

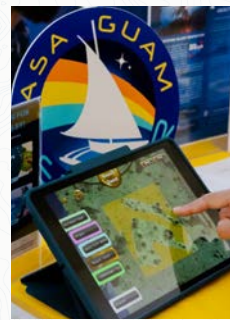
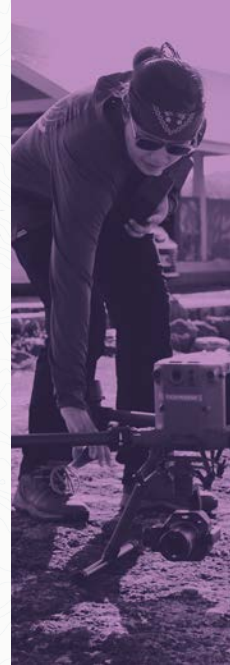


# Charting New Horizons

MAGIC LAB  
2023-2024 IMPACT REPORT











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# Håfa Adai from the MAGIC Laboratory!

The **Micronesia Area Geospatial Information Center (MAGIC) Lab** is proud to release its 2023-2024 Impact Report, showcasing recent research, achievements, and resources.

The MAGIC Lab aims to:



Develop and maintain an online hub of geospatial datasets to assist researchers, natural resource managers, and policymakers in the Micronesia region.



Promote and offer services of emerging technologies that augment research activities and monitoring of our natural resources.



Produce effective scientific research and case studies to further solidify the University of Guam as an esteemed research institution in the Western Pacific.



Utilize effective communication techniques to educate and raise awareness of environmental issues unique to Pacific Islands.



Provide place-based learning opportunities for students by establishing pathways with our local and federal partners through internships, fellowships, and co-production.

Programs associated with the MAGIC Lab include the Pacific Islands Climate Adaptation Science Center (PI-CASC), NASA Guam EPSCoR, NASA Guam Space Grant, UOG Drone Corps, and the U.S. Department of Agriculture's (USDA) Partnerships for Climate-Smart Commodities. We are also very grateful for the partnerships with numerous agencies, organizations, and institutions that collaborate with us and support our work.

We hope you will be inspired by our recent efforts.

Si Yu'os Ma'åse'!



**Romina King, Ph. D**  
University of Guam



**Leslie Aquino, Ph. D**  
University of Guam



# About Our Programs



## NASA Guam Space Grant

As part of the University of Hawai'i Space Grant Consortium, NASA Guam Space Grant aims to inspire and train future generations of professionals in areas concerned with the understanding, utilization, exploration, and investigation of both space and earth, particularly as they apply to our regional island environments.



## NASA Guam EPSCoR

NASA Guam EPSCoR supports the NASA Earth and Ocean Science Missions through critical research unique to Guam's environmental challenges. The program builds partnerships with government, higher education, and industry that are designed to affect lasting improvements in Guam's infrastructure, research, and development capacity.



## Pacific Islands Climate Adaptation Science Center

The Pacific Islands Climate Adaptation Science Center (PI-CASC) is a collaborative partnership between the U.S. Geological Survey and a university consortium designed to support sustainability and climate adaptation in communities across the Pacific Islands.



## University of Guam Drone Corps

The University of Guam Drone Corps program, co-funded by NASA Guam EPSCoR and NASA Guam Space Grant, aims to build technical capacity for drone services on Guam by creating a cadre of Federal Aviation Administration Part 107b-licensed, informed, and responsible remote pilots.



## USDA - Partnerships for Climate-Smart Commodities

USDA's Partnerships for Climate-Smart Commodities provides voluntary incentives and technical support for producers to facilitate the adoption of climate-smart practices for Guam, as well as develop solutions to make local commodities more marketable and affordable for island communities.

FOLLOW US



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@nasaguamepscor  
@pacificcasc

Subscribe to  
MAGIC Lab's  
Newsletter!





