

The background features a satellite in the upper left corner, with a complex visualization of ocean currents in shades of blue, green, and yellow. The currents are depicted as swirling patterns and lines, suggesting a dynamic and turbulent flow. The overall scene is set against a dark blue background, emphasizing the satellite and the intricate current patterns.

# Upper Ocean Current Usage for Sargassum and Marine Litter Drift Applications

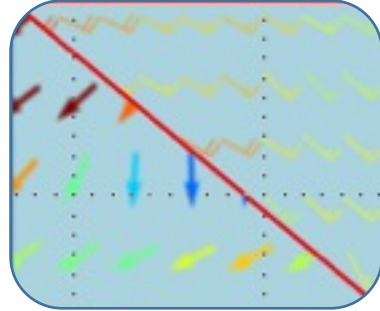


# Rationale

- Focus on providing users with actionable intelligence
  - integrated indicators
  - derived from statistical analysis of drift results
- Regional services
- Global solution
- Near surface drift
- Operational time frame
- User focus approach



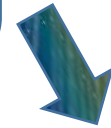
# Components



Ocean surface current & wind Data acquisition



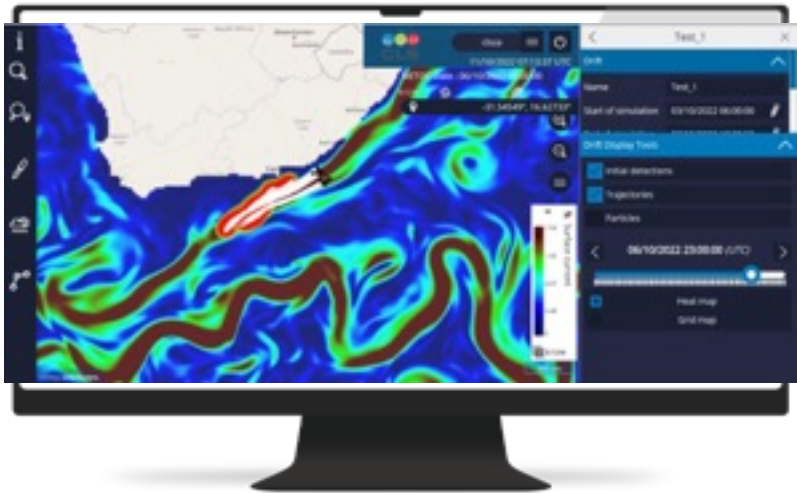
Lagrangian drift model simulations



Statistical analysis & indicator computation



Web based visualisation





# Marine Litter Application



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- Understanding the **pathways** and potential **accumulation areas** is crucial to elaborate **collection strategy** and evaluate **policy impacts**.
- CLS has developed a proven and unique approach combining
  - **In-situ data** for ground truthing (ARGOS/GPS satellite trackers)
  - **Lagrangian drift model simulations** to evaluate wide spectra of macro marine debris (probabilistic)
  - a **planning tool** : an interactive web portal to track and evaluate the probability of macro marine debris





