eSAMarine (Phase 1)

A Now-cast/Forecast system for South Australian Fisheries and Aquaculture

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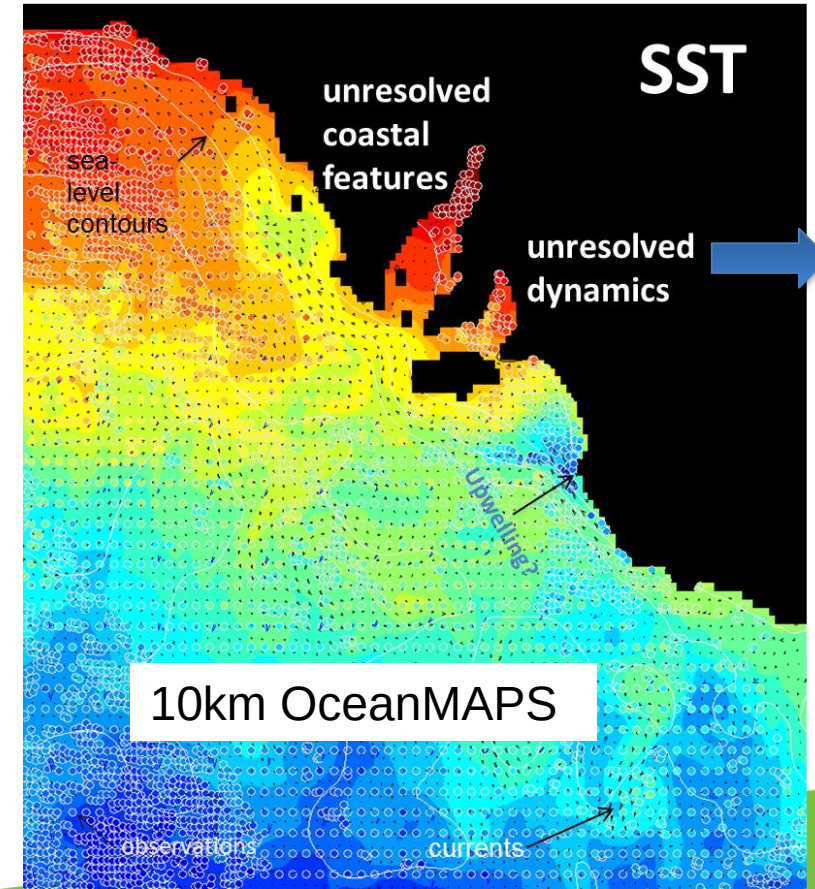
Why Ocean Forecasting: phase 1

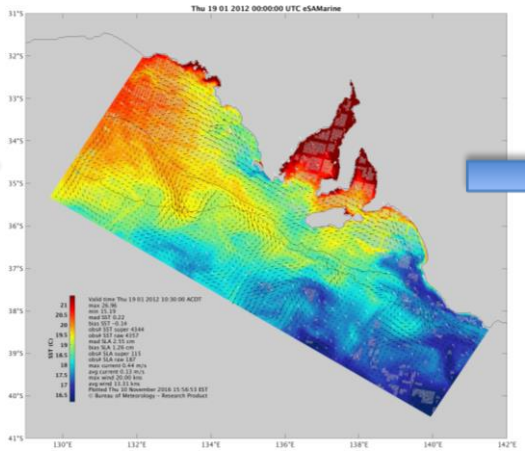
- Forecasting extreme events
- Trajectory predictions of toxins, HABs, oil: mitigation
- Optimal ship routing for SBT towing
- Environmental indicators (e.g. temperature) of fish habitat
- Search and Rescue
- Archives of now-casts for fisheries research
- Science/add value to field trips
- Phase 1 (one year study) provides a starting point in capability for the above

Nested Model Approach

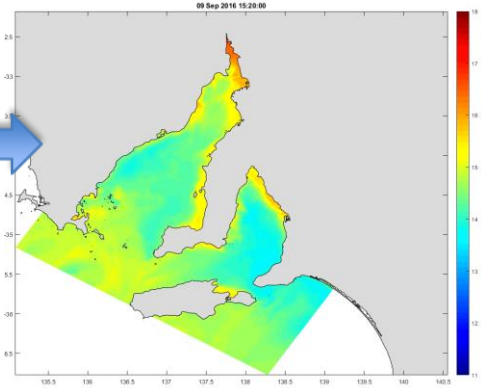
IMOS Integrated Marine Observing System

DATA





2.5 km SAROM



500 m Two Gulfs Model

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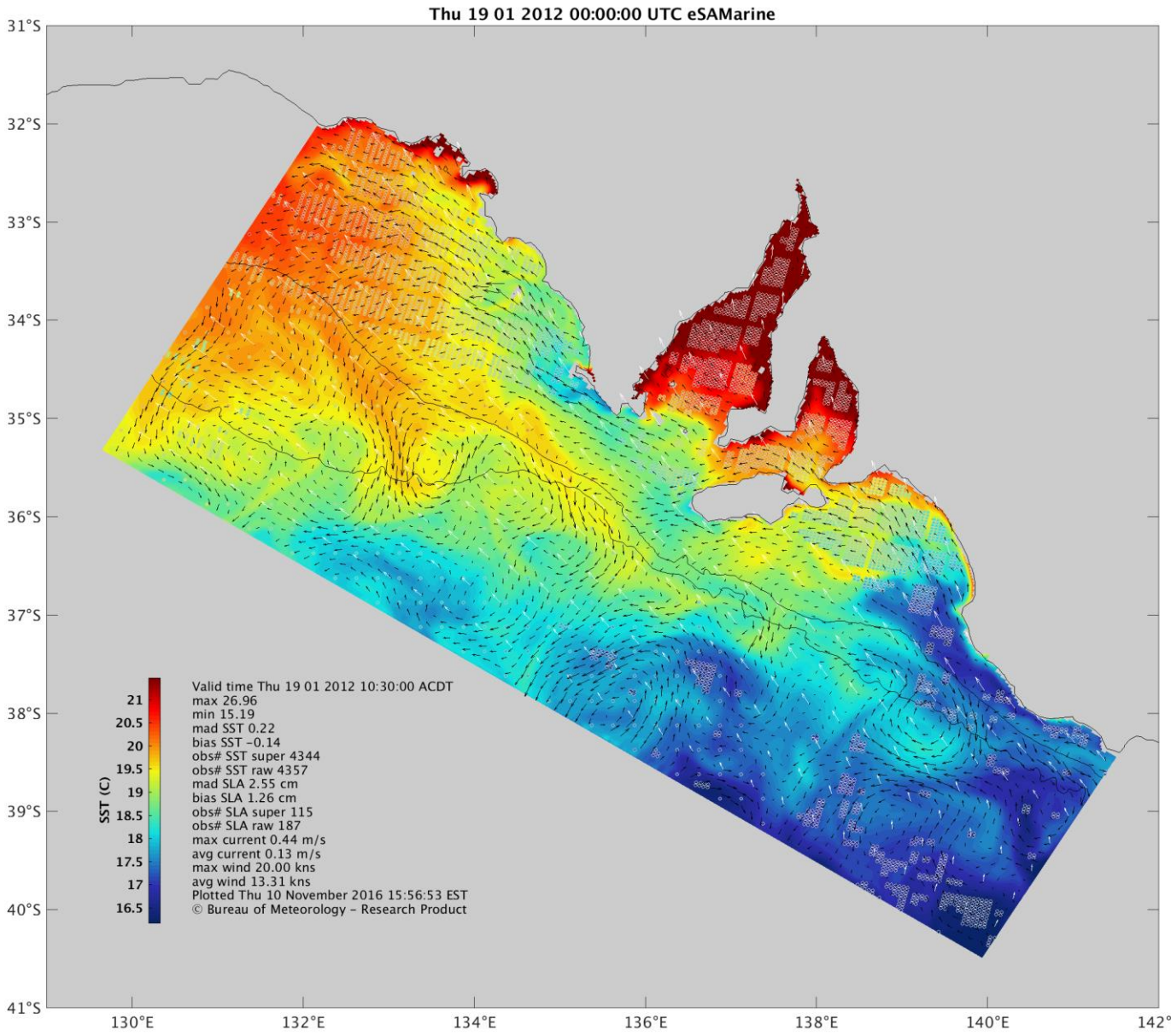
eSAMarine shelf reanalysis system

