

Unlocking the potential of consumer-grade drones as tools for tropical marine and coastal research relevant to the UN Ocean Decade

Sonia Bejarano

Leibniz Centre for Tropical Marine Research

Observing
the Global Ocean



Partnership for
Observation of the Global Ocean



BIOGEOCHEMISTRY AND GEOLOGY

Carbon and nutrient cycling



Ecological biogeochemistry



Geocology and carbonate sedimentology



Submarine groundwater discharge



ECOLOGY

Experimental aquaculture



Fish ecology and evolution



Reef ecosystems



Mangrove ecology



SOCIAL SCIENCES

Institutional and behavioural economics



Social-ecological systems analysis



Deliberation, valuation and sustainability



INTEGRATED MODELLING

Complexity and climate



Data science and technology



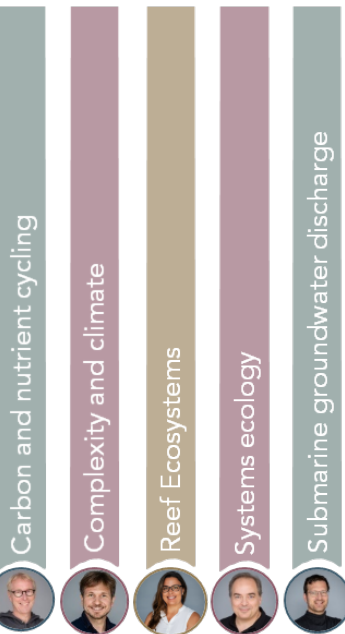
Spatial ecology and interactions



Systems ecology



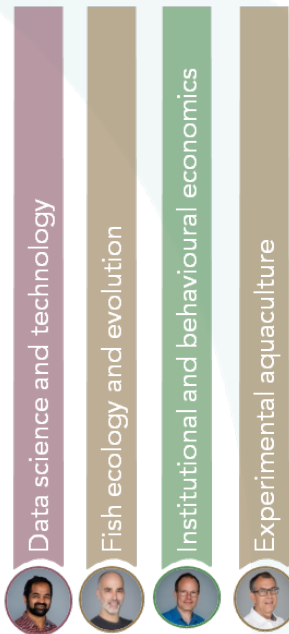
Global change impacts and adaptation



Land-ocean fluxes and transformation



Coastal resources and sustainable Blue Economy



Ecosystem co-design for a sustainable Anthropocene



Ocean literacy, equity and leadership







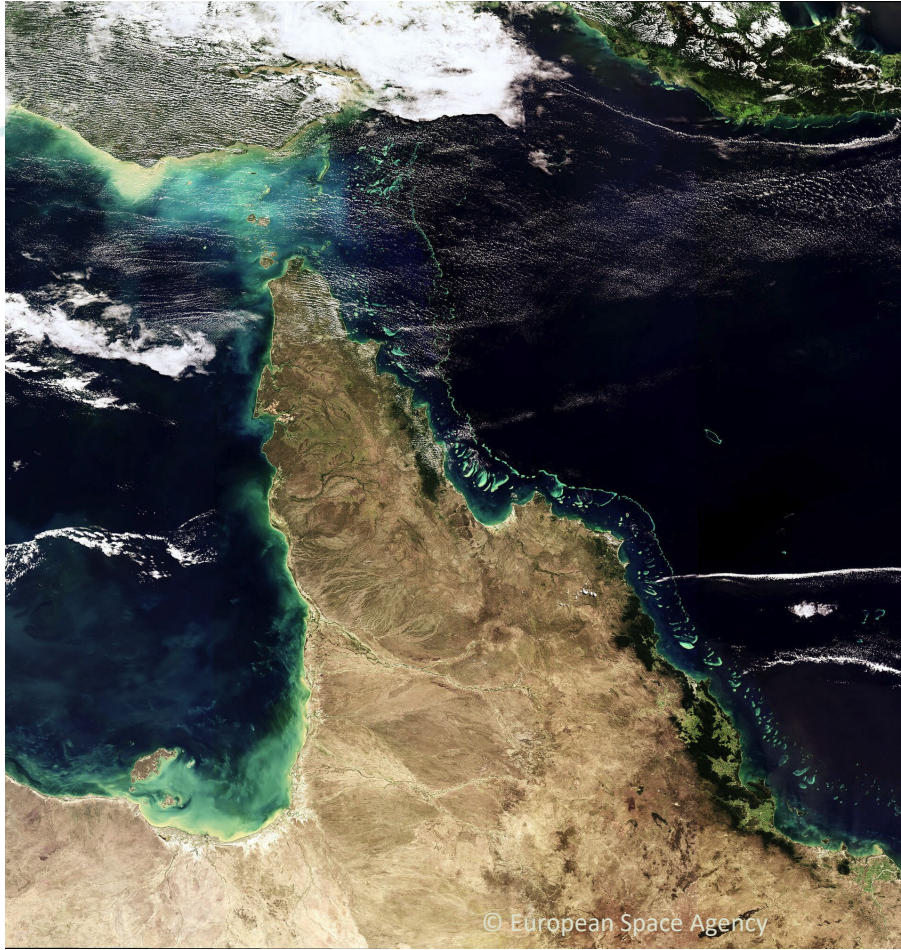
© The Ocean Agency - Ocean Image Bank



© The Ocean Agency - Ocean Image Bank



© The Ocean Agency - Ocean Image Bank



© European Space Agency



© Nasa Visible Earth



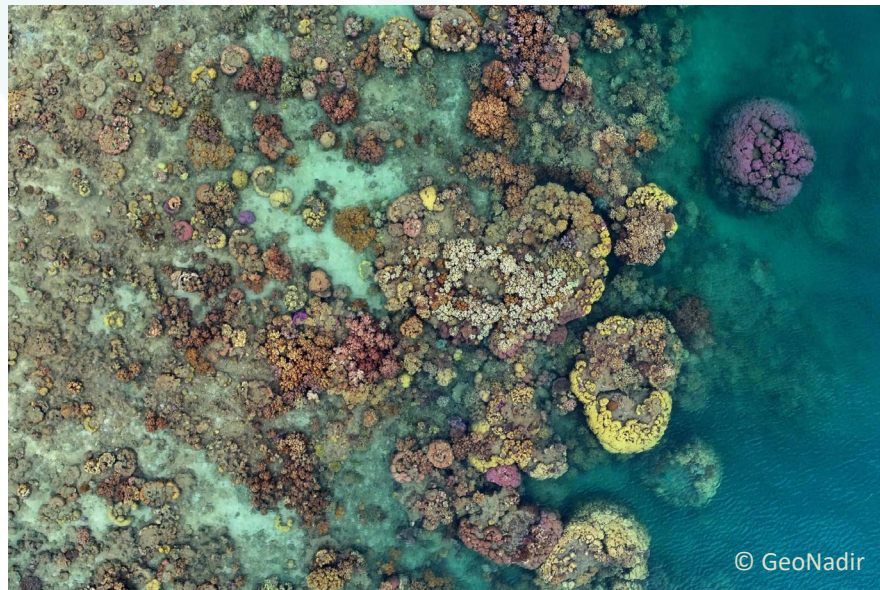
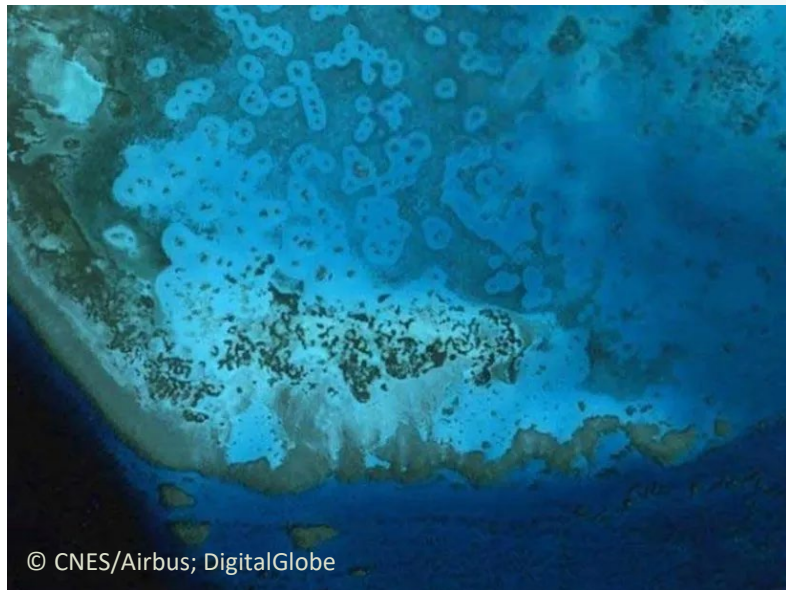
© Pia Lewin

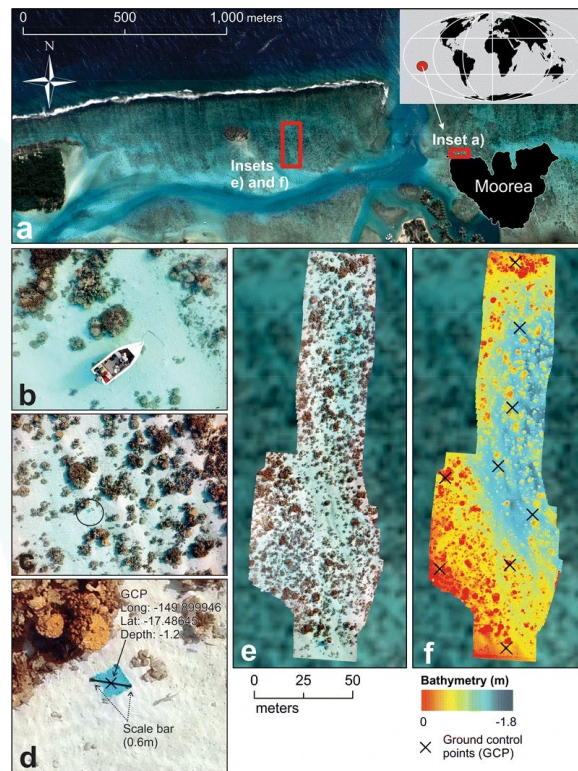
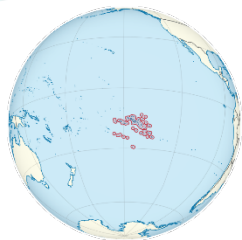


