

National Seagrass Blue Carbon Accounting in Bahamas using Earth Observation

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Deutsches Zentrum
für Luft- und Raumfahrt
German Aerospace Center



Seagrass Meadows
Sentinel-2 mosaic
Great Bahamas Banks

100 million

Seagrasses provide coastal protection to more than 100 million people.

Seagrasses reduce wave strength and protect the coast from erosion.

25-50%

Reduction of Tidal Height

159

The countries which have seagrasses in their coastal extent.

350,000 km²

The approximate total global seagrass extent, almost the size of Germany.



CO₂



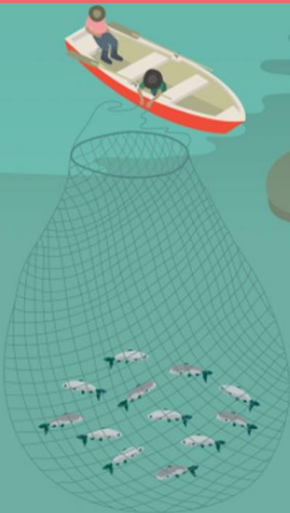
18%

The amount of the annual oceanic carbon sequestered by seagrasses.

This number is 29% more than the annual carbon emissions of the whole cruise ship industry.

20%

The percentage of global fisheries supported by seagrasses.



50%

The reduction of marine pathogenic bacteria by seagrasses.

Seagrasses reduce exposure to bacterial pathogens known to cause diseases in both humans and marine organisms.



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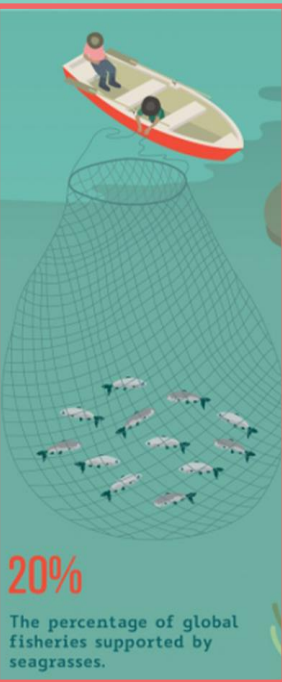
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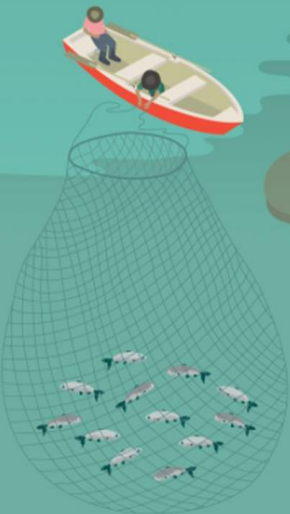
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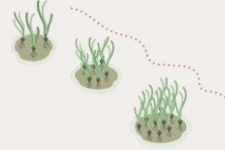
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Known Unknowns

1. Decline of **7%** of extent **per year** (Waycott09)



2. Lack of **spatially explicit** data on extent, condition, **ecosystem services** and **natural capital**

3. Lack of **spatially explicit** scalable **ecosystem accounting** methodologies

4. Problematic **tracking** of progress of **MEA** (NDCs, SDGs, MPAs, CBD)

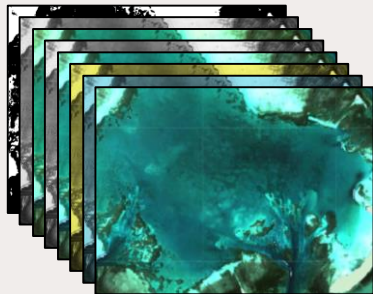


Earth Observation Advances to the Rescue

Powerful Cloud computing

Google Earth Engine

Big satellite data analytics



Artificial Intelligence



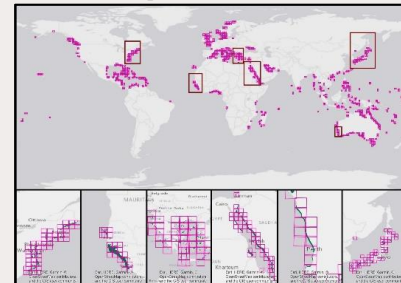
Big reference data



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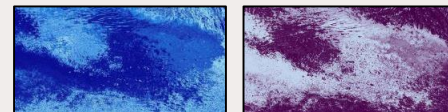
**Spatially-explicit
seagrass ecosystem extent**



