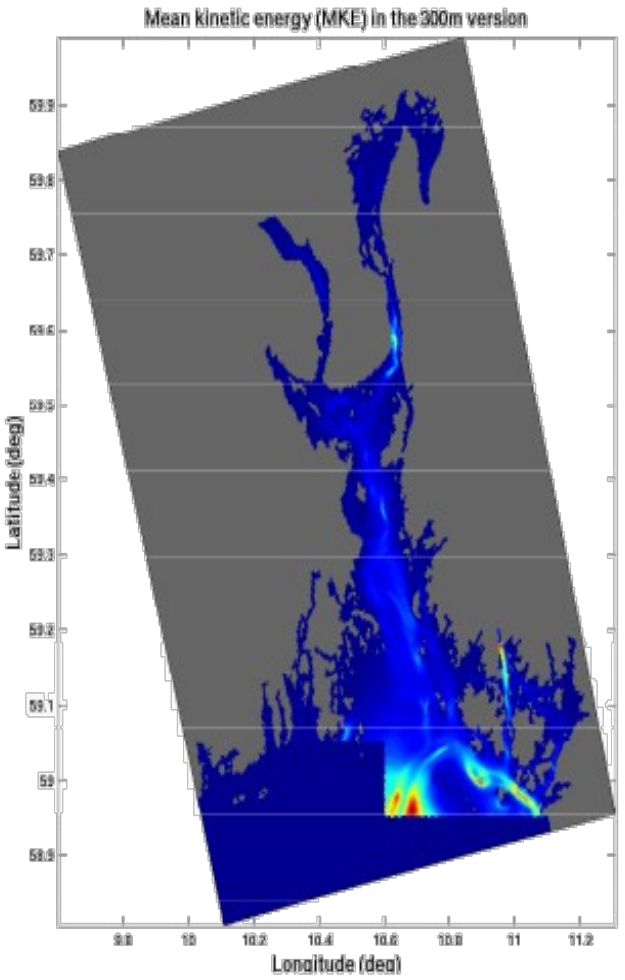
Dispersed trajectories

Kinetic energy distribution; 300m version

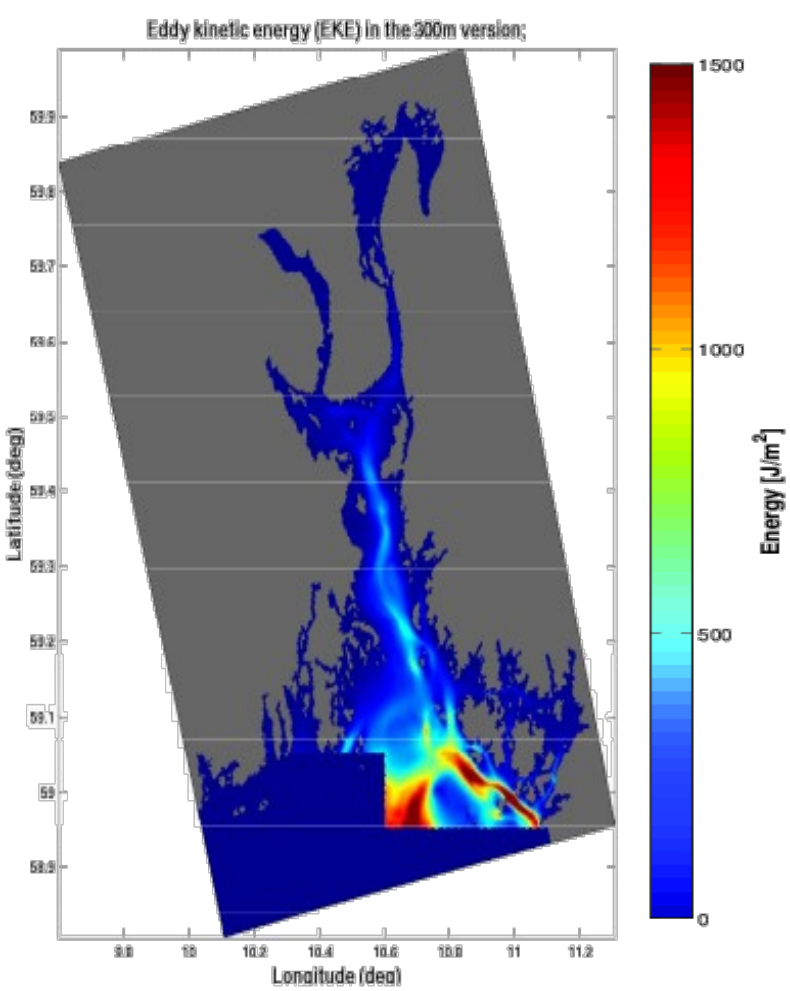
