MaRHE

UNIVERSITÀ DEGLI STUDI DI MILANO BICOCCA

MTMT

Mapping Technologies and Monitoring Techniques in Coral Reef Environments

14-22 April 2025

Training Course

Magoodhoo, Faafu Atoll
Republic of the Maldives

For registration and information
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Introduction

Why this workshop?

Coral reefs are a complex and productive ecosystem that encompasses the highest biodiversity of any marine ecosystem. They are unique as they depend on a strong interaction between geomorphic and ecological processes. Investigating the formation and morphological change of coral reefs and reef-associated landforms contributes to a deeper understanding of a number of geomorphological, environmental and ecological issues, such as sediment and nutrient transport processes, larval dispersion mechanisms, estimation of their carrying capacity as habitat, etc. Moreover, it is crucial to improve coral reef conservation with a view of changing environmental conditions resulting from an increased stress by both anthropogenic and climate changes. To date, we have lost most of the global coral reef systems worldwide due to several impacts, such as overfishing, coastal development, sedimentation, marine-based pollution (e.g. plastic pollution).

Until less than a decade ago, geomorphological mapping in coral reef environments was carried out using satellite data ground-truthed by field studies. Because of this, geomorphological mapping lacked a 3D representation at high spatial resolution. As a consequence, geomorphological and habitat mapping, together with monitoring investigations, were challenging topics. Nowadays, detailed mapping of coral reef environments is possible thanks to the use of both acoustic equipment (e.g. Multibeam Echosounder - MBES) and Uncrewed Aerial Vehicles (UAVs), thus we are able to map, study and plan monitoring actions to be carried out to preserve such productive ecosystems.

The IV Edition of the Mapping Technologies and Monitoring Techniques in Coral Reef Environments is your opportunity to gain hands-on experience on data acquisition and post-processing techniques by using different equipment, focusing on the importance of cutting-edge monitoring techniques for mapping coastal and nearshore environments.

Introduction

About the workshop

During the first edition of Mapping Technologies in Coral Reef Environments in 2019, the main goal was to provide an overview of the most advanced technique used to collect elevation data in coral reef environments and to integrate multi-scale elevation datasets to obtain seamless Digital Terrain Models (DTMs).

The IV Edition of this practical training, as well as the past editions, is called *Mapping Technologies and Monitoring Techniques in Coral Reef Environments*, and it also aims at providing advanced knowledge on how to plan and carry out multi-scale and multi-sensor monitoring activities in nearshore environments.

This course offers comprehensive training on utilising aerial drones to monitor coastal environments, with a special emphasis on coral reefs. Participants will gain expertise in planning and executing UAV surveys tailored to specific environmental characteristics and monitoring goals, employing advanced ground station software. Additionally, the course delves into underwater photogrammetry, enabling the capture of highly detailed imagery for 3D reconstructions of coral colonies and reef sections. The data collected will be processed using Structure from Motion (SfM) techniques to create high-resolution Digital Terrain Models (DTMs) and orthomosaics. These outputs will serve as valuable tools for geomorphological and habitat characterization. Finally, participants will integrate the processed data into a Geographic Information System (GIS) for statistical analysis and the computation of morphometric indices, providing critical insights into reef dynamics and coastal management.

Lessons will be held at the Marine Research and High Education Center (MaRHE Center) of the University of Milano-Bicocca in Magoodhoo Island, Faafu Atoll, which is about three hours by speedboat from Malé airport. Field activities will be carried on land, on board a traditional Dhoni (wooden sailing vessel), and in snorkelling. Practical activities will include the use of dedicated software for processing collected data and performing their integration and interpretation.

Introduction

The organizing team

The workshop will be coordinated by Dr. Luca Fallati and the Ph.D candidate Andrea Giulia Varzi.

Dr. Luca Fallati is a Researcher in the Department of Earth and Environmental Sciences (DISAT) at the University of Milano-Bicocca. 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.

Andrea Giulia Varzi is a Ph.D candidate in the DISAT at the University of Milano-Bicocca. Her scientific interests are towards geomorphological and habitat mapping, together with habitat and restoration suitability models. Her research is focused on the “white ribbon” area, the land-sea continuum, to define a reference workflow to integrate high resolution multi-scale and multi-source geospatial datasets for creating seamless models to bridge the gap.

Introduction

What to expect

The course will consist of a series of frontal lessons and field activities. It will be coordinated by researchers with experience in the use of aerial drones (UAVs) to perform coastal mapping together with underwater photogrammetry techniques.

After completion of this training course, you will be able to:

1. plan UAV surveys with the ground station software and;
2. execute the survey and georeference the obtained models with RTK GNSS ground control points;
3. recognise main carbonate producers in coral reef environments;
4. collect terrestrial and submarine topographic/bathymetric data using different technologies (UAV, photogrammetry);
5. process imagery data with Structure from Motions (SfMs) algorithms to build orthomosaics and/or 3D models (Agisoft Metashape);
6. create geomorphological and habitat maps (ArcGIS Pro).

At the end of the Training Course the University of Milano-Bicocca will release a digital certificate (Open Badge) to recognize the participant's skills and achievements in Mapping Technologies and Monitoring Techniques.

For more details, please visit:

www.openbadges.org and https://bestr.it/badge/show/400?ln=en

Daily Programme

DAY 1
- Arrival at Malé International Airport and transfer to MaRHE Center
- Welcome to Magoodhoo island
- Briefing on the next day's activities

DAY 2
- Snorkelling and water confidence
- Group division and software installation
- Introduction to Coral Reef environment
- Introduction to UAV

DAY 3
- UAV data collection
- SfM data processing
- Introduction to Underwater Photogrammetry

DAY 4
- Underwater Photogrammetry data collection
- SfM data processing
- Introduction to GIS environment

DAY 5
- Underwater Photogrammetry data collection
- SfM data processing
- ArcGIS Pro data analysis

DAY 6
- ArcGIS Pro data analysis
- Group working time

DAY 7
- Picnic island - mixed field activties
- Group working time

DAY 8
- Group working time
- Prodcution of final outputs

DAY 9
- Transfer by speedboat to Malé International Airport, Maldives

Useful information

Documents

Travelling to the Maldives requires a passport, with at least 6 months of validity from your departure from the Maldives and at least 2 empty pages.

Clothing and Equipment

The air temperature is around 28-29°C. The weather is always pleasant, even during the rainy months (**Figure 1**). Please note that most of the day will be occupied by field activities, seminars and exercises, it is, therefore, 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.

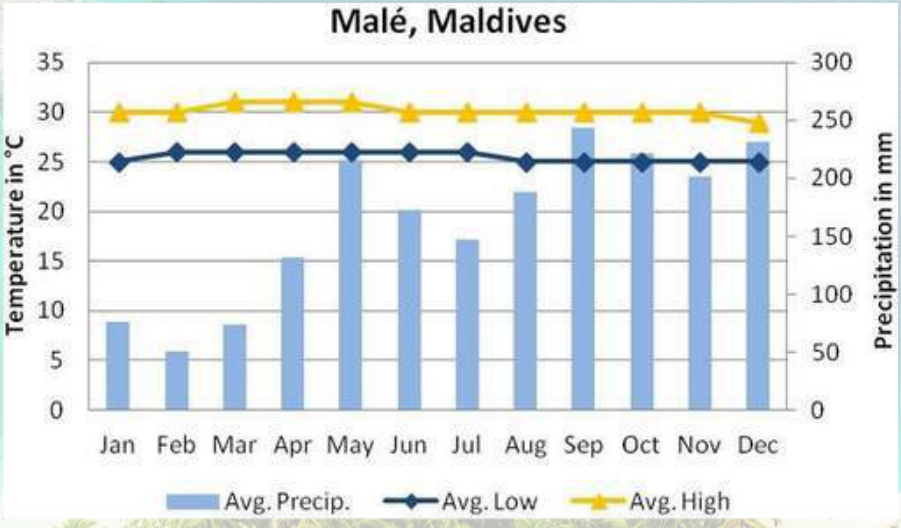

Figure 1: Monthly air temperature (°C) recorded in Maldives and monthly averages of sunny and rainy hours recorded in Maldives.

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.

Useful information

Accommodation and 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.

Health

No vaccination is required for travellers coming to Maldives from Europe. However, each participant should take care of this aspect in order to enter the country.

Safety

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 Rufiyaa

1 US $ = about 15 Rufiyaa

Cost and Registration

Cost

The cost* of the IV Edition of Mapping Technologies and Monitoring Techniques in Coral Reef Environments is:

- 1500 Euro for students (regularly registered at any university course)
- 1600 Euro for non-students

- on request the fee can be split in two instalments:

- 750 € and 750€ for students
- 800 € and 800 € for non-students

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 softwares used during the workshop;
- lessons and boat activities provided for the internship program.

The above amount DOES NOT include:

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

* the fee for Maldivian citizens to participate in the MTMT training course is €900

Cost and Registration

Registration

To proceed with the registration, you will have to fill in the following Google Form:

https://forms.gle/E6eLDfNiW6CY4gzr5

After completing the above questionnaire, we ask you to send an email to the address workshop.marhe@unimib.it specifying in the subject:

"Name Surname – Registration Mapping Technologies and Monitoring Techniques" and attach a JPEG colour copy of your passport naming the file "MTMT25_Surname_Name_PPT"

You will also have to fill the "Medical Questionnaire for Activities at the MaRHE Center" that you can find at this link:

http://bit.ly/408fUN4

IMPORTANT: YOU WILL HAVE TO WAIT FOR OUR CONFIRMATION BEFORE PURCHASING YOUR FLIGHTS.

The workshop will be activated once a minimum number of participants (15) has been reached, thereafter we will give you the green light to purchase the flights and we will send you the invoice, after which you can proceed with the payment of the workshop fee.

The registration deadline is fixed for 7 February 2025.

The maximum number of participants is up to 24 people.

Cost and Registration

Flights

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 17 March 2025 to be able to proceed, if necessary, to the entry visa request, of which we will deal entirely.

Important notes

Please wait for our confirmation before purchasing the flights.

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 programmes and/or universities must inquire at their teaching secretary.

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

Cancellation policy

Following the payment of the fee, reimbursements for cancellations will be subject to 10% admin fee. In case of cancellation from the workshop after 17 March 2025, no refund will be possible.