PI-CASC Host Agreement  
OCT. 2019 - SEP. 2024

**\$700K**

TOWARDS:

- Research for actionable climate science in the region
- Products and tools for natural resource management
- Co-production among scientists and managers



PI-CASC (Coral Bleaching)

**\$145K**

PI-CASC (Jellyfish Lake)

**\$243K**



USDA Partnerships for  
Climate-Smart Commodities  
NOV. 2023 - NOV. 2028

**\$5M**



TOWARDS:

- Supporting Local Farmers
- Reducing Greenhouse Gas Emissions
- Strengthening Food Security



# By the Numbers | Financial Overview

**NASA Guam Space Grant**  
APR. 2020 - APR. 2025

**\$600K**



TOWARDS SUPPORTING:

- Fellowships and Internships
- STEM Opportunities
- Building local and technical capacity in the workforce

**NASA Guam EPSCoR HFAT**  
OCT. 2021 - SEP. 2024



**\$715K**

**RISC SUPPORT @ UOG**  
JULY 2023 - JUNE 2028

**\$200K**



**NASA Guam EPSCoR RID**  
MAY 2022 - MAY 2027

**\$1M**



TOWARDS SUPPORTING:

- NASA-aligned research and capacity building in the region
- Education and training with emphasis on remote sensing, GIS, and unmanned aerial systems
- Opportunities to advance cyberinfrastructure





# Pioneering Pathways

with **NASA Guam Space Grant Internships & Fellowships**



Students come first at NASA Guam Space Grant, which aims to provide unique opportunities for students to incorporate NASA technology and standards into research.

The grant, which is part of the Hawai'i Space Grant Consortium, currently hosts a fellowship program for graduate students and an internship program for undergraduate students. The programs give students opportunities to pursue original research projects and valuable experiences in line with NASA's Science Mission Directorate Goals. Interns can pursue one of three pathways: a research internship, a professional internship, or a teaching internship.

NASA Guam Space Grant is housed within the Micronesian Area Research Center at the University of Guam and supports educational initiatives that focus on science, technology, engineering, and mathematics (STEM) as they support NASA's missions.

Ultimately, NASA Guam Space Grant works to foster the growth of future generations of space scientists and engineers spanning across a variety of sectors, who will help further our understanding of Earth, our solar system, and the universe.

## Student Success: Jonelle Sayama



For her thesis project under the mentorship of Dr. Romina King, NASA Guam Space Grant fellow Jonelle Sayama monitored the health of Guam's mangroves by mapping the often difficult-to-traverse ecosystems from above with drones.

After earning her Master of Science in Environmental Science in 2023, Jonelle has continued to lead aerial mapping missions that produce orthomosaic imagery of Guam's diverse natural resources such as coral reefs and agricultural sites.

## Student Success: Thomas Torres II



Thomas Torres II, a NASA Guam Space Grant Professional Intern and a member of the University of Guam Drone Corps, recently played a crucial role in a groundbreaking two-week mission to map ancient man-made terraces in Palau. This mission, as part of his internship with 2cofly, utilized advanced drone and LiDAR technology to reveal these hidden historical sites.

Led by archaeologist Dr. Jolie Liston and funded by the U.S. Ambassadors Fund for Cultural Preservation, the project aimed to map around 3,000 acres of ancient terraces in Aimeliik.



## GRADUATE FELLOWS



**Jonelle Sayama**  
Environmental Science  
Mentor: Dr. Romina King

Graduated Fall 2023



**James Pangelinan**  
Hydrology  
Mentor: Dr. Chris Yeo

Graduated Spring 2023



**Frank Lujan II**  
Environmental Science  
Mentor: Dr. Romina King

## UNDERGRADUATE INTERNS



**John Tristan Palanca**  
Research Intern  
Mentor: Dr. Romina King

Graduated Spring 2018



**Johnny Parke**  
Research Intern  
Mentor: Dr. Leslie Aquino

Graduated Spring 2023



**Allen Jake Aromin**  
Research Intern  
Mentor: Dr. Romina King

Graduated Fall 2019



**Aurienne Cruz**  
Teaching Intern  
Mentor: Dr. Leslie Aquino

Graduated Fall 2023



**Gian Paras**  
Teaching Intern  
Mentor: Dr. Hyunju Oh



**Ernie Samelo**  
Teaching Intern  
Mentor: Dr. Leslie Aquino

Graduated Spring 2024





**MENTOR PARTNERS**



**PROFESSIONAL INTERNS**  
FALL 2023 - SPRING 2024



**Julian Abella**  
Bella Wings Aviation



**Sierra Avellana**  
KLARA M



**Jared Diaz**  
2cofly



**Thuy Nguyen**  
2cofly



**Thomas Torres**  
2cofly



# Cultivating Tomorrow's Experts



## NASA Guam Space Grant Professional Internship Program

Launched in August 2021, the NASA Guam Space Grant Professional Internship program aims to build technical and workforce capacity for the local community. This program bridges the gap between the academic and career sectors by pairing students with mentors from industries or trades they aim to specialize in.