TKE



MKE

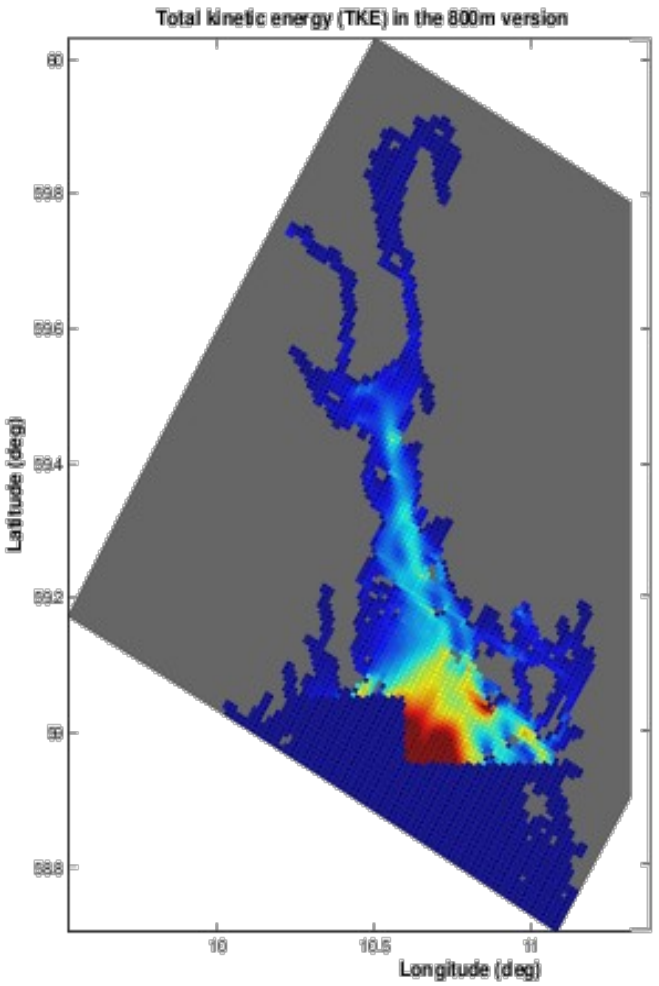


EKE

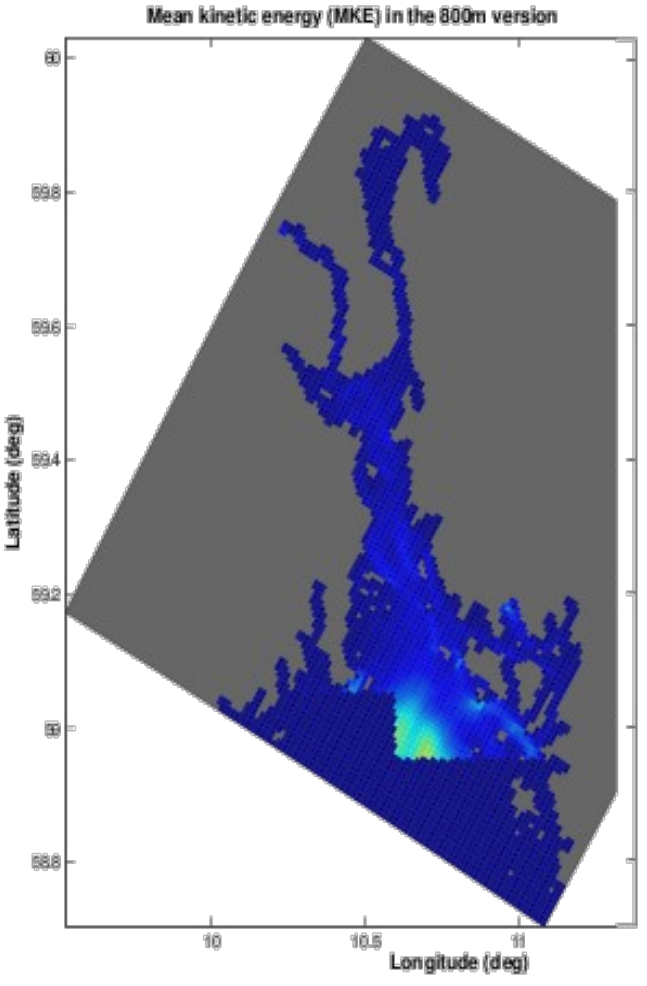


Kinetic energy distribution; 800m version

