
MAX PLANCK INSTITUTE
OF ANIMAL BEHAVIOR
National Oceanography Centre
UNIVERSITÀ DEGLI STUDI DI MILANO BICOCCA
MaRHE
WORKSHOP
Mapping Technologies and Monitoring Techniques in Coral Reef Environments
8-16 MARCH 2027
MaRHE Center, Maldives
PROGRAMME
Registration DEADLINE: 4 December 2026
For info and registration: workshop.marhe@unimib.it
MTMT

INTRODUCTION

Coral reefs are among the most complex, productive, and biodiverse ecosystems on Earth. Their structure and evolution result from the interaction between geomorphological processes and biological dynamics, including reef growth, erosion, sediment transport, and ecological interactions. **Understanding reef morphology and its variability is essential to investigate sediment and nutrient pathways, larval dispersal, habitat complexity, and ecosystem carrying capacity**.

However, coral reefs are increasingly threatened by anthropogenic pressures and climate change, including overfishing, coastal development, pollution, ocean warming, and acidification. **Accurate mapping and quantitative monitoring are therefore essential to assess reef conditions and support effective conservation and management**.

Traditionally, reef mapping relied mainly on satellite imagery and limited field observations, often lacking the high-resolution three-dimensional data needed for detailed spatial analysis and long-term monitoring. Advances in remote sensing and surveying technologies, including Multibeam Echosounders (MBES), Uncrewed Aerial Vehicles (UAVs), and underwater photogrammetry, now enable high-resolution, multi-scale assessment of reef environments.

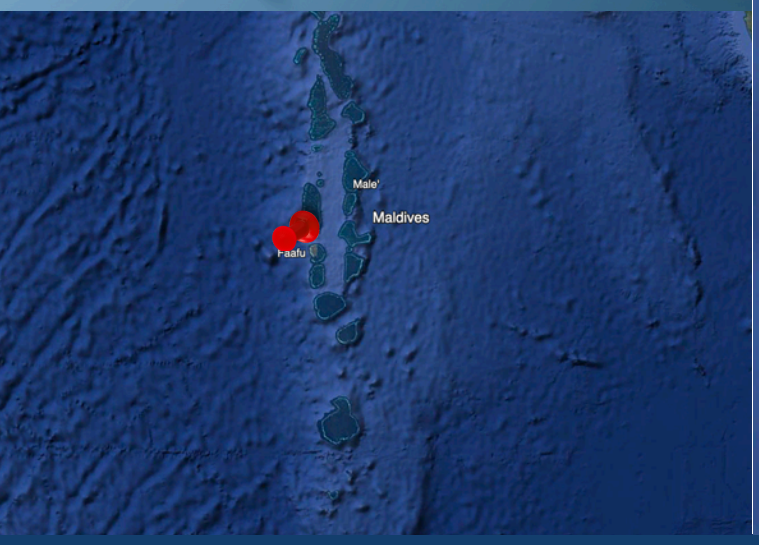
The **V Edition of the Mapping Technologies and Monitoring Techniques in Coral Reef Environments (MT&MT)** workshop provides hands-on training in the acquisition, processing, and interpretation of high-resolution spatial data in tropical coastal and nearshore environments. Building on previous editions, the workshop focuses on multi-scale and multi-sensor monitoring approaches and their applications in scientific research and coral reef conservation, providing participants with advanced methodological skills applicable to both research and applied conservation contexts.