**Spatially-explicit
seagrass ecosystem
condition & services**



**Per-pixel
probabilities & uncertainties**



Big Sentinel-2 Data Analytics

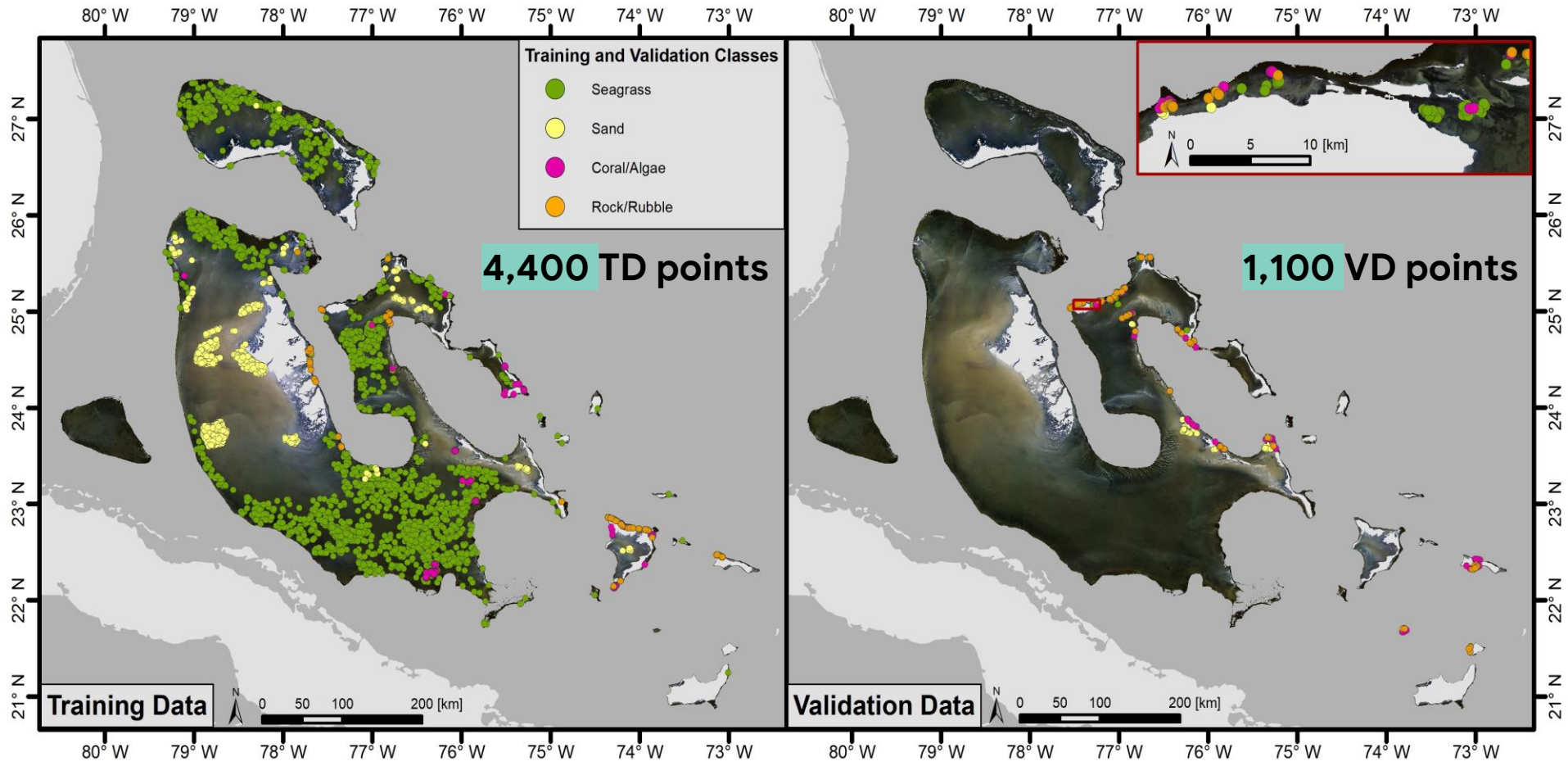