© The Ocean Agency - Ocean Image Bank

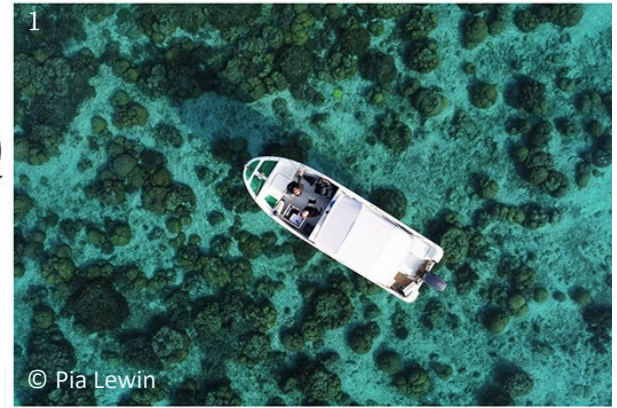
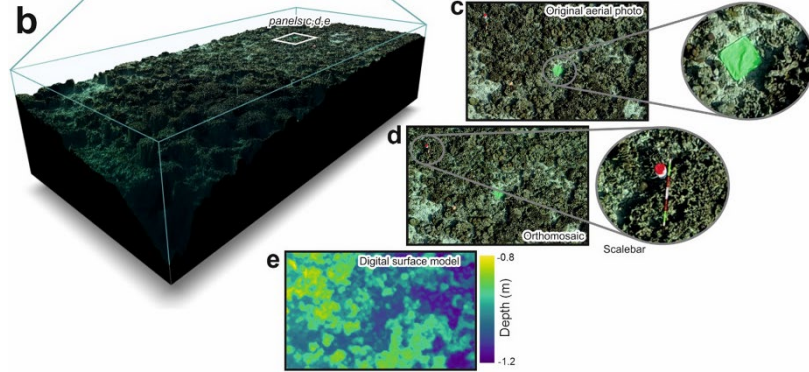
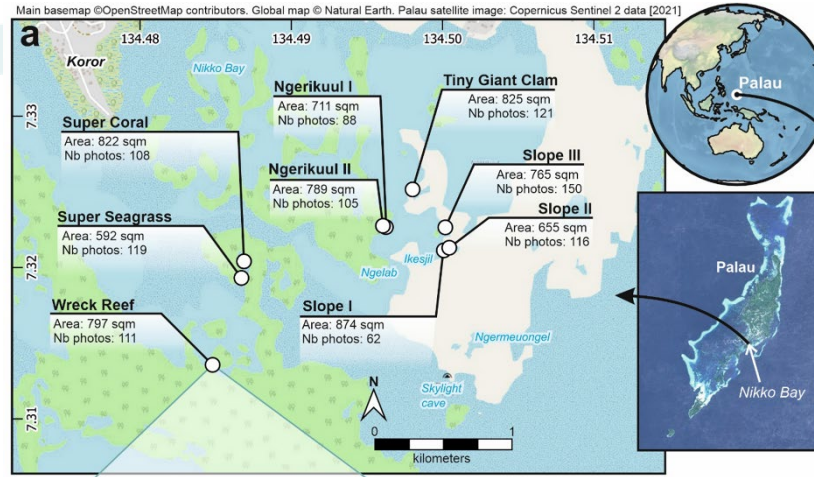


