SOMISANA: A Sustainable Ocean Modelling Initiative: A South African Approach

Jennifer Veitch
South African Environmental Observation Network

Operational oceanography for well-informed decision making

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Operations Phakisa and the Oceans Economy

An initiative to 'fast-track' the implementation of solutions highlighted as issues in the National Development Plan 2030

Six work streams:

1. Marine Transport and Manufacturing

2. Offshore Oil and Gas Exploration

4. Marine Protection Services and Ocean Governance

5. Small Harbours

6. Coastal and Marine Tourism

Why Oceans Economy matters:

Potential to contribute up to R177 billion to SAs GDP by 2033 and to create over a million jobs

The Oceans and Coastal Information Management System

Marjolaine Krug, OCIMS manager, DFFE

OPERATION PHAKISA
planning | implementation | growth

https://www.ocims.gov.za

- Harmful Algal Bloom
- Ops at Sea
- Coastal Flood Hazard
- Integrated Vessel Tracking
- Coastal Viewer
- Marine Spatial Planning
- Water quality
- Oil spill / Bilge Detection
- Fisheries Support

Science aimed at societal issues and in support of institutional decisions

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The Oceans and Coastal Information Management System

2016: HAB event costs the aquaculture industry R70m

Harmful Algal Bloom

The Marine Information Management System
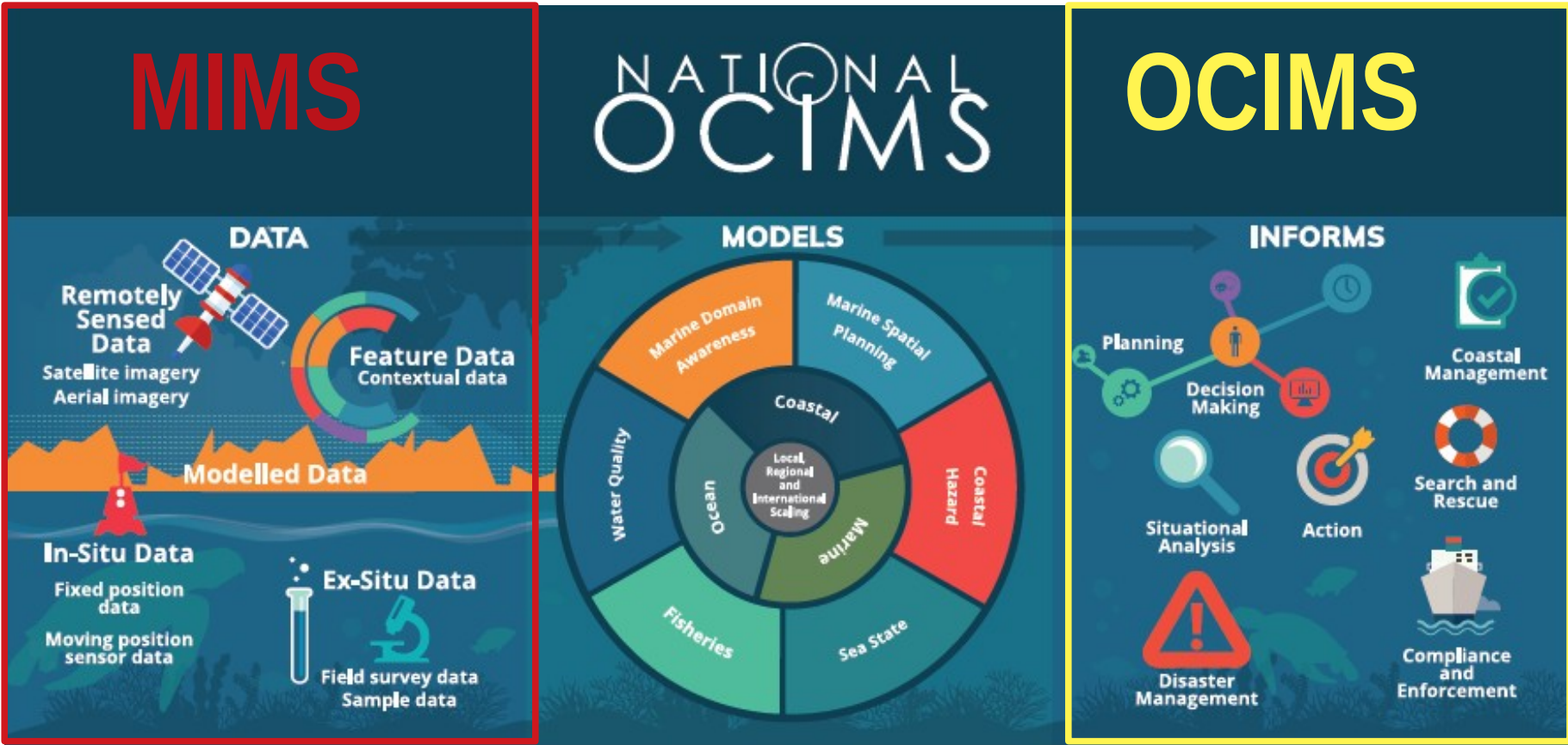
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The Sustainable Ocean Modelling Initiative: a South AfricaN Approach
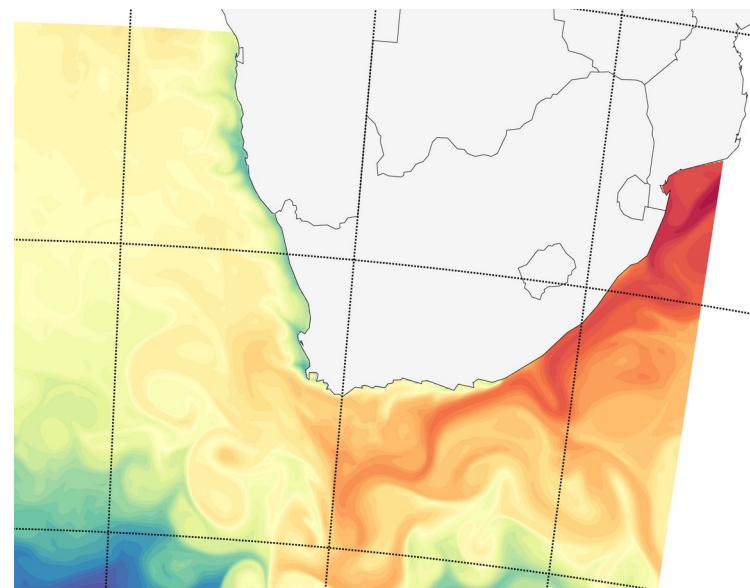
Jennifer Veitch, SOMISANA lead, SAEON

VISION

A sustained and transformed **critical mass** of internationally recognized South African numerical ocean **modelling experts** who provide **accurate information** about the changing state of the ocean for **enhanced impact**.

