



# Future Directions for the Digital Ocean and its Digital Twins

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2021 United Nations Decade  
2030 of Ocean Science  
for Sustainable Development



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RESILIENCE



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# Outline

- ***What?*** is the Digital Ocean and its Digital Twins?
- ***Why?*** we need Digital Ocean Twins
- ***How?*** future directions



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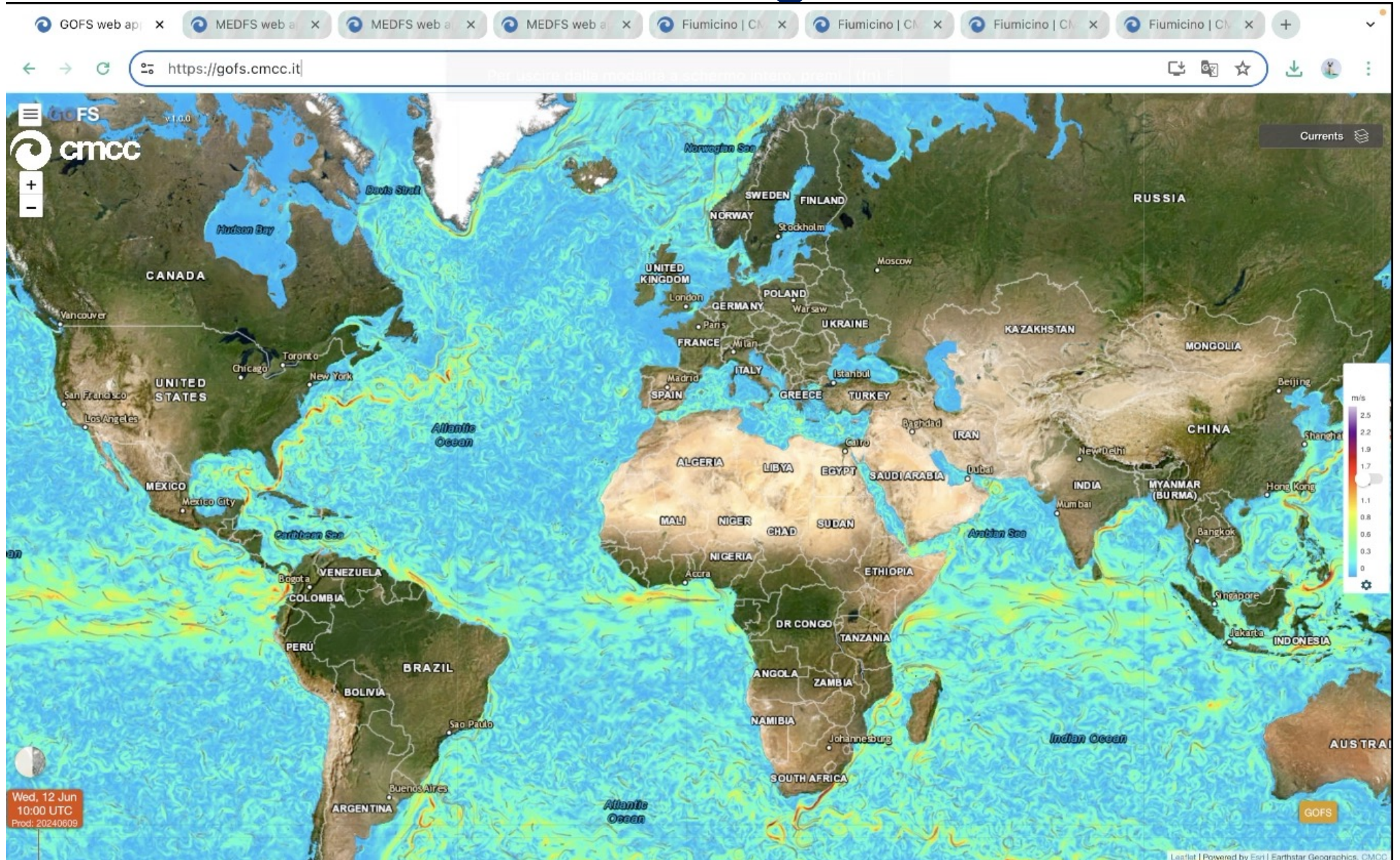
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# What is the Digital Ocean