Partnership for
Observation of the Global Ocean

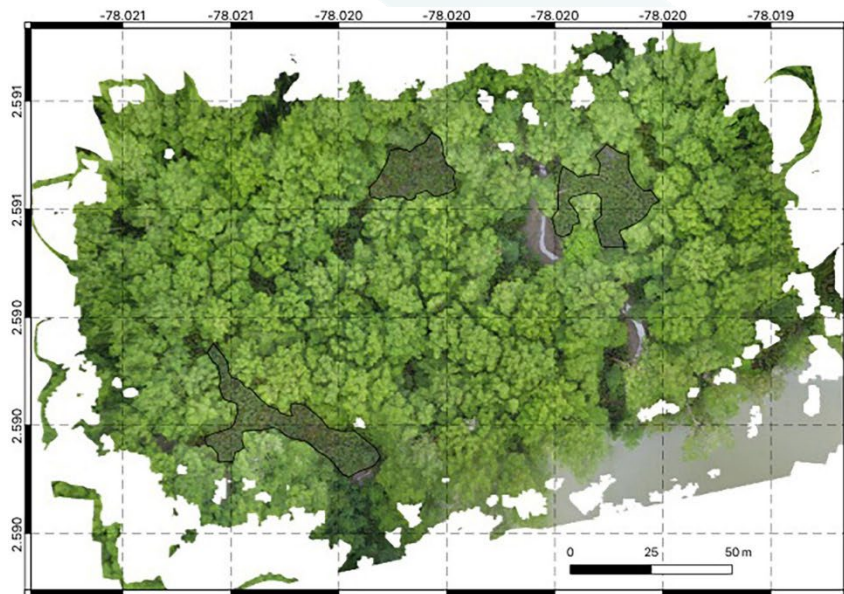




© Coral Reefs, Casella et al 2017



© Coral Reefs, Casella et al 2022



© Castellanos-Galindo et al 2021



The potential of drones for ecological research is enormous



Drone technology is evolving fast



Drone use regulations are variable and changing

Unlocking the
potential of consumer-
grade drones in
marine research



General Event Information

Programme 26th June

Programme 27th June

Programme 28th June



**2021
2030** United Nations Decade
of Ocean Science
for Sustainable Development

Unlocking the potential of consumer-grade drones in marine research

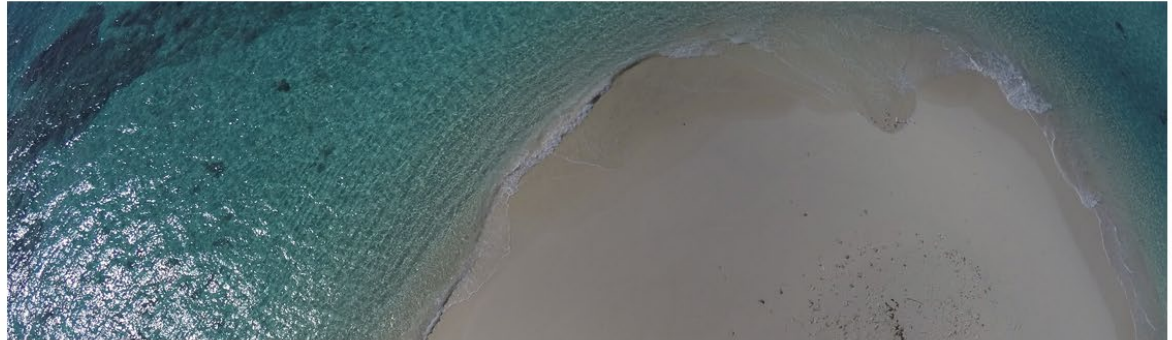
AUTHOR

Sonia Bejarano

PUBLISHED

June 12, 2024

General Event Information



How are drones
used in coastal
research?

What drones
and capabilities
are available
now?



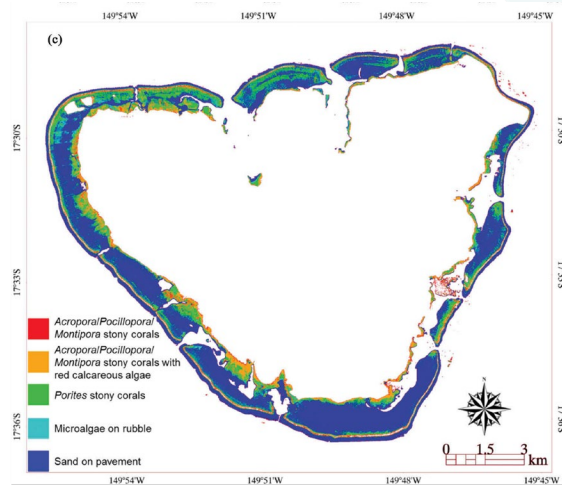
What is the current
status of drone use
legislation?

Presenters from 9 countries

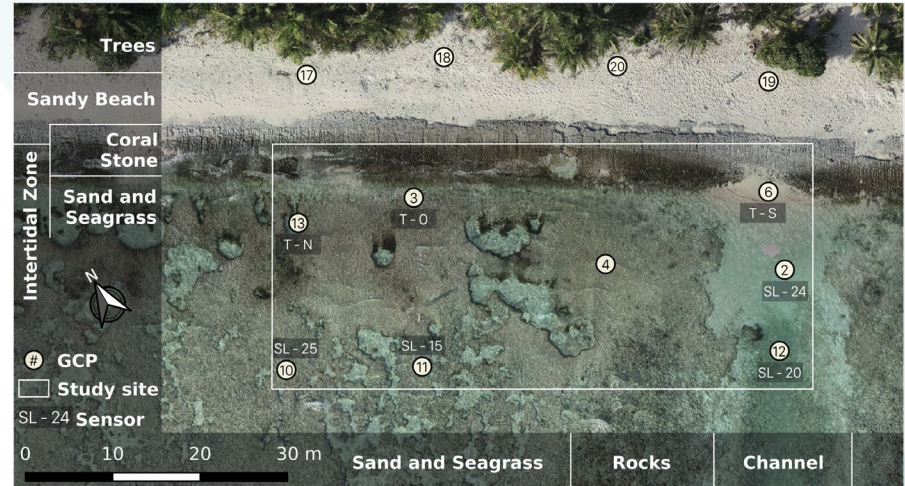


How are drones used in coastal research?