- Data assimilating ROMS 2.5km model
- Atmospheric forcing from NCEP CFSR reanalysis
- Nested in BRAN
- Tidal forcing TPX08
- Assimilates all available satellite and in-situ ocean observations (available on GTS)
- 2010-2015

[Go to eSA-Marine website]



Case Studies Continued

- Now-cast/forecast of dispersal of toxins/HABS/sea lice/MOB

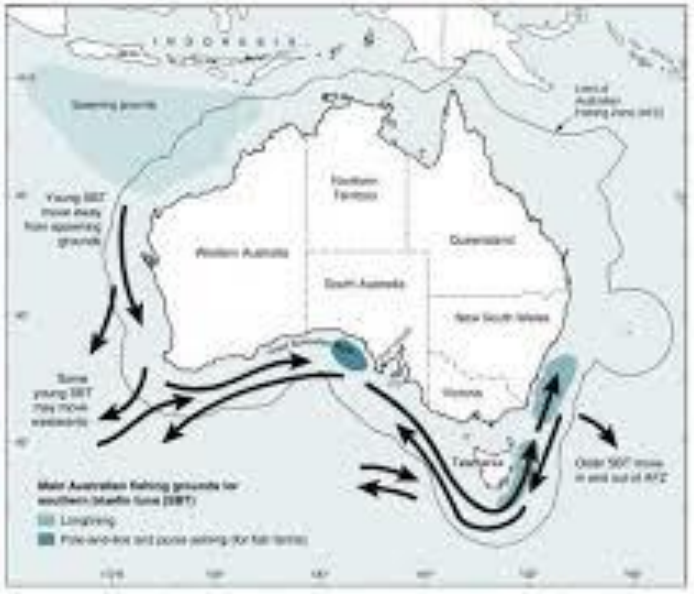
a) Boston Island Region

b) North Kangaroo Island region

c) Wallaroo

d) Can backtrack particles to find origin

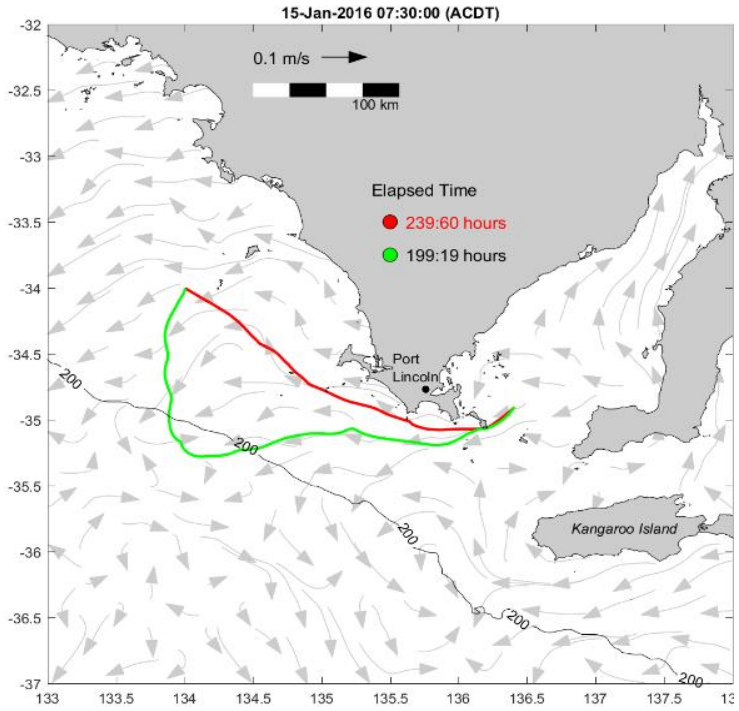
Case Studies Continued- Ship Routing



The problem: SBT are caught in very large pens on the southern shelves but can only be towed back to Port Lincoln at relative speeds V equal (or less) than 1 knot =0.5 m/s (avoid bruising) and in water depth > 40 m (avoid grounding).

