

# FAIR and Interoperable Coastal Ocean Forecasting: a South African Model for Resilient Digital Ocean Services

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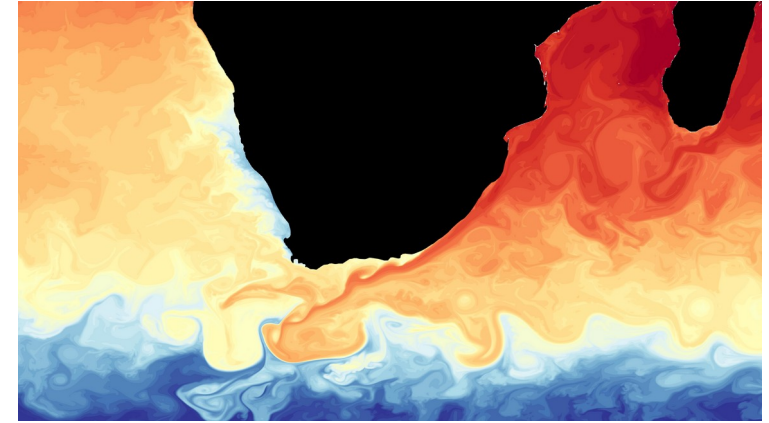


SAEON  
South African Environmental  
Observation Network

30 January 2025

**MEDIA ALERT: FISHERS CALL FOR URGENT ACTION AND ACCOUNTABILITY FOR OIL SPILL ON WEST COAST**

# West Coast beaches polluted by oil spill



## Update: Oiled seabirds sighted in Strandfontein days after oil spill.



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# Austral summer 2016/2017

## RED TIDE

### DEVASTATES SOUTH AFRICAN ABALONE FARMS

Dr. Anna Mouton, BVSc, MSc

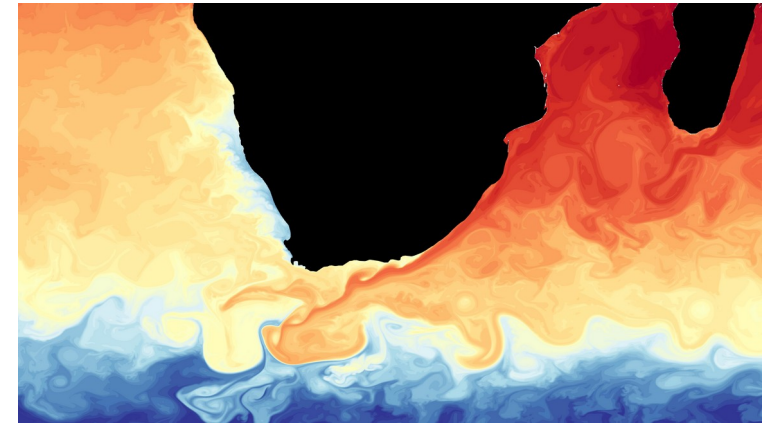
South African abalone farms suffered devastating losses due to a harmful algal bloom earlier this year. Three farms situated in Hermanus, on the South coast, lost up to 50 percent of their stock. These farms held an estimated 24 million abalone, or a third of the total South African farmed abalone population.

NEWS & FOX PREMIUM

## Abalone farming: slow recovery from red tide

Algal bloom a serious blow to Hermanus operation, with 46% drop in turnover to R81m in six months to end-December

March 29, 2018 at 08:58 am



**THE BLUE BEAUTY OF THE BEAST**  
What the sea lacks in beauty in the daytime during the red tide, it makes up for at night with spectacular displays of phosphorescence in Walker Bay. According to resident Ronnie Hazell there have been beautiful displays in the breaking waves and spray along the Hermanus coastline.

PHOTO: Ronnie Hazell

## Monstrous red tide is the largest ever

De Waal Steyn

This red tide is huge – this is definitely mother nature at her most powerful and the sheer size of the algal bloom is astounding. A red tide of this magnitude has never been recorded in Hermanus before, says Tim Hodges, Managing Director of Abagold.

According to Tim, the algae

bloom stretches at times well over 3 km into the ocean from the shoreline and can be viewed on satellite imagery from the West Coast past Cape Point up to Cape Agulhas – an area spanning some 500 km.

Residents and visitors were alerted to the red tide last week and urged to refrain from harvesting any shellfish, especially mussels, as this could lead to illness if eaten.

"We are lucky that the current red tide is not toxic and ingesting shellfish or sea water will probably only cause a mild upset stomach. The impact on marine life however, especially abalone, is unfortunately much more severe. Prolonged exposure to these conditions causes high levels of stress for these animals.

The dinoflagellate organisms clog the gills of abalone and they suffer stress from a lack of

oxygen. This may lead to significant losses for abalone farms," adds Tim.

But, according to him, Abagold's employees have united in their efforts to manage this event and are currently working around the clock to ensure the well-being of their stock. "I cannot describe how proud I am of our Abagold team. We became aware of a build-up of nutrients in the water in early January, which is normal each

year, but when the excessive volume of the bloom started on 16 January we were ready to put all our energy into combating the effects of the red tide.

"For the past two weeks our employees have been split up into groups that cover the farm 24 hours a day, 7 days a week. Our employees ensure that the animals receive enough water (leading to more dissolved and available oxygen) and they clean and

flush out the tanks at least once a day. By reducing the number of animals in each tank and by diluting the infected water with as much clean water as possible (when we get natural breaks in the tide) we have been able to keep losses to a minimum. Abagold pumps close to 12 million litres of sea water per hour into our tanks. To date we have sustained losses of 3.3% of our stock equating to some 26 tons."

Continued on P 3

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# National Oceans and Coastal Information Management System

## OCIMS: decision support tools for South Africa's Blue Economy



- Improve ocean protection and management and promote the development of an environmentally conscious ocean economy through the **sharing of knowledge and data** across the public and private sector.
- Encourage across-government collaborations, **communities of practices** and partnerships.
- Develop a fit-for-purpose operational system through continued consultations between developers and stakeholders.
- Remain locally relevant and **globally cognizant**.

# National Oceans and Coastal Information Management System

## OCIMS: FAIR Data Management



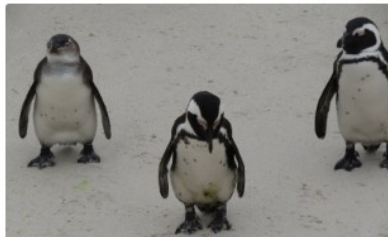
### Data related initiatives



#### Marine Information Management System (MIMS)

MIMS is an archival data repository for marine and coastal data.

Launch >



#### Bird flu (Avian Influenza) reporting form and dashboard

A data capture (SA seabird bird flu form) and visualisation response to the bird flu outbreak.

Launch >



#### Marine Animal Sightings dashboard

The dashboard shows information regarding marine animal sightings captured by permitted operators.

Launch >

- **Marine Information Management System (MIMS):**
  - South African Node for ocean data and an accredited data unit of the IOC and the AfrObis Node for Sub-Saharan Africa
  - **Interoperable** system that shares metadata with external repositories to maximize discoverability
- **Data Capture Apps:**
  - Data captured by various stakeholders and general public using smartphones, tablets and laptops
  - **Immediately received and visualized** in near real time.



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# National Oceans and Coastal Information Management System

## OCIMS: freely available static tools



### Static Tools



#### Coastal Viewer

View marine and coastal spatial data from various custodians and perform basic spatial queries.

[Contact us](#) to contribute data.

Launch >



#### Marine Spatial Planning

Viewer for Marine Spatial Planning activities in terms of the Marine Spatial Planning Act (Act no. 16 of 2018).