Presentation by Alessio Rovere and Elisa Casella
Ca Foscari University, Italy



Collin et al. (2018) - Int. J. Remote Sensing
(Taylor and Francis - All Rights Reserved)



David et al. (2021) - Coral Reefs
(CC BY 4.0)

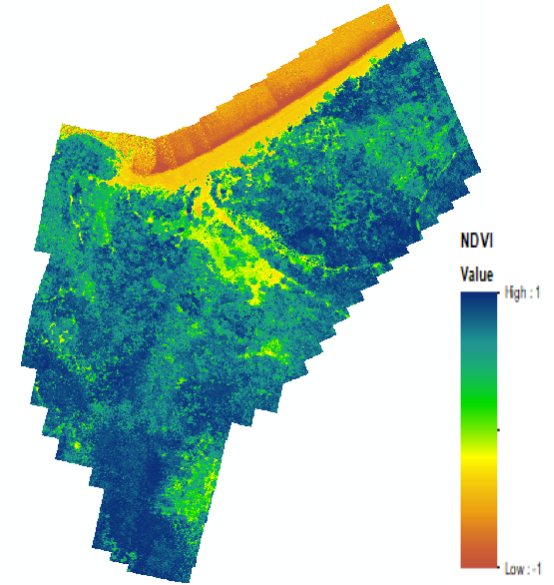
How are drones used in coastal research?

Presentation by Diana Carolina Romero
INVEMAR, Colombia



Orthophotomosaic
Multispectral (UAV)

Generated from 1500 photographs
with an 80% horizontal and vertical
overlap



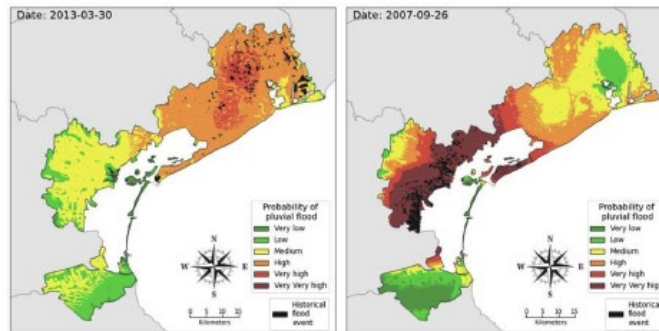
Normalized Difference
Vegetation Index - NDVI



Pluvial Flood Risk in coastal areas: a ML approach

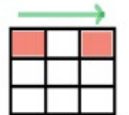
Map of susceptibility to flood risk

Comparison between model predictions and pluvial flood areas for the two historical events

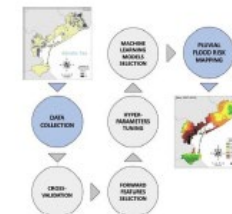


A novel AI-based methodology
for **pluvial flood**
susceptibility

Topographic, climatic,
land use/cover,
vegetation data are used
as **predictors**



Pixel by Pixel analysis



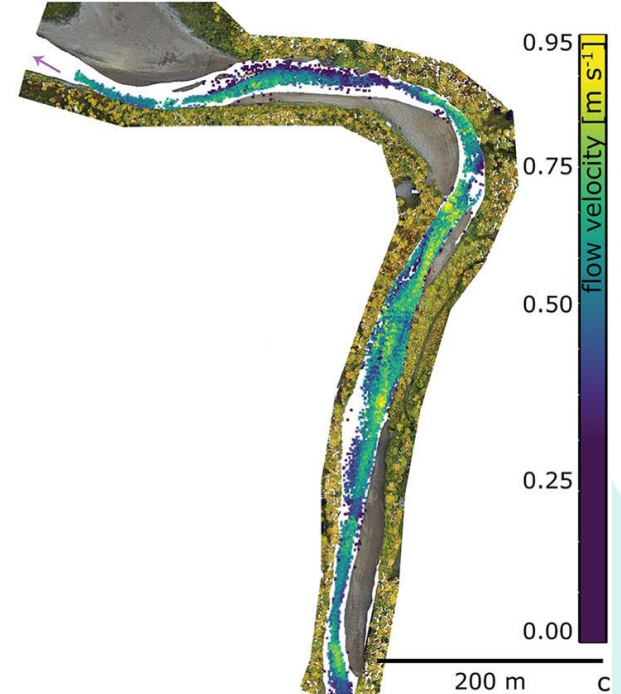
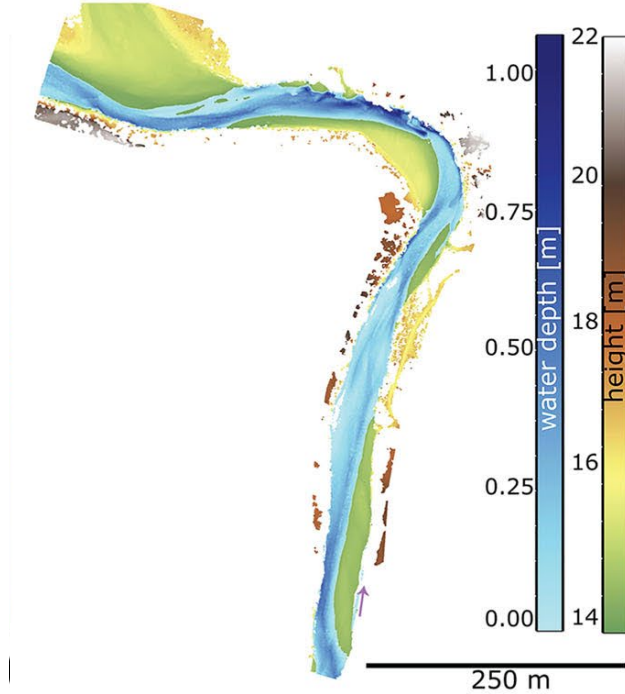
A set of **pluvial flood**
susceptibility maps are
developed to **support**
local adaptation
processes.