Mosaic of 18,881 images

Area of 633,063 sq. km

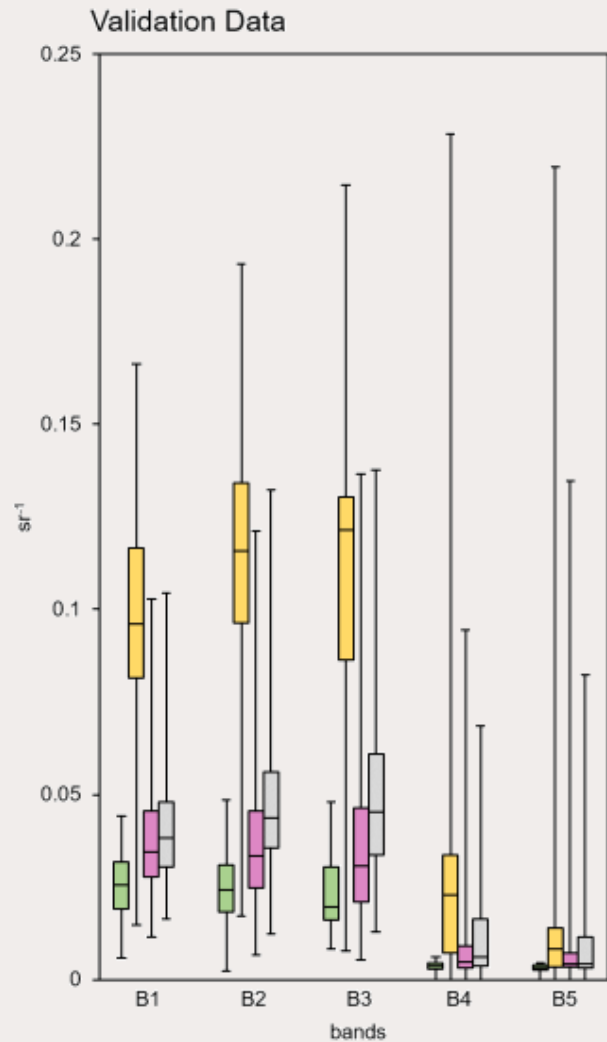
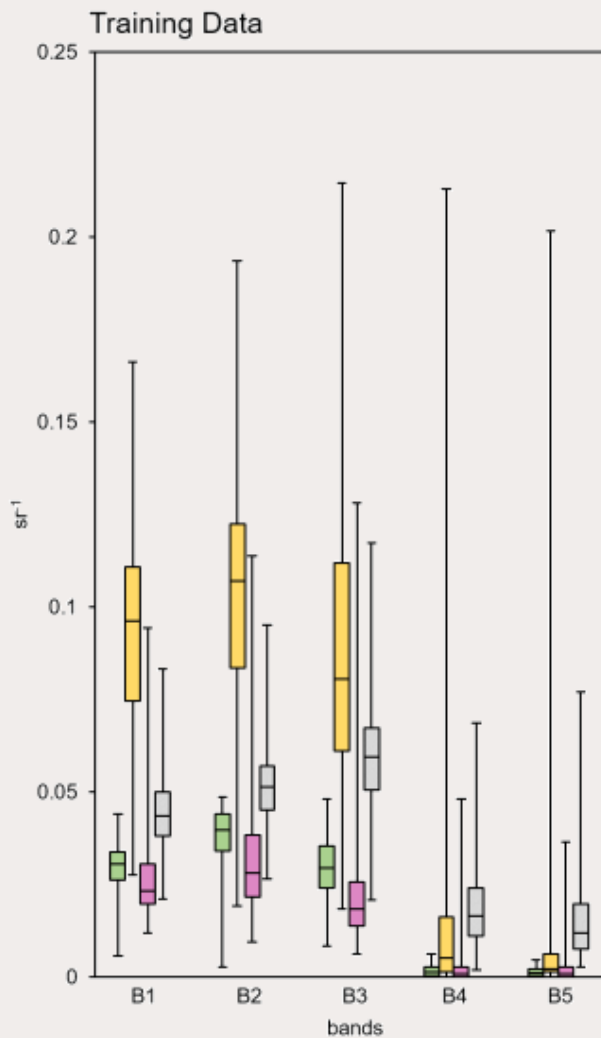
Masked area of 113,037
sq. km



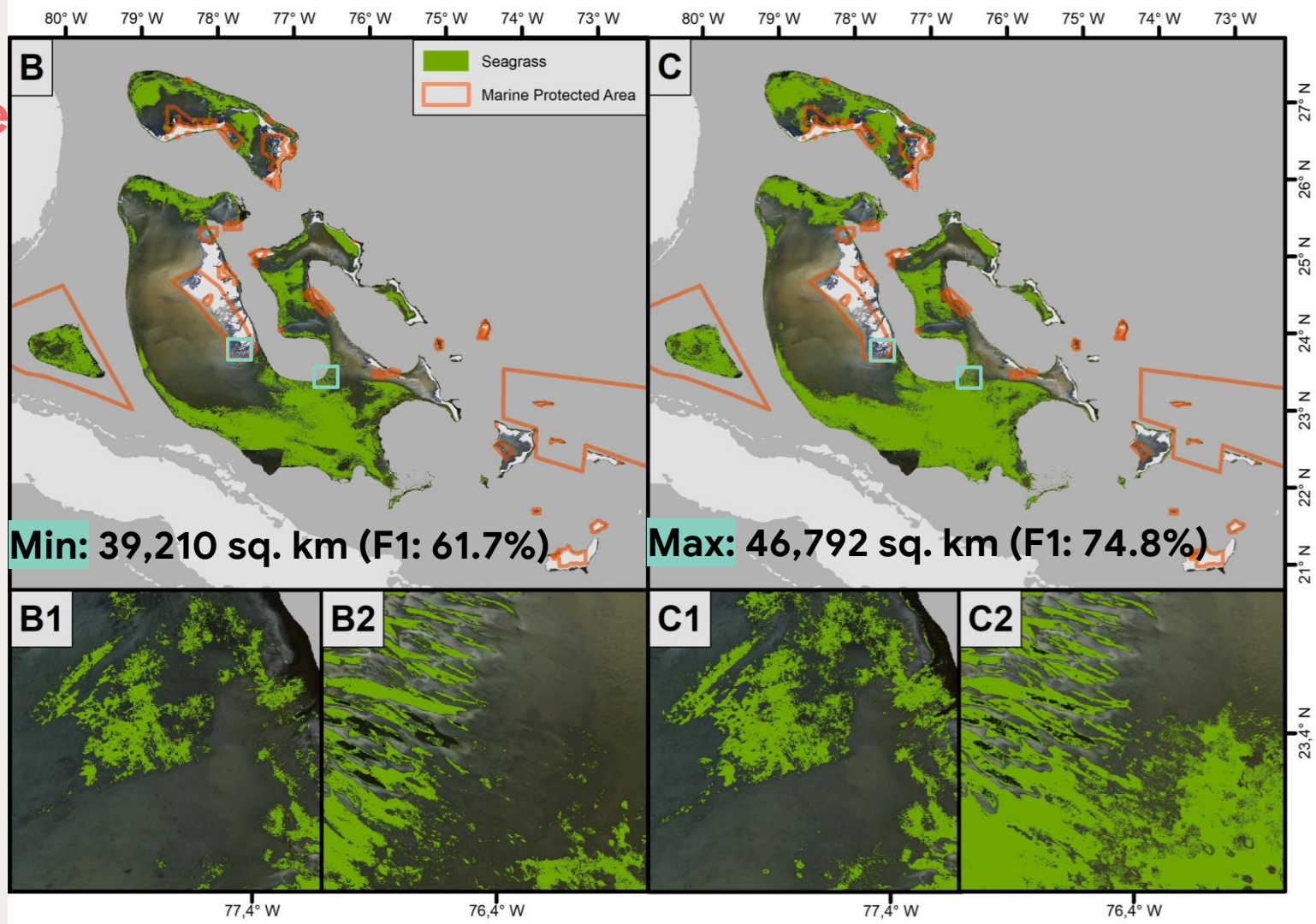
Big Reference Data Analytics



Harmonized Habitat Reference Data






Bahamian Nationwide Seagrass Extent



Bahamian Physical and Monetary Blue Carbon Accounting

Seagrass extent (sq. km)	Tier 2 Blue carbon stock (MgC)	Tier 2 Blue carbon sequestration rate (Mt CO₂/yr)	Annual monetary value (EUR)
39,210	604.5 million	103	6.99 billion
46,792	771.4 million	123	8.34 billion