MISSION

An **ocean modelling hub and platform** that promotes the **inclusive development of local expertise** and that produces and **provides state-of-the-art ocean information**, tools and research that is **visible and accessible to all**.

GOAL

1. **Modelling developments:**
   - Limited domain regional OFSs
   - Optimized hindcasts
   } **OCIMS**

2. **Capacity development:**
   - student supervision, workshops etc ..

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GOAL: Capacity Development

Student supervision as part of collaborative projects:

Realistic, coupled hydrodynamic-biogeochemical modelling
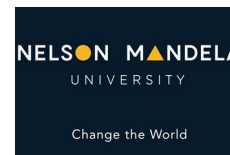
Data assimilation

Lagrangian-particle tracking

High frequency, high resolution bay-scale modelling

Analysis of model output

Model evaluations

	Hons.	MSc	PhD	Postdoc
Graduated	4	3	2	1
Current	0	2	5	

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GOAL: Capacity Development

Funded: Three-year NRF-IRD project to develop ocean modelling capacity via:

- workshops and training schools
- mobility for collaborative projects

Proposed: A BRICS Predicted Ocean: Roadmap and Demonstration of model validation, intercomparisons and applications for sustainable management of the coastal ocean.

- workshops and training schools
- engagement with HDIs to *co-develop* coursework

SUSTAINED SOLUTIONS!

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GOAL: Contribution to OCIMS

1. Adding value to existing operational satellite and model products

Matt Carr and Cristina Russo, Ocean Product developers

Core and edges of Agulhas Current
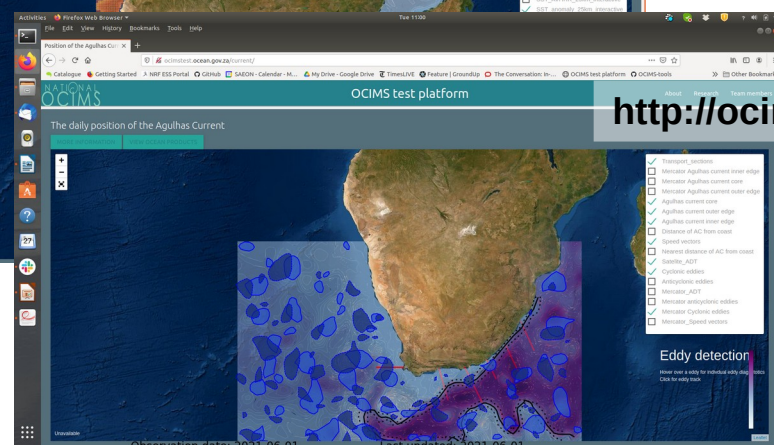
Distance of Agulhas Current from major ports
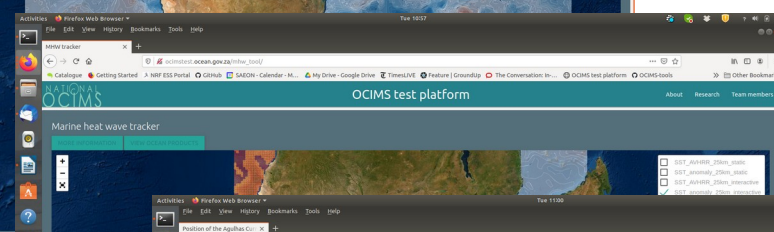
Current transports

SST anomalies

Marine heat waves

Eddy tracking
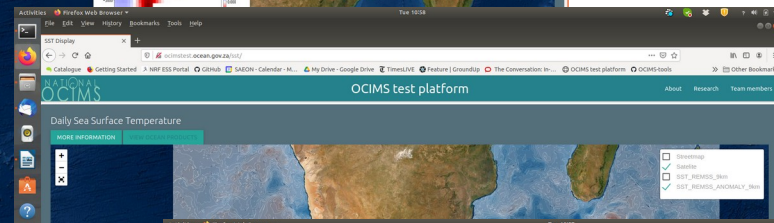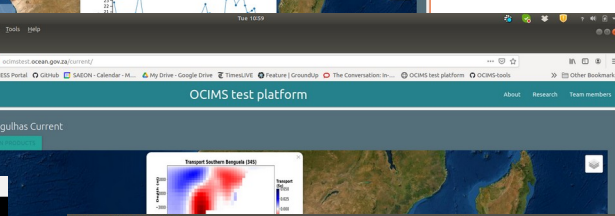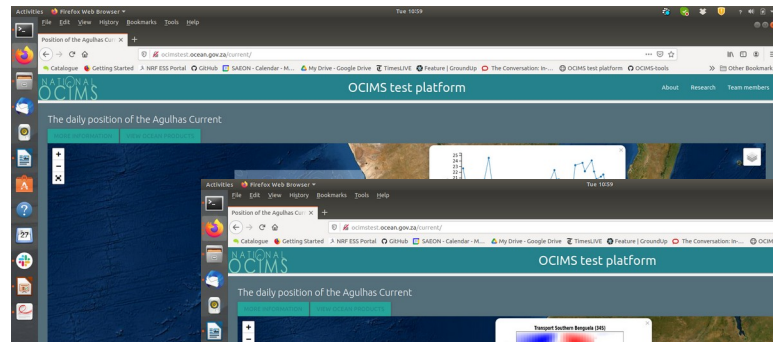
http://ocimstest.ocean.gov.za/