The Professional Internship is one of three pathways offered by NASA Guam Space Grant, alongside its teaching and research internships, which collectively focus on

preparing students with career-building steps and practical skills.

This Spring 2024 semester, we welcomed four new Professional Interns who are collaborating with experts in the drone industry. Their work spans various fields including construction, engineering, and marketing. Through this opportunity, these students gain hands-on experience and are able to participate in case studies guided by their respective mentors.





MODULE OVERVIEW

Exploring Our Universe



Space Guess Quest



The Expanding Universe



Pocket Solar System



Land Cover



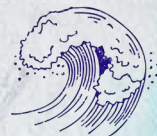
Exploring Our Earth



Cloud in A Bottle



Mapping Sea Level Rise





# Igniting Curious Minds

with STEM Saturdays



To achieve the goal of developing a robust STEM education and outreach program based on the National Informal STEM Education Network's "Explore Science-Earth & Space 2019 Toolkit," NASA Guam Space Grant launched its inaugural STEM Saturday event this year.

This brand-new, dynamic, out-of-school program aims to educate local elementary and middle-grade students about complex STEM topics such as climate change and the nature of our universe through enjoyable, creative, and hands-on activities. The event is hosted monthly throughout the year, with

each month focusing on brand new modules that aim to get young learners excited about STEM.

In our first module, titled "Getting to Know the Universe," students participated in outer space-based activities, such as discovering the expanding nature of our universe with balloons and even creating their own pocket-sized solar system. Through the STEM Saturday series, NASA Guam Space Grant aspires to create meaningful connections with our students to inspire a lifelong curiosity and passion for science, technology, engineering, arts, and mathematics.





# Hånom Fresko yan Acho' Tåsi

A deeper look at our valuable Northern Guam Lens Aquifer



Now on its third year, NASA Guam EPSCoR's *Hånom Fresko Yan Acho' Tåsi* project is deep into compiling and processing imagery and relevant datasets for the Northern Guam Lens Aquifer (NGLA) and the surrounding ocean. Key efforts within the past year include:

- Thermal infrared mapping at Ague Cove and Tumon Bay and collecting coral reef imagery at Ague Cove, Tumon Bay, Sharks Cove, and Faifai Beach
- Deployment of data loggers along the western coast to collect and regularly monitor water temperature and salinity, along with an installment of a rain gauge to assess precipitation and water budget
- Processing of satellite data from 1989 to 2021 to produce information on land cover and classification change, species identification, and soil moisture at NGLA
- Assessing general hydrological features of surface runoff systems and sub-marine groundwater discharge systems

## What is HFAT?

*Hånom Fresko yan Acho' Tåsi*, which translates to "Freshwater and Coral," is a three-part project that will produce maps of coastal freshwater discharge, fine-tune variables needed to better estimate the aquifer's water supply, and look for relationships between that freshwater discharge and coral reef health.

The project is funded by a grant awarded through a NASA EPSCoR Research Cooperative Agreement.



## Why is this important for Guam?

The Northern Guam Lens Aquifer provides 90% of the island's drinkable water. Gaining a better understanding of the aquifer's freshwater budget will aid natural resource management in monitoring, maintenance, and conservation.





### Onsite observations

Maria Villareal and Logen Flem, working under the NASA Guam EPSCoR *Hånom Fresko'yan Acho' Tåsi* (Freshwater and Coral) project, explore a crack along the coastline where freshwater discharge is present.





# Focused Sciences

Supporting research through seed grants



NASA Guam EPSCoR over the years has produced quality research on our natural resources and ecosystems, with projects ranging from multispectral remote sensing applications on Guam's southern watersheds to studying reef fish spawning aggregation sites using cutting-edge technology.

These projects fostered innovation and research experience among the local community, increased professional capacity at collegiate and management levels, and produced high-grade products that can be used in future research opportunities and policymaking decisions.







## FY2023 Seed Grants

---

**"The Application of Statistical and Machine Learning Models for Predicting Saltwater-Groundwater Interactions in Guam"** by Dr. Yong Sang "Barry" Kim. This project looked at potential correlations between sea level rise and chloride levels in groundwater and sought optimal prediction models using learning algorithms and statistical models.

**"Predicting Flight Responses of Reef Manta Ray (*Mobula alfredi*) via UAS Surveys"** by Dr. Brett Taylor, Julie Hartup, and Logen Flem. This project examined the relationship between human activity and flight initiation responses of manta rays, as well as overall behavior patterns of the species, through drone surveys.