Marco, Z., Elena, A., Anna, S., Silvia, T., & Andrea, C. (2022). Spatio-temporal cross-validation to predict pluvial flood events in the Metropolitan City of Venice. *Journal of Hydrology*, 612, 128150.

How are drones used in coastal research?



Presentation by Anette Eltner



How are drones used in coastal research?

Presentation by Luca Fallati
MARHE Centre, Maldives



What consumer-grade drones are available?

Presentation by Oda Ryggen
Blueye, Norway



BLUEYE X1 UNDERWATER DRONE

The ultimate tool for professionals. Quick and user-friendly inspection of your assets below the surface.



Camera
TILT



Excellent
SUPPORT



Multiple spectators
OBSERVER APP



Depth
1000 FT



Battery
5 HOURS*



Live streaming
to MS Teams



Fully
CERTIFIED



Self-
SERVICEABLE



1x
GUEST PORT

[More technical details](#)

[See all products](#)



blueye **X1**

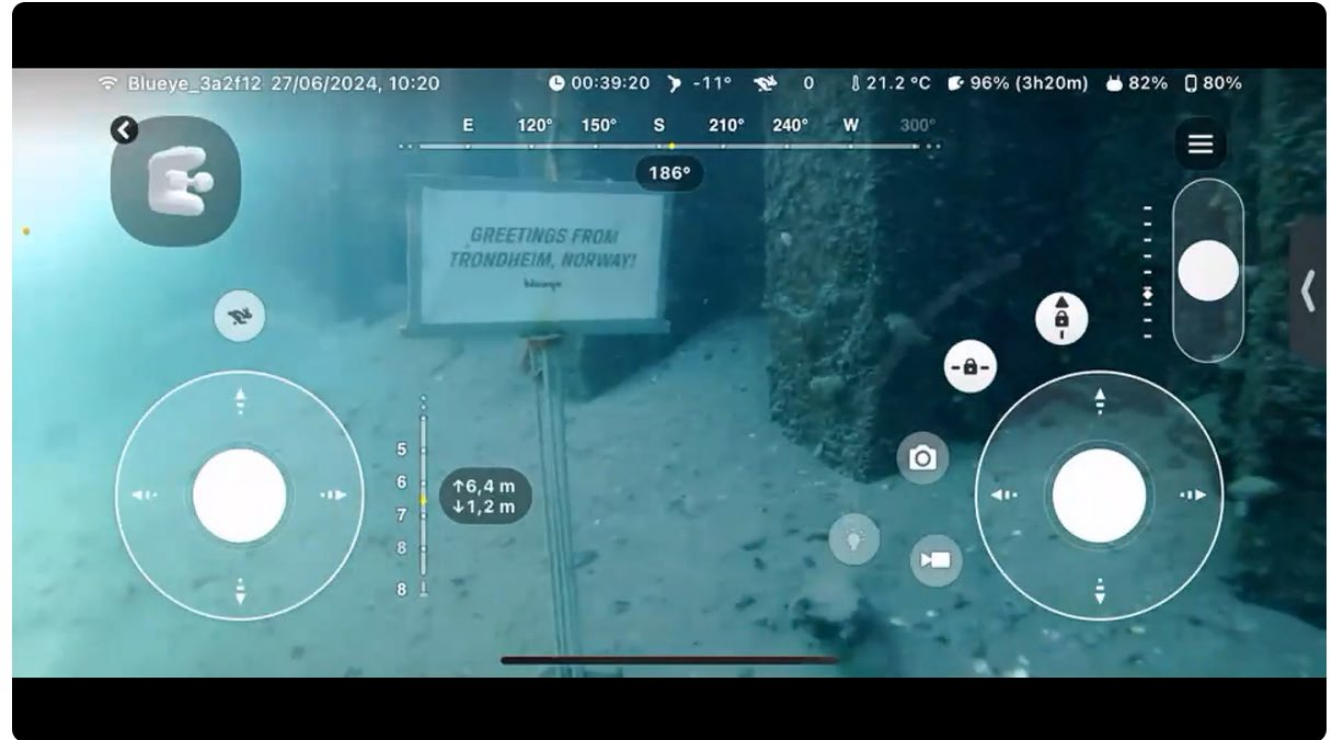
What consumer-grade drones are available?

Presentation by Oda Ryggen
Blueye, Norway



What consumer-grade drones are available?

Presentation by Oda Ryggen
Blueye, Norway



What consumer-grade drones are available?

Frank Lehmann
OptoPrecision, Germany



OPTOPRECISION AIRBORNE SYSTEMS AIRBORNE LONG RANGE LONG ENDURANCE VERTICAL TAKE OFF SYSTEM



- VERTICAL TAKE OFF AND LANDING
- OPERATION WITH (CAR/CONTAINER) OR WITHOUT GROUND LOGISTICS
- SPAN 4,0M, TAKE OFF WEIGHT 75KG
- LOAD VOLUME 75L, 12KG MAX
- ENDURANCE UP TO 6H, 600KM RANGE
- ANTI ICING
- 100KM/H OPT. MAPPING SPEED
- UP TO 7KM FLIGHT ALTITUDE



- PAYLOAD (OPTIONAL):
- CAMERASYSTEMS VIS, NIR, SWIR, THERMAL
- 3D MAPPING
- LASER RANGE FINDER
- RELAY NETWORK SUPPORT
- FIRE AND GAS DETECTION
- GAS SENSORS SO₂, CO₂, NO_x, METHAN, PARTICELS
- VULCANIC GASES AND RADIOACTIVE PARTICLES
- DEPLOYMENT OF GROUND AND MATITIME PROBES



CU COPTERUNI

Deine **PREMIUM**
Drohnenflugschule

× Hilfe / Help?

The banner features a dark background with a drone in flight on the left and a man in a black t-shirt gesturing with his hands on the right. A large, glowing orange sphere is positioned between the drone and the man. The text 'CU COPTERUNI' is in a stylized, glowing blue font at the top left. Below it, 'Deine PREMIUM Drohnenflugschule' is written in white and blue. A small '× Hilfe / Help?' button is in the bottom left corner.

Current drone-use legislation

Presentation by Diana Carolina Romero
INVEMAR, Colombia



Chapter C

RAC 100.205 Categories of operation

Refers to different classifications or types of operations that drones can undertake based on their characteristics and intended use. For the Colombian territory, the categories are:



Open Category

It corresponds to non-commercial operations (non-profit) carried out with an UA, with a maximum gross take off weight of up to 25 kilograms



Specific Category

It corresponds to operations with an UA of any weight, but not exceeding 250 kilograms of gross takeoff weight, carried out by natural or legal persons, nationals or foreigners, for commercial purposes (for profit).



Certified category

It corresponds to operations of remotely piloted aircraft systems (RPAS), whose flight conditions and purposes of use are similar to those of manned aviation.



Sonia Bejarano



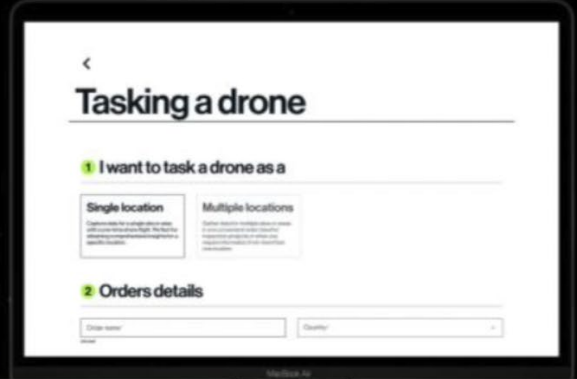
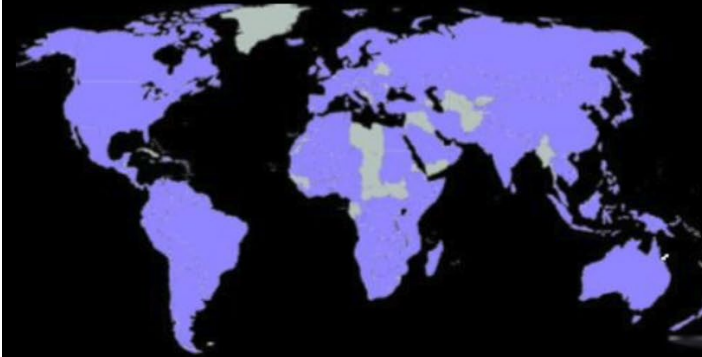
Presentation by Diana Carolina Romero
INVEMAR, Colombia



GLOBHE | COMPANY PRESENTATION

Access the world's largest drone data marketplace

11,000+ local operators in 147 countries



The screenshot shows a web interface titled "Tasking a drone". It includes a section "1 I want to task a drone as a" with two options: "Single location" and "Multiple locations". Below this is a section "2 Orders details" with input fields for "Order name" and "Quantity".



Protect and restore ecosystems and biodiversity



Unlock ocean-based solutions to climate change



Increase community resilience to ocean hazards



Sustainably expand the global ocean observing system



Create a digital representation of the ocean

What next?