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GOAL: Contribution to OCIMS

2. Downscaling global forecast models, optimized for key coastal regions

Giles Fearon, Model Developer

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Limited-domain operational ocean forecast system (OOFS):
Algoa Bay as a pilot

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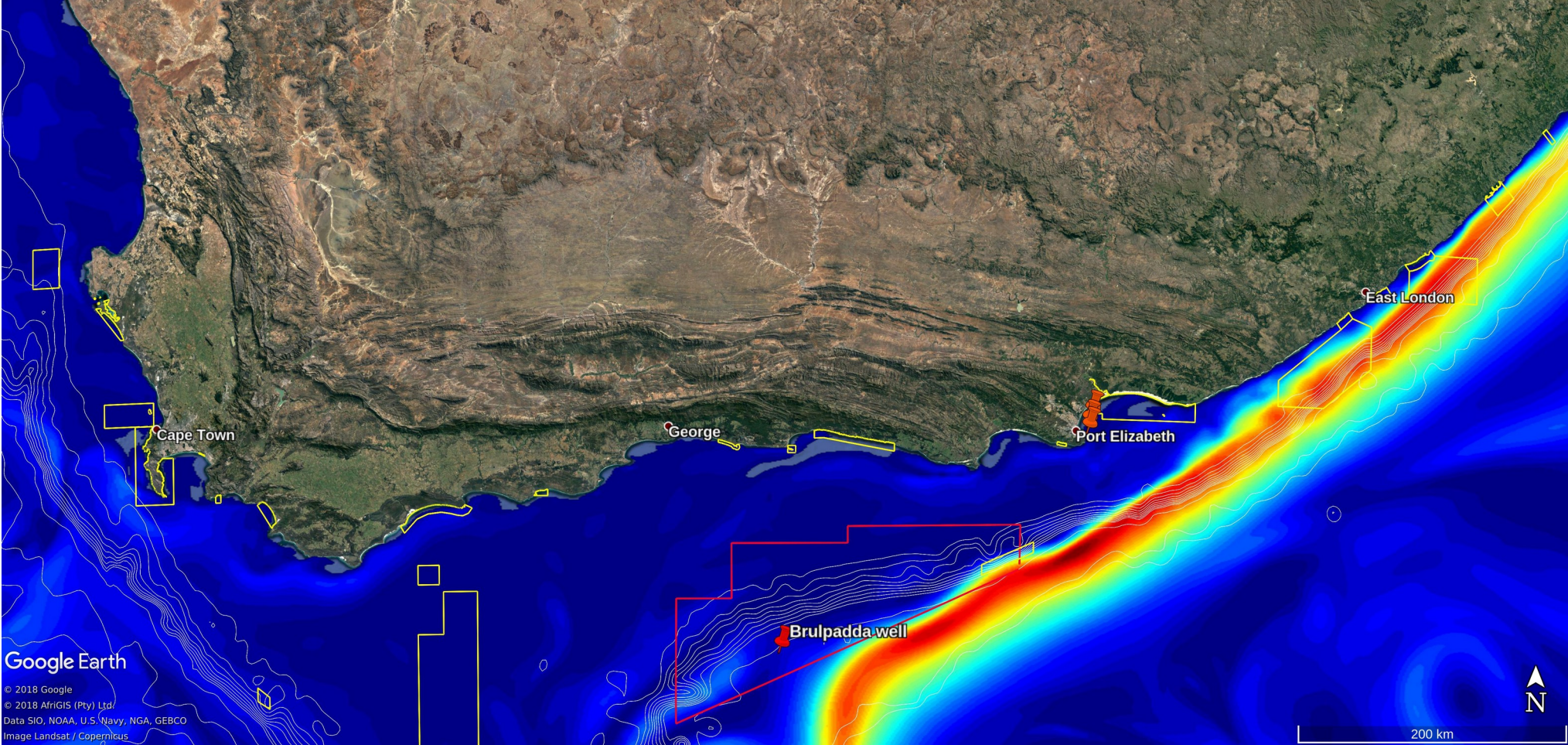
SAEON SMCRI* sentinel site and therefore relatively data-rich
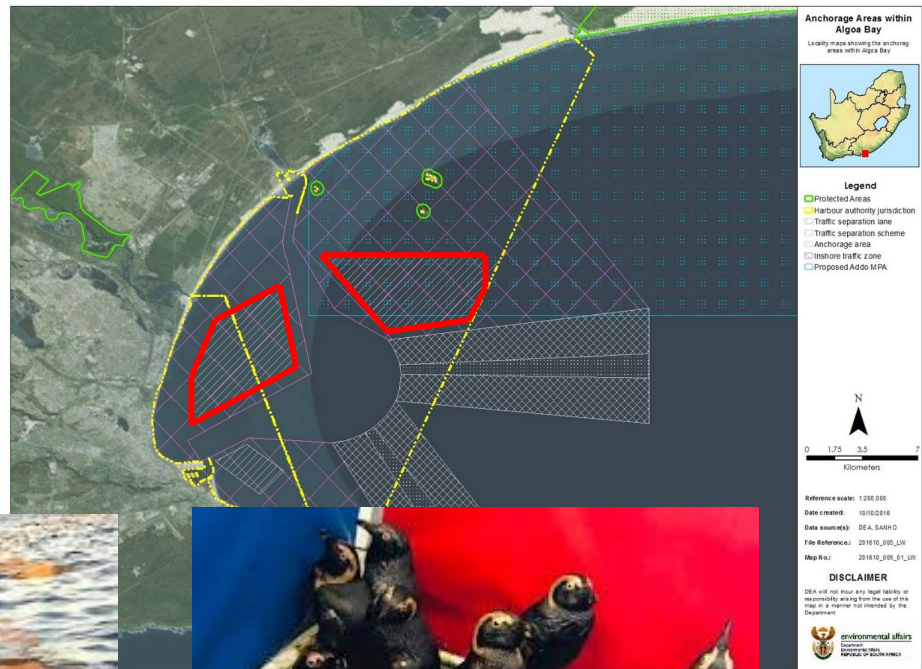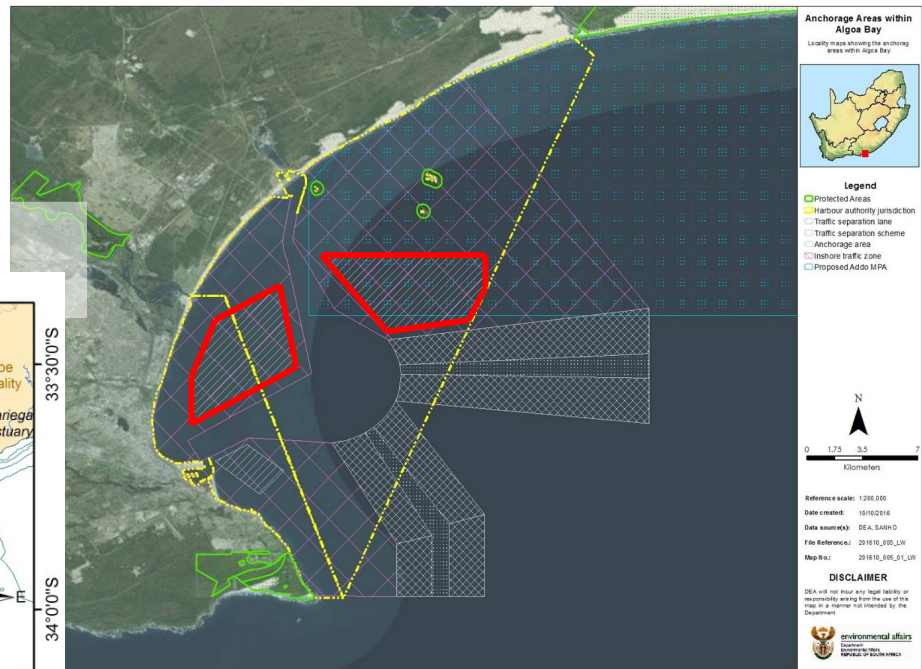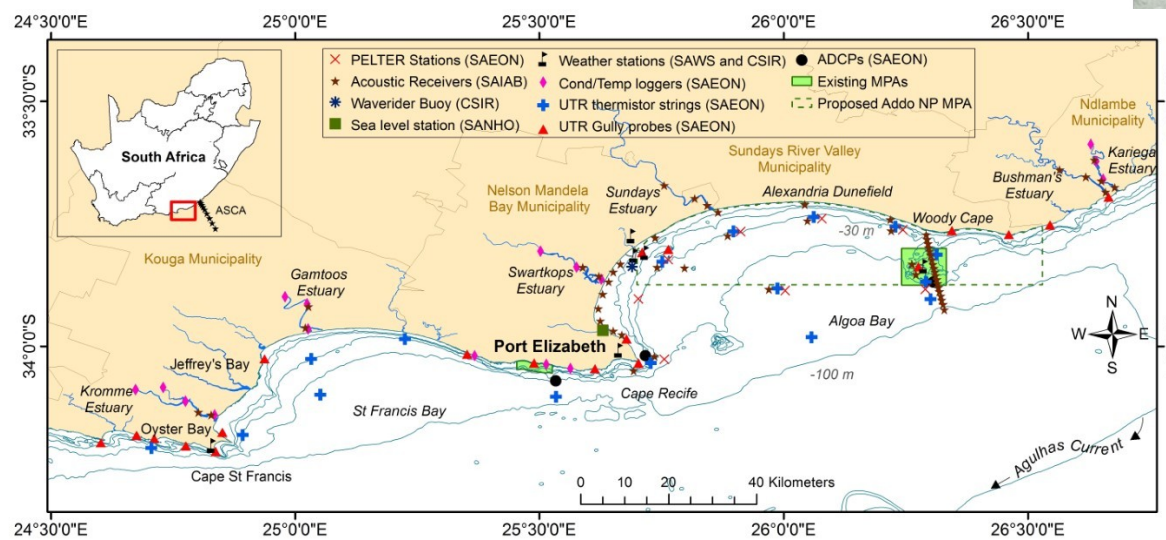
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GOAL: Contribution to OCIMS