**"Research-based Initiative on Sustainable Construction Materials for Guam: Properties of Pervious Concrete from Demolished Buildings"** by Dr. Ernesto Guades. This project used mathematical models in an attempt to determine the properties of recycled aggregate concrete from demolished buildings.



### Learn more

NASA Guam EPSCoR seed grants are awarded on a rolling basis, based on funding availability. UOG faculty who are interested in learning more may reach out to NASA Guam EPSCoR Executive Director Dr. Leslie Aquino at [aquinol8112@triton.uog.edu](mailto:aquinol8112@triton.uog.edu).



# 3<sup>rd</sup> Annual NASA Guam Research Symposium

2024 UOG Conference on Island Sustainability



NASA Guam Space Grant and NASA Guam EPSCoR's 3rd Annual NASA Guam Research Symposium was a success, offering a full day of research, technology, and insights from leading professionals in local NASA-funded projects. Held at the Hyatt Regency Guam on April 8 as a pre-conference event to the 2024 Conference on Island Sustainability, the symposium showcased the latest advancements and opportunities within our island community, attracting a diverse audience of students, researchers, and STEM enthusiasts.

The symposium kicked off with a feature panel on Project *Hånom Fresko yan Åcho' Tåsi* (Freshwater & Coral), highlighting its significance for Guam's coral reefs. The symposium continued with presentations from NASA Guam EPSCoR's seed grant-funded projects, covering topics ranging from coral health and manta ray populations to saltwater-groundwater interactions and sustainable construction materials. To round out the symposium, the afternoon sessions featured special topic

presentations from NASA Guam Space Grant's STEM Saturday and UOG Drone Corps programs. These presentations covered a diverse set of themes such as making STEM education more accessible for youth and using drone technology to assist in natural disaster relief efforts.





# SYMPOSIUM HIGHLIGHTS



## 2024 Conference on Island Sustainability Sustainability Endures

After the research symposium, students and researchers spent the conference week hosting a booth in the event hall to share their work with attendees.

NASA Guam Space Grant and NASA Guam EPSCoR express deep gratitude for the partnerships and support that made this event possible. Serving as a space for researchers and students to gather and foster innovation, the programs aim to continue growing and expanding efforts to advance science and technology in our region.







**Giving feedback on local climate issues:** PI-CASC hosted an engagement workshop on April 9 for the Fifth National Climate Assessment as part of the 15th UOG Conference on Island Sustainability.



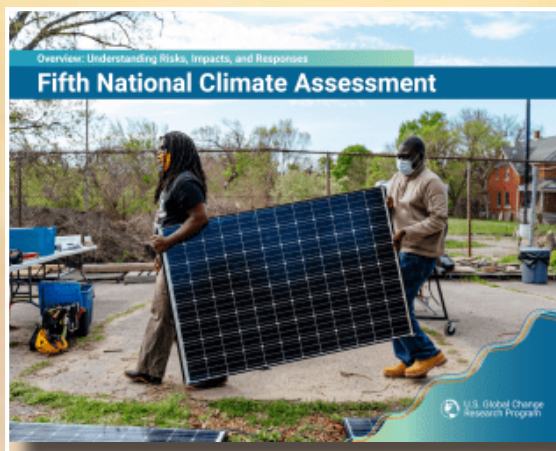
# National Climate Assessment



Addressing environmental challenges in the region

PI-CASC played a key role in the development and creation of the Fifth National Climate Assessment's chapter on Hawai'i and the U.S. Affiliated Pacific Islands. PI-CASC UOG lead Dr. Romina King served as a co-author of the chapter, and PI-CASC Guam Communications Coordinator John I. Borja was among dozens of technical contributors.

To assist with the promotion of the government-mandated report, PI-CASC at UOG coordinated a public engagement workshop as part of the 15th UOG Conference on Island Sustainability. The workshop included a facilitated discussion among King and fellow co-authors and PI-CASC researchers Christopher Shuler and Kirsten Oleson, as well as NCA 5 Chief



of Staff Chris Avery. Participants had the opportunity to provide feedback on the report and share suggested topics and resources for the next assessment. King has also been instrumental in sharing the NCA 5 within Micronesia, primarily through presentations at regional conferences.

View the NCA 5 at  
[www.bit.ly/nca-5](http://www.bit.ly/nca-5)



# Storytelling from the Field

PI-CASC Climate Adaptation for Resource Management fellow Farron Taijeron headed to Washington, D.C. in April to attend the 2024 Planet Forward Summit as a finalist in the StoryFