



# SARGCOOP

**GRUPO DE TRABAJO : FORO CARIBEÑO DE LUCHA  
CONTRA EL SARGAZO**

**SEMINARIO WEB DEL 13 ENERO 2023 :  
«SARGAZO: ANTICIPAR Y MEDIR EL IMPACTO»**

## Proyecto

**Sistema de monitoreo en tiempo-real de corrientes marinas y presencia de  
sargazo en el Caribe Mexicano.**

Participantes

Xavier Flores Vidal

Héctor García Nava

Napoleón Gudiño Elizondo

Eduardo Cuevas Flores

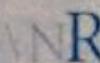
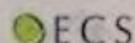
Abigail Uribe Martínez

Universidad Autónoma de Baja California

UABC



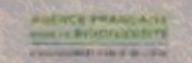
UNION EUROPEENNE



INR

Instituto Nacional de Recursos Naturales

INSTITUTO NACIONAL DE RECURSOS NATURALES



AFD

Agence Française de Développement

AFD





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**Radio  
Oceanografía**

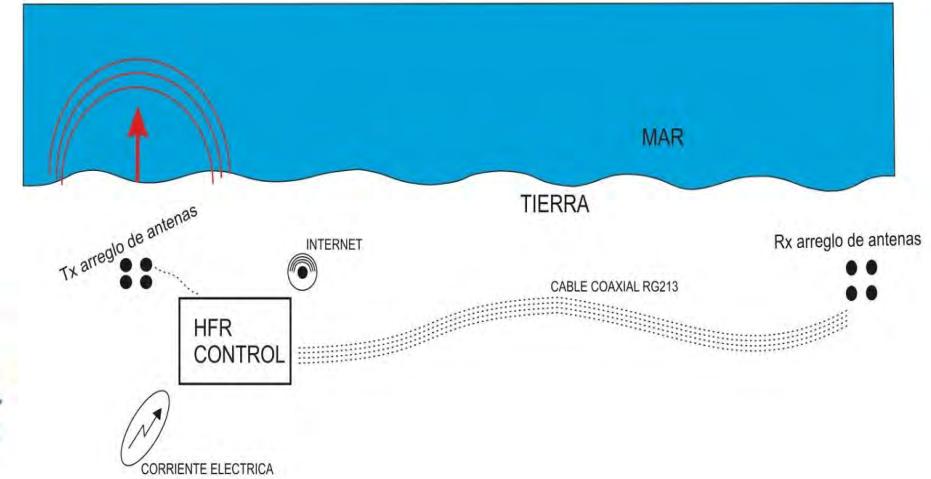
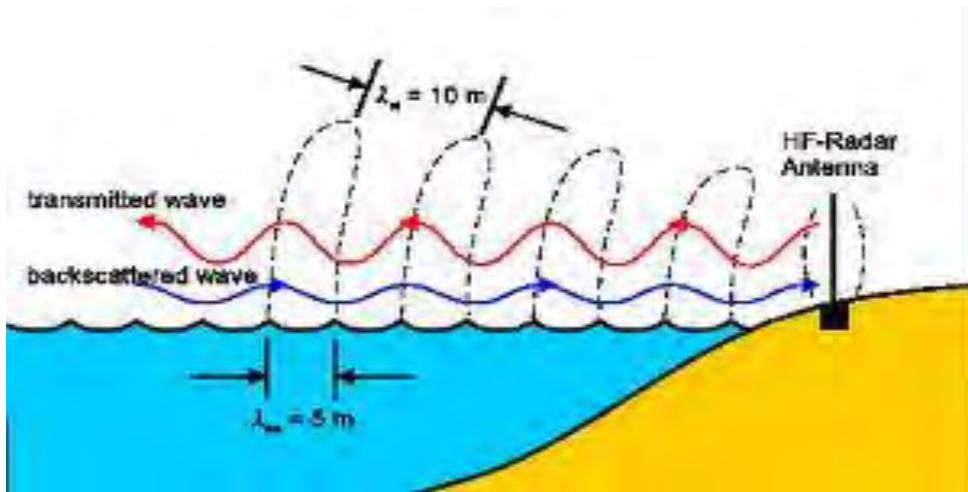


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**SEMAR**  
SECRETARÍA DE MARINA

**DORIS®**



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# Dr. Xavier Flores-Vidal



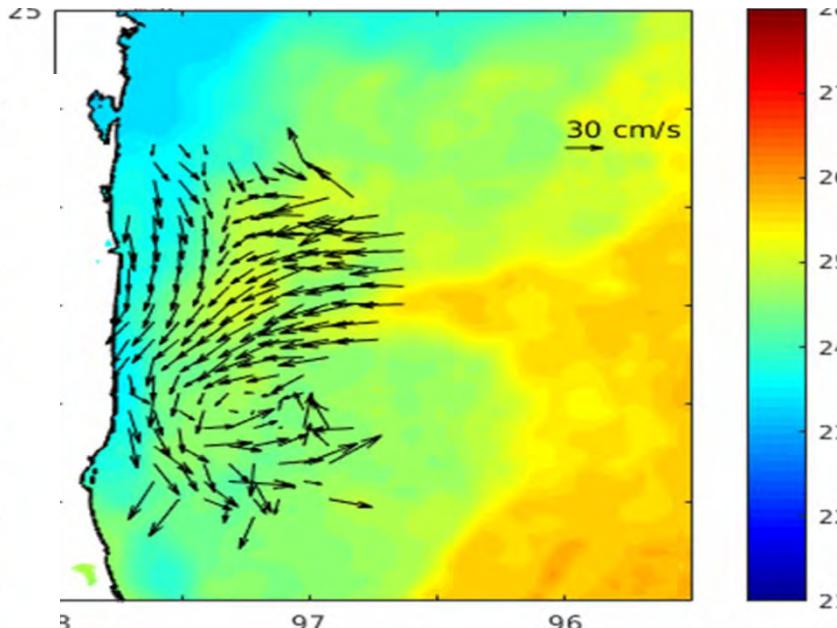
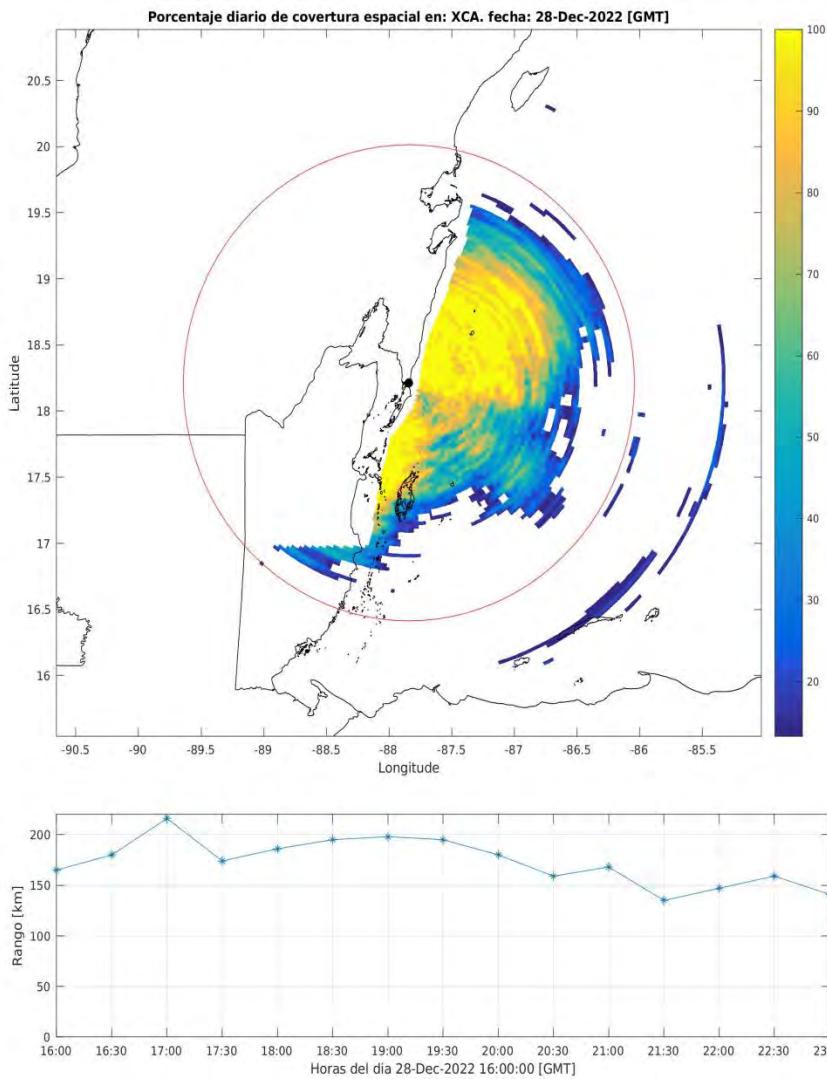
Observatorio Oceanográfico Regional Costero