GeoNadir

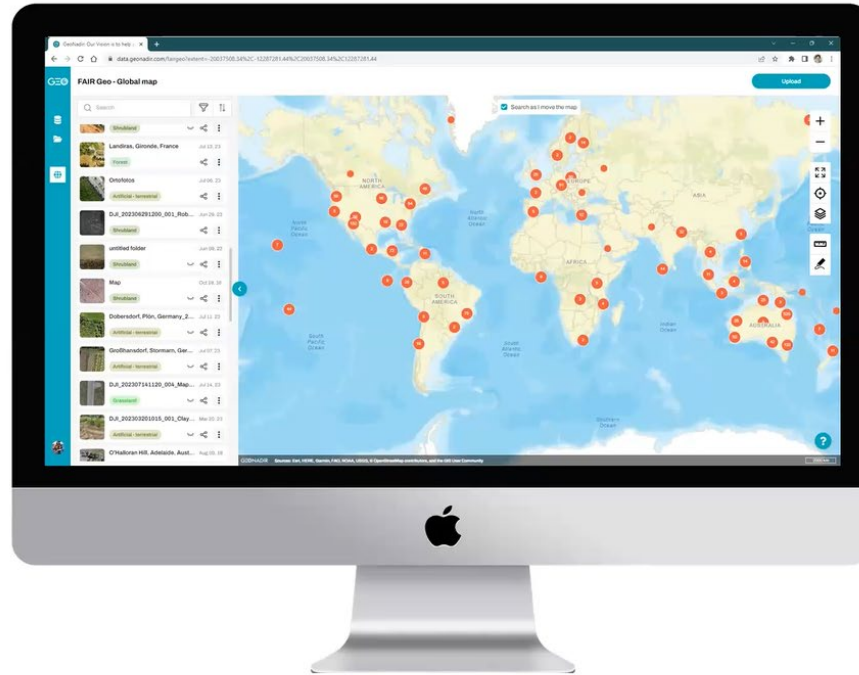
@GeoNadir · 867 subscribers · 57 videos



We help people capture the best possible drone mapping data to s
twitter.com/GeoNadirAu and 4 more links

Subscribe

Home Videos Shorts Playlists



Our global
repository now
hosts >1.8M
drone mapping
images from 80
countries, with
9.5K users



The potential of drones is superior to other imaging tools



Standardising data collection methods



Achieving the best possible metadata documentation



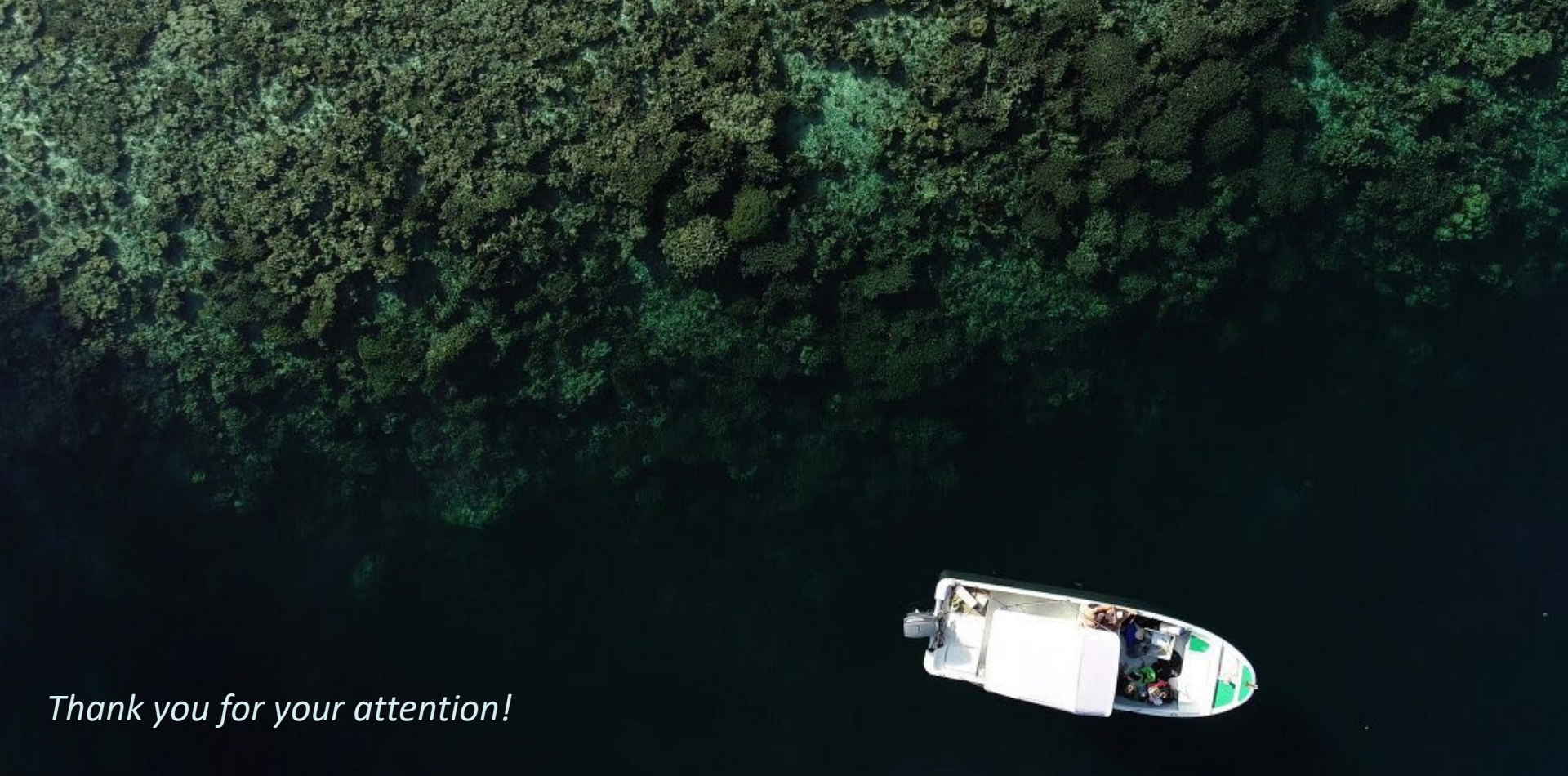
Improving data accessibility, reusability, and integration across disciplines



More and better financial and government support



Towards a globally-coordinated observation system



Thank you for your attention!