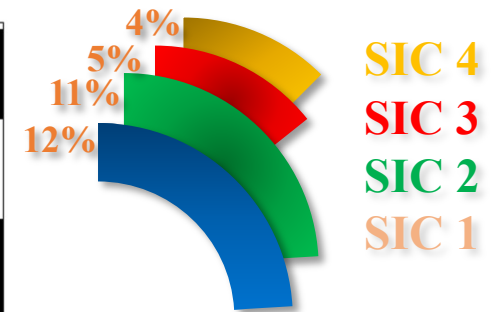
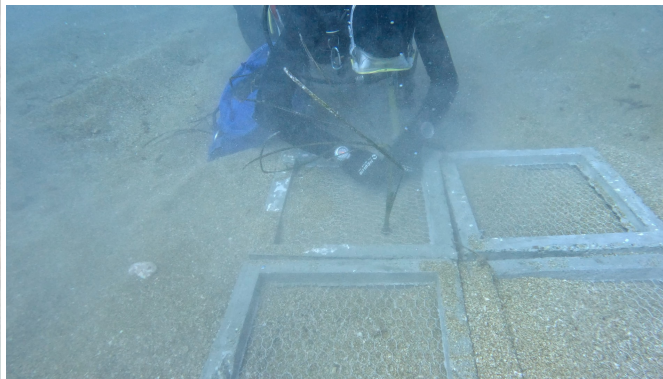
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# What are Digital Ocean Twins

**Adaptation solution to be sought:  
How do I decrease wave energy at the coasts  
and where do I restore seagrass habitat?**

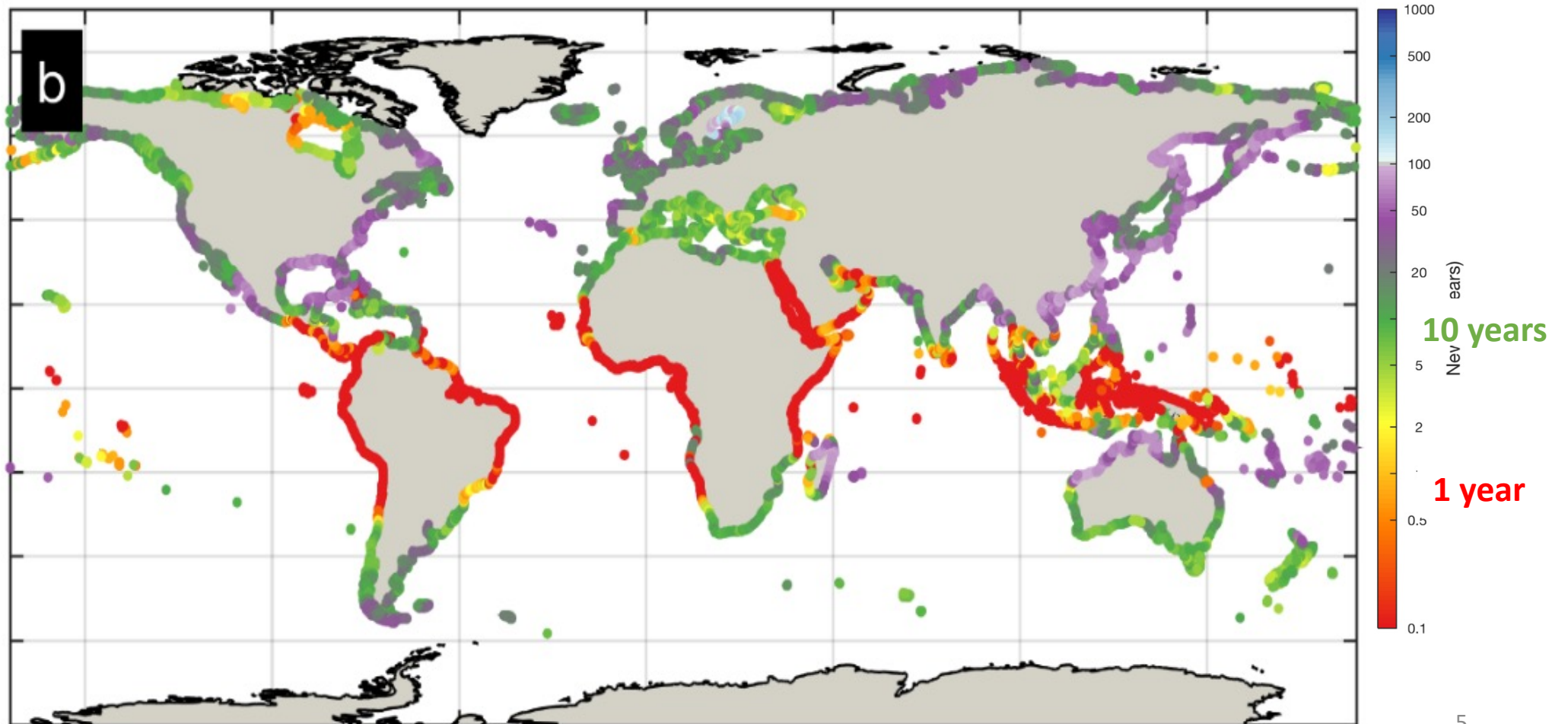
## DIGITAL VEGETATION POSITIONS



**Percentage  
wave height  
reduction**

# Why we need the Digital Ocean and its Digital Twins

Frequency of the 100 year storm surge event in 2100

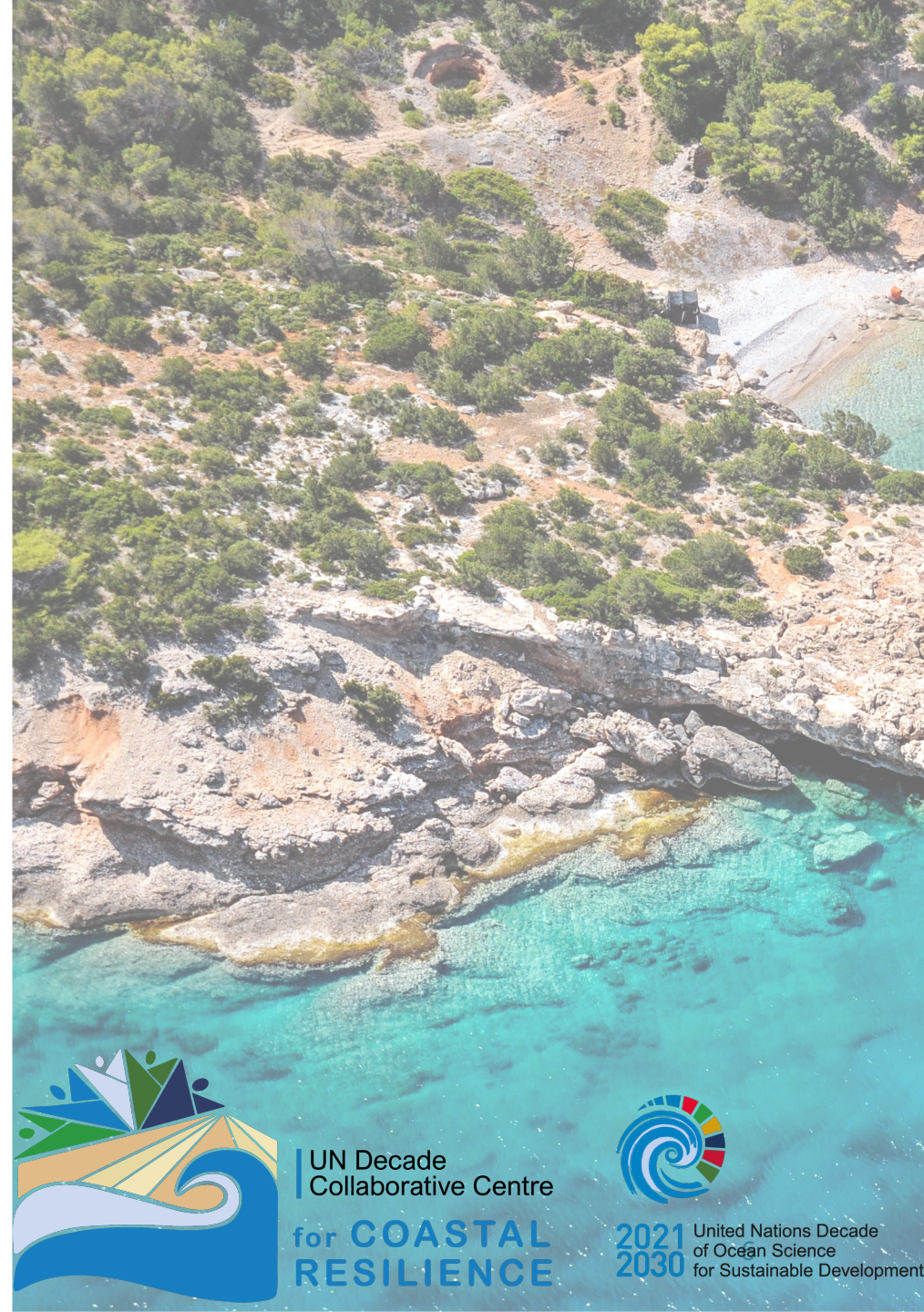


From: Vousdoukas et al., Nature communication, 2018



# How we develop the Digital Ocean and Twins?

- **1. Enhance and expand *risk science research* to bolster coastal resilience and adaptive capacity**
- **2. Enhance observation collection with a focus on coastal areas, leveraging Digital Twins and AI-based solutions**
- **3. Expand cloud-based computing and infrastructure to enhance accessibility**



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# Enhance and expand *risk science research* to bolster coastal resilience and adaptive capacity

Dr. Joanna Post, Head of the Ocean Observations and Services Section at the Intergovernmental Oceanographic Commission (IOC) of UNESCO, Paris



# Enhance observation collection with a focus on coastal areas, leveraging Digital Twins and AI-based solutions

Dr. Giovanni Coppini, Director of the Global Coast Division,  
Centro EuroMediterraneo sui Cambiamenti Climatici, Lecce, Italy





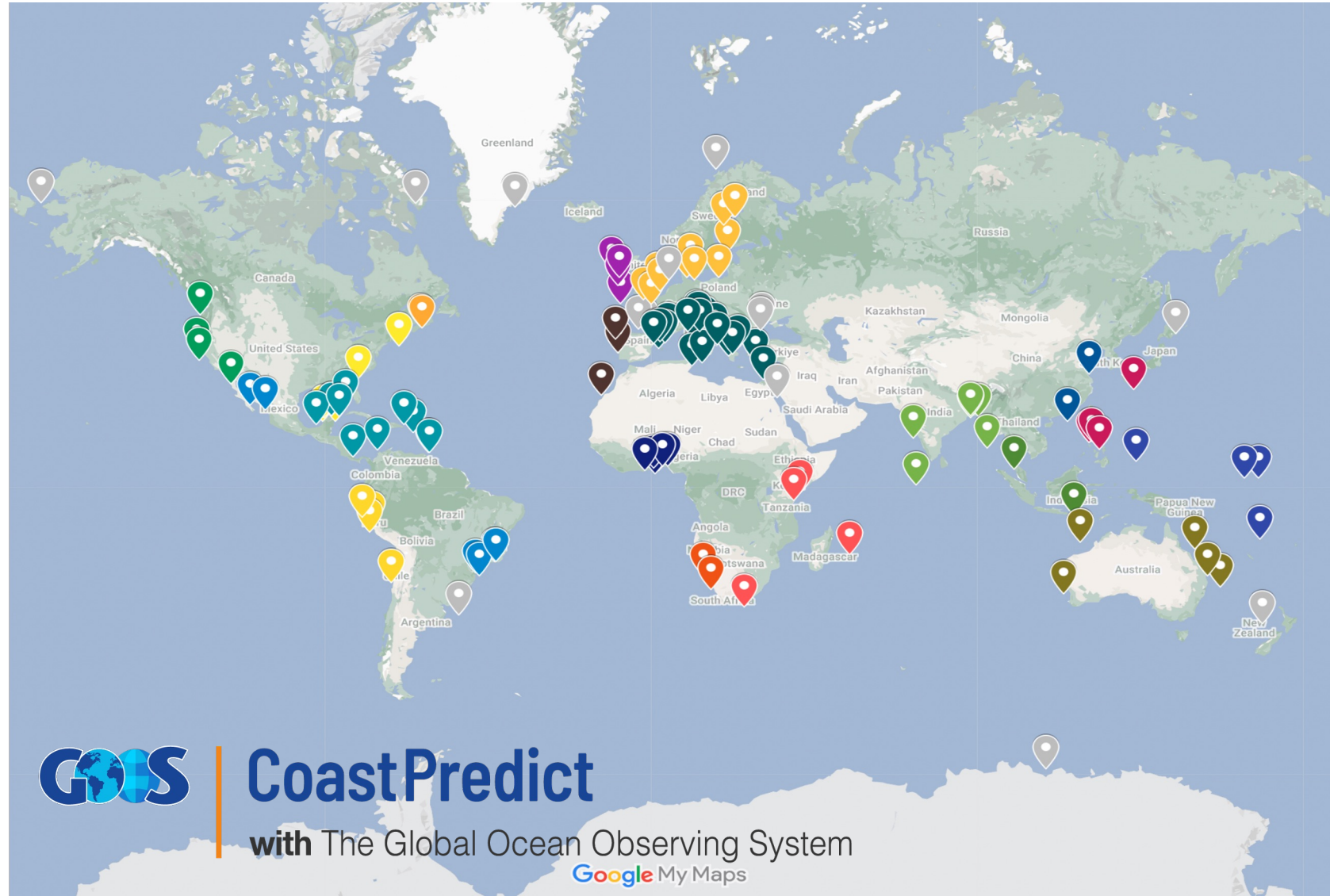
# Expand cloud-based computing and infrastructure to enhance accessibility

Dr. Richard Signell, Open Science Computing, LLC, Massachusetts, United States



# The Future: Relocatable Solutions for the GlobalCoast Network on the Cloud

125 coastal Pilot sites of the Global Coastal Ocean are ready to try replicable solutions



**CoastPredict**

with The Global Ocean Observing System

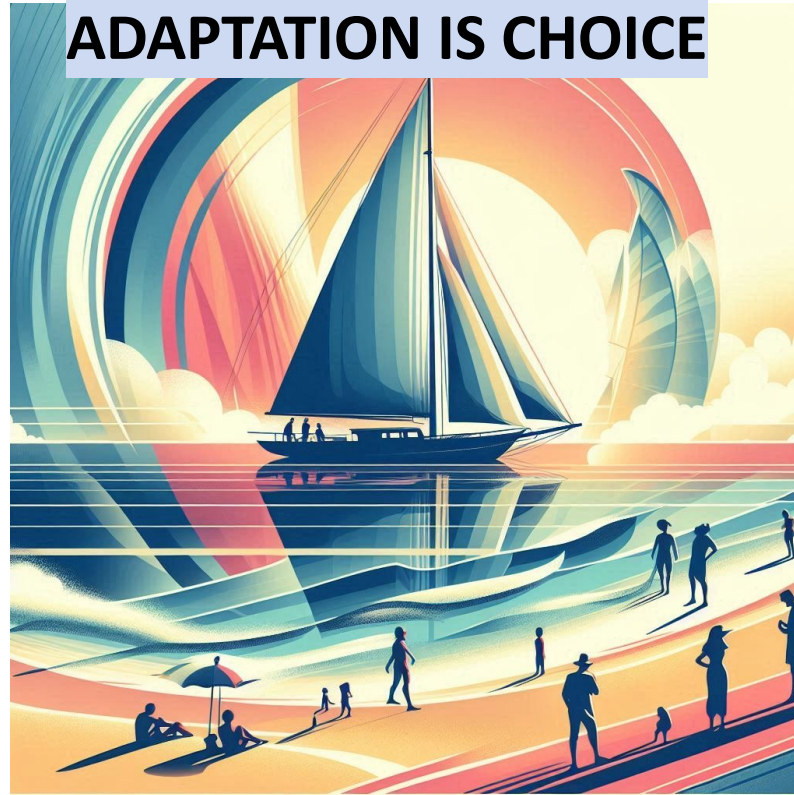
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How do we get to the ocean we want?

From Prof. Syders AR, Delaware University, June 2024