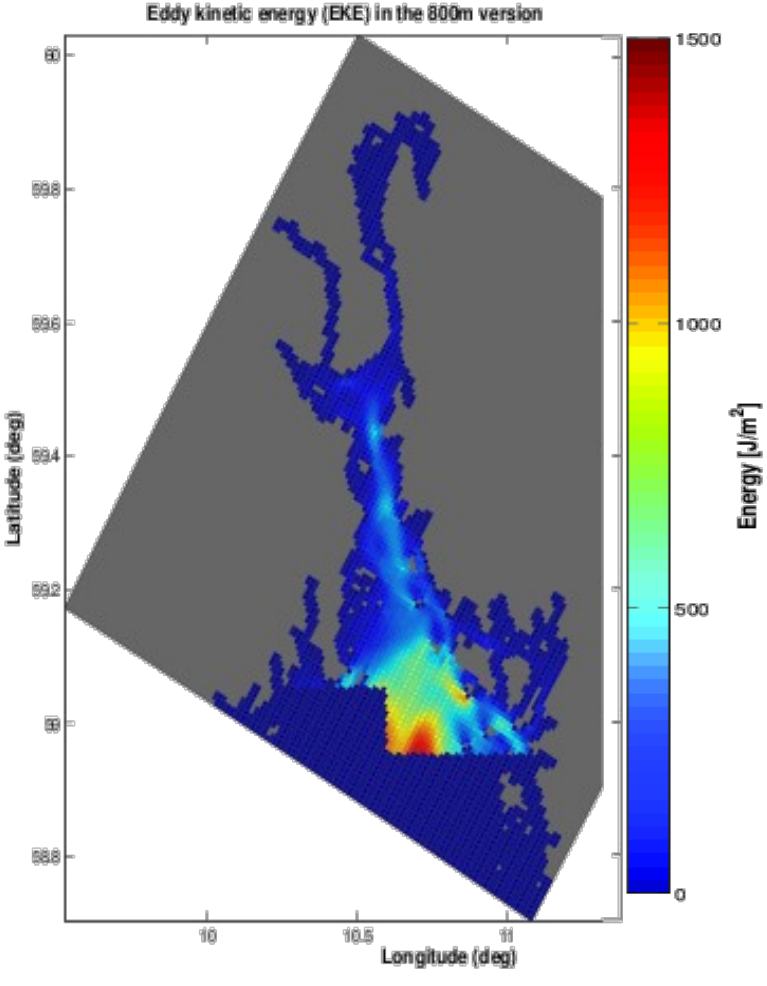
TKE



MKE

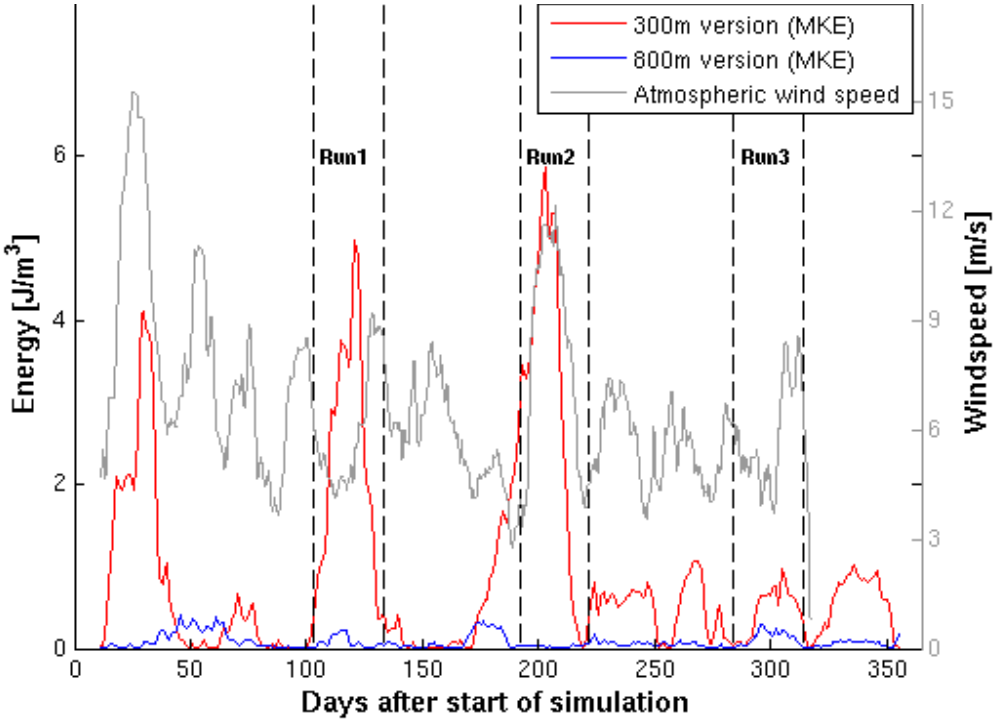


EKE

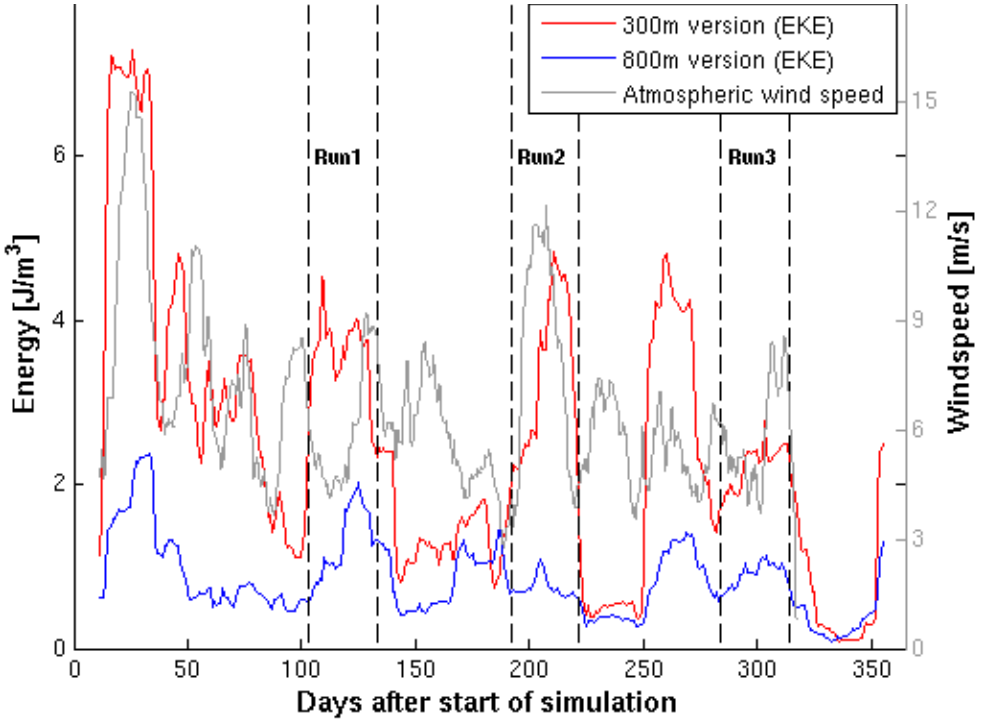


