

BATIMETRÍA DERIVADA DE SATÉLITE EN LAS COSTAS DEL CARIBE, EE. UU. Y MEDITERRÁNEO



IPReM

Greater Caribbean 2023

IDENTIFICATION | PROTECTION | RESTORATION | MANAGEMENT

JUNE 28th-30th, PANAMA

*Science and technology for sustainable beaches
in a climate change scenario*



BATIMETRÍA DERIVADA DE SATÉLITE EN LAS COSTAS DEL CARIBE, EE. UU. Y MEDITERRÁNEO



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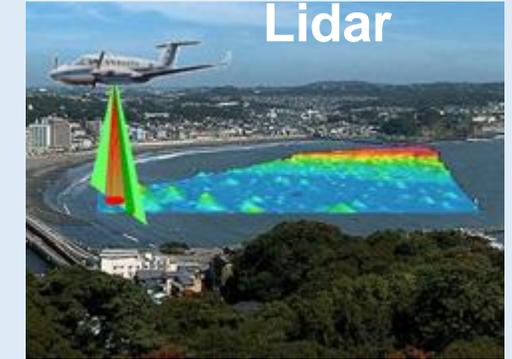
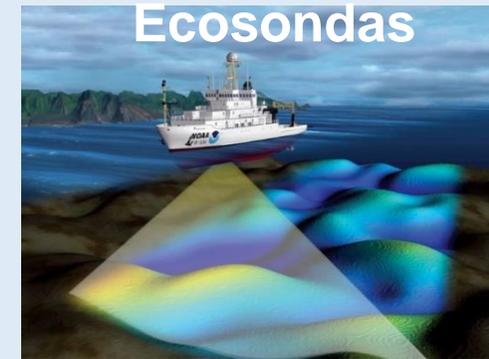
**“Más del 70% del fondo marino sin
cartografiar”**

**Organización Hidrográfica Internacional
Comisión Oceanográfica
Intergubernamental**

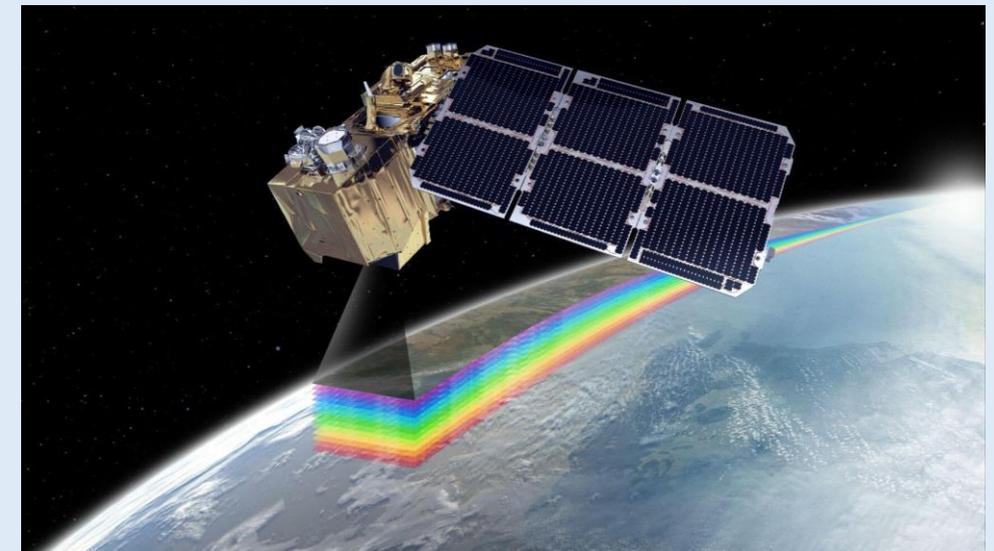
La batimetría somera



Técnicas tradicionales



Batimetría derivada de satélite (SDB)



PLATAFORMA DE TELEDETECCIÓN

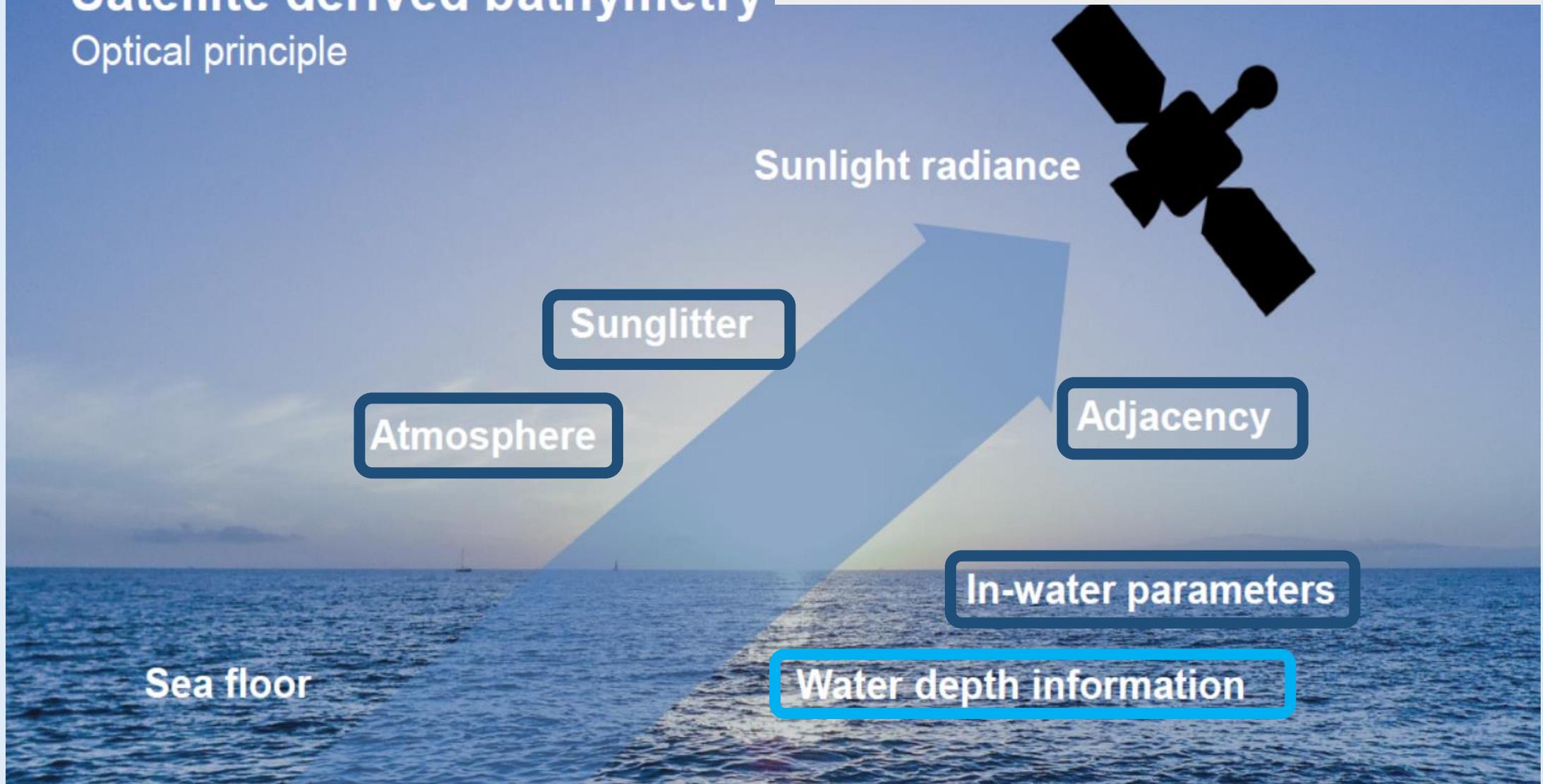
- Satélites Sentinel-2A & 2B (2015 & 2017)
- Resolución espacial: 10 m pixel
- Imágenes cada 5 días
- De acceso libre y gratuito
- Satélites Sentinel-2C & 2D (2024 & 2025)