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# Manual for Real-Time Quality Control of High Frequency Radar Surface Current Data

A Guide to Quality Control and Quality Assurance for High Frequency Radar Surface Current Observations

Version 1.0  
May 2016

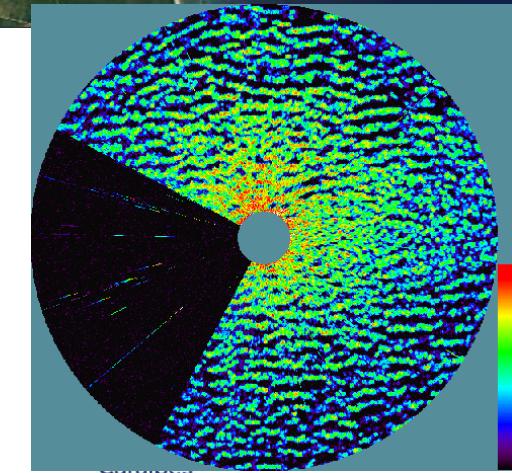


# Radares Banda X



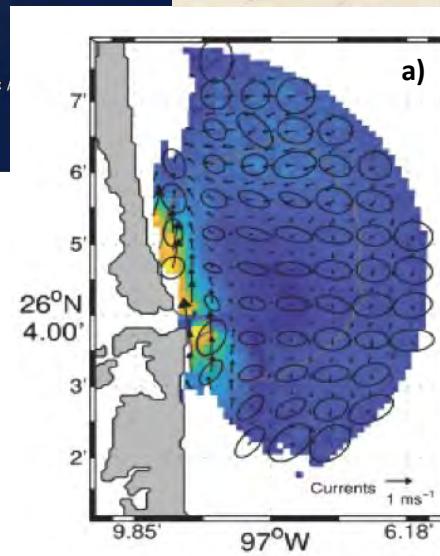
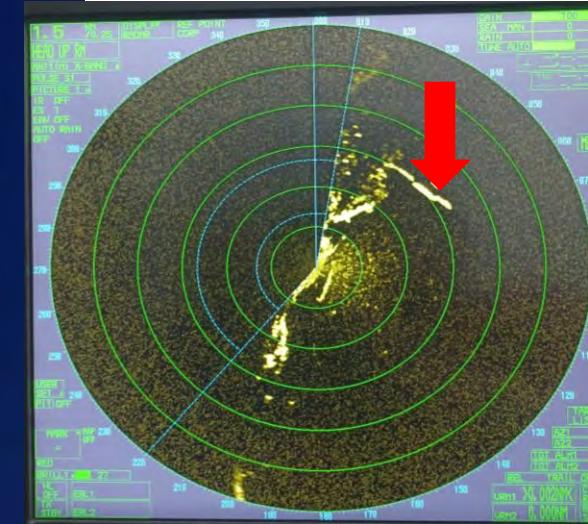
**SEMAR**  
SEGURIDAD DEL MARINA

b)

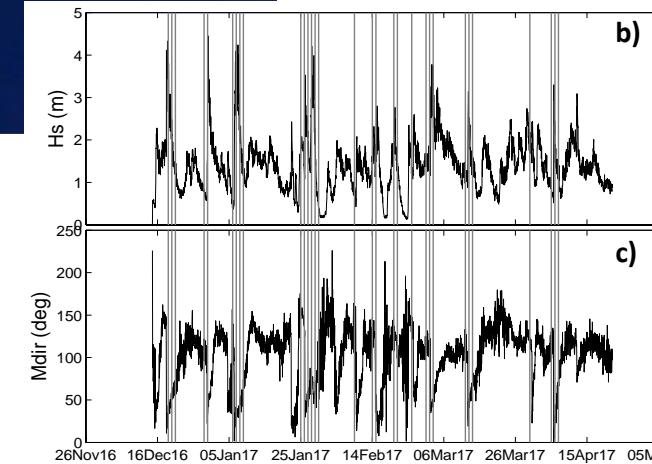


Mahahual

BX-MH

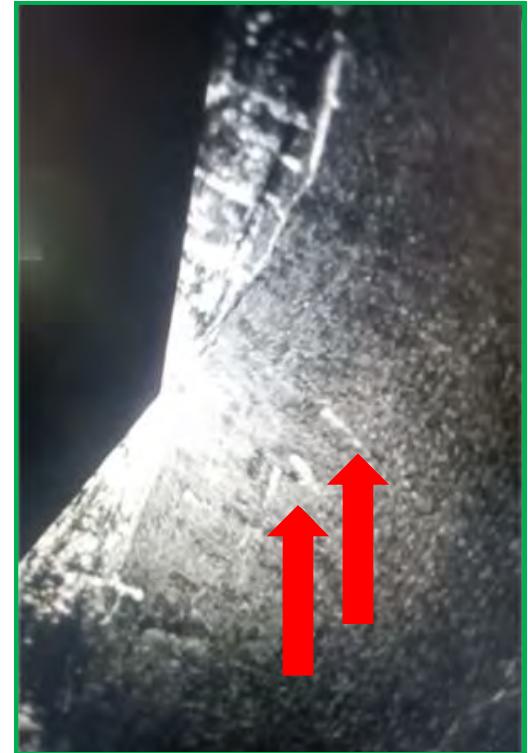


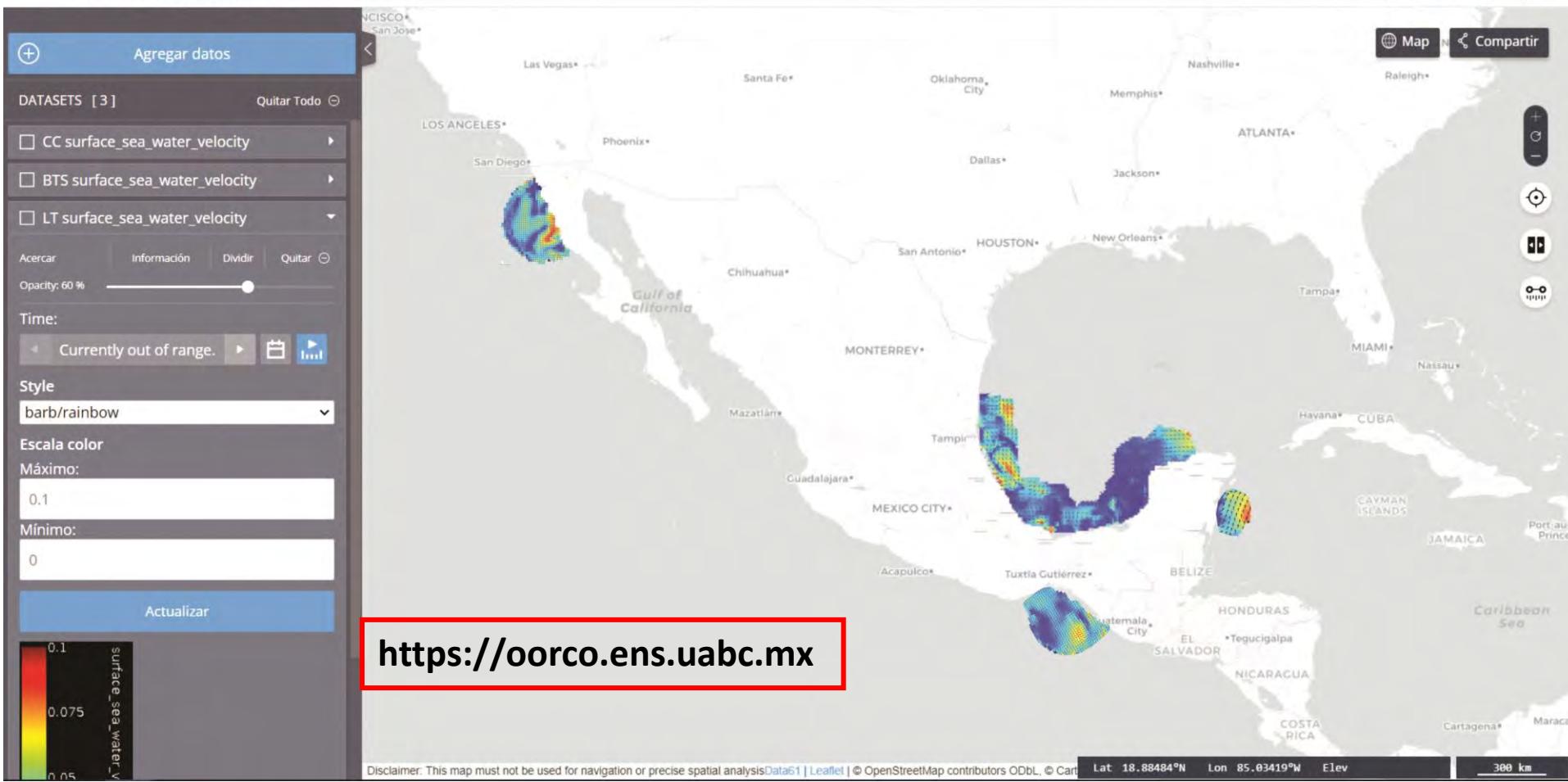
a)



b)

c)