Kinetic energy time series

MKE



EKE

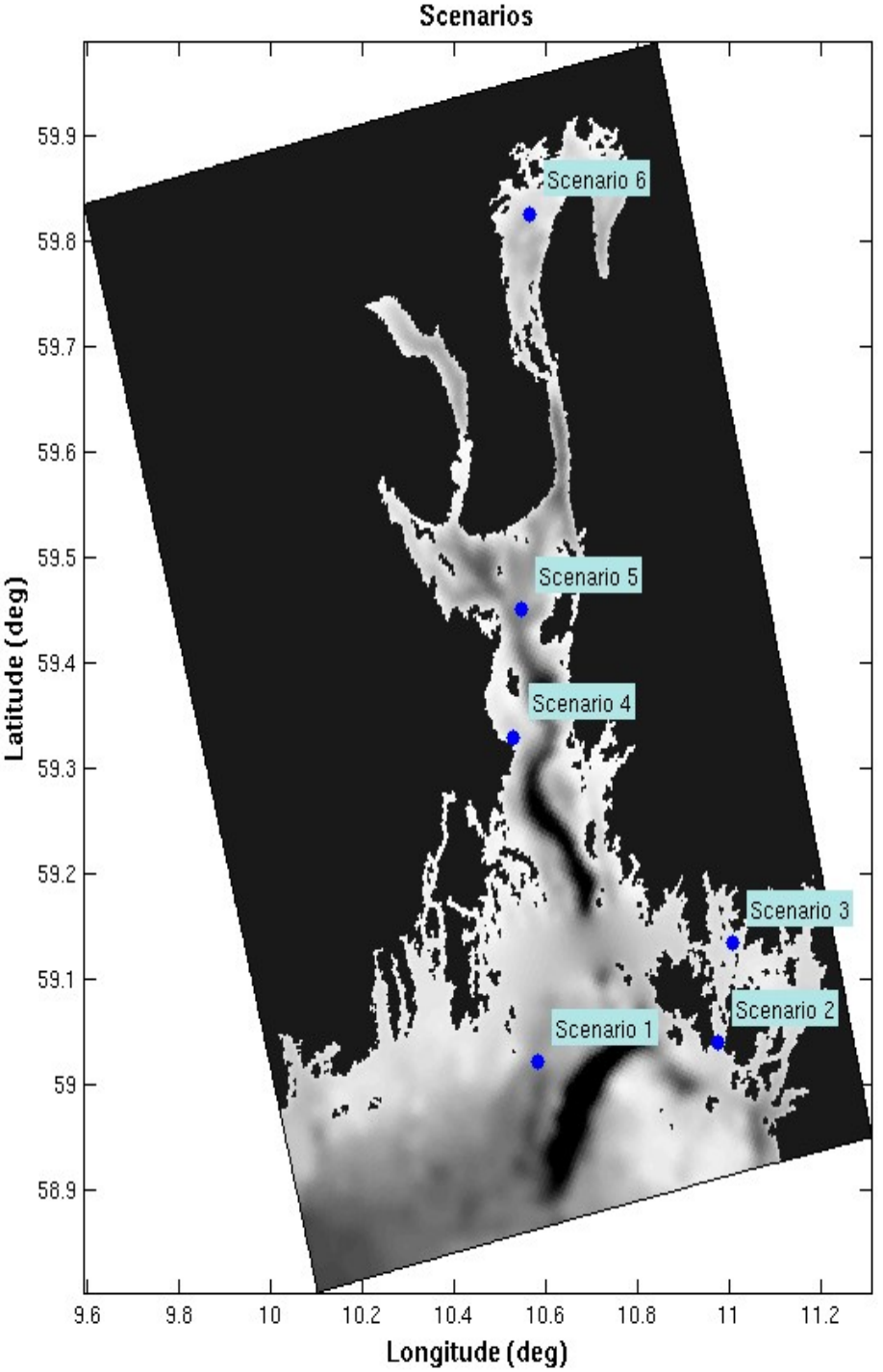


Particle trajectories

3 runs

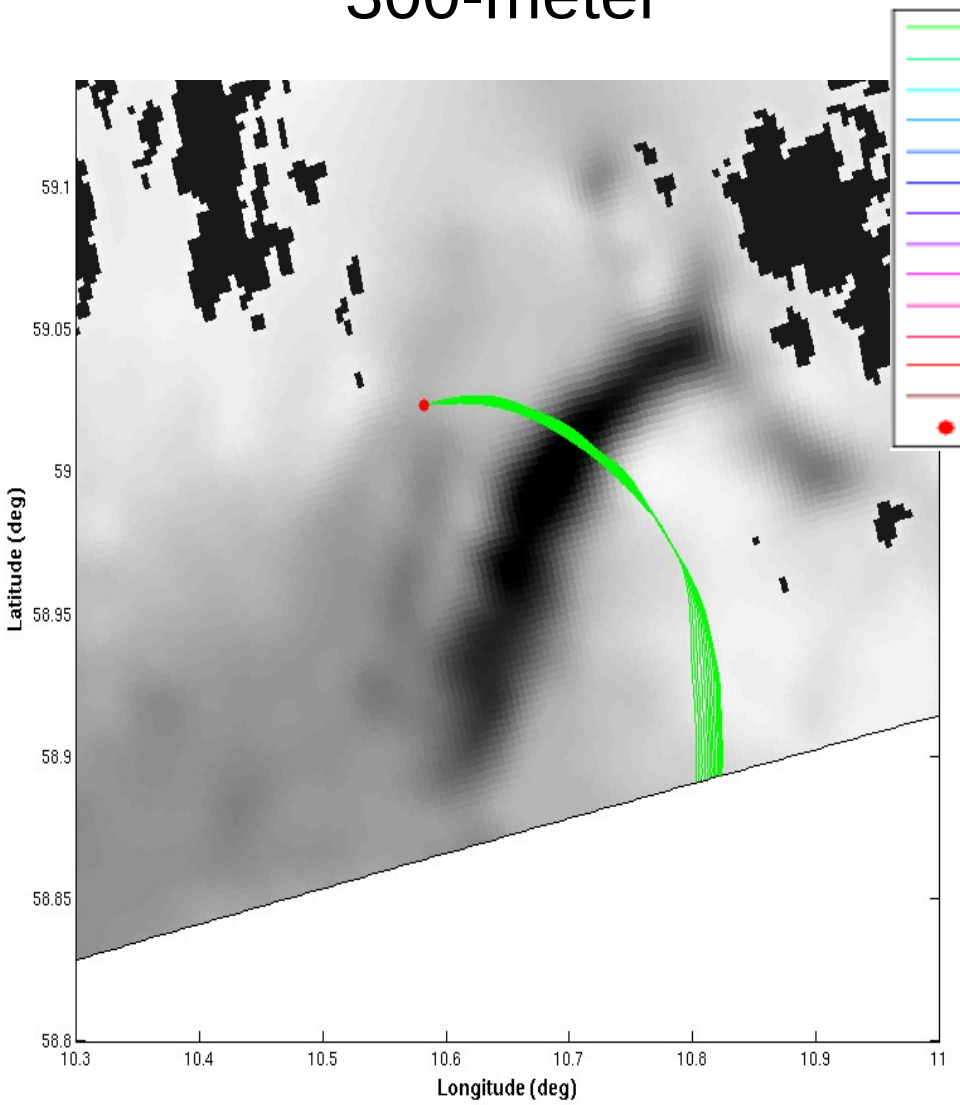
- 6 scenarios
- 24 Lagrangian drifters released
- 5 minute spacing

Run no.	Start	End
1	11 Feb.	11 Mar.
2	11 May	9 Jul.
3	11 Aug.	9 Sept.