El “arte” de SDB en la costa

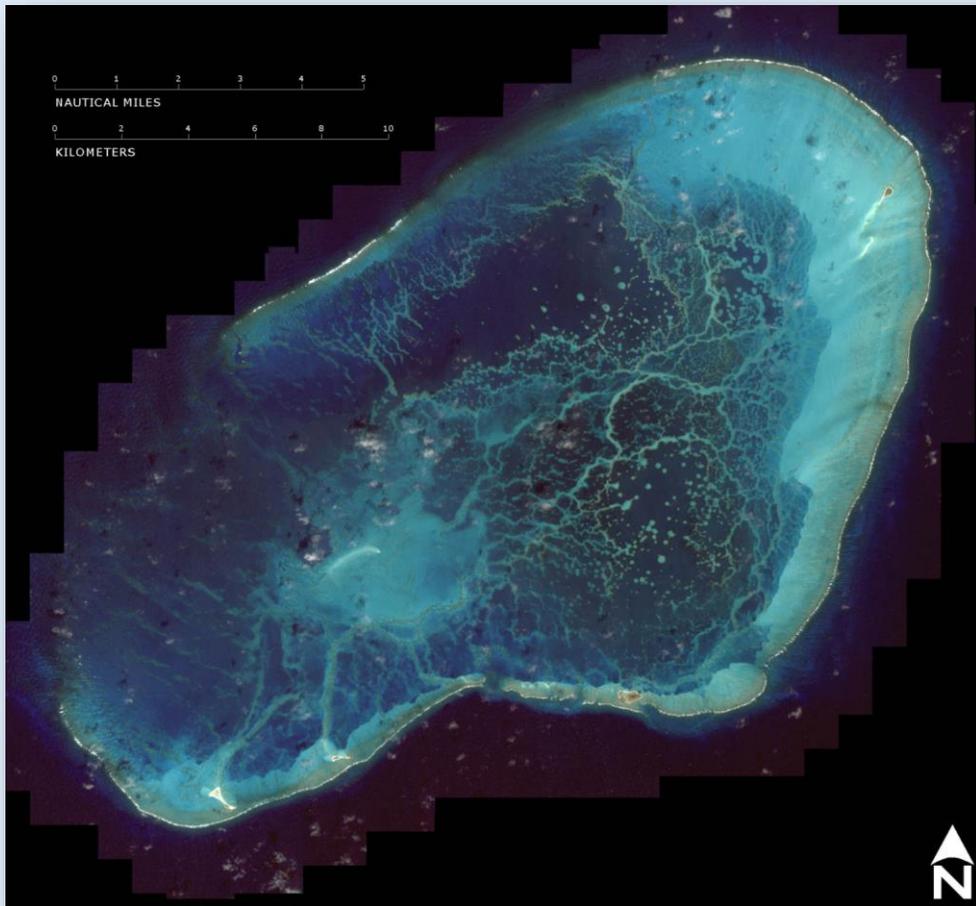
Satellite derived bathymetry

Optical principle



RETOS

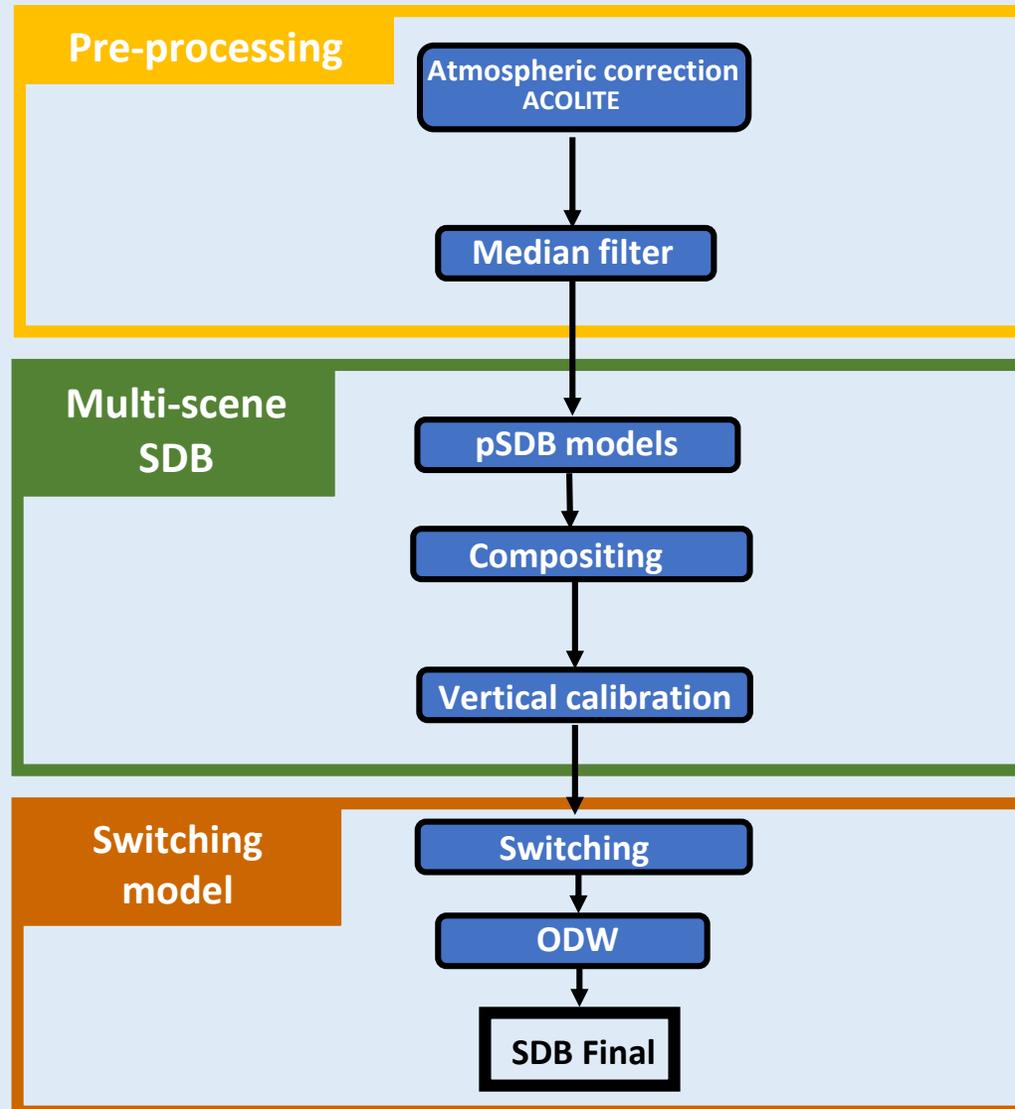
Arrecifes de coral (baja turbidez)



Ensenadas, estuarios, bahías, etc.
Todos experimentan problemas
temporales de turbidez.



BATIMETRÍA DERIVADA DE SATÉLITE EN LAS COSTAS DEL CARIBE, EE. UU. Y MEDITERRÁNEO



Método innovador y semi-automático

BATIMETRÍA DERIVADA DE SATÉLITE EN LAS COSTAS DEL CARIBE, EE. UU. Y MEDITERRÁNEO



Research Article Vol. 28, No. 8/13 April 2020 / Optics Express 11742
Optics EXPRESS

Atmospheric correction for satellite-derived bathymetry in the Caribbean waters: from a single image to multi-temporal approaches using Sentinel-2A/B

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Contents lists available at ScienceDirect
International Journal of Applied Earth Observation and Geoinformation
 journal homepage: www.elsevier.com/locate/jag

Semi-automated bathymetry using Sentinel-2 for coastal monitoring in the Western Mediterranean

Sandra Paola Viana-Borja^{a,*}, Angels Fernández-Mora^b, Richard P. Stumpf^c, Gabriel Navarro^a, Isabel Caballero^a

^aInstitute of Marine Sciences of Andalucía (ICMAN), Spanish National Research Council (CSIC), Puerto Real, 11519, Cádiz, Spain
^bBalearic Islands Coastal Observing and Forecasting System (ICTS SOCIB), Palma de Mallorca, 07121, Mallorca, Spain
^cNational Centers for Coastal Ocean Science, NOAA National Ocean Service, Silver Spring 20910, Maryland, U.S.

remote sensing



Towards Routine Mapping of Shallow Bathymetry in Environments with Variable Turbidity: Contribution of Sentinel-2A/B Satellites Mission

Isabel Caballero^{1,2,*} and Richard P. Stumpf¹

¹ National Centers for Coastal Ocean Science, NOAA National Ocean Service, East West Highway, 1305, Silver Spring, MD 20910, USA; richard.stumpf@noaa.gov
² Instituto de Ciencias Marinas de Andalucía (ICMAN), Consejo Superior de Investigaciones Científicas (CSIC), Avenida República Saharaui, 11510 Cádiz, Spain
 * Correspondence: isabel.caballero@icman.csic.es

Contents lists available at ScienceDirect
Estuarine, Coastal and Shelf Science
 journal homepage: www.elsevier.com/locate/ecss

Retrieval of nearshore bathymetry from Sentinel-2A and 2B satellites in South Florida coastal waters

Isabel Caballero^a, Richard P. Stumpf

^aNational Centers for Coastal Ocean Science, National Ocean Service, NOAA, Silver Spring, MD, USA

Contents lists available at ScienceDirect
Science of the Total Environment
 journal homepage: www.elsevier.com/locate/scitotenv

Confronting turbidity, the major challenge for satellite-derived coastal bathymetry

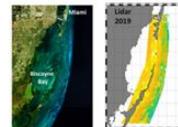
Isabel Caballero^{a,*}, Richard P. Stumpf^b

^aInstituto de Ciencias Marinas de Andalucía (ICMAN), Consejo Superior de Investigaciones Científicas (CSIC), Avenida República Saharaui, 11519 Puerto Real, Spain
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HIGHLIGHTS

- The twin satellites Sentinel-2 are used for mapping shallow seabed cartography.
- Several environments are evaluated along the Caribbean and eastern coast of the USA.
- A multi-temporal compositing method automatically addresses water quality issues.
- The maximum detectable depth is defined

GRAPHICAL ABSTRACT



remote sensing



Preliminary Assessment of Turbidity and Chlorophyll Impact on Bathymetry Derived from Sentinel-2A and Sentinel-3A Satellites in South Florida

Isabel Caballero^{1,*}, Richard P. Stumpf¹ and Andrew Meredith²

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² National Centers for Coastal Ocean Science (NCCOS), National Oceanic and Atmospheric Administration (NOAA), Charleston, SC 29412, USA; andrew.meredith@noaa.gov
 * Correspondence: isabel.caballero@icman.csic.es

Contents lists available at ScienceDirect
Coastal Engineering
 journal homepage: www.elsevier.com/locate/coastaleng

On the use of Sentinel-2 satellites and lidar surveys for the change detection of shallow bathymetry: The case study of North Carolina inlets

Isabel Caballero^{a,*}, Richard P. Stumpf^b

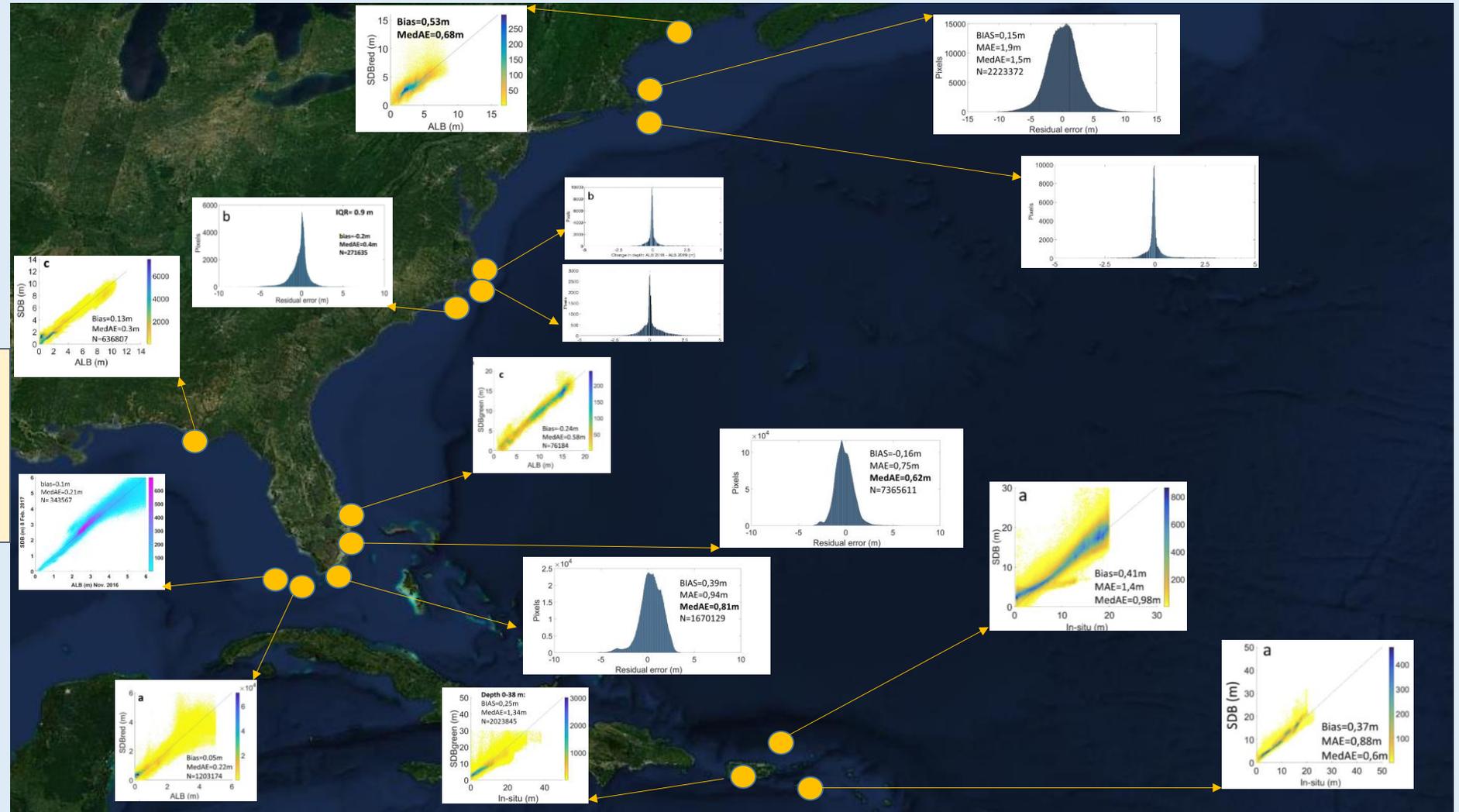
^aInstituto de Ciencias Marinas de Andalucía (ICMAN), Consejo Superior de Investigaciones Científicas (CSIC), Avenida República Saharaui, Cádiz, 11510, Spain
^bNational Centers for Coastal Ocean Science, NOAA National Ocean Service, East West Highway, 1305, Silver Spring, MD, 20910, USA