Launch >



#### Coastal Flood Hazard

Bathtub-based flood model allowing users to incrementally 'drown your town', which is useful for risk scenario planning.

Launch >





- **Freely available access** to layers with basic interactivity for non-experts.
- Stakeholders include: coastal municipalities, coastal provinces, town planners, disaster managers, environmental practitioners, developers

# National Oceans and Coastal Information Management System

## OCIMS: co-designed & freely available operational tools



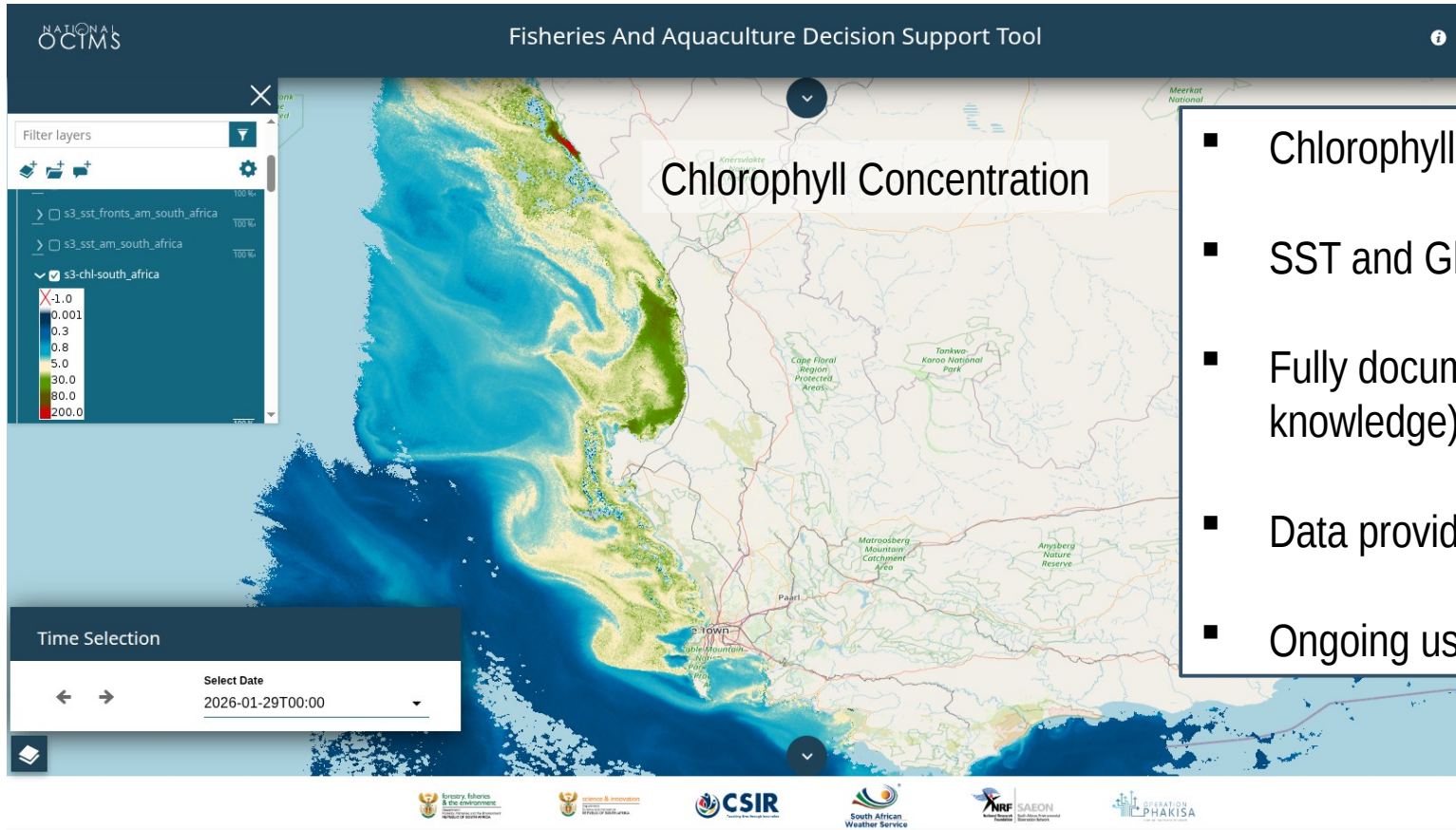
### Operational Tools

 <p><b>Fisheries and Aquaculture Support</b></p> <p>A satellite remote-sensing product showing where algal blooms are occurring.</p> <p><a href="#">Launch &gt;</a></p>	 <p><b>Coastal Operations at Sea</b></p> <p>Use of ocean models and sea state parameters.</p> <p><a href="#">Launch &gt;</a></p>	 <p><b>Integrated Vessel Tracking</b></p> <p>This tool is access controlled. Please <a href="#">contact us</a> if you would like to discuss further.</p> <p><a href="#">Learn more &gt;</a></p>	 <p><b>EO for Water Quality</b></p> <p>Using earth observations (EO) to determine water quality.</p> <p><a href="#">Launch &gt;</a></p>
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- Four operational decision support tools
- Data intensive and requires constant updates
- Expert knowledge to support local optimization
- All tools are **free**, some require a login by specific stakeholders
- Tools are **co-designed** by users who also provide data

# OCIMS Fisheries & Aquaculture Tool:

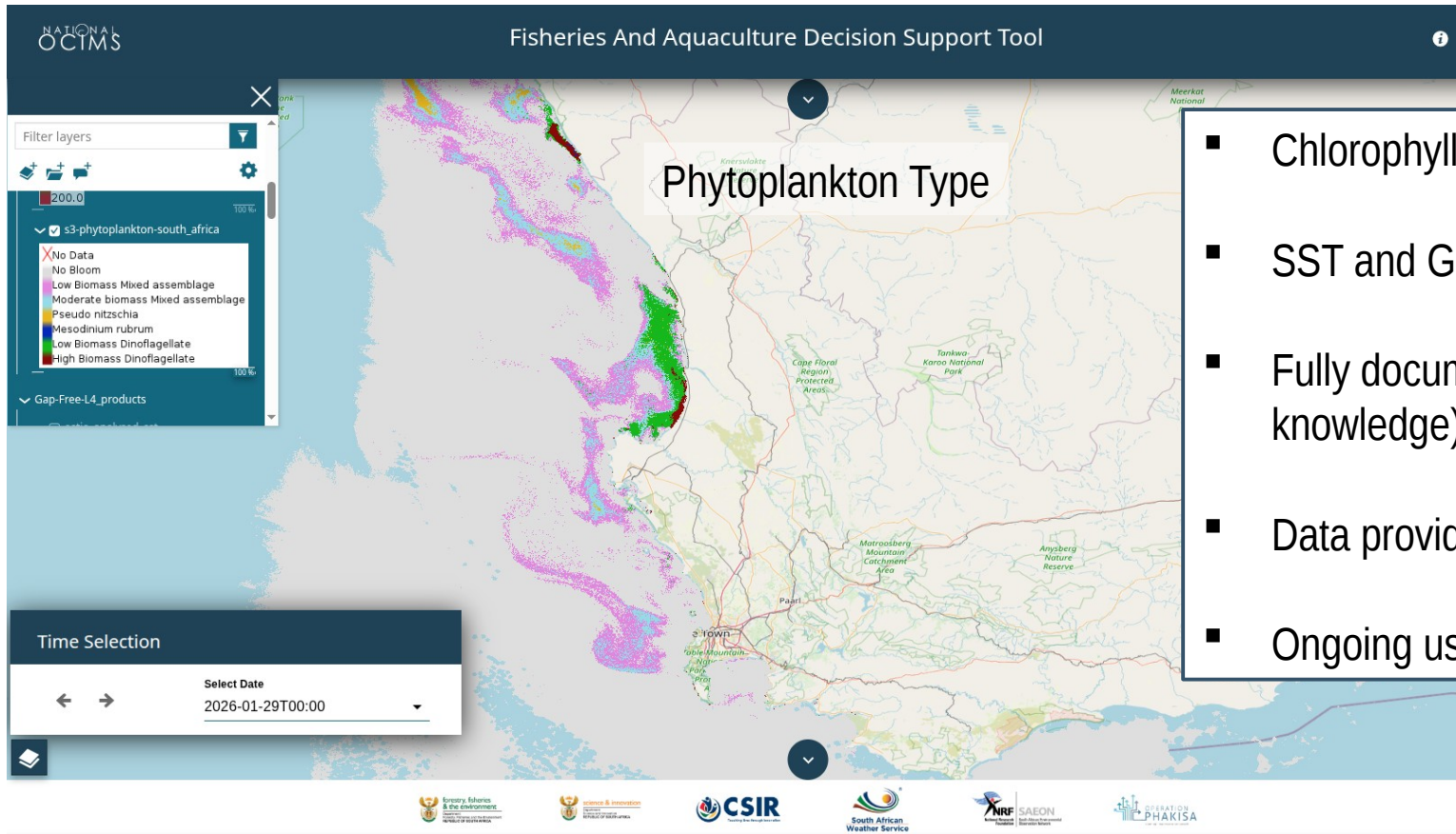
## adding value to free and FAIR global Earth Observation datasets



- Chlorophyll from ESA's Sentinel-2 and -3 satellites
- SST and GlobColour from Copernicus Marine Data Store
- Fully documented locally optimized algorithms (expert knowledge)
- Data provided by stakeholders
- Ongoing user engagement supporting effective co-design

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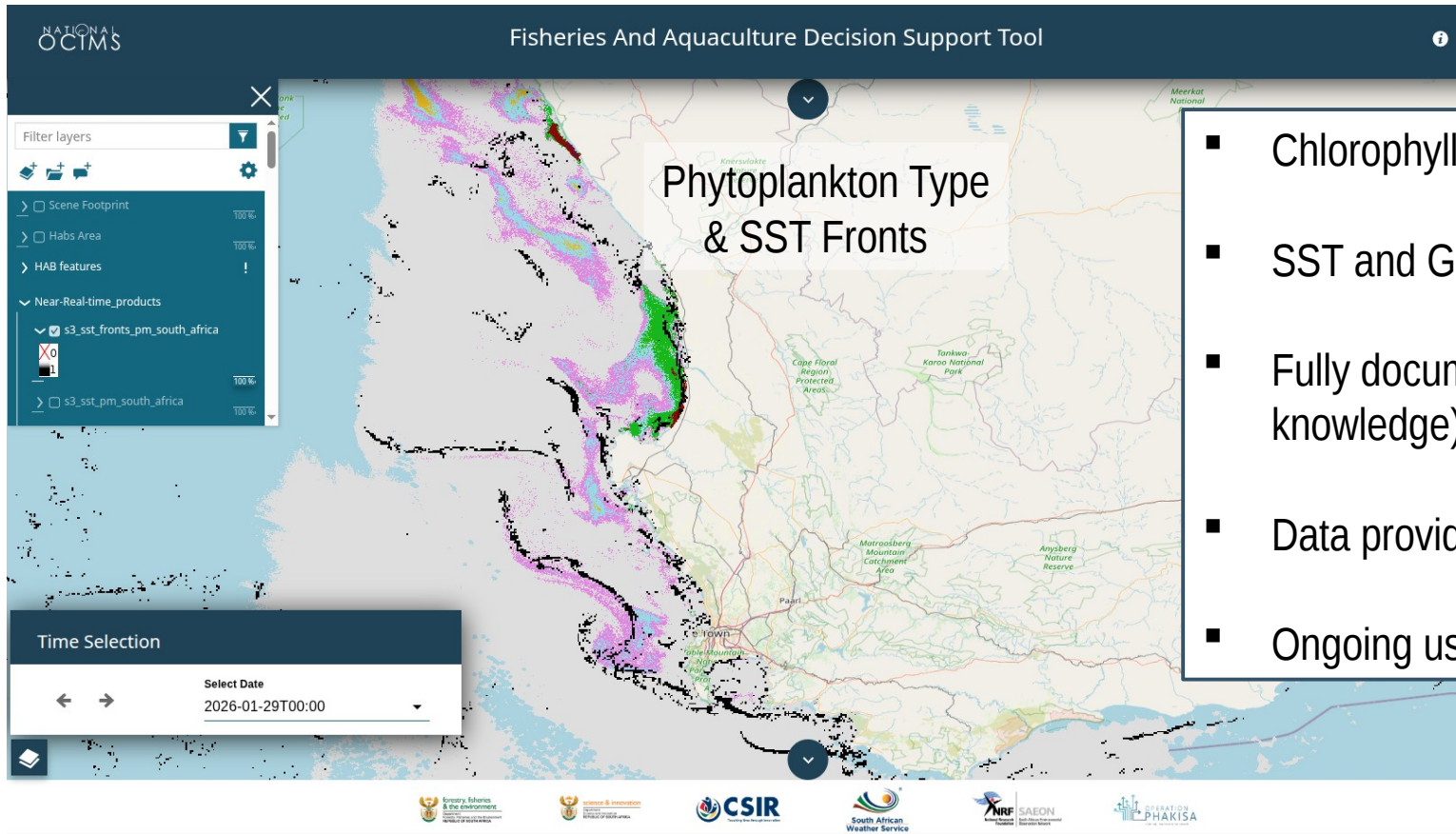
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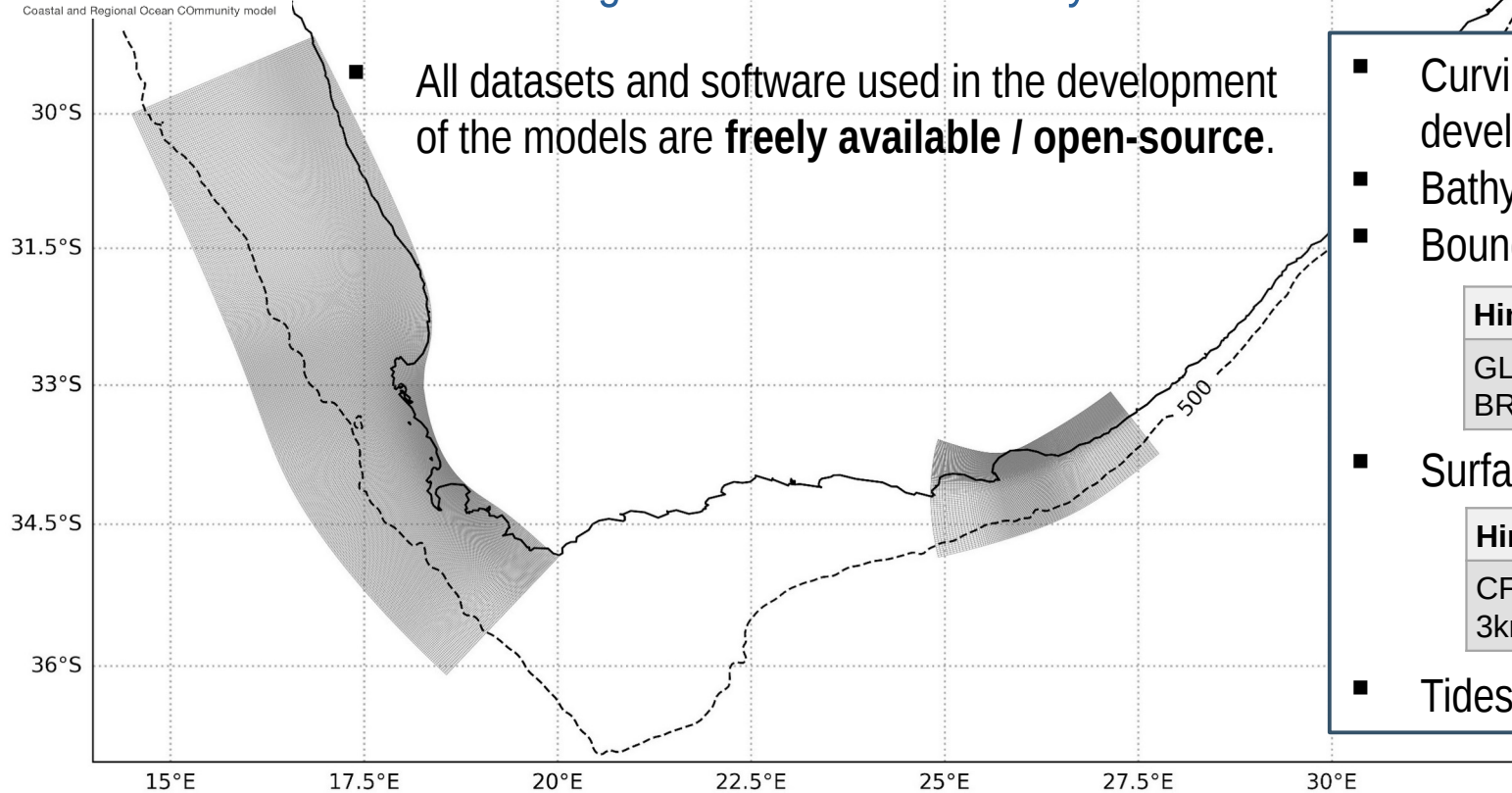


# Regionally optimized forecast models

## adding value to free and FAIR global ocean model datasets



### CROCO Coastal and Regional Ocean COmmunity model



■ All datasets and software used in the development of the models are **freely available / open-source**.

- Curvilinear grids (< 1km at the coast) developed using Delf3D tools
- Bathymetry from high resolution nautical charts
- Boundary Forcing:

Hindcasts	Forecasts
GLORYS, HYCOM, BRAN	MERCATOR, HYCOM

- Surface Forcing:

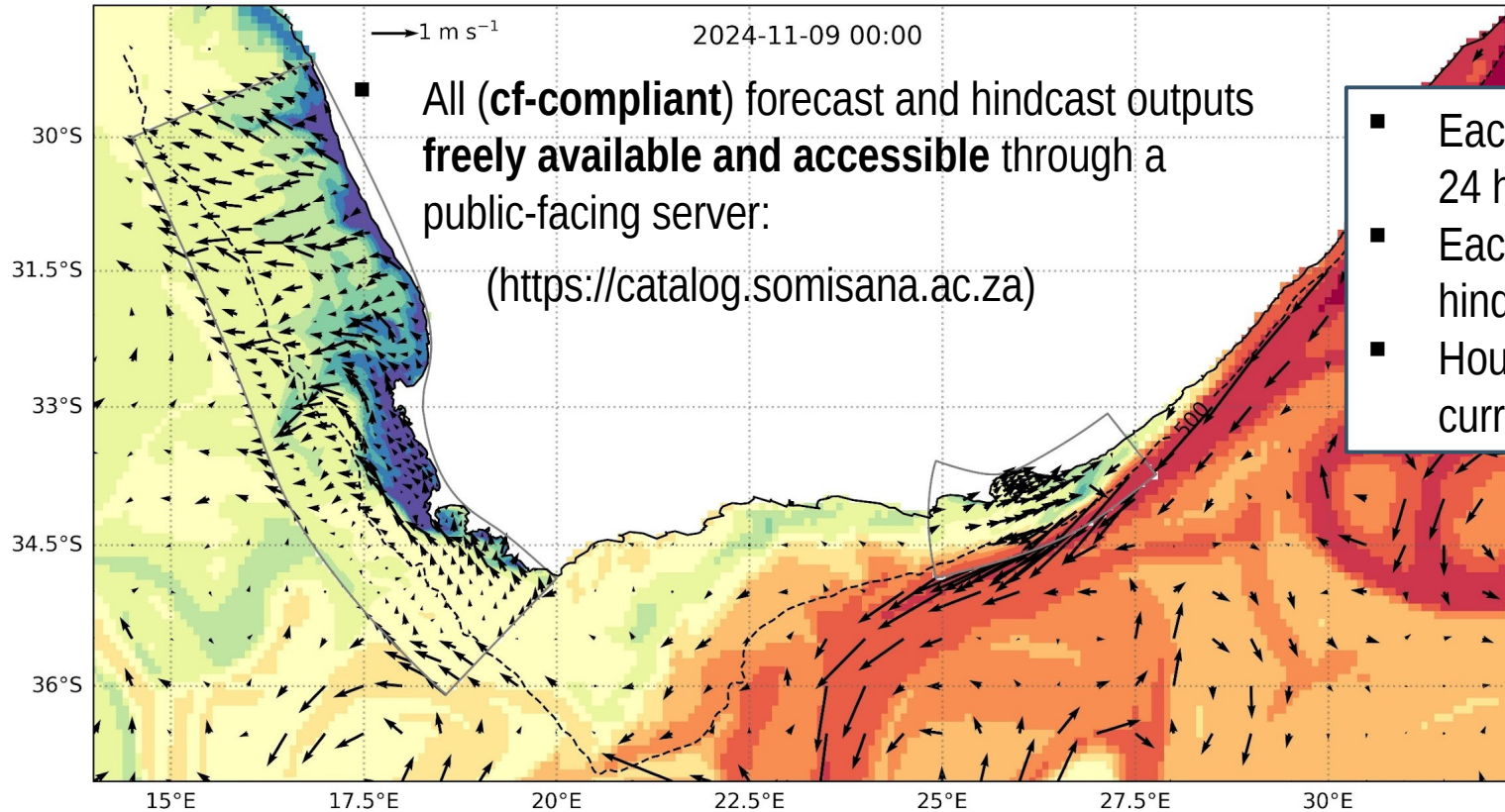
Hindcasts	Forecasts
CFSR, ERA5, WRF 3km	GFS, SAWS 4 km

- Tides: TPX010



# Regionally optimized forecast models

adding value to free and FAIR global ocean model datasets



■ All (cf-compliant) forecast and hindcast outputs **freely available and accessible** through a public-facing server:  
(<https://catalog.somisana.ac.za>)

- Each 'ensemble member' is initialized every 24 hours
- Each initialization runs for 10 days with a 5 day hindcast and 5 day forecast
- Hourly averages saved of: temp, salt, ssh, currents



# Regionally optimized forecast models

## with a fully documented and open source workflow



### Upstream data providers

#### OGCMs:

- HYCOM 1/12°
- MERCATOR 1/12°

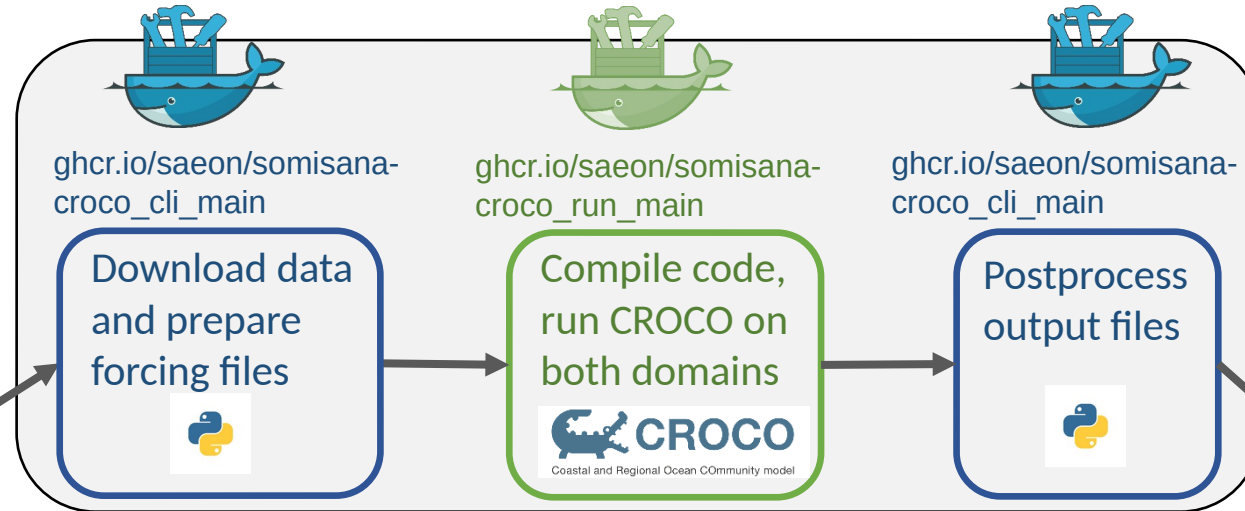
#### Atmospherics:

- GFS 1/4°
- SAWS 4 km

#### Tides:

- TPXO10

Github Actions workflow  
<https://github.com/SAEON/somisana-croco>



Data for downstream services

Public facing file server

<https://catalog.somisana.ac.za/>

# Regionally optimized forecast models and value-added components



## Upstream data providers

### OGCMs:

- HYCOM 1/12°
- MERCATOR 1/12°

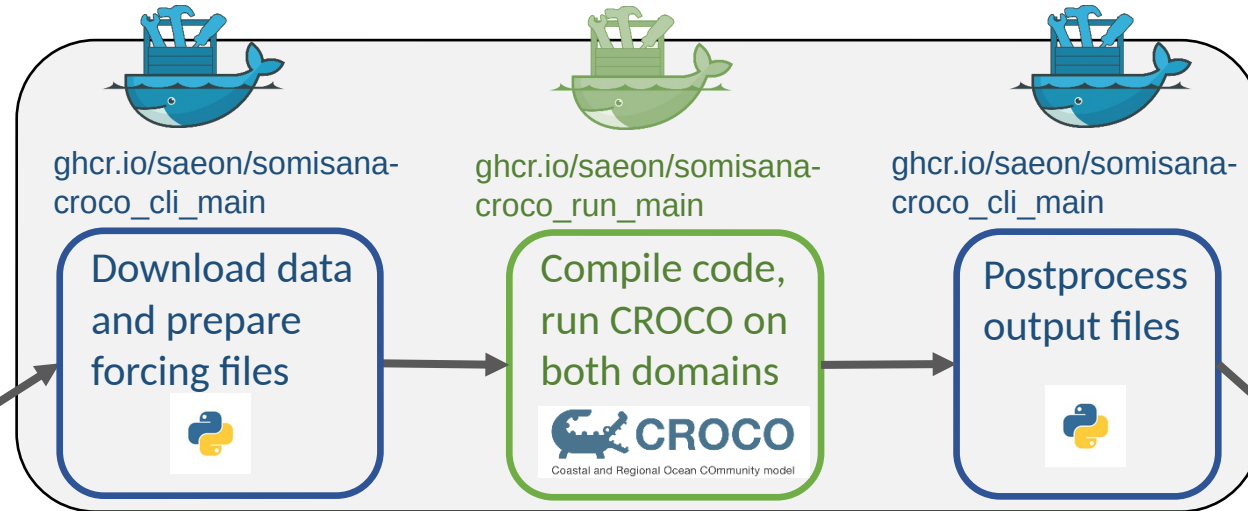
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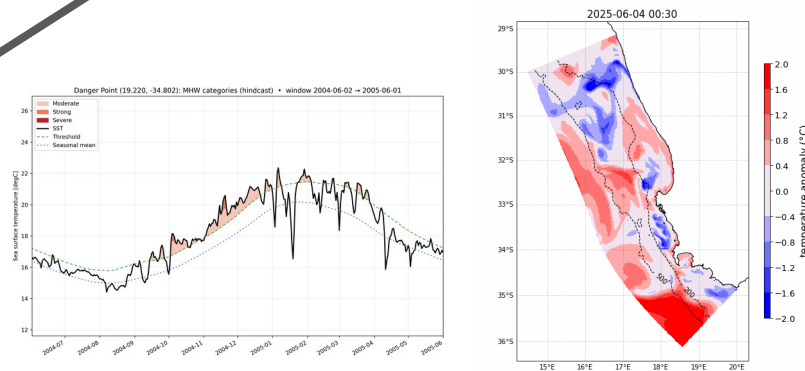
Github Actions workflow  
<https://github.com/SAEON/somisana-croco>



Data for downstream services

Public facing file server

<https://catalog.somisana.ac.za/>



Marine Heat Waves & Cold Spells

Temperature Anomalies

Visualizations

# Regionally optimized forecast models and value-added components



## Upstream data providers

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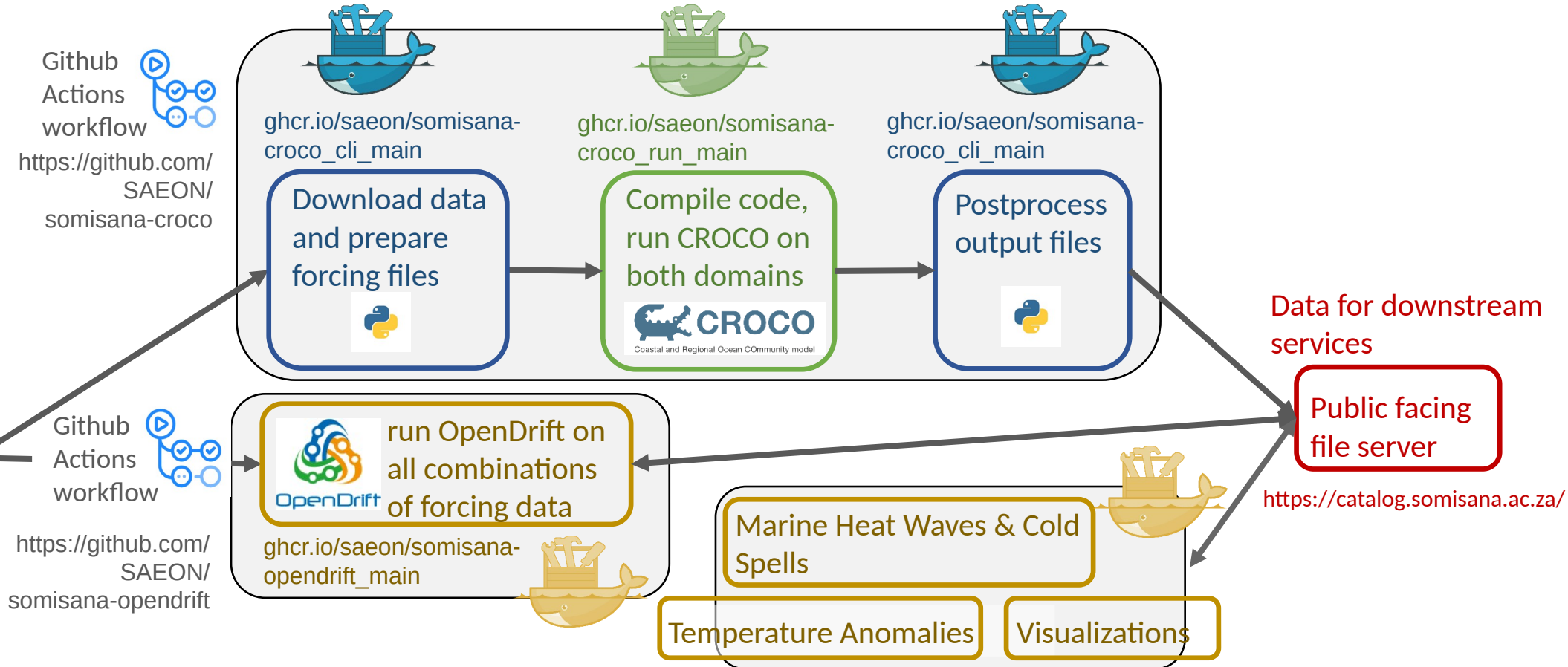
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- MERCATOR 1/12°