2. Downscaling global forecast models, optimized for key coastal regions

Giles Fearon, Model Developer

Limited-domain operational ocean forecast system (OOFS):
  Algoa Bay as a pilot

- Developed with the Coastal and Regional Ocean COmmunity model (CROCO) – NO assimilation

- Atmospheric forcing: GFS 30 km forecasts

- Boundary forcing: ~ 7-9km GLORYS forecasts
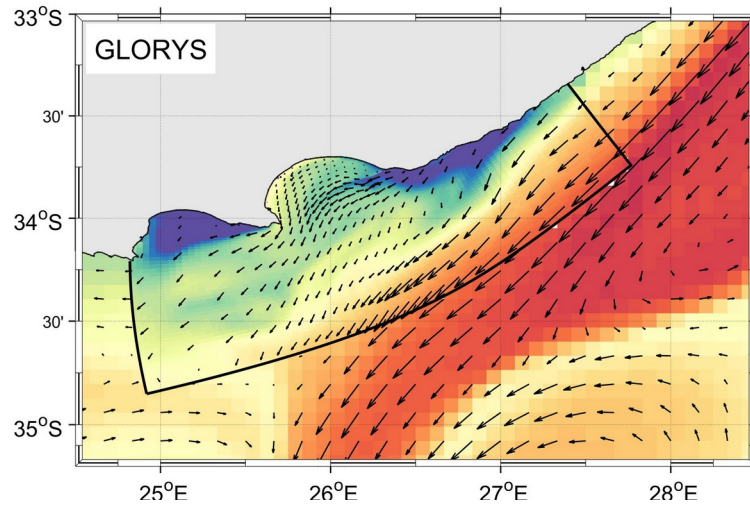
- <u>**EASY TO IMPLEMENT AND RELOCATE**</u>
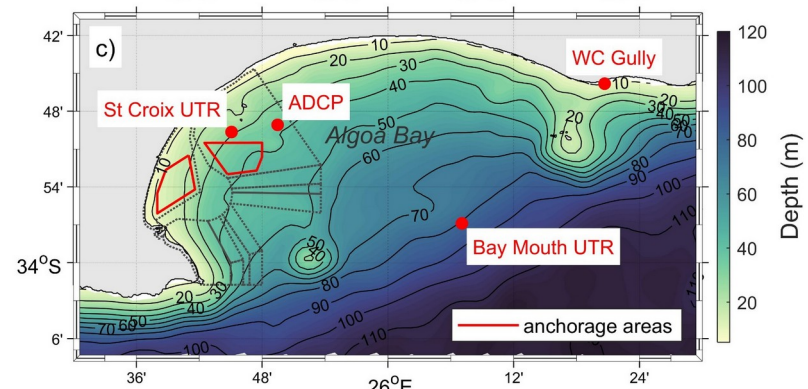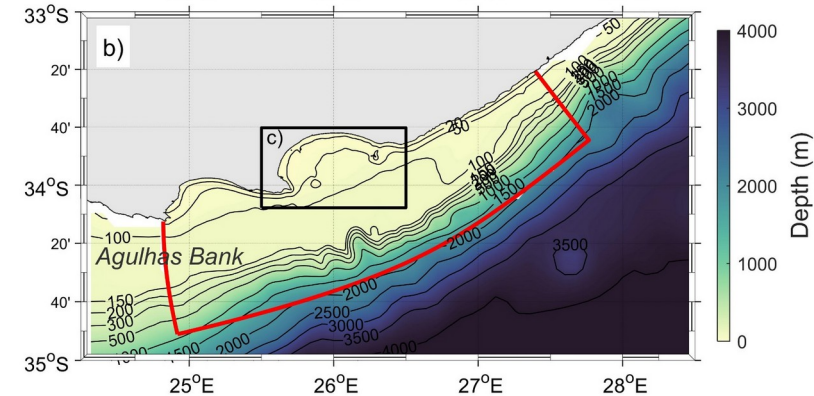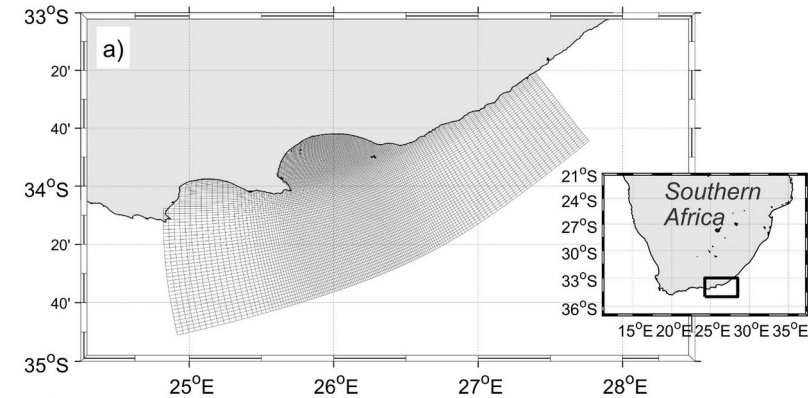
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GOAL: Contribution to OCIMS

2. Downscaling global forecast models, optimized for key coastal regions
Testing the model configuration in hindcast mode