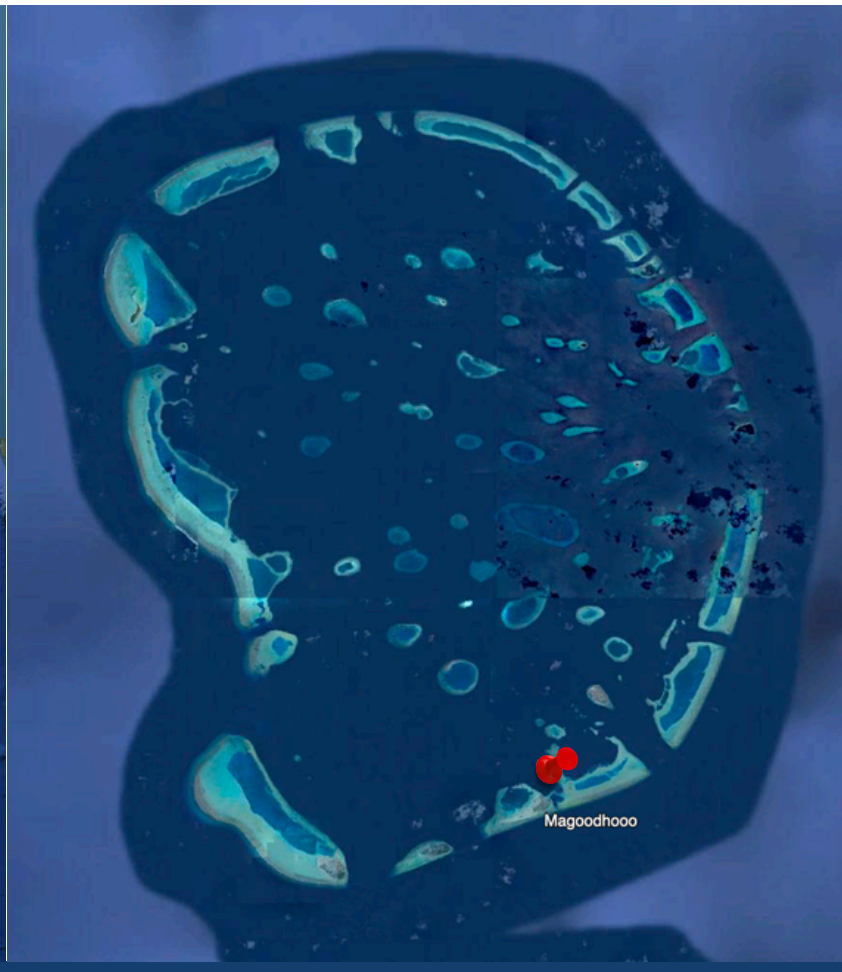
INTRODUCTION

The workshop will take place **from 8 to 16 March 2027 at MaRHE Center, Marine Research and High Education Center of the University of Milano-Bicocca**, located on Magoodhoo Island, Faafu Atoll, Republic of the Maldives. All communications should be directed to workshop.marhe@unimib.it, unless otherwise specified.

The course focuses on coastal and coral reef monitoring through the integrated use of **Uncrewed Aerial Vehicles (UAVs)**, **underwater photogrammetry,** and **Multibeam Echosounder (MBES) surveys**. Participants will explore methods for generating high-resolution orthomosaics, 3D reconstructions of coral colonies and reef structures, and detailed bathymetric maps. The programme also introduces machine learning (ML) techniques for the classification of reef habitats and benthic communities using photogrammetric data. The resulting datasets will be integrated within a GIS environment to support spatial analysis, habitat characterisation, and the quantitative assessment of reef morphology and complexity.







INTRODUCTION

The course combines frontal lectures with hands-on field and processing sessions, providing a balanced mix of theoretical background and practical experience.

Practical sessions will include the use of dedicated software for data processing, integration, and interpretation, ensuring an applied and immersive learning experience.

Field activities will be conducted on land, on board a traditional Maldivian dhoni, and in the water through snorkelling, allowing participants to experience the full workflow from data acquisition to analysis in a real coral reef setting.

Teaching and supervision are carried out by researchers with extensive expertise in coastal and reef mapping, with a strong focus on the integrated use of UAVs, acoustic systems, and underwater photogrammetry.

Participants will be actively involved in all phases of the monitoring workflow, from survey design and data acquisition to data processing, analysis, and interpretation in a coral reef environment.



INTRODUCTION

At the end of the workshop, participants will be able to:

- Design, plan, and execute UAV surveys using ground-station software, defining flight parameters and acquisition strategies in accordance with photogrammetric best practices and environmental constraints, and georeferencing outputs using RTK GNSS ground control points.
- Acquire terrestrial and submarine topographic and bathymetric data through integrated approaches, including UAV-based photogrammetry, MBES, and underwater imaging techniques.
- Process acoustic bathymetry and backscatter data using specialised software (Qimera, FMGT) to generate high-quality seafloor products.
- Process optical imagery using SfM workflows to produce high-resolution orthomosaics and three-dimensional models (Agisoft Metashape).
- Generate a habitat classification model using Machine Learning (TRex)
- Visualise and combine data within a GIS environment (ArcGIS Pro, QGIS), to perform advanced spatial analyses and support quantitative assessment and monitoring of reef systems.
- Recognise and interpret carbonate producers and geomorphological features in coral reef environments, linking geomorphology to habitat structure and reef complexity.



TEAM



Dr. Luca Fallati is a Researcher in the Department of Earth and Environmental Sciences (DISAT) at the **University of Milano-Bicocca, Italy**. His research is mainly centered on marine geomorphology and habitat mapping in coastal and submarine environments, with a particular focus on innovative remote sensing technologies for multiscale approach in changing environments, together with underwater photogrammetry and reconstruction of 3D models for immersive Virtual Reality (VR) scenarios.



Dr. Andrea Giulia Varzi is a Researcher at the **National Oceanography Centre (NOC) in Southampton, UK**. Her research focuses on geomorphological and habitat mapping in coastal and deep-sea environments. She primarily works with acoustic bathymetric and backscatter data to generate high-resolution digital terrain models and investigate seabed morphology and habitat distribution, integrating advanced geospatial analysis and GIS-based approaches for fine-scale geomorphological interpretation, and habitat mapping.



Dr. Angela Albi is a postdoc in the Department of Collective Behaviour at the **Max Planck Institute of Animal Behavior** and the **University of Konstanz, Germany**. She studies collective animal movement, its ecological importance, and how individual interactions shape group behaviour. Her current research investigates collective hunting in blacktip reef sharks in the Maldives, using tracking and behavioural analysis to study predator coordination and prey responses. She also develops AI methods for image-based analysis.

WORKSHOP #MT&MT2027

PROGRAMME

*the programme may be subject to changes due to unforeseen circumstances and weather conditions.

DAY 01

- Arrival at Malé International Airport
- Transfer by speedboat to **MaRHE Center**
- **Welcome in Magoodhoo Island**
- Briefing on the next day's activities

DAY 02

- Water confidence & snorkelling
- Group division & software installation
- **Lessons** (Coral Reefs; Remote Sensing)
- **Equipment exibition**

DAY 03

- **Lessons** (Plan UAV surveys; GPS & Georeferencing)
- **Practical** (UgCS software; plan a survey)
- **Field** (GCP placement; UAV data collection)
- **Group** (Data download)

DAY 04

- **Lessons** (SfM; GeoSLAM; Acoustic surveys)
- **Practical** (UAV data processing, no RTK)
- **Field** (UAV/GeoSLAM/MBES data collection)
- **Group** (Data processing; working time)

DAY 05

- **Lessons** (Underwater photogrammetry)
- **Practical** (Dry photogrammetry; data processing)
- **Field** (Photogrammetry: coral colony)
- **Group** (Data processing; working time)

DAY 06

- **Lessons** (Machine learning for ecology)
- **Practical** (data processing; data analysis)
- **Field** (Photogrammetry: reef transect)
- **Group** (Data processing; working time)

PROGRAMME

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DAY 07

- **Trip** to a desert local island
- **Free time**
- **Group** (Working time)

DAY 08

- Additional data collection
- **Group** (Working time)
- **Group final presentations**

DAY 09

- **See you soon MaRHE Center!**
- Transfer by speedboat to Malé International Airport



REGISTRATION

To register, please follow these steps:

1. Complete the **Questionnaire** by clicking the button 

2. Complete the **Medical Questionnaire** at this link (in the field "Which MaRHE Center workshop are you signing up for?" please put **MTMT27**)

3. Send an email to workshop.marhe@unimib.it (subject: MTMT27_SURNAME_NAME) attaching a PDF colour copy of you passport, naming the file as "MTMT27_SURNAME_NAME_PPT). **Important**: please see below for the passport submission requirements. If you do not have a passport yet, or if your passport does not meet the required specifications, you must submit it as soon as it is available or compliant with the requirements.

Registration will close on **4 December 2026**.

PASSPORT

To enter the Maldives, your passport must be valid for **at least six months beyond your departure date** and contain **at least two blank pages** for visa purposes.
If you do not yet have a passport, we strongly encourage you to apply as soon as possible, as processing times may be lengthy.

Please scan your passport in high quality, in colour, and save it as a PDF file. Low-resolution photographs, images showing fingers holding the document, or other unsuitable formats will not be accepted.

Please wait for our confirmation before booking your flights.

The workshop will be confirmed once the minimum number of 12 participants has been reached. We will authorise flight bookings only after this threshold has been met. Please note that we cannot reimburse any costs resulting from errors in your bookings, including incorrect travel dates or other booking mistakes.

COST

The **cost*** of the V Edition training course is:

- 1550€ for students (regularly registered at any university course)
- 1650€ for non-students
- 1240€ for people already working in the Maldives (not Maldivians)

***for Maldivian participants a reduction of the price (half of the fee) will be applied (775 Euro € or 825 Euro €)**

The above amount includes:

- entry business visa to the Maldives
- boat transfer from/to Malé airport
- transfers for all the activities envisaged under the internship program
- room and food at the MaRHE Center
- full board treatment and accommodation in multiple rooms (single rooms are not available)
- trial licences for all the software used during the workshop
- lessons and boat activities provided as part of program

The above amount **DOES NOT** include:

- flight to/from Malé
- passport renewal expenses
- anything else not specified here above

CANCELLATION POLICY

Following the payment of the fee, reimbursements for cancellations will be subject to 30% admin fee. In case of cancellation from the workshop after 5 February 2027, no refund will be possible.

FLIGHT

You will be responsible for purchasing the flight. The choice of the airline is yours, the important thing is to be at the airport on the day and at the time established (we will share with you the necessary information once registered). Pay attention while purchasing the flight tickets as your mistakes (incorrect flight dates or other) cannot be reimbursed.
Furthermore, it is necessary to send us a copy of the air ticket by 1st February 2027 to proceed with the entry visa request, which we will handle entirely.

NOTES

There will be a recognition of training credits for students on the International master's programme in **Marine Sciences (University of Milano-Bicocca)**. In particular, for such students, the set of all the activities carried out during the workshop can reach a total of **4 CFU (practical training)**.

Students enrolled in other degree courses and/or PhD course and/or at other Universities or Institutions are requested to inquire at the respective administrative secretariats for the possible recognition of credits ECTS.

For any information, please contact us at workshop.marhe@unimib.it

ACCOMODATION & MEALS

The accommodation is organised at the Centre, in multiple rooms with bathroom, full board (breakfast, lunch and dinner). Sheets and towels are provided. The food is prepared according to the local customs and consists, for the most part, of fish, chicken, rice and vegetables prepared in different ways.

Special dietary requirements and allergies are to be mentioned in the application form.

NOTES

CLOTHING & EQUIPMENT

The air temperature is around 28-29°C. The weather is always pleasant, even during the rainy months. Please note that most of the day will be occupied by field activities, seminars and exercises. It is advisable to wear comfortable sportive clothes.

It is recommended to avoid too skimpy clothing, as the island of Magoodhoo is not a tourist destination and local costumes are those of an Islamic country.

For field activities in the sea it is necessary to have - in addition to a bathing suit and a towel - the following equipment:

- Mask
- Snorkel
- Fins (booties if needed)

It is possible to rent snorkelling equipment on-site, depending on size and availability. Please inform us in advance in case you need anything.

HEALTH & SAFETY

The insurance included with the Business Visa has a cover limit of 100.000 Maldivian Rufyiaa (MVR), approximately 6.500 USD $, for health issues. It is, therefore, up to you to decide whether to buy private health insurance.

Any field activity presents risks and dangers, and there are some basic rules to be observed in order to minimise them. In the water it is necessary to respect the buddy system: working groups will be settled, and, within the group, working couples will be established.

CURRENCY

The Maldivian currency is the Maldivian Rufiyaa (MVR). Euros and dollars are accepted in any bank and exchange office.
1 Euro = about 16 Rufyiaa - 1 US $ = about 15 Rufyiaa