# The Marine debris Program in Indonesia (2020-2021)



Financed By



For the count of



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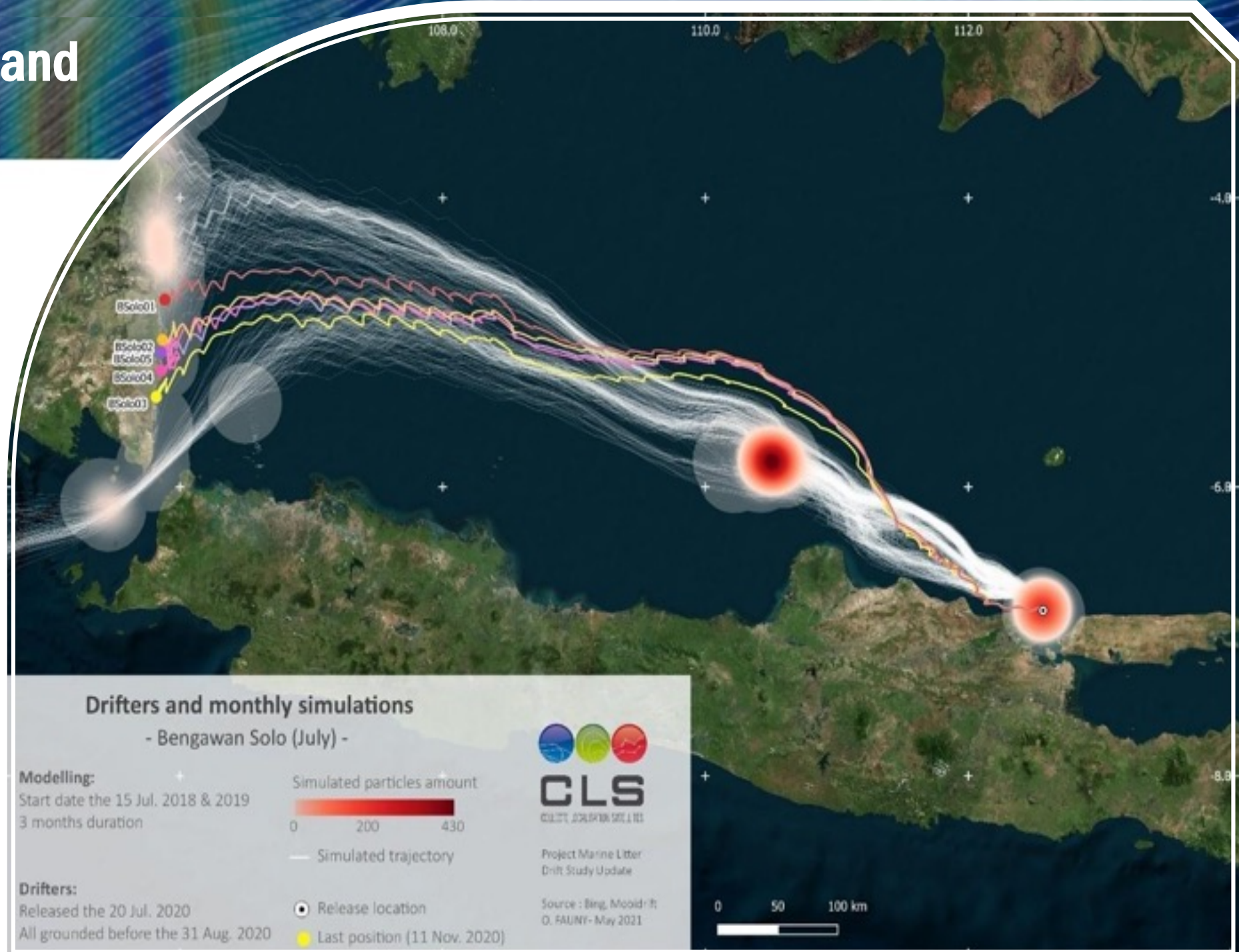




# Combining Drifters and Simulations



- ❑ Model used to represent wider range of plastics
- ❑ Drifters within model envelope
- ❑ Areas of plastic accumulation on map
- ❑ Wooden drifters deployed to track plastics (ESA MARLISAT project)





# Sargassum algae Application



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# A user-centric approach to develop SAMTool

In 2018, development with the support of ESA:

- Propose an operational service to monitor floating Sargassum algae in the Caribbean and Atlantic area
- Make use of EO data to support society and environmental challenges



## # Public authorities:

- Cleaning beaches and monitor H<sub>2</sub>S concentration

## # Wildlife protection :

- Protection for juveniles

## # Tourism sector:

- Nuisances for beaches and nautical activities



## # Operations at sea & navigation:

- Sailing boats security, Collection operations





# SAMTool : integrated system for sargassum monitoring



**6** satellite sensors including medium and high resolution



**24/7** operational & scalable service

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Daily sargassum detection

Drift forecast



**5** days to **5** months forecast



**+80** users since 2018

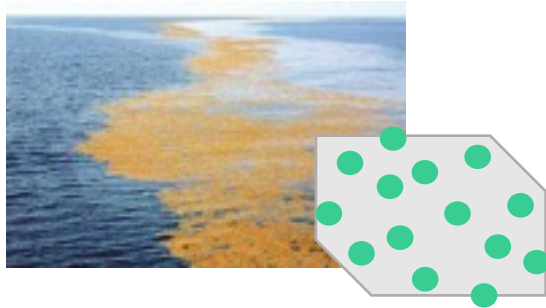
User-friendly web platform

Scalable bulletins, early warning





# Mobidrift Lagrangian modeling system



## OBJECT

- Shape (Point, polygone, line)
- Start date
- Initial position

## Drift parameters

- Coefficient of METOC data
- Probabilistic mode:
- › Number of particles
  - › Disturbance on forcings
  - › Initial position radius