Temperature

Measurements courtesy of SAEON Elwandle coastal node

Currents

Observations courtesy of Lwandle Marine Environmental Services (on behalf of PetroSA)
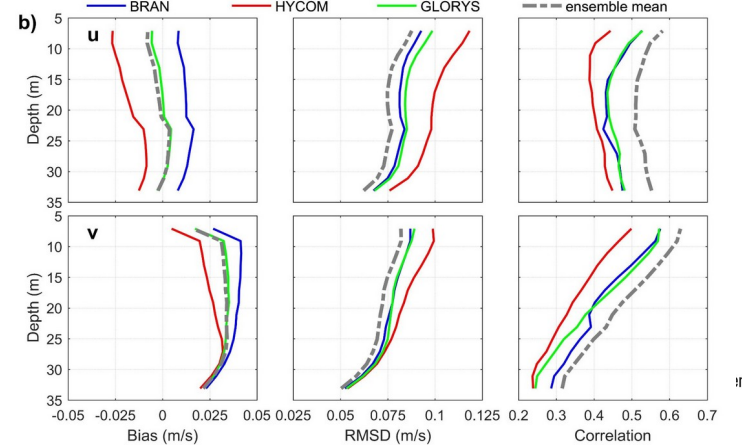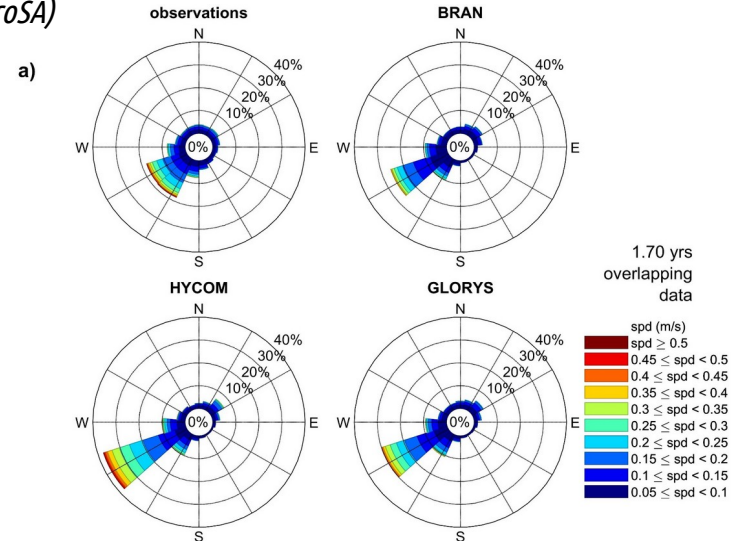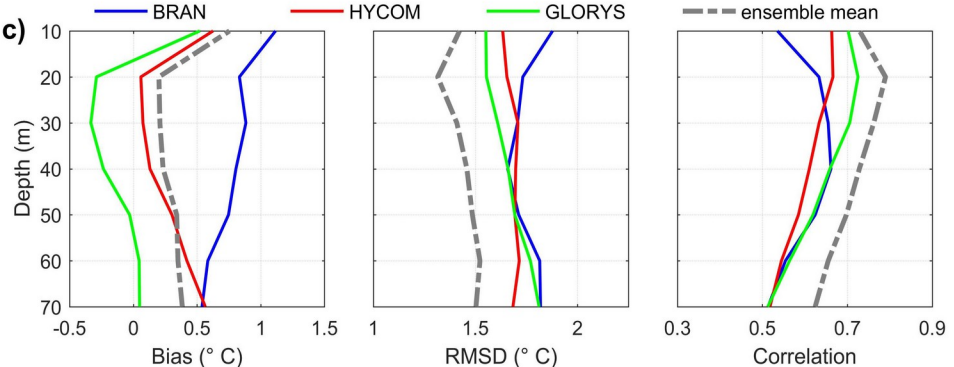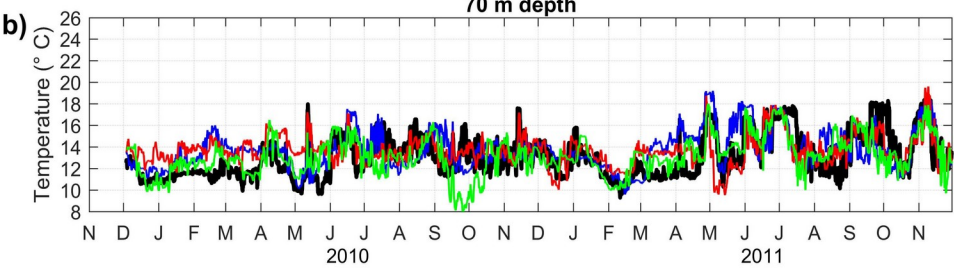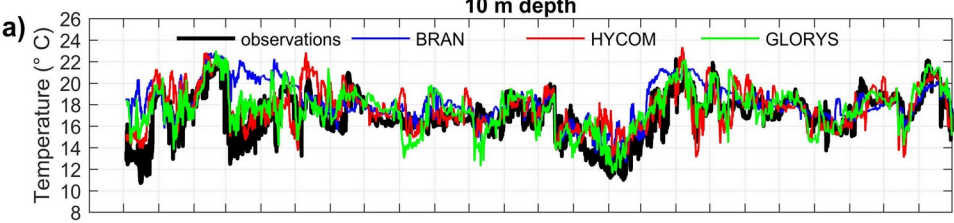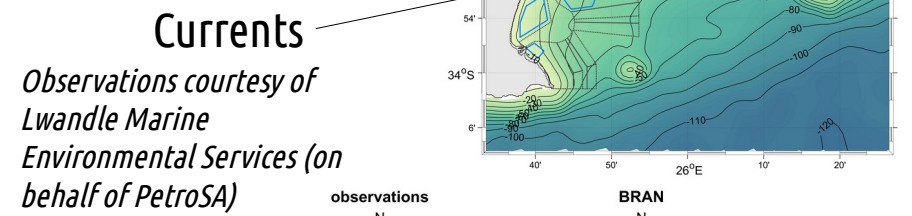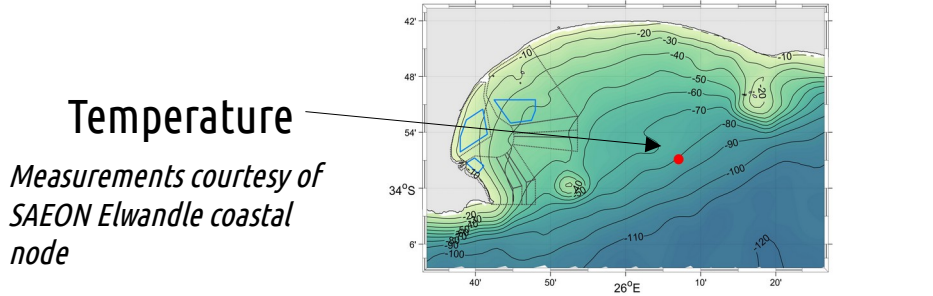
Limited area operational forecast system: Algoa Bay

- Forecast generated once per day, from 5 days into the past to 5 days into the future
- Model boundary conditions from CMEMS, surface forcing from GFS

http://ocimstest.ocean.gov.za/
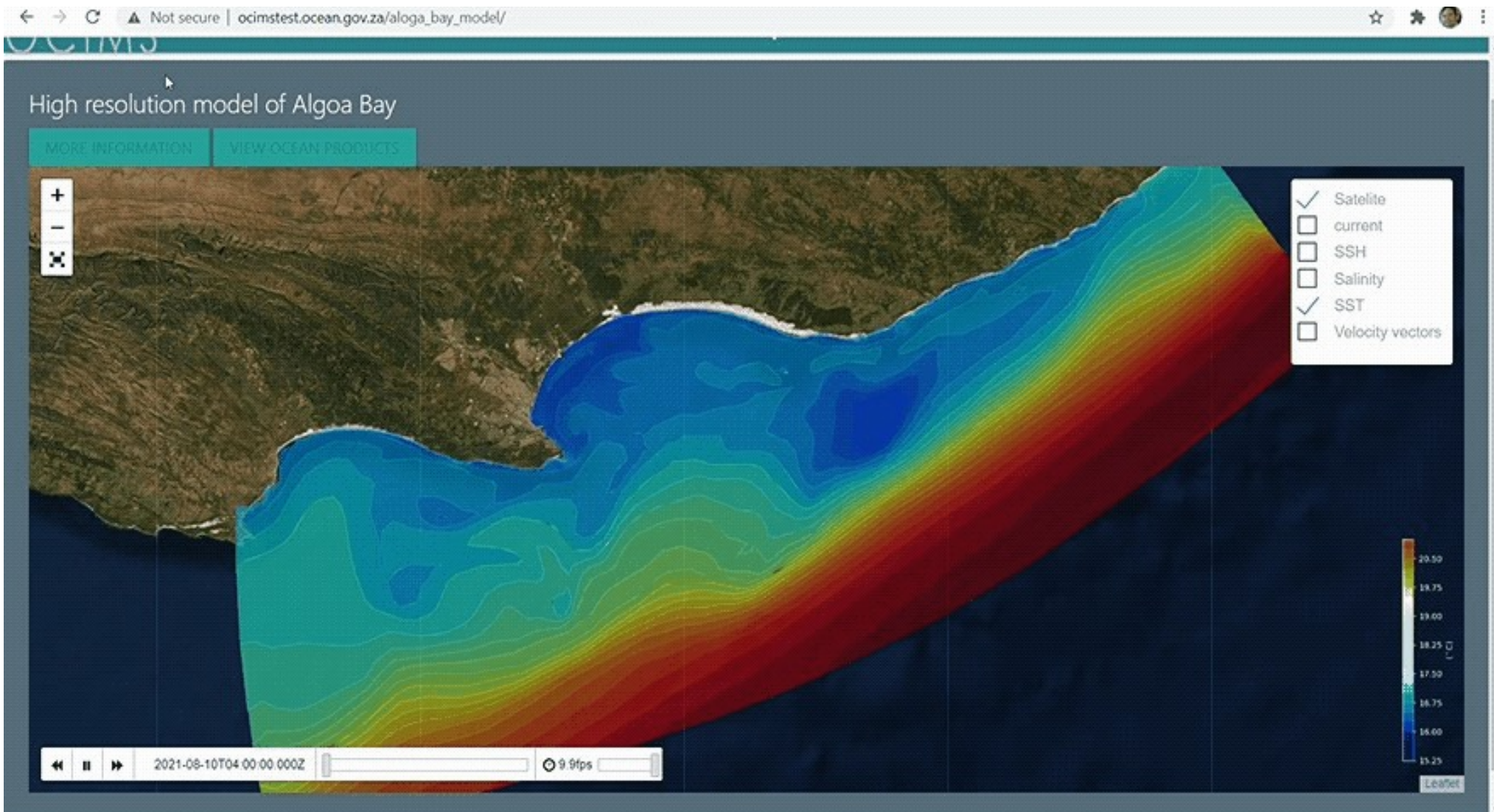
Limited area operational forecast system: hypothetical surface oil spills

- Particles advected using OceanParcels (https://oceanparcels.org/)
- Forced by CROCO surface currents and 3% of GFS 10 m winds

http://ocimstest.ocean.gov.za/
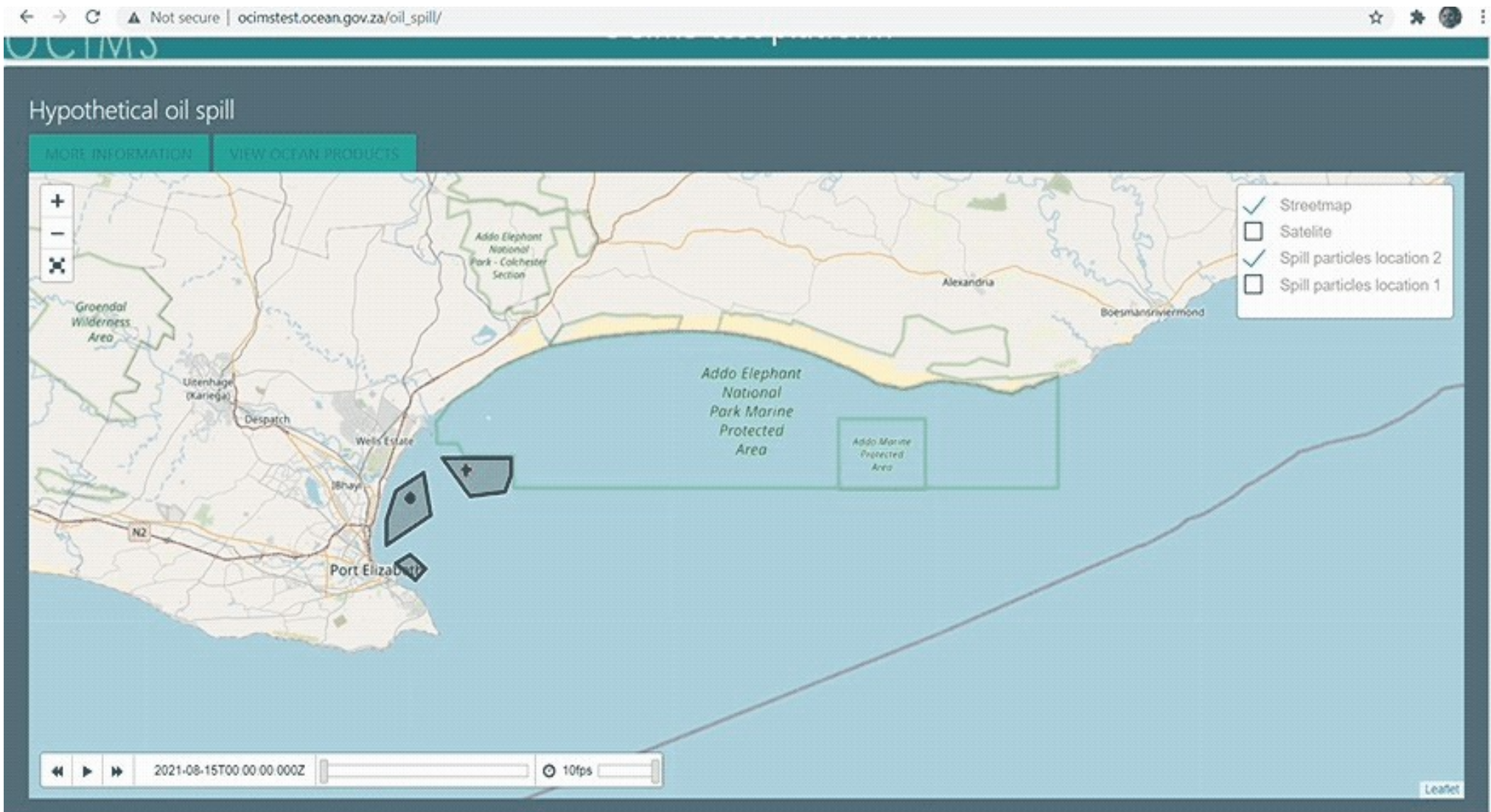
Limited area operational forecast system
List of things to do