New Known Unknowns

1. Only **< 11%** of seagrass extent within Bahamian **MPAs** (UNEP-WCMC21) 
2. Lack of nationally-aggregated high-quality **seagrass extent** and **soil carbon** data
3. Lack of spatially explicit **uncertainties** to improve the Earth Observation modelling
4. Problematic **tracking** of progress of **MEA** (NDCs, SDGs, MPAs, CBD)  

Next Steps

1. Holistic **systems-level** approach by fusing Earth Observation, Ecosystem Accounting and biophysical models
2. Collaboration with scientists for integration of new big **field** reference **data**
3. Collaboration with policy makers to streamline spatially explicit and uncertainty aware coastal **conservation and restoration**
4. Collaboration with governments, industry and NGOs to improve funding for long-term, **holistic ecosystem service accounting**, reliant on ecology and translated into economic units and measurable targets



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Project Manager



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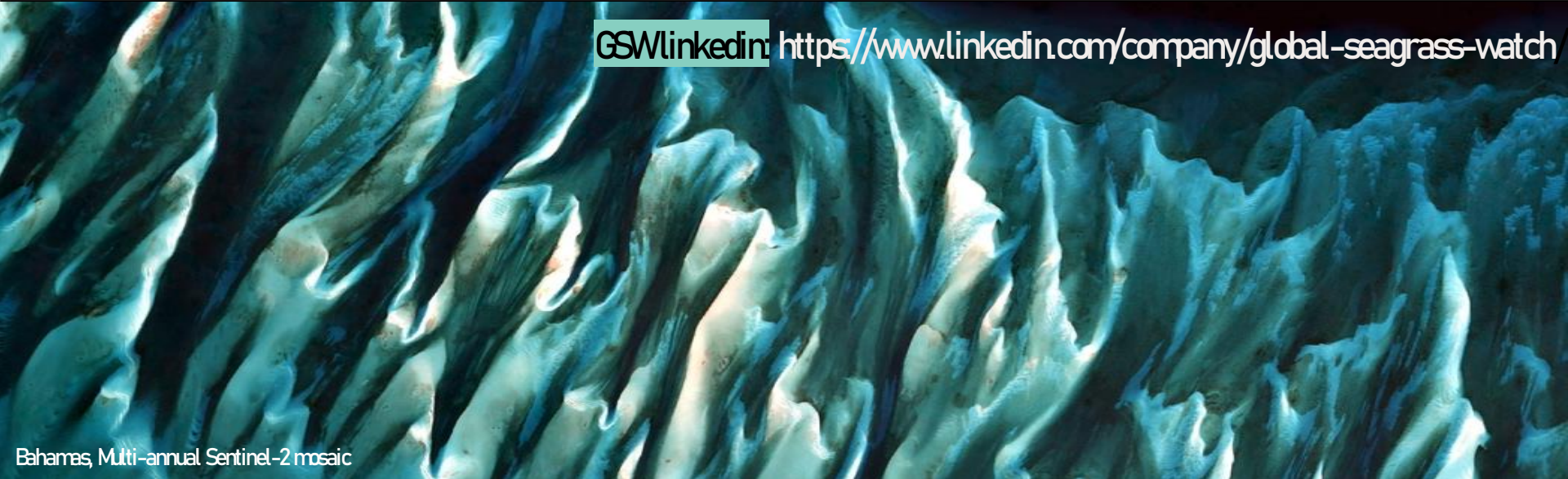
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Avi Putri Pertiwi
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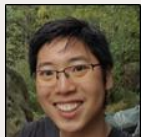


Alina Blume
Research Associate

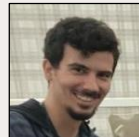


GSWlinkedin: <https://www.linkedin.com/company/global-seagrass-watch>

Bahamas, Multi-annual Sentinel-2 mosaic



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