## DRIFT COMPUTATION

## METOC Data

- Surface current
- Tide current
- Wind field
- Bathymetry



## RESULTING PARTICLES

- Position step by step
- Speed and age
- Trajectory
- Ensemble statistics



# MOBIDRIFT

CLS APPLICATIONS





# Forcing sources

## Current models

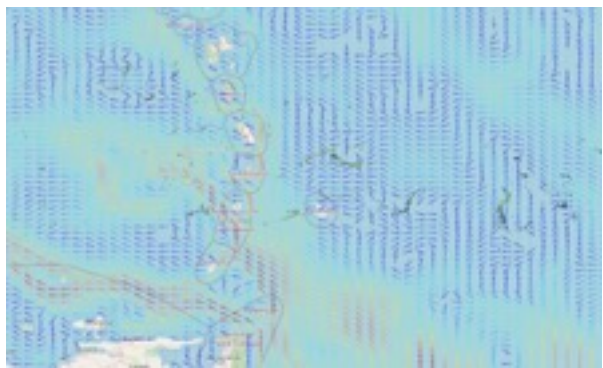


**Copernicus Marine GLO NRT** 1/12°, daily, hourly (SMOC)

**NOAA Hycom** : 1/12°, daily

**Regional models** (1/30°, hourly)

**FES Tidal currents** Global, 1/16°, hourly (CNES/LEGOS/CLS)

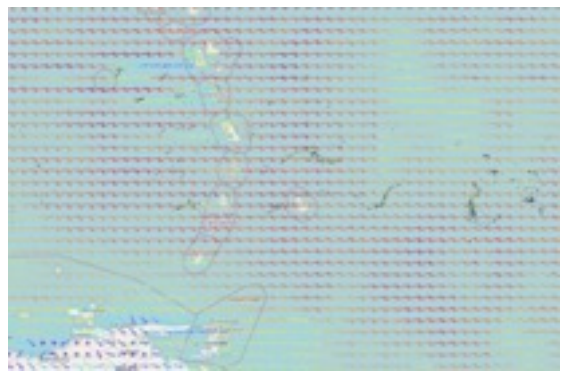


## Wind models



**NOAA NCEP** Global, 1/8°, 3-hour

**ECMWF Global**: 1/8°, 3-hour;



## Bathymetry/ coastline



Fine resolution of the coastline for grounding estimation

**ETOPO1** Global, 1/30°

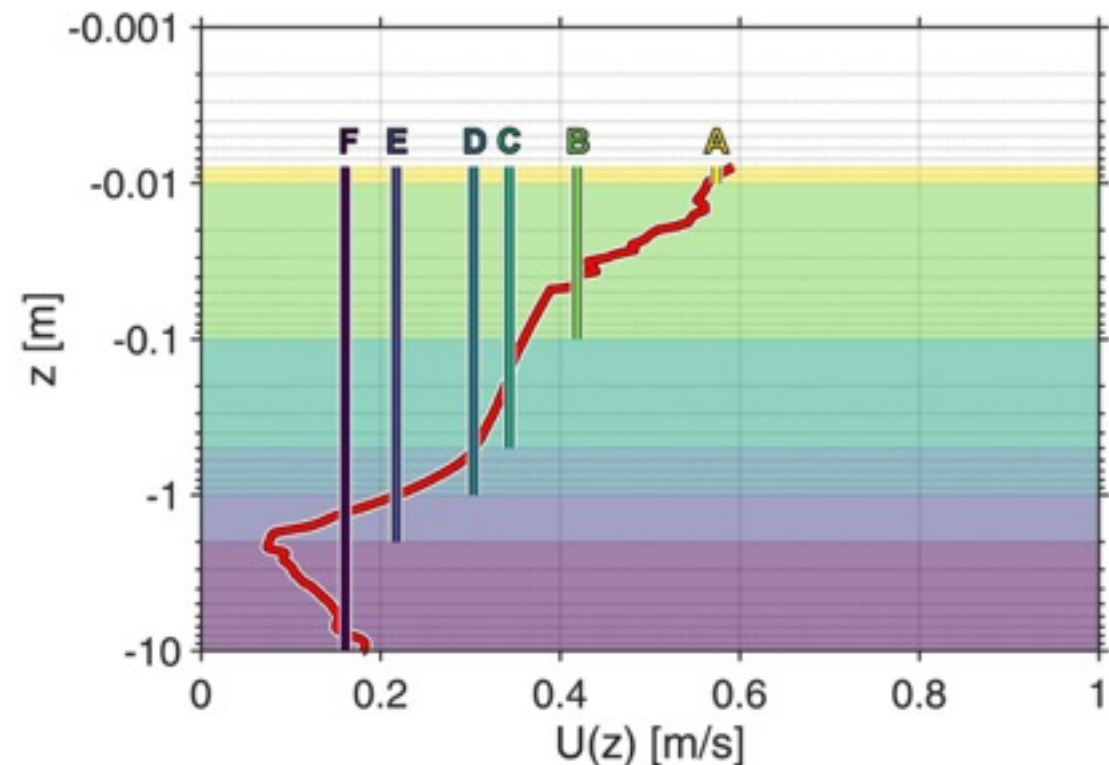
**OpenStreetmap**: 1/30°





# Conclusion : our needs for ocean currents

- Global datasets
- **Hourly** time resolution
- Accurate **eddies position/shape**
- **Coastal dynamics** resolved for accumulation and beaching forecasts
- Near surface ocean currents
- More **in-situ lagrangian observations** (coastal & near surface)
- Hindcast, nowcast & **forecast** mode



Laxague, N.J., Özgökmen, T.M., Haus, B.K., Novelli, G., Shcherbina, A., Sutherland, P., Guigand, C.M., Lund, B., Mehta, S., Alday, M. and Molemaker, J., 2018. Observations of near-surface current shear help describe oceanic oil and plastic transport. *Geophysical Research Letters*, 45(1), pp.245-249.