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15 regiones de estudio

Resultados consistentes

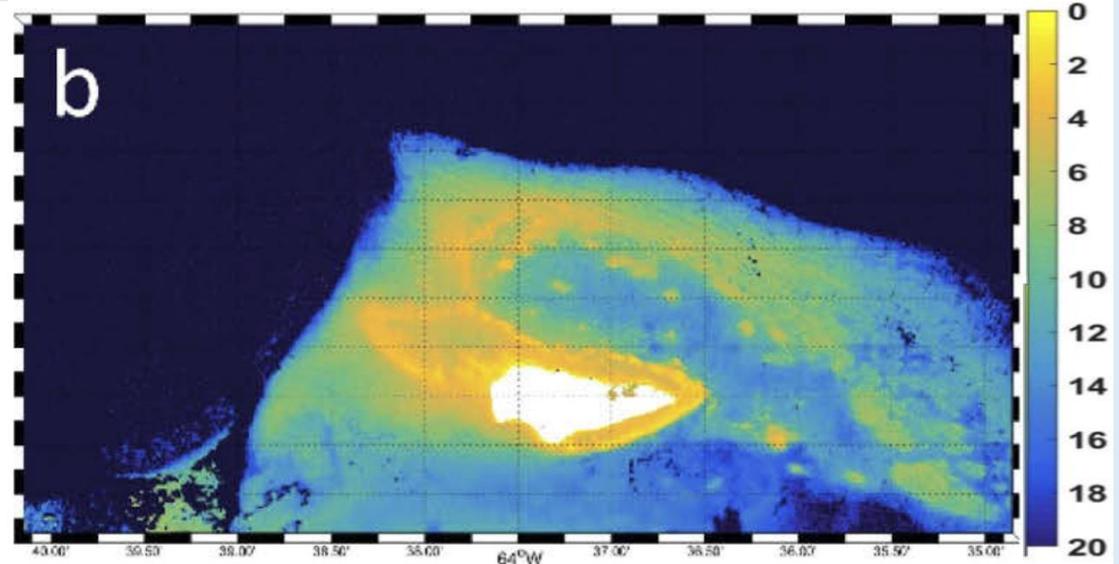
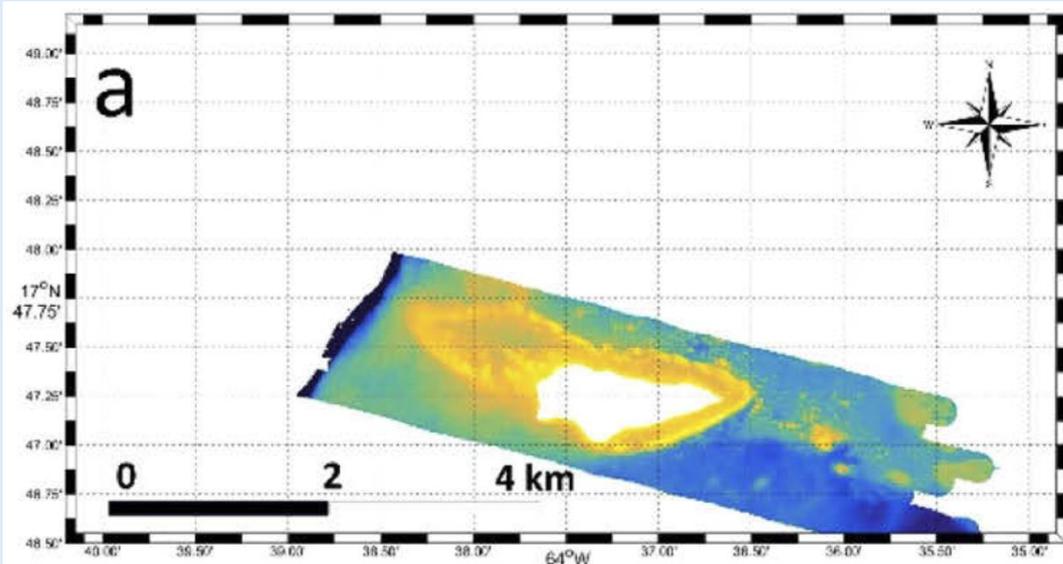
Resolución espacial 10 m
Profundidades 0-30 m
MedAE ~1 m
Bias < ± 0.5 m