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### Tides:

- TPXO10

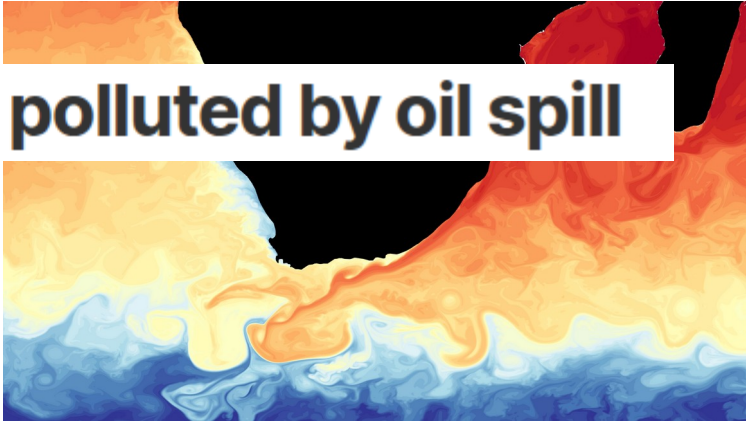


# Cost-effective value added components

making impact

## West Coast beaches polluted by oil spill

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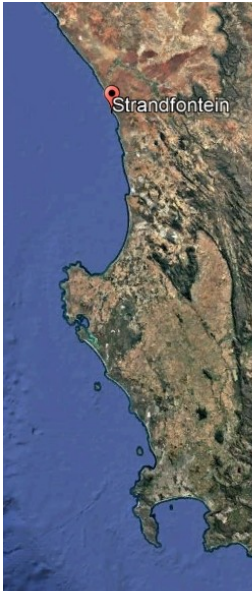
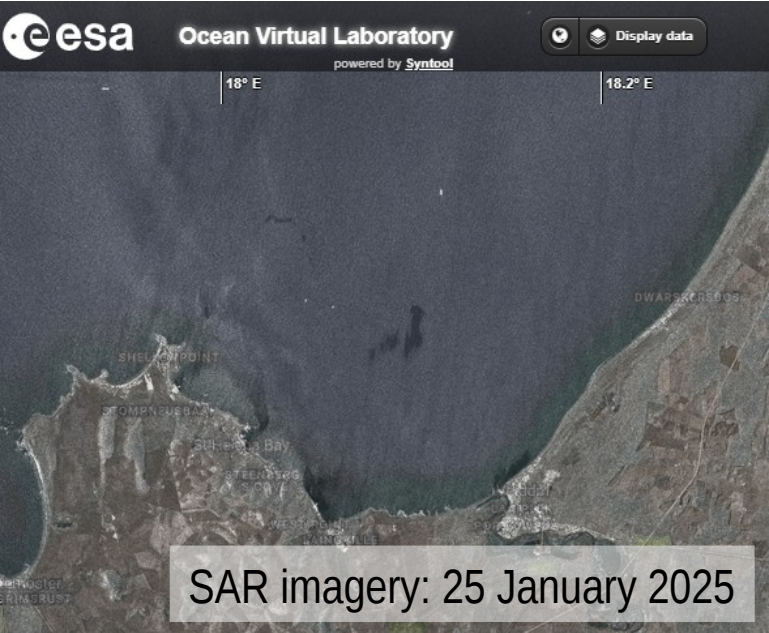
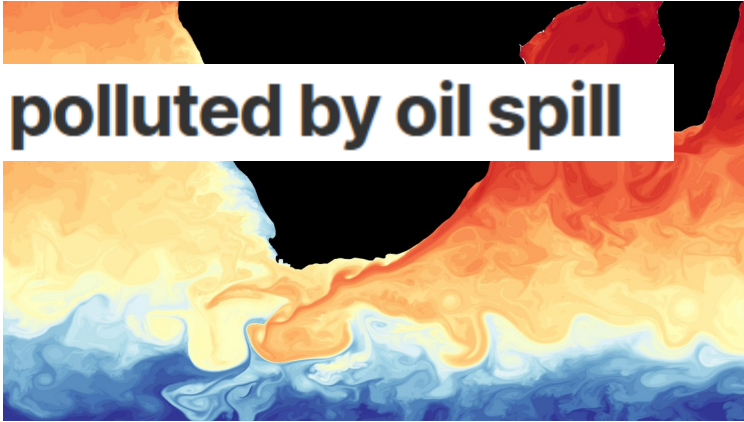