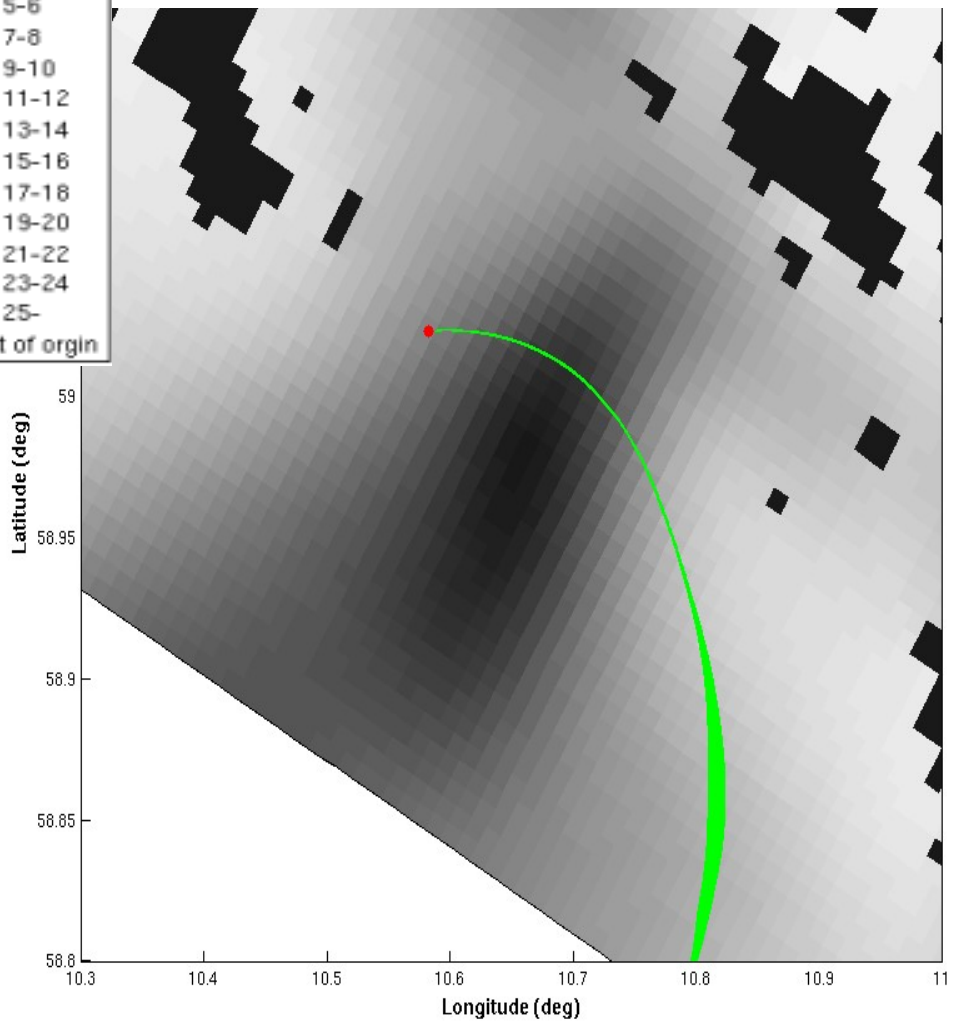


Regime 1

300-meter



800-meter

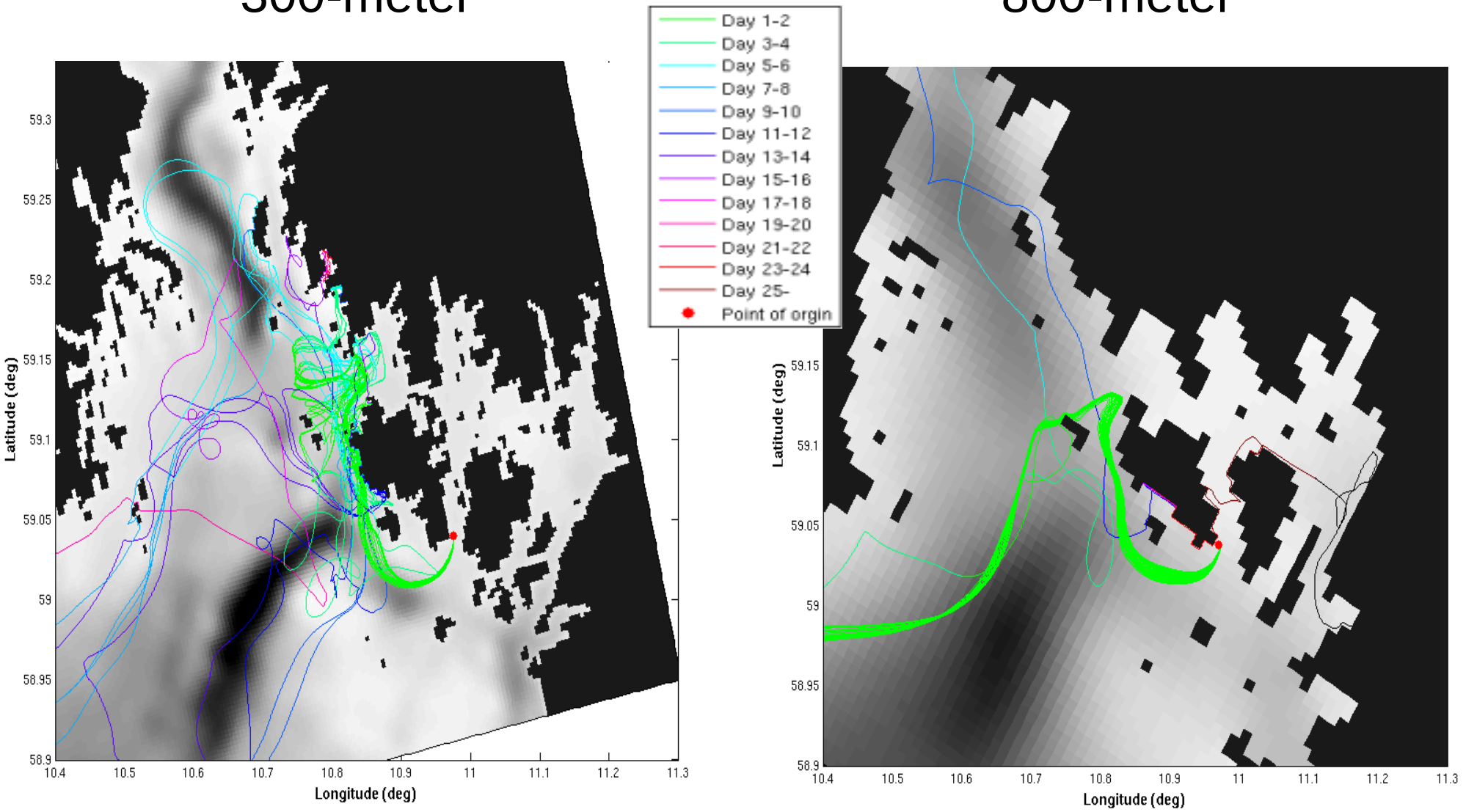


Scenario 1; Run 2

Coastal effects I

300-meter

800-meter

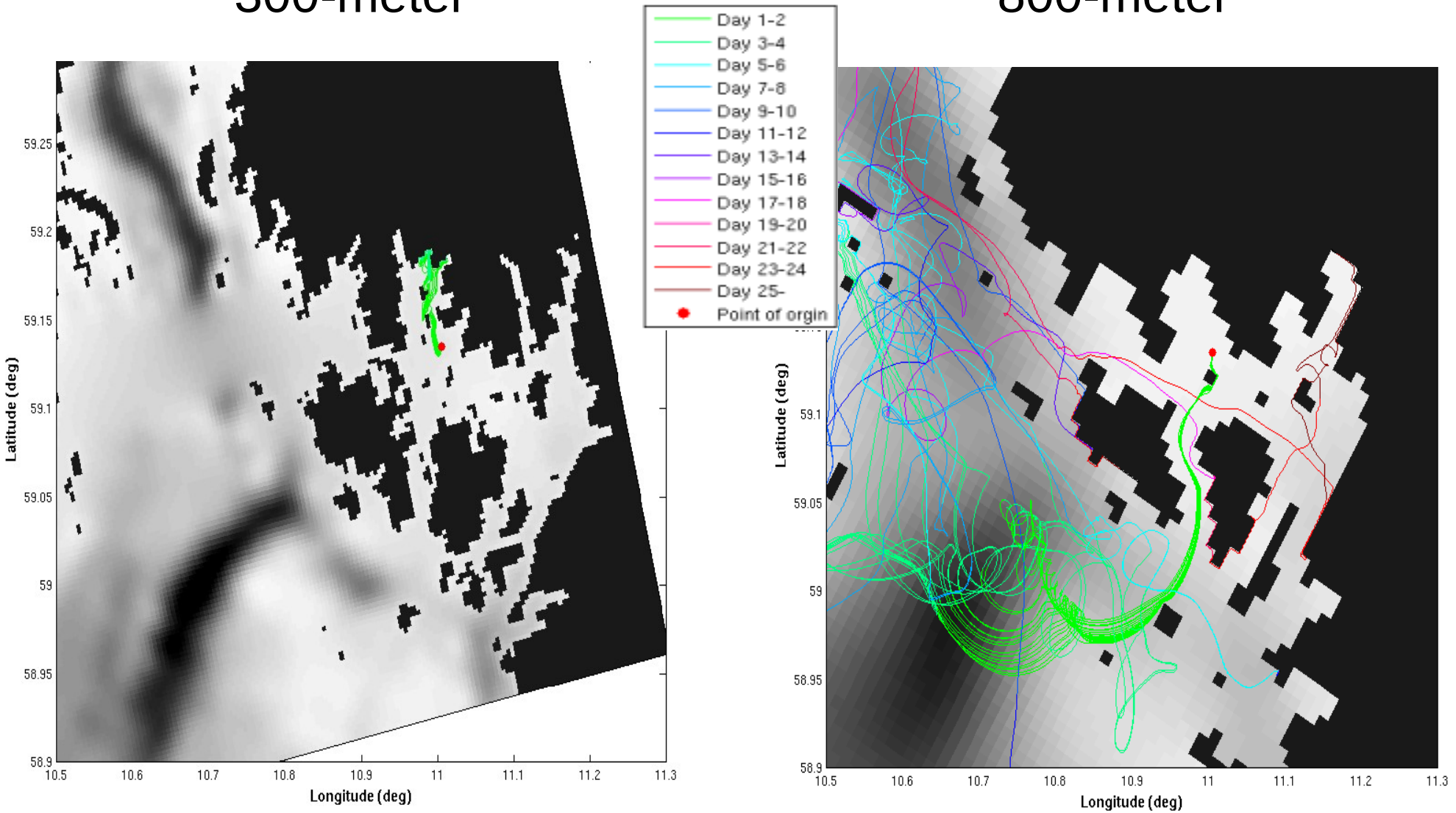


Scenario 2; Run 3

Coastal effects II

300-meter