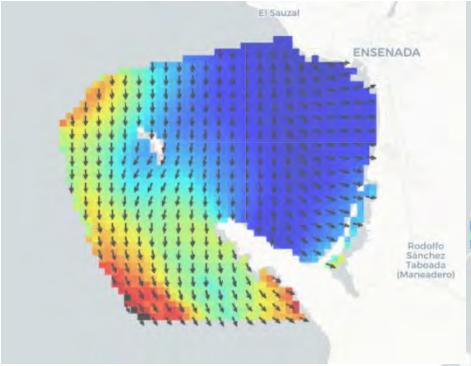


2 sitios en Rosarito (2002 a 2004)  
 2 sitios en el Golfo de Tehuantepec (2004-2008)  
 3 sitios en California (2003-2008, 2010-2015)

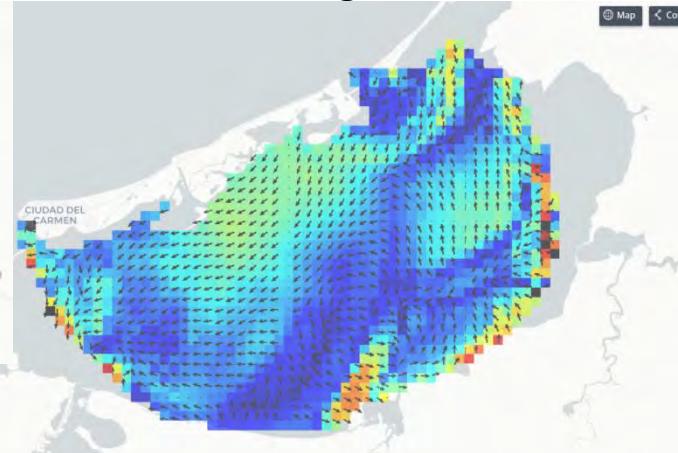
3 sitios en la Bahía de Todos Santos (2009-2019)  
 2 sitios en Laguna de Términos (2017-2019)  
 15 sitios Golfo de México (2017-2020, 2022-) \*\*  
 2 sitios en el Caribe (2021-)\*\*