BATIMETRÍA DERIVADA DE SATÉLITE EN LAS COSTAS DEL CARIBE, EE. UU. Y MEDITERRÁNEO

Región del Caribe

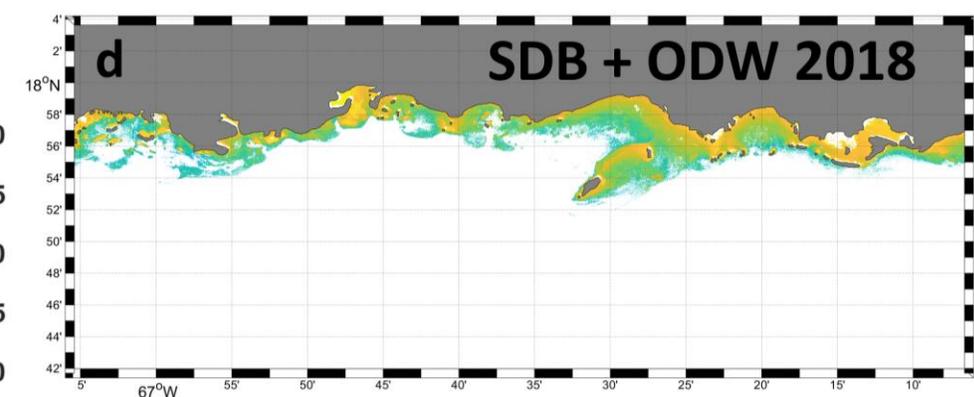
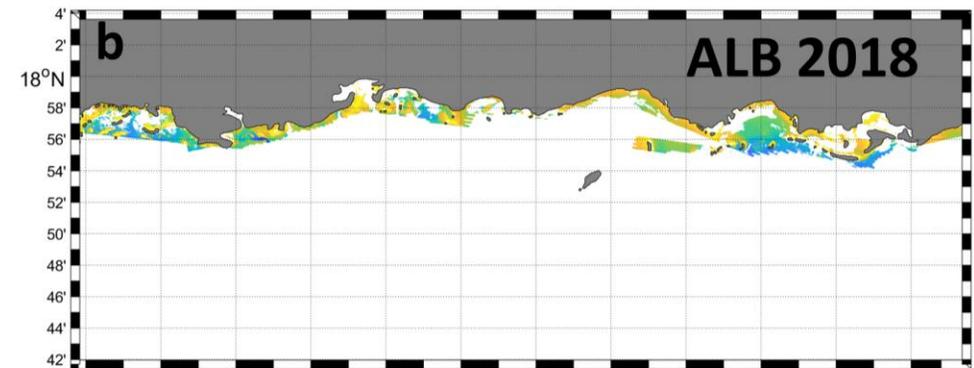
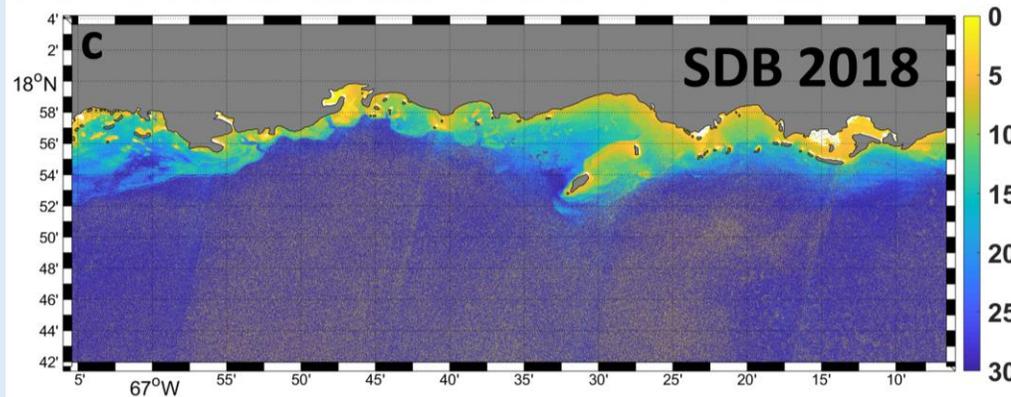
Profundidad= 0-25 m
Bias=0.37 m
MedAE=0.6 m



BATIMETRÍA DERIVADA DE SATÉLITE EN LAS COSTAS DEL CARIBE, EE. UU. Y MEDITERRÁNEO



Profundidad= 0-30 m
Bias=0.35 m
MedAE=1.31 m



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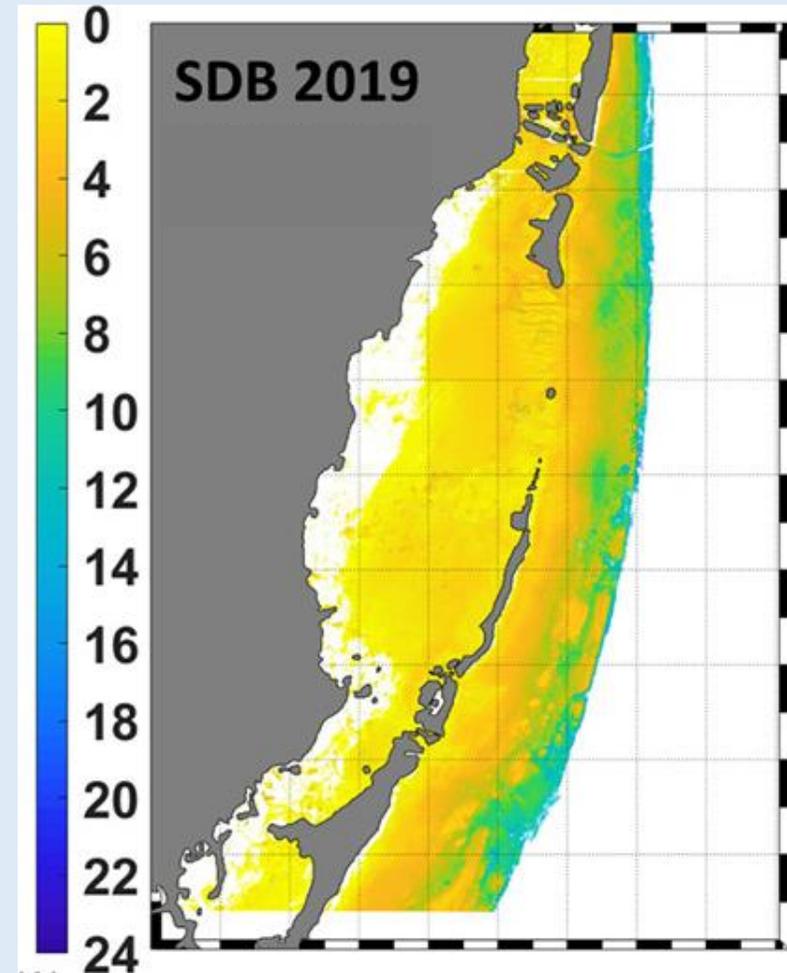
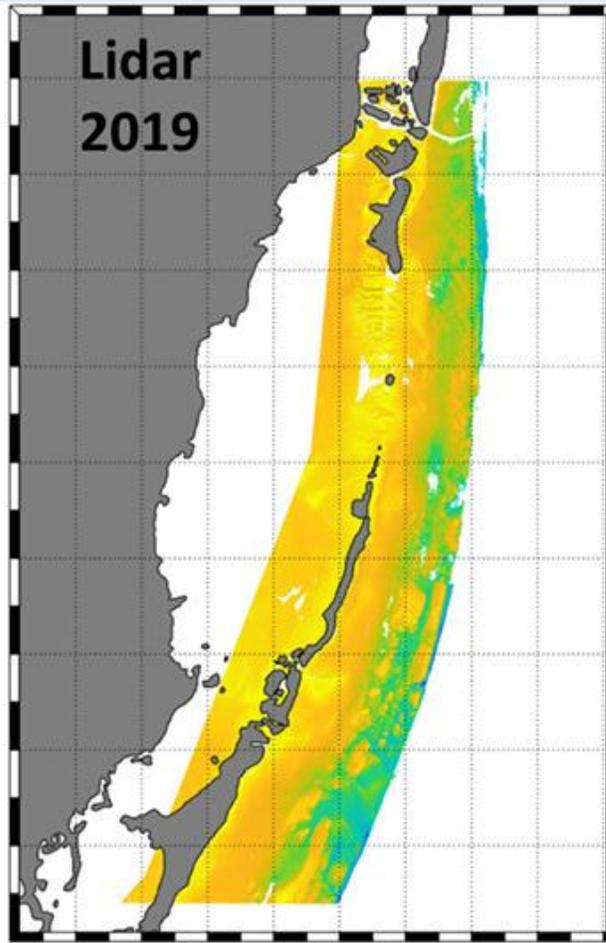