- Validation of the ocean forecast and an operational **QA/QC strategy**

- Include model **assimilation** of real-time in-situ observations

- **Improve the oil spill** component of the system (oil weathering and oil-shoreline interaction) and allow for user-specified spill parameters (e.g. time, location, volume, spill duration, oil type)

- Move to **higher resolution atmospheric forecasts** to force the ocean model e.g. from SAWS UM

- Development of **user-defined visualizations**

- Estuary-/Harbour- scale **Delft3D downscaling**

- Ongoing stakeholder **engagement** and **feedback** to ensure that products suit the needs of end-users for maximum socio-economic impact as well as to support the sustainable governance of our oceans and coasts.

- **Apply to other areas of interest** (Southwestern cape coast under construction)

Limited area operational forecast system
List of things to do, challenges .....

Infrastructure!

In situ data!

Bandwidth!

Human capacity!

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Limited area operational forecast system
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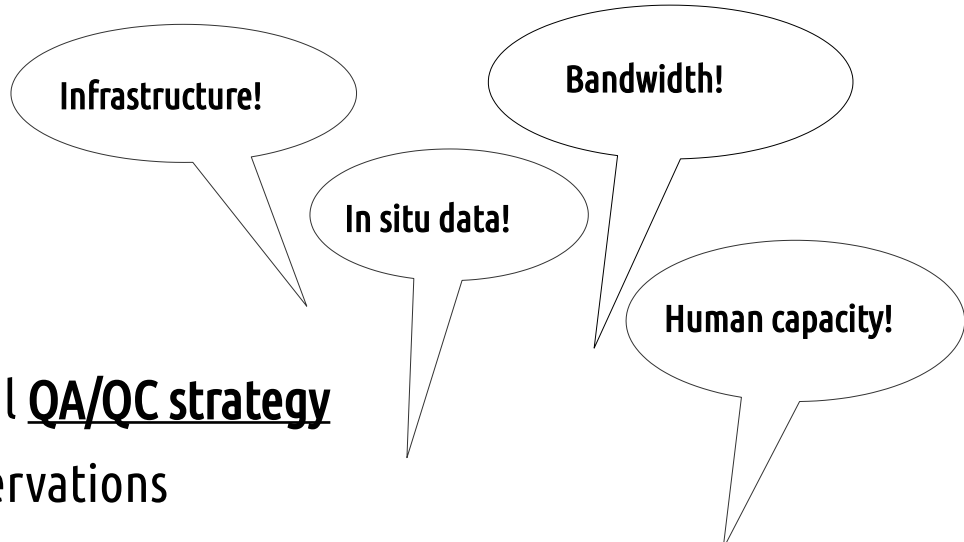### or opportunities?

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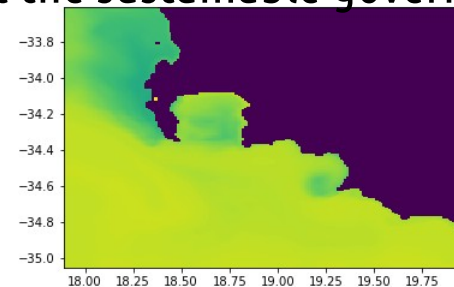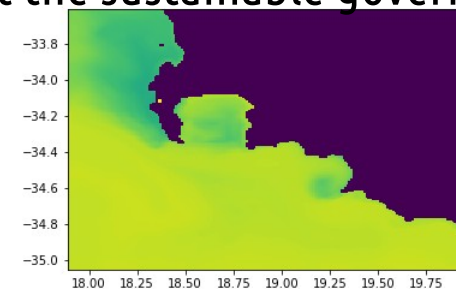- **Apply to other areas of interest** (Southwestern cape coast under construction)

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SOMISANA
From local development to global relevance

Local development that supports bespoke solutions designed for the specific challenges and needs of under-resourced nations

CoastPredict
toward a more resilient society

ForeSea
making ocean prediction more impactful and relevant

DITTO
A shared capacity to access, manipulate, analyze, visualize and effectively use marine information.

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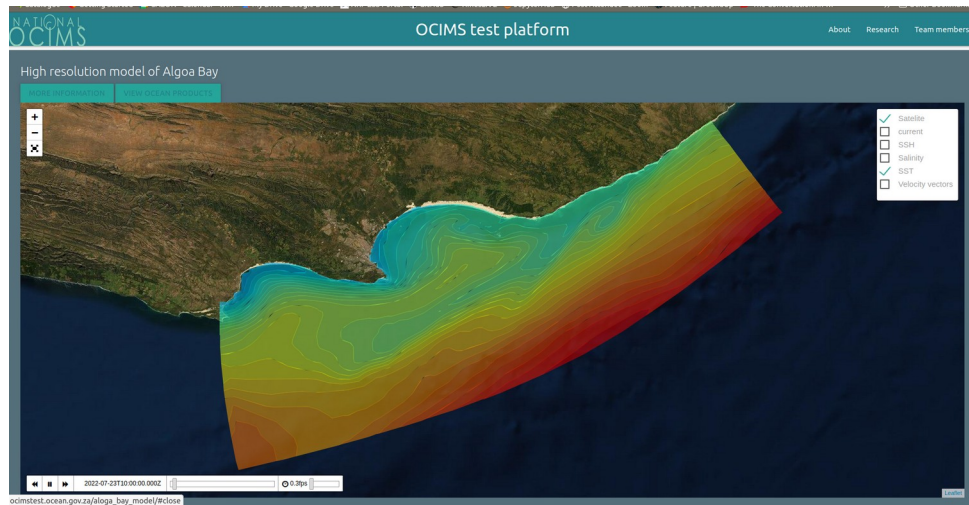Forestry, Fisheries and the Environment
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CLIVAR-GOOS: From Global to Coastal, Trieste, August 2022

Thank you
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