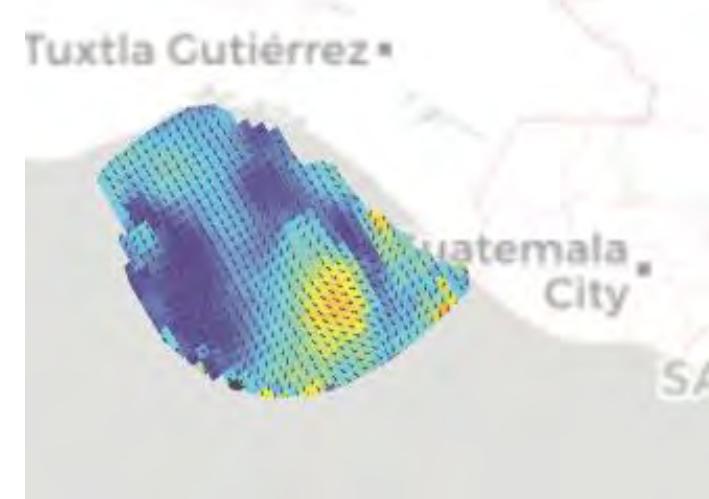
# Todos Santos Bay



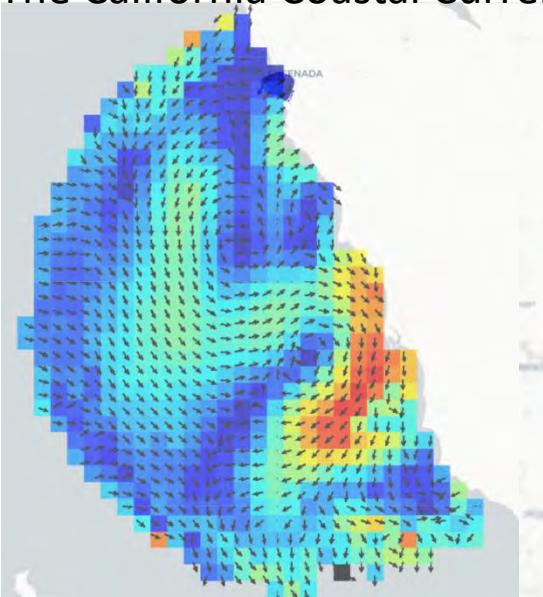
# Terminos Lagoon



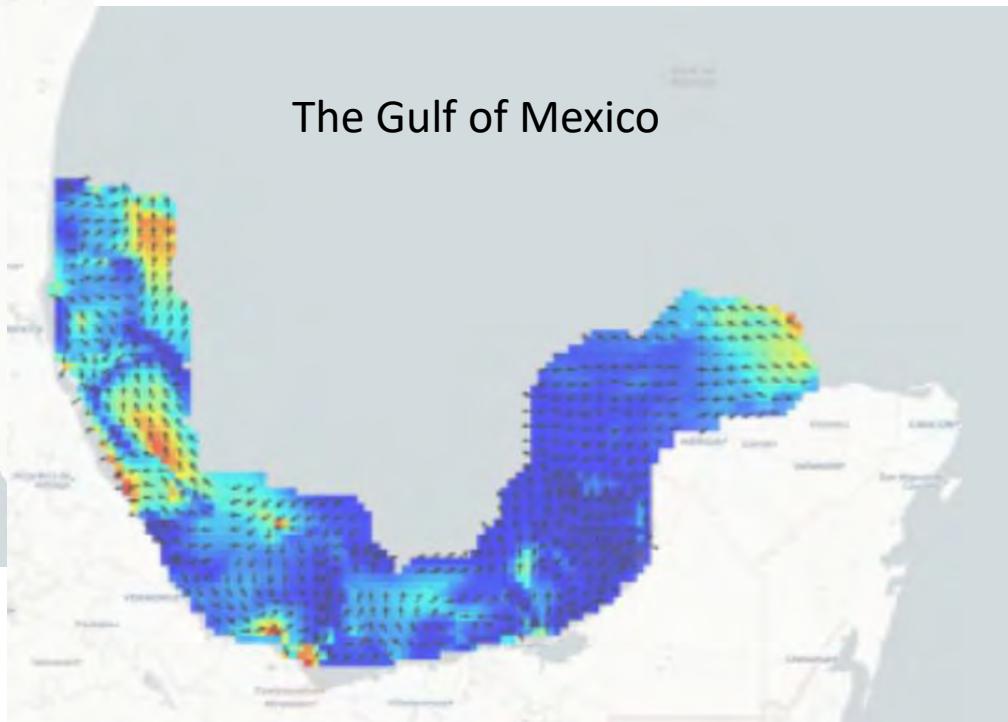
# The Gulf of Tehuantepec



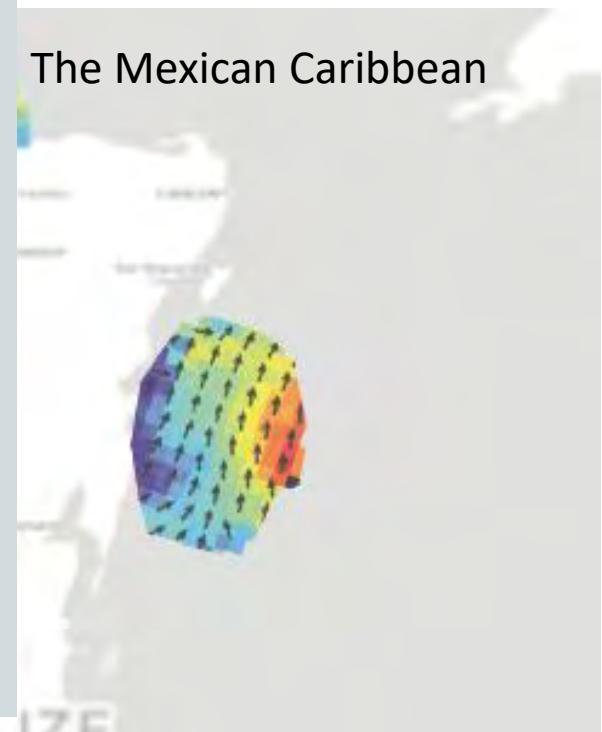
## The California Coastal Current



## The Gulf of Mexico



## The Mexican Caribbean



**The Mexican Radar Network, has its own data management system**

(<https://oorco.ens.uabc.mx>) using world wide standards:

Data format for storage is **NetCDF4** format with metadata and structure adhered to the **Climate & Forecast conventions**.

Distribution now is thru, **ERDDAP** and **THREDDS** data servers, which provide web interfaces for users, as well as standard protocols, such as **OpenDAP**, **OGC-WMS**, among others.

With the intention of making the information more accessible to users, a web application for interactive visualization was deployed, where geospatial data layers are presented on a map. These graphical representations are dynamically generated on request from **THREDDS** or **ERRDAP** servers.



All the software was developed is using open source libraries.

Netcdf <https://www.unidata.ucar.edu/software/netcdf/>

Climate & Forecast <http://cfconventions.org/>

OpenDAP <https://www.opendap.org/>

OGC-WMS <https://www.ogc.org/standards/wms>

Thredds <https://www.unidata.ucar.edu/software/tds/current/>

ERDDAP <https://coastwatch.pfeg.noaa.gov/erddap/download/setup.html>

Terria IS <https://terria.io/>

Go Fair <https://www.go-fair.org/>





Dr. Napoleón Gudiño Elizondo



<https://laboratorio-de-oceanografia-aerea-iio-uabc-uabc-iio.hub.arcgis.com/>

# Laboratorio de Oceanografia Aerea



Esta es una plataforma creada para explorar los distintos productos cartográficos y servicios que ofrece el laboratorio de oceanografía aérea del IIO-UABC, quien recientemente fué apoyado por el CONACYT para el fortalecimiento de su infraestructura dentro del marco de la convocatoria "APOYOS A LA CIENCIA DE FRONTERA: FORTALECIMIENTO Y MANTENIMIENTO DE INFRAESTRUCTURAS DE INVESTIGACIÓN DE USO COMÚN Y CAPACITACIÓN TÉCNICA 2021"

Ranger EX



## Tarot FY680 (Hexacopter)

### Mugin T-tail (3 m de ala)



VTOL EVE-2000



## NanoTalon (Mini-plane)

A black and white photograph of a multi-rotor drone flying against a clear blue sky. The drone has eight arms and eight propellers, with a camera mounted on top. It is shown from a slightly low angle, looking up at the aircraft as it flies towards the viewer.

Tarot peeper TL750S1 (Quadcopter)



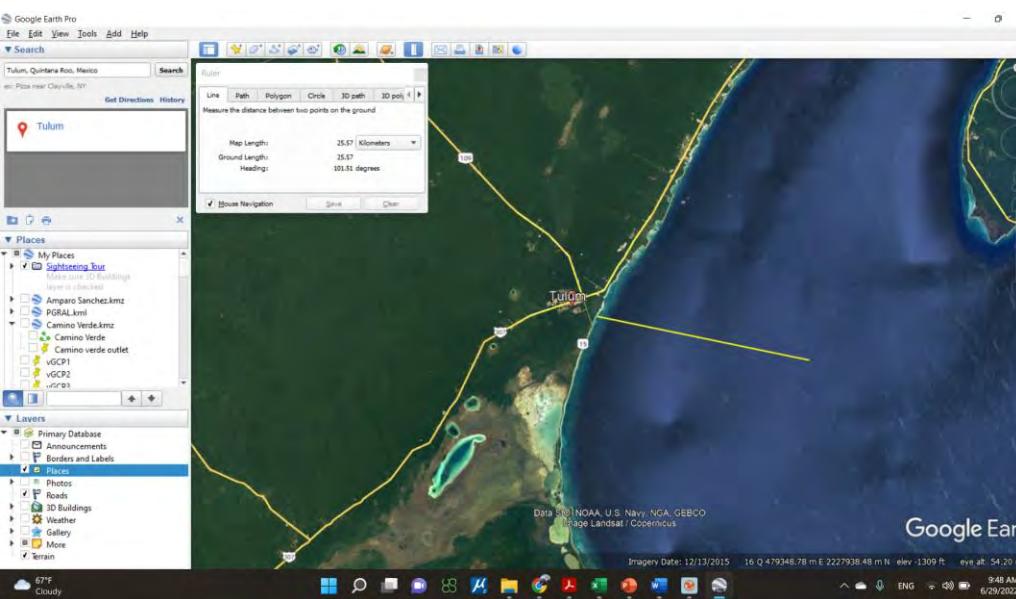
### Caraïbes

**Carabes**  
Revista multidisciplinaria de divulgación y investigación

Fonds européen de développement régional

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# Structure from Motion (3D Photo-reconstruction )

UAS (Drone)