Estados Unidos

Profundidad= 0-25 m

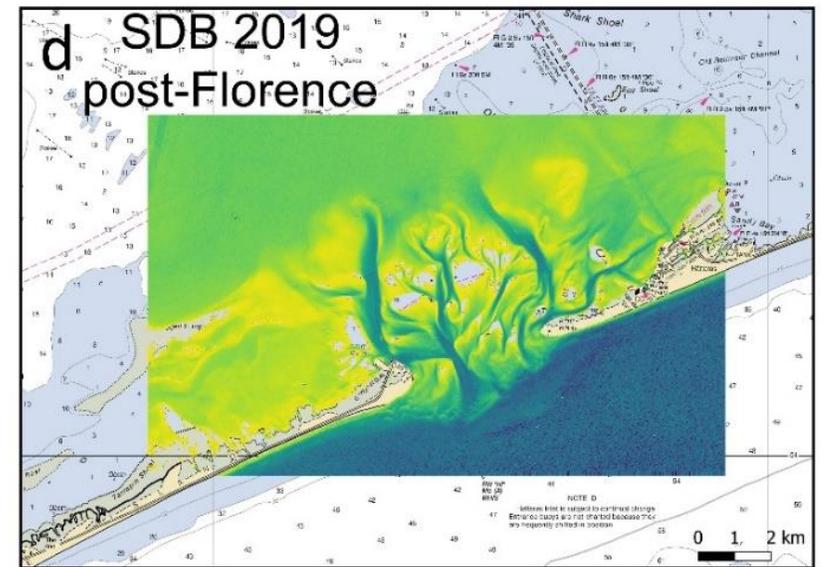
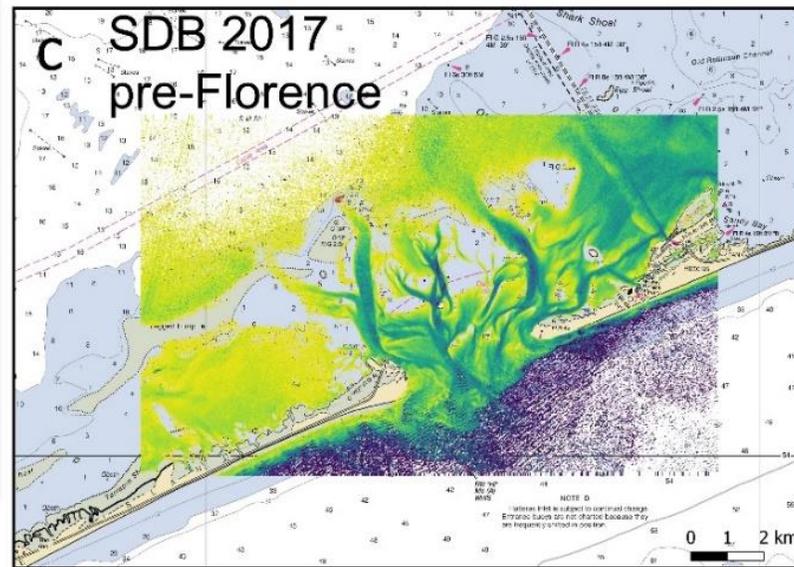
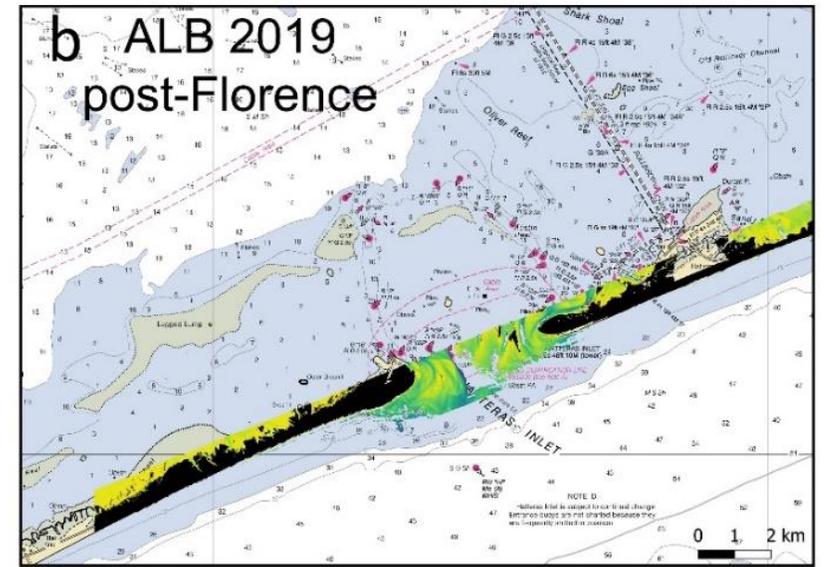
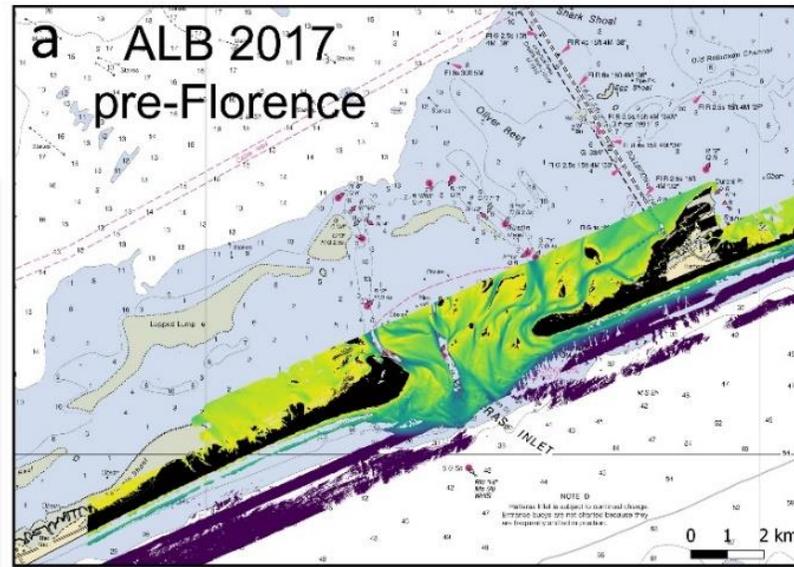
Bias=0.17 m