# Cost-effective value added components

making impact

## West Coast beaches polluted by oil spill

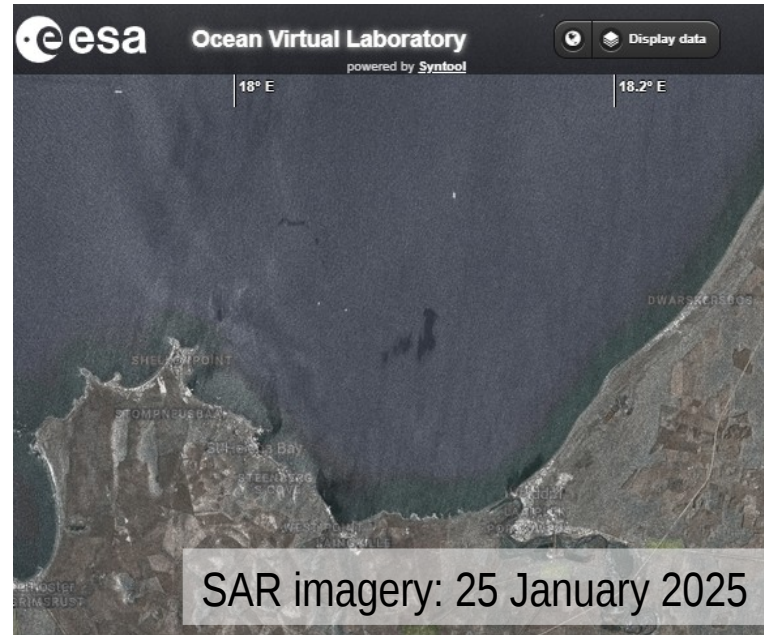
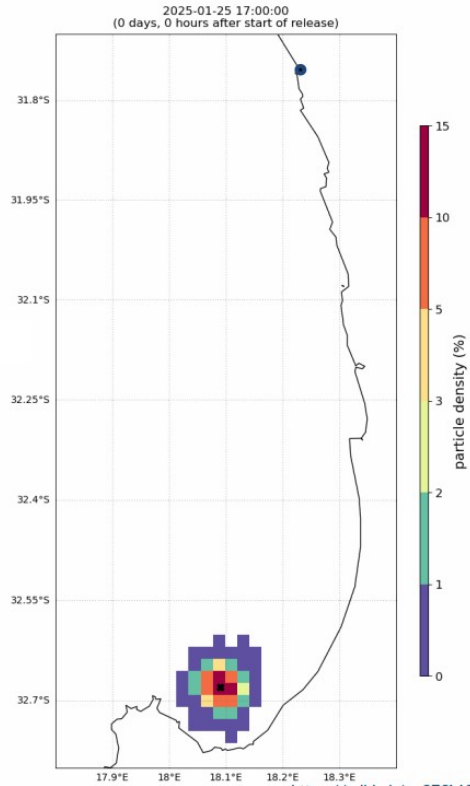
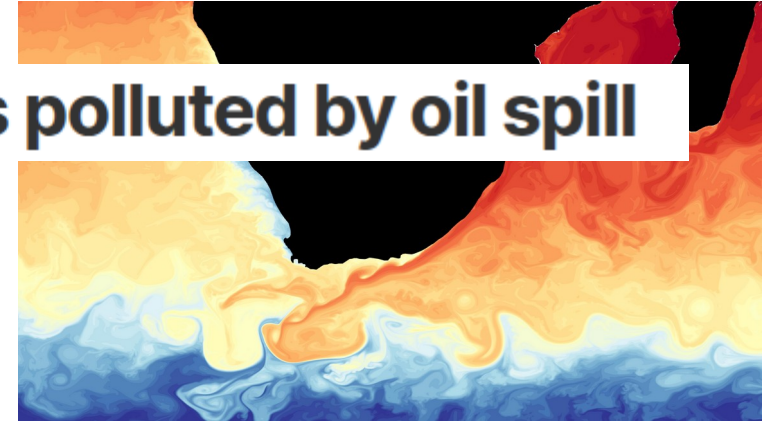
30 January 2025



# Cost-effective value added components making impact

## West Coast beaches polluted by oil spill

30 January 2025



25 January 2025, 5pm

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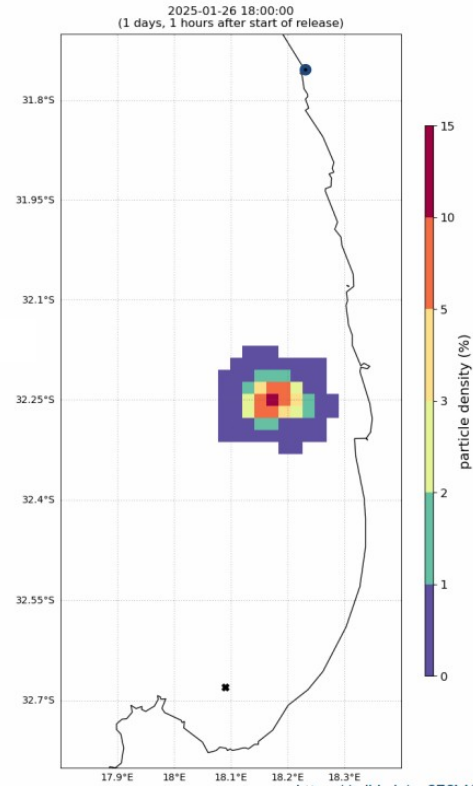
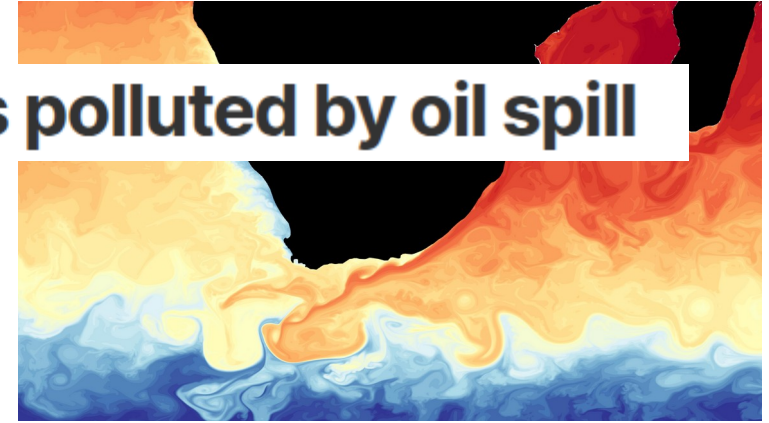
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# Cost-effective value added components making impact

## West Coast beaches polluted by oil spill

30 January 2025



26 January 2025, 6pm

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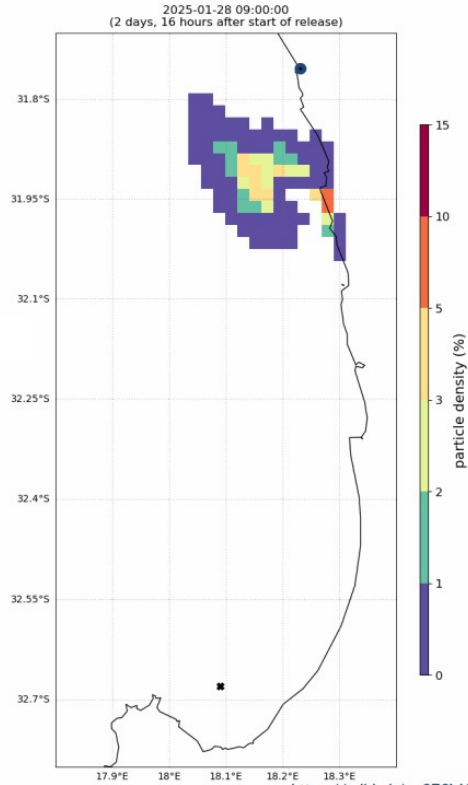
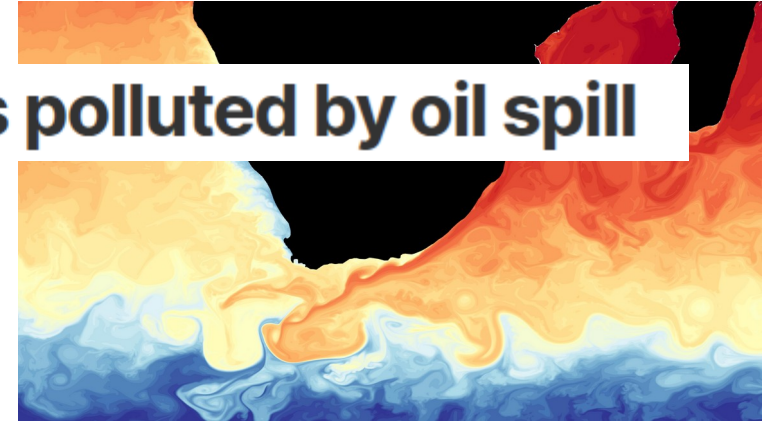
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# Cost-effective value added components making impact