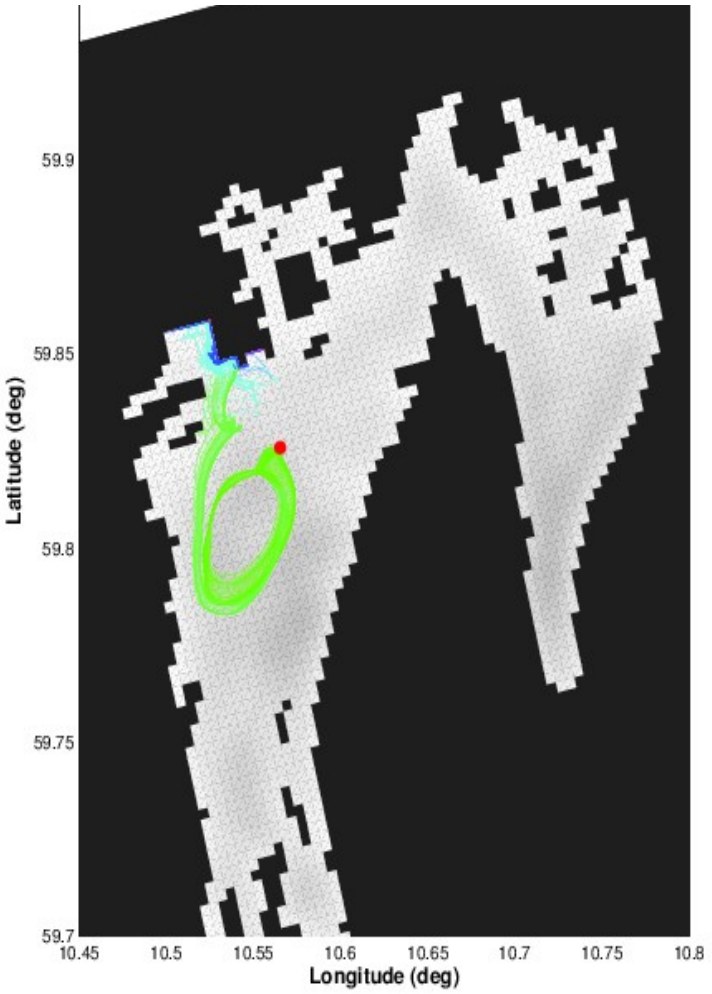
800-meter

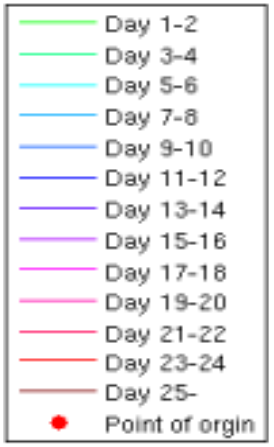


Scenario 3; Run 3

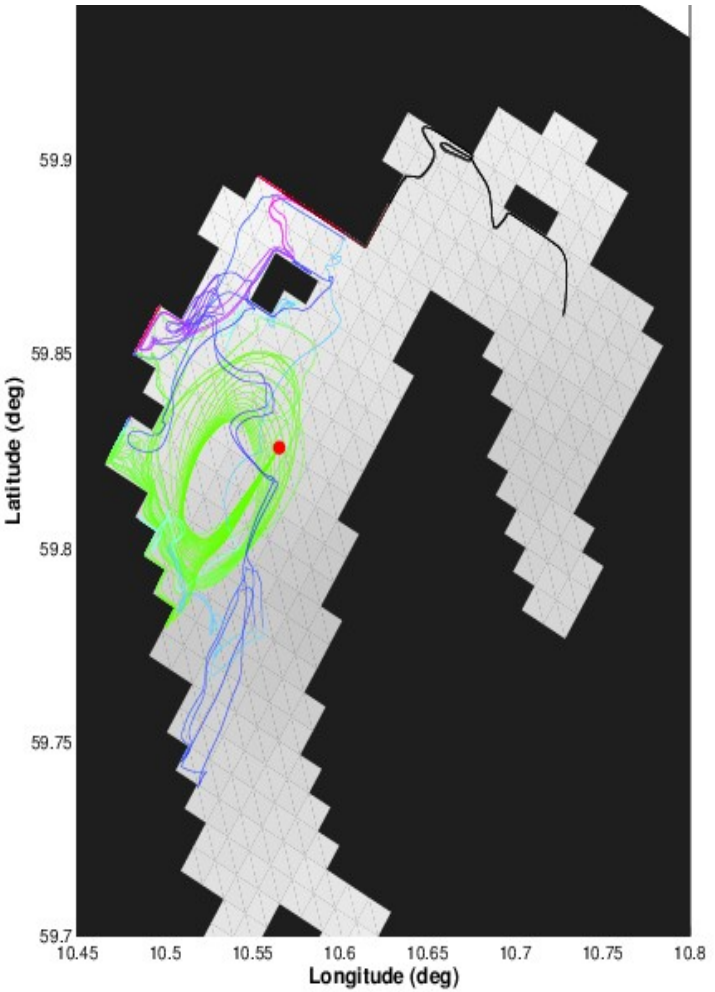
More confined eddy mapping

300-meter





800-meter



Scenario 6; Run 3

Summary

Increased grid resolution has several effects:

- Increased skill in representing coastal geometry and topography
- Increased ability to resolve smaller scale eddies
  - particular submesoscale eddies
  - resulting in a sharper and more confined representation
- Emergency services (e.g., oil spills, search and rescue)