MedAE=0.6 m

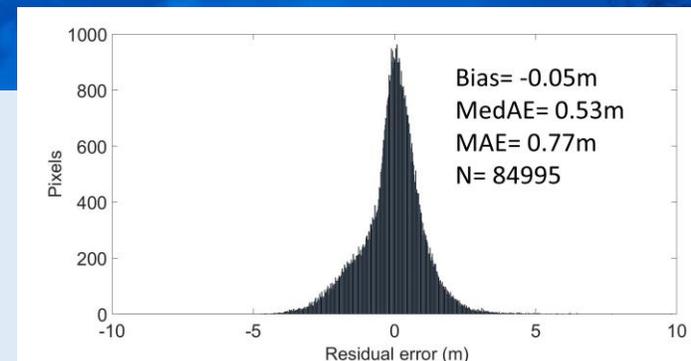


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Evaluación de cambios después del huracán Florence 2018



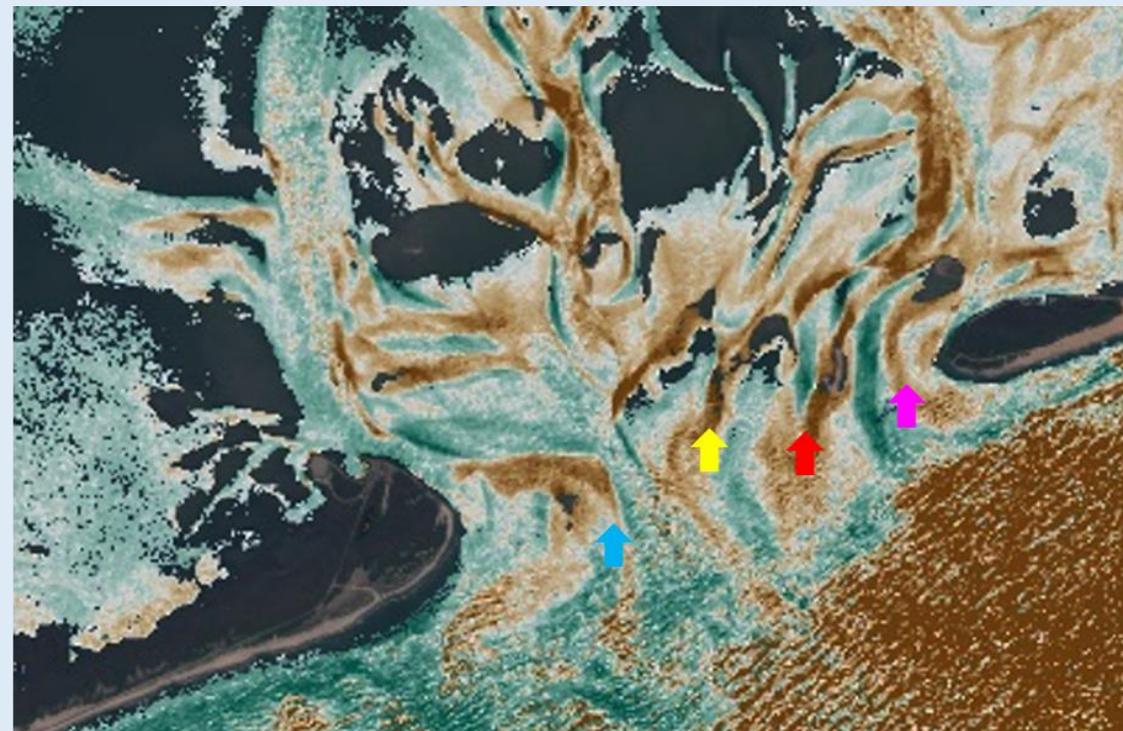
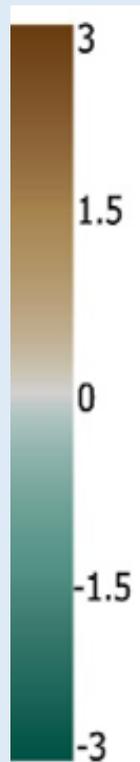
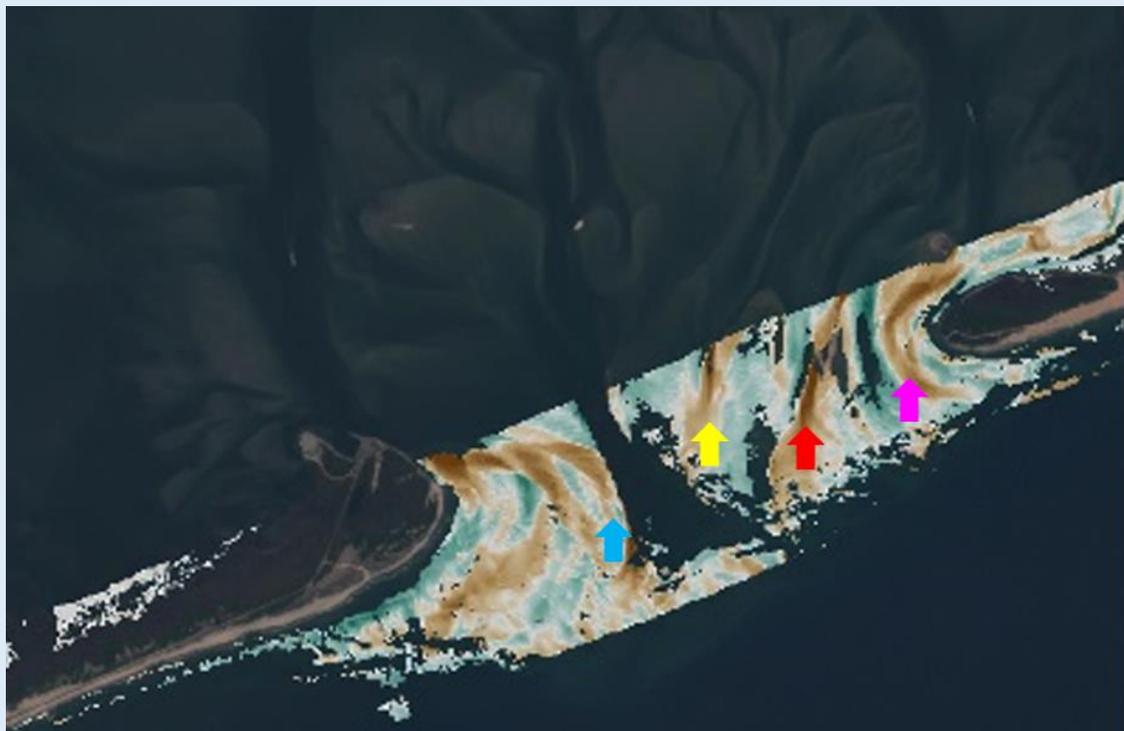
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ALB Lidar

Acreción (m)