Transit time can take 10 days so can “optimal routes” be determined that will minimise the transit times and transit distances and save money and time?

GAB example: Use SAROM re-analysis archive of surface currents (U) for Jan 5th Jan to 15th 2016: weaker currents from S.E.



Play Animation

Initial path guess = 4 way points.

Shortest transit time route (green) time = 199 hrs (distance =382 km)

Shortest distance route (red) time = 239 hrs (distance = 271 km)

Saving of 40 hrs (20 %).

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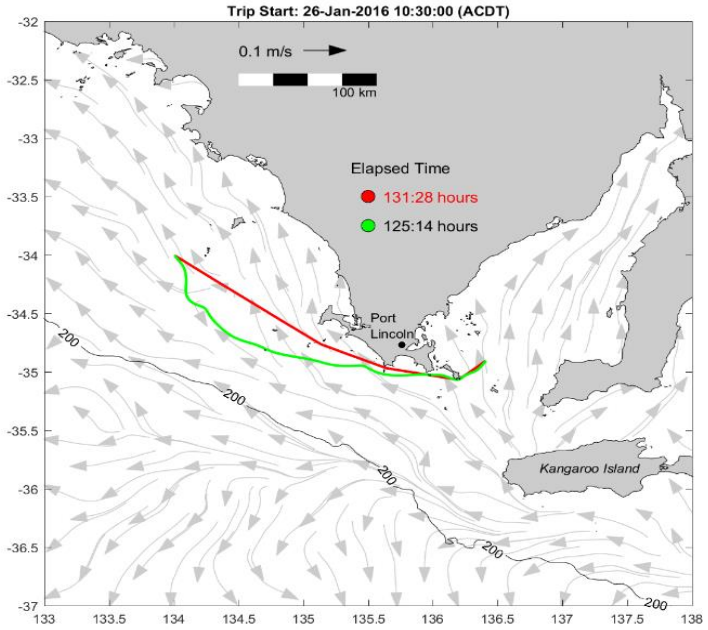
GAB example: Use SAROM re-analysis archive of surface currents (U) for Jan 26th Jan to 2nd Feb 2016: weaker currents from S.E.



Play Animation

Initial path guess = true minimum distance solution s.t. U=V=0 & H>40 m

Shortest transit time route (green) time = 125 hrs (distance =287 km)

Shortest distance route (red) time = 131 hrs (distance = 265 km)

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Ship Routing Summary

- if vessel speed V large , the fasted and shortest routes are equal to the true minimum distance route
- using the true minimum route as a first guess appears to lead to the shortest distance and transit time routs
- strong variable ocean currents should lead to shortest time route transits being significantly smaller that those for the shortest distance.
- ocean currents can increase route time by 50 %
- effects of waves and winds need to be incorporated.

eSA Marine - Phase II

While the Phase I project is on track, the following have been identified as beyond current project scope and most needed for Phase II.

- Extra computer “grunt” needed by SARDI to deliver now-casts on time –currently a day late.
- Coffin Bay included

- Plan view results need to be exported as Google Earth maps where (lat,longs) obtained by “right click”

- TGM to become data assimilating to improve accuracy – new satellites for higher res. SST, SSH will greatly help.

- Additional testing of model validity and limitations.

- Optimal ship routing to be further explored and effects of waves/winds incorporated.
- Other environmental indices or relevance to be incorporated (eg., sardine location)