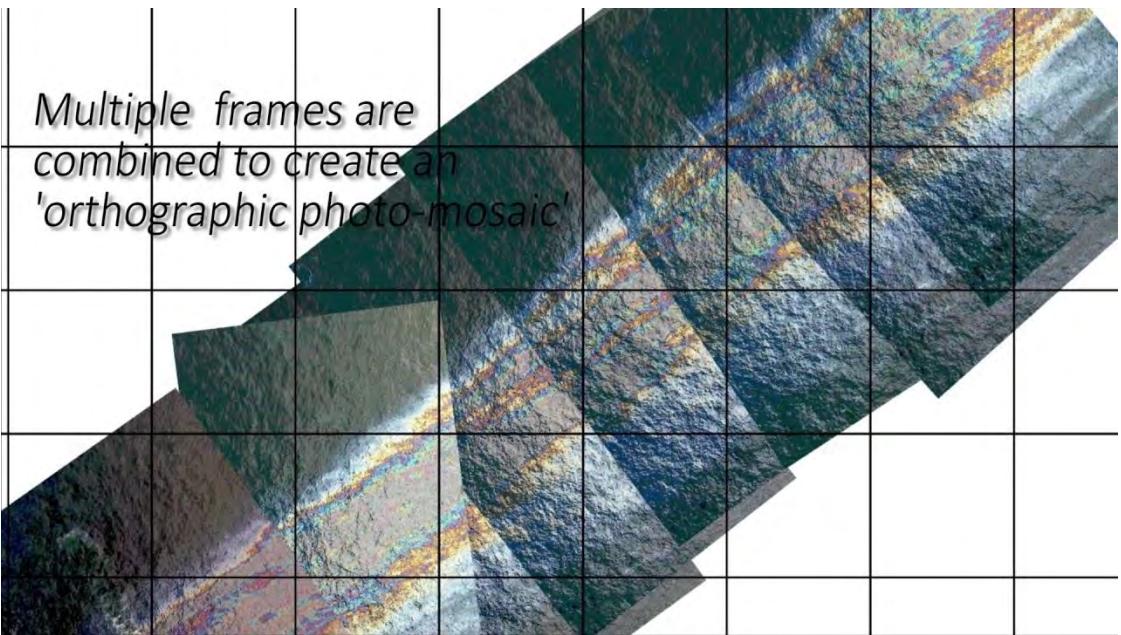
Ground Control Points dGPS

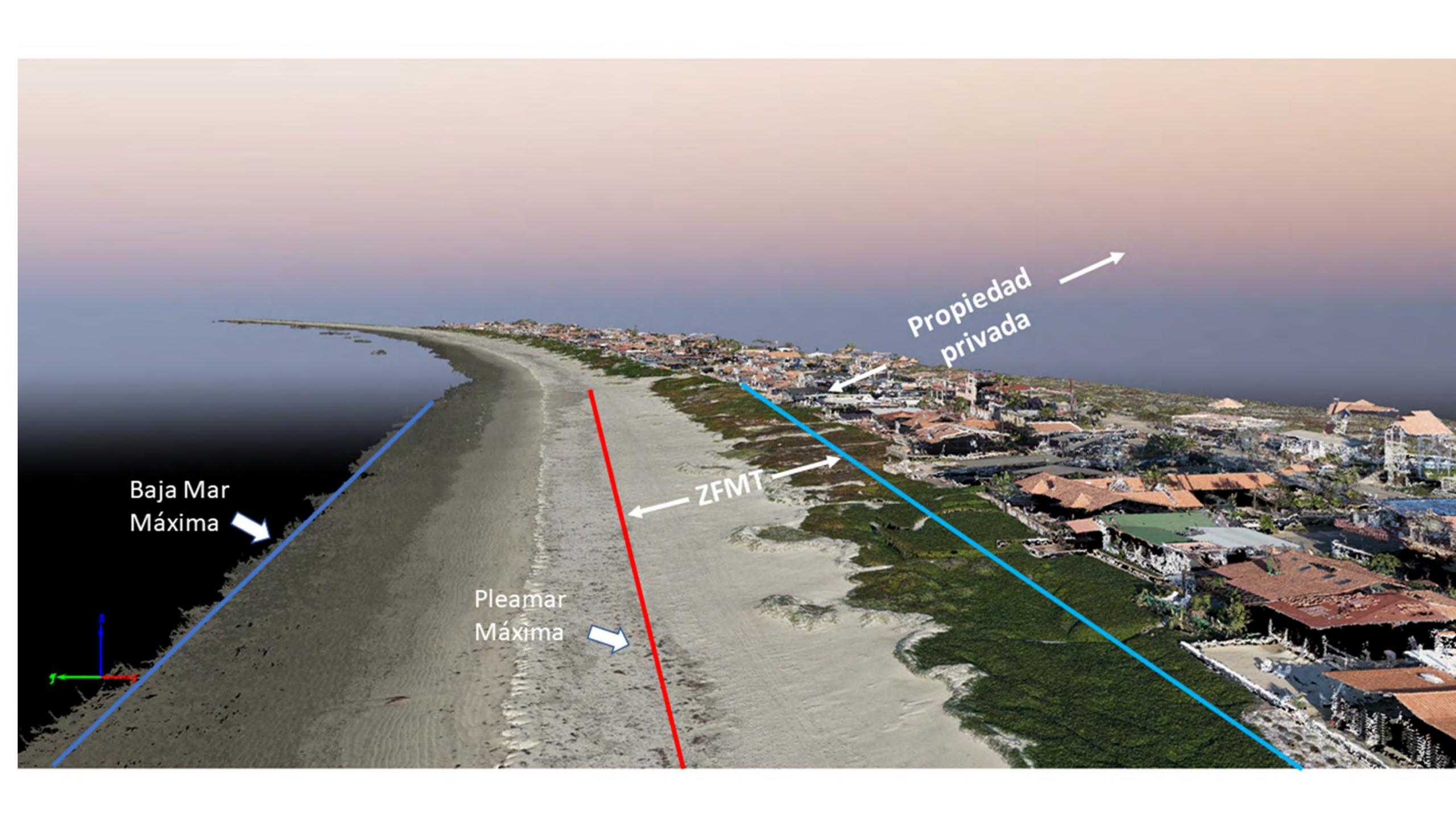
Point cloud (Agisoft)



# Structure from Motion

## (Ortomosaico en HR)





Baja Mar  
Máxima

Pleamar  
Máxima

ZFMT

Propiedad  
privada

# Mexican Caribbean



## A satellite remote-sensing multi-index approach to discriminate pelagic *Sargassum* in the waters of the Yucatan Peninsula, Mexico

Eduardo Cuevas    , Abigail Uribe-Martínez    and María de los Ángeles Liceaga-Correa 

<sup>a</sup>Departamento de Recursos del Mar, Laboratorio de Percepción Remota y SIG, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional, Unidad Mérida, Mérida, México; <sup>b</sup>Centro de Investigación de Ciencias Ambientales, CONACYT-Universidad Autónoma del Carmen, Cd. Del Carmen, Campeche, Mexico

### ABSTRACT

Recently, the need for quantitative information on the spatiotemporal distribution of floating macroalgae, particularly the two species of genus *Sargassum*, has grown because of blooms of these species in the Gulf of Mexico and Caribbean Sea. Remote sensing is one of the most frequently used tools to assess pelagic *Sargassum* distribution. The purpose of this study was to implement a methodological approach to detect floating algae in an efficient and replicable manner at a moderate cost. We analyzed Landsat 8 imagery, from which we calculated four vegetation indices and one floating-algae index to implement a supervised classification, together with the bands 2 and 5, using the Random Forest algorithm. The analysis was performed monthly from 2014 to 2015 for the northeastern Yucatan Peninsula, Mexico, with a total of 91 analyzed images. The quantitative performance metrics of the classifier (overall, Kappa and Tau) were greater than 80%, whereas bands 2 and 5 as well as the atmospherically resistant vegetation index made the greatest contributions to the classifications. During summer 2015, more than 4,000 ha of *Sargassum* coverage per image were observed, which was substantially greater than that over the rest of the period. This approach constitutes a transferable alternative for the systematic detection of *Sargassum*, which enables a quantitative semi-automated time series comparison.

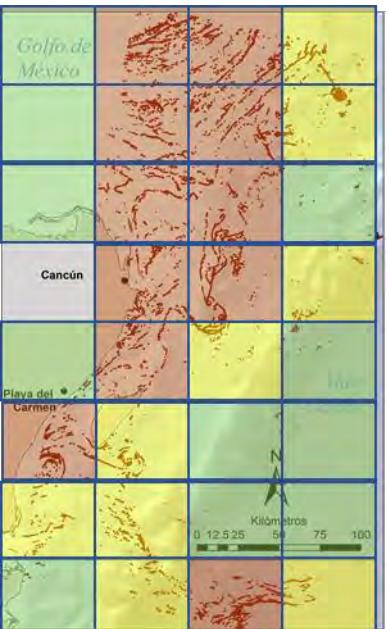
### 1. Introduction

The pelagic *Sargassum* genus include two species of Phaeophyta macroalgae that are irregularly distributed in configurations whose lengths range from 50 cm to several kilometres (Butler et al. 1983). *Sargassum* is widely distributed along the Gulf of Mexico

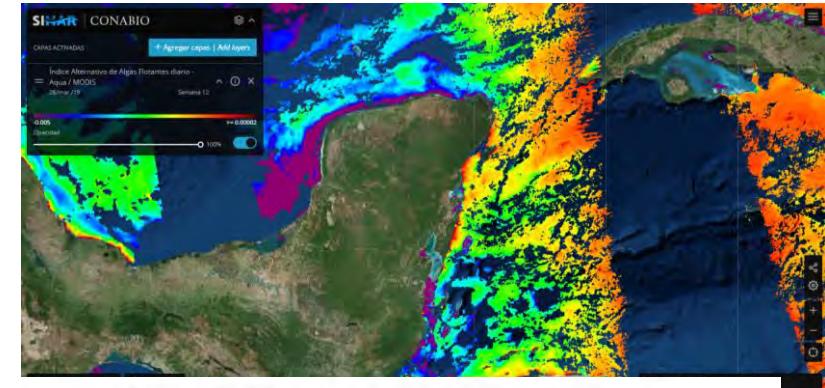
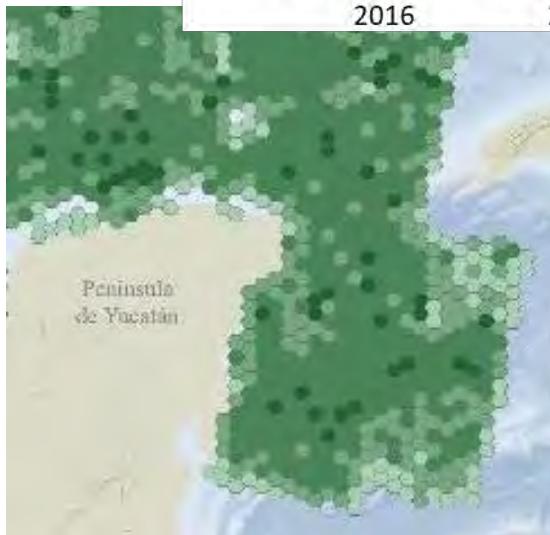
### ARTICLE HISTORY

Received 29 June 2017  
Accepted 24 February 2018

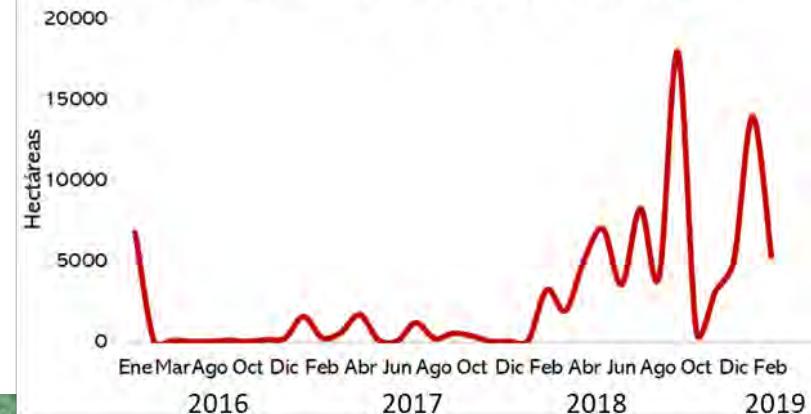
# Dr. Eduardo Cuevas Dra. Abigail Uribe



**Estadística anual**  
A esta fecha, las agregaciones de sargazo se concentran en la zona frente a Playa del Carmen con coberturas promedio de 30 ha.



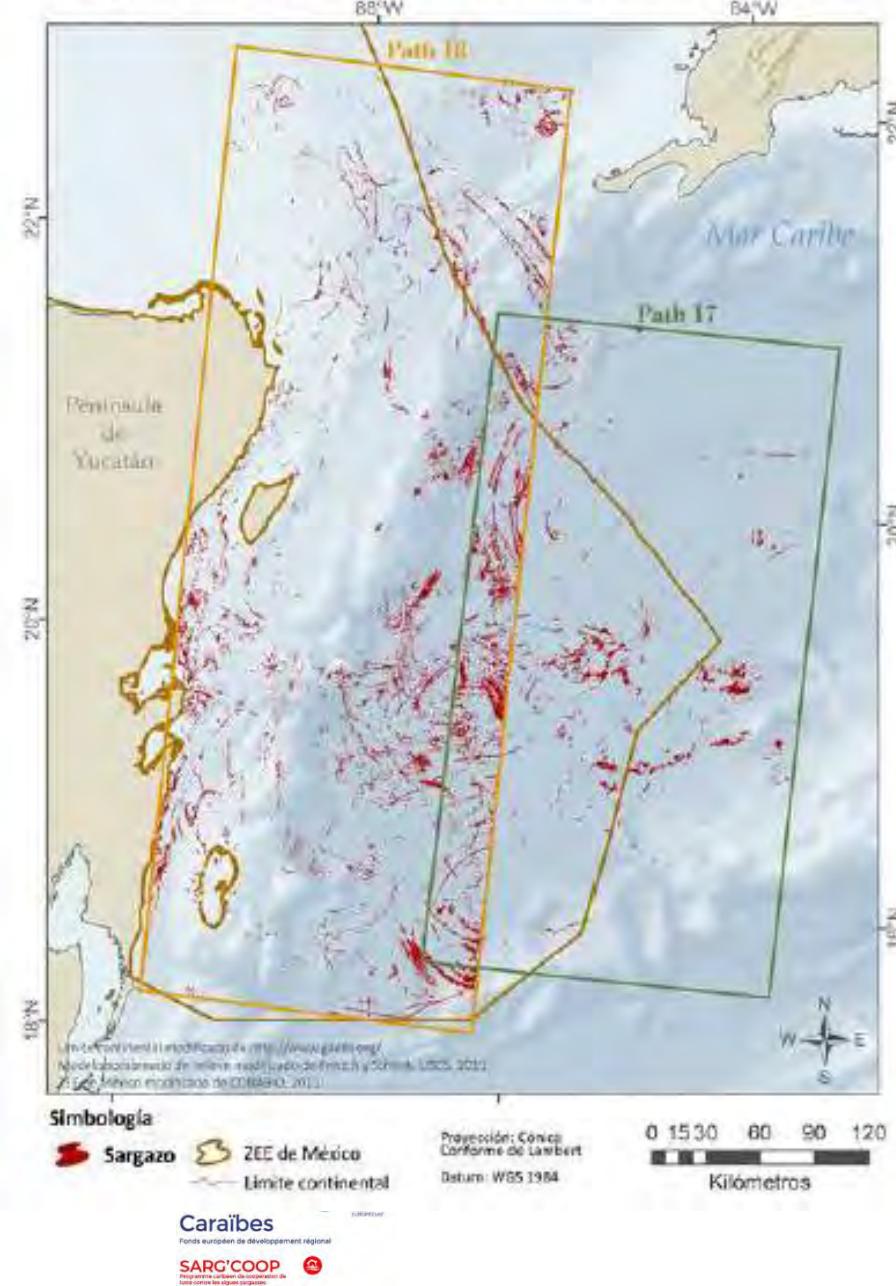
Área acumulada de sargazo detectado



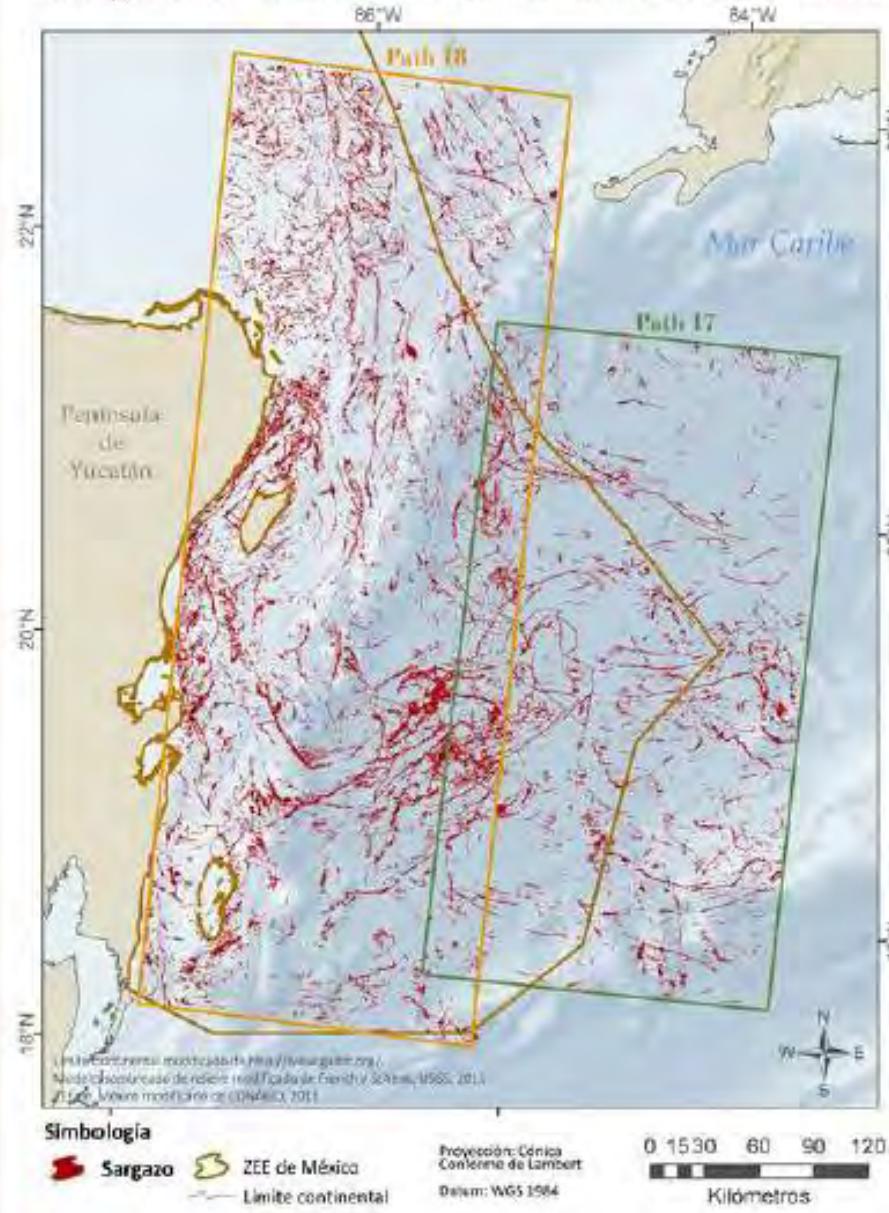
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## Sargazo en el Caribe Mexicano durante el 2014



Sargazo en el Caribe Mexicano durante el 2015

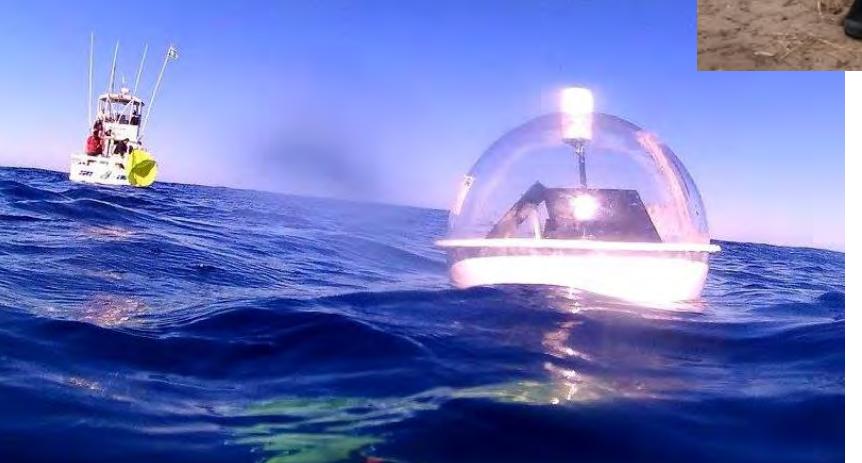
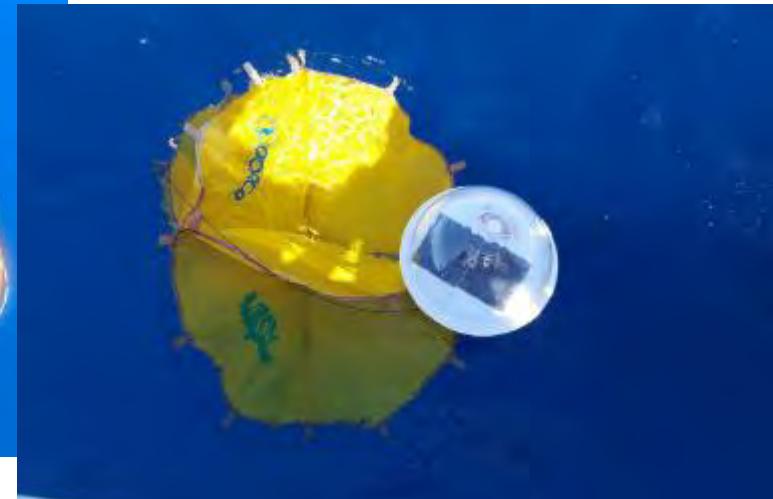
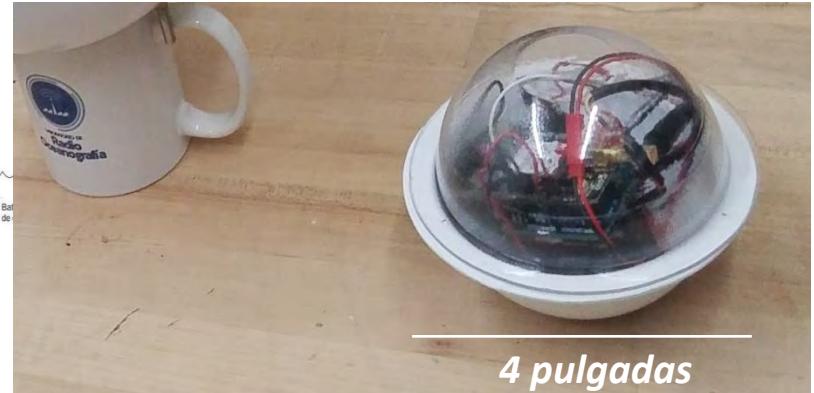
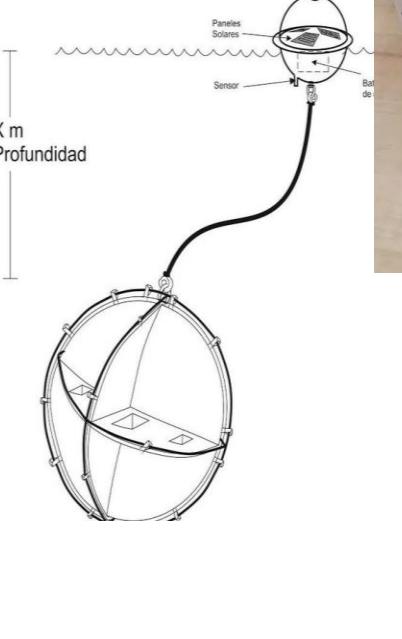


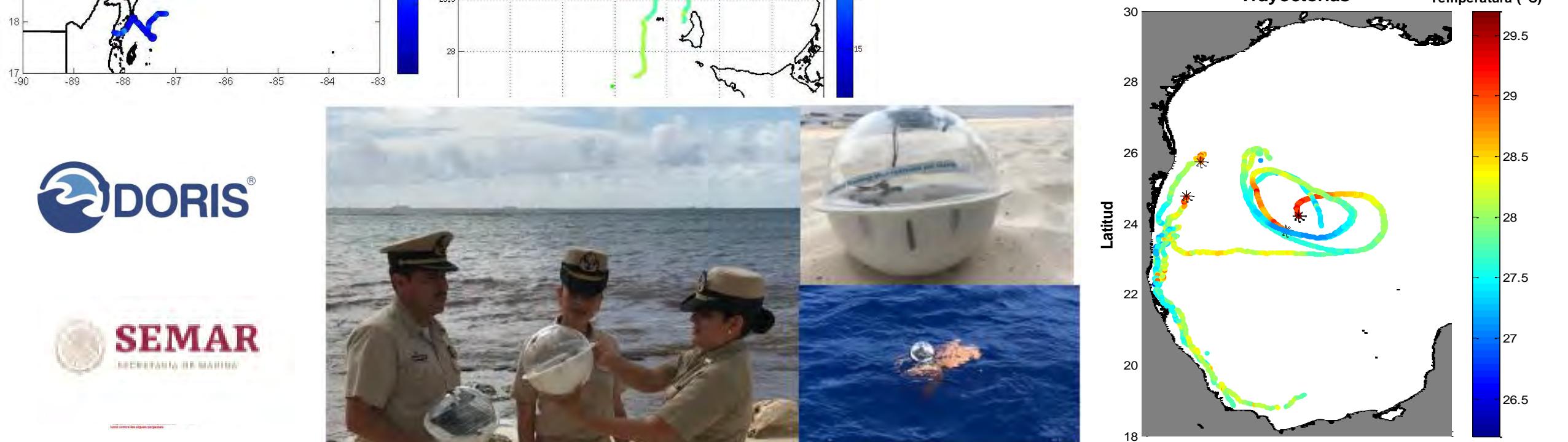
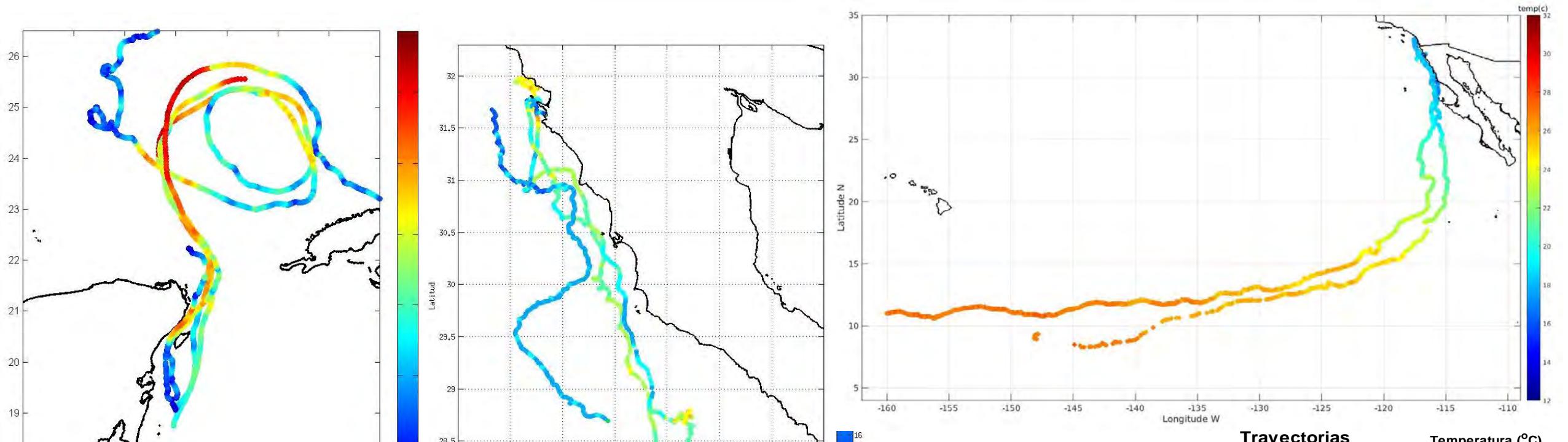
Análisis basados principalmente en MODIS and LANDSAT

Con resolución espacio temporal de algunas decenas de metros y 1 día

# Diseño y construcción de derivadores oceanográficos “DORIS”

## Dr. Xavier Flores-Vidal





The figure shows a screenshot of the OORCO Radar-HF web application. The main view is a map of the Gulf of Mexico and parts of Central America and the southern United States. A green line on the map traces the path of a drifter named 'drifter\_300234067164720\_001'. The map includes state/province boundaries and names like Texas, Louisiana, Mississippi, Alabama, Georgia, Florida, and Cuba. Below the map is a chart titled 'Charts' showing 'Temperatura del agua' (Water Temperature) in Celsius over time from October 5 to October 15, 2019. Three data series are plotted: 'drifter\_300234064163720\_001' (blue line), 'drifter\_300234067164720\_001' (green line), and 'drifter\_300234067402750\_001' (orange line). The orange line shows a significant dip to approximately 17.13°C on October 8, 2019, at 11:17 UTC. The chart also includes a legend and a timestamp 'Tue Oct 8 2019 11:17:00 (UTC)'.

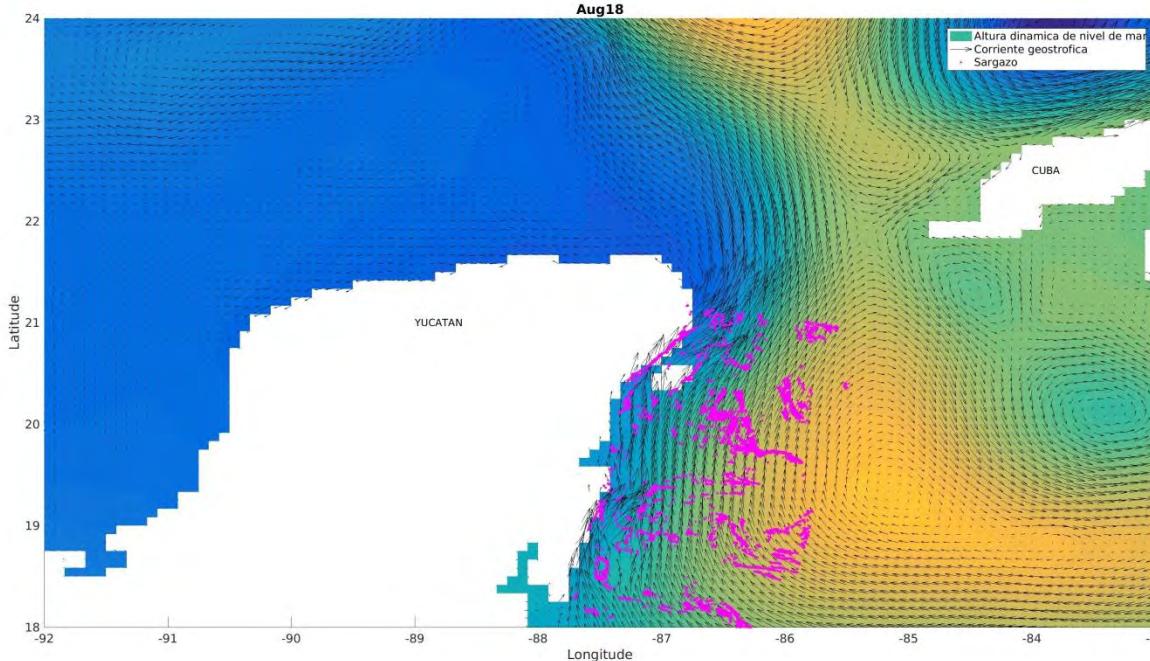


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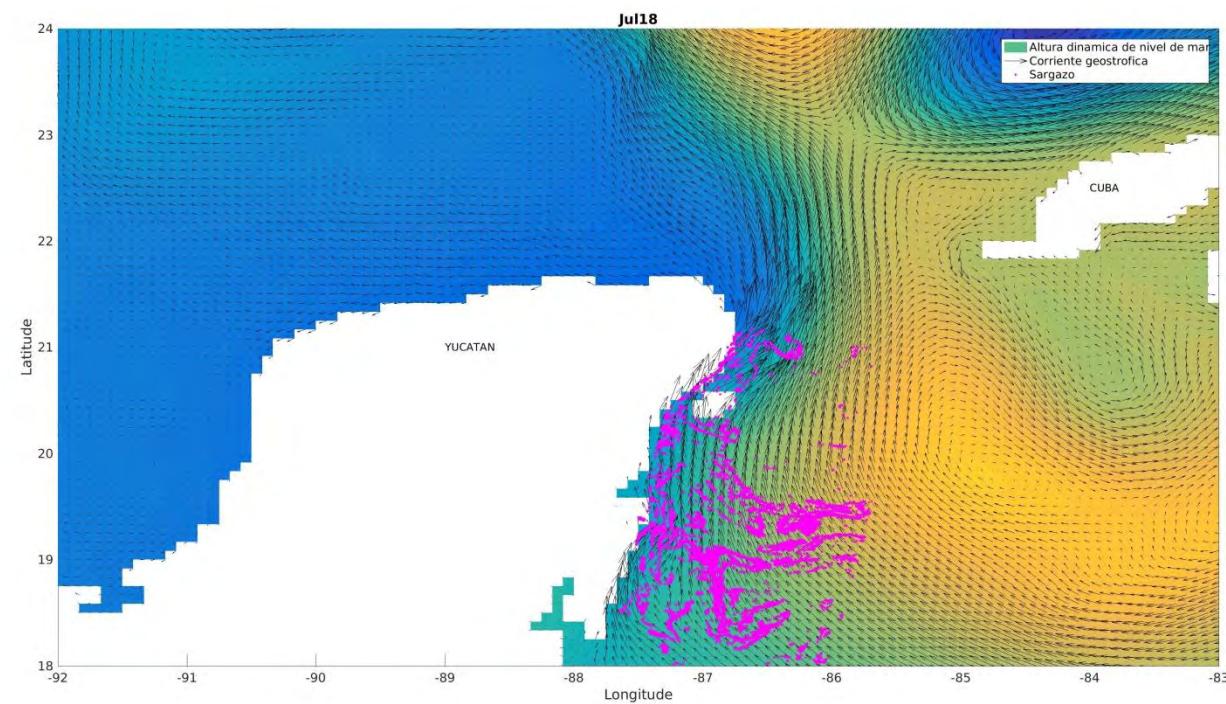


## **CONCLUSIONES**

- Con estas herramientas tenemos la intención de generar una herramienta virtual, disponible al público a través de la web, que permita observar la última posición de las “balsas” de sargazo basados en productos satelitales, imágenes aéreas y radares banda X, así como la magnitud y dirección del campo de corrientes sobre el que se mueven.



- Esta información tiene el potencial de actualizarse hasta 3 o 4 veces por día, con resolución espacial de algunos cientos de metros, y formato virtual que permita al observador dar “zoom” sobre ciertas regiones, y observar “hacia atrás” el origen del sargazo y su movimiento para estimar de forma observacional su posible destino y hora.
  - La diferencia de este producto y otros similares, radica en que esta basado en mediciones *in-situ*, transmitidas en tiempo real (diferidas de 1-4 horas)





# GRACIAS

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Laboratorio de Radio Oceanografía

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