SDB



Erosión

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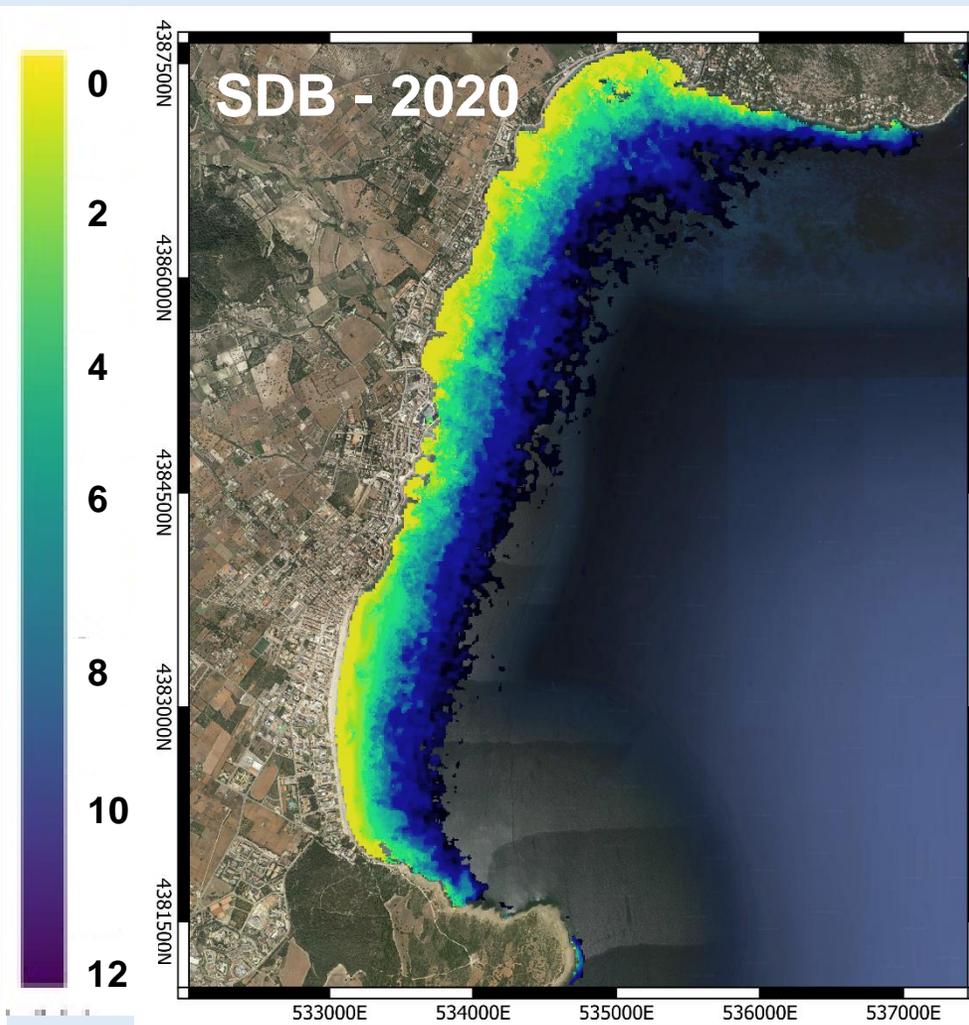
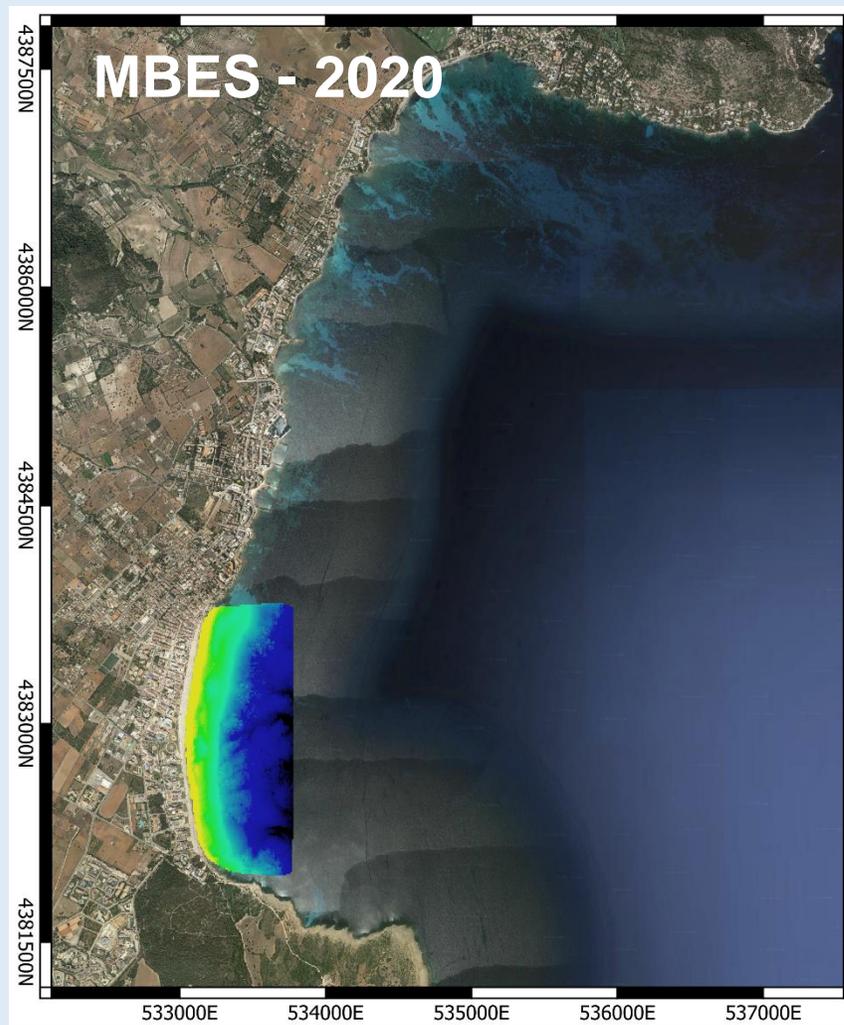
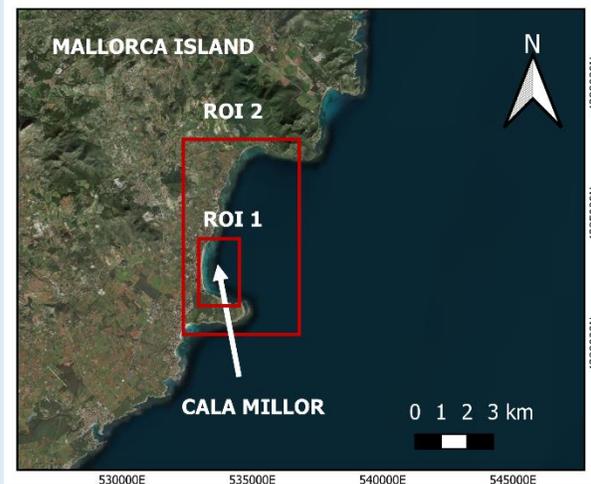


Mediterráneo

Profundidad= 0-14 m

Bias=0.06 m

MedAE=0.57 m



Beneficios

- Método SDB semi-automático y robusto que ofrece batimetría de precisión.
- Corrección automática del impacto de la turbidez.
- Se abordan otros retos complejos en el procesamiento de imágenes tales como pixeles sin información, artefactos y ruidos propios de la imagen.
- Solo requiere de una calibración con < 15 puntos in situ.
- Mejora substancialmente los datos obtenidos de las regiones más someras (< 5 m).

**BATIMETRÍA DERIVADA DE SATÉLITE EN LAS
COSTAS DEL CARIBE, EE. UU. Y
MEDITERRÁNEO**



MUCHAS GRACIAS!

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