## West Coast beaches polluted by oil spill

30 January 2025



28 January 2025, 9am

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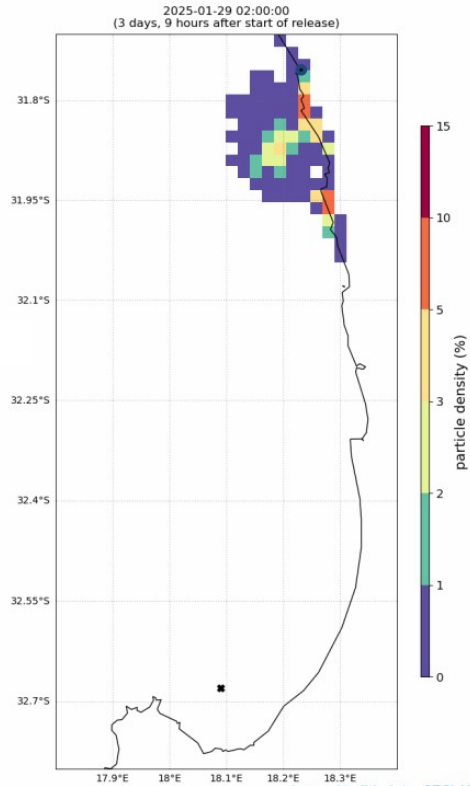
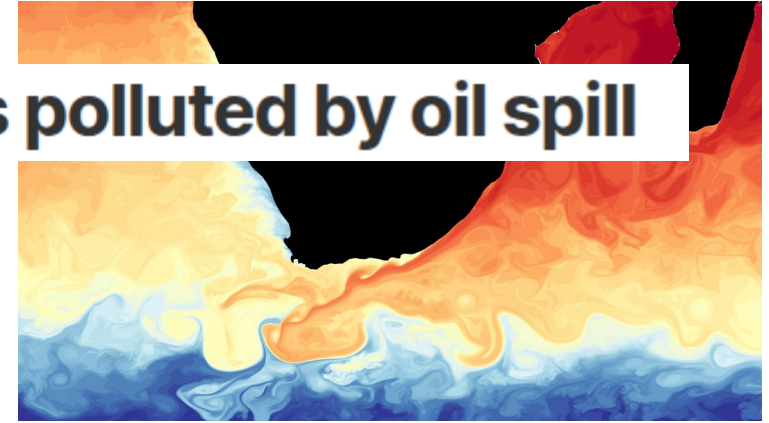
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# Cost-effective value added components making impact

## West Coast beaches polluted by oil spill

30 January 2025



29 January 2025, 2am

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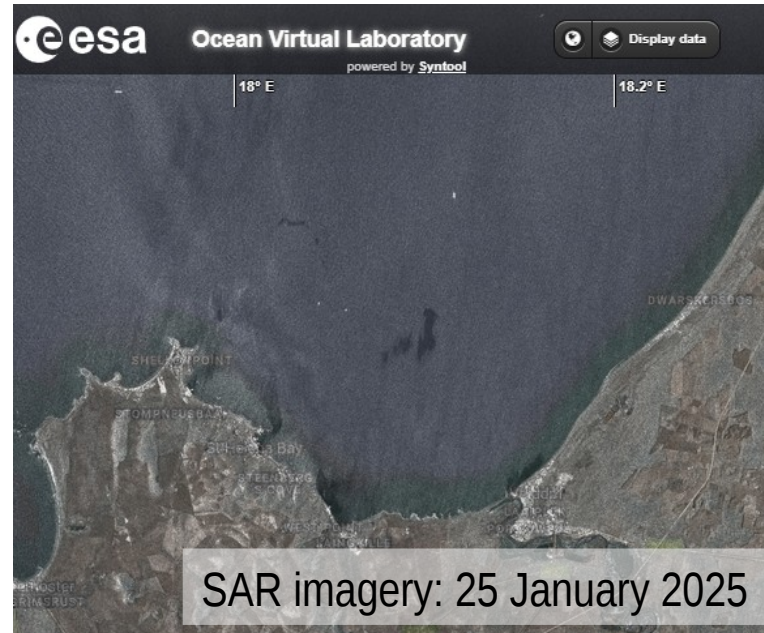
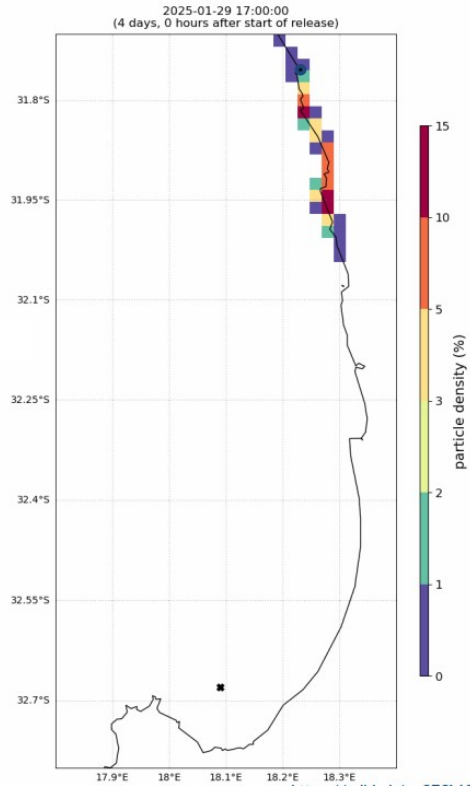
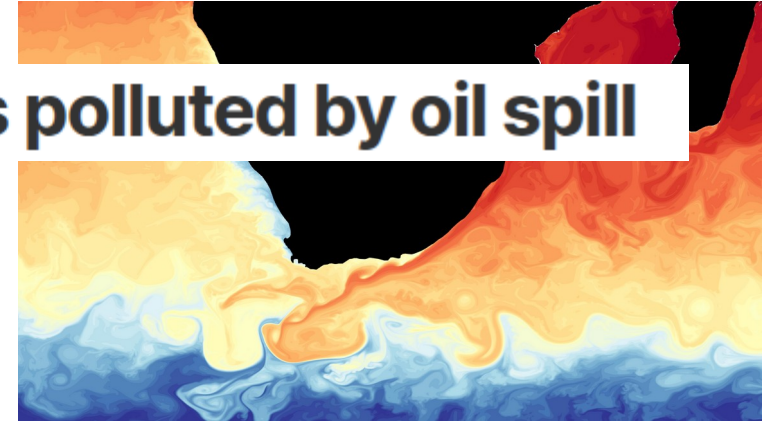
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# Cost-effective value added components making impact

## West Coast beaches polluted by oil spill

30 January 2025



29 January 2025, 5pm

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# FAIR digital ocean services support cost effective solutions for a sustainable Blue Economy

- **Resilience:** an open-source fully documented work-flow ensures system survival beyond a single individual or server
- **Knowledge Transfer:** FAIR, open-source and fully documented workflow (best practices!) reduces the barrier to entry for other institutes who require a cost effective solution

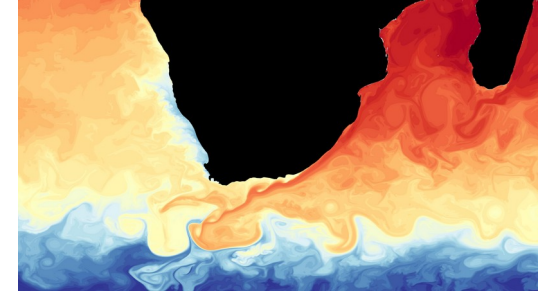


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- **Knowledge Transfer:** FAIR, open-source and fully documented workflow (best practices!) reduces the barrier to entry for other institutes who require a cost effective solution
- **Adding local value:** regionally optimized solutions based on free and FAIR global products
- **Empowering start-ups:** Freely available model outputs support small scale tech start-ups.
- **Supports system improvement (feedback):** More users = more validation and helps to ensure fit-for-purpose systems and services

FREE STUFF HELPS!

# Móran Taing Many Thanks



**Jennifer Veitch (ja.veitch@saeon.nrf.ac.za)**

A Sustainable Ocean Modelling Initiative: a South African Approach  
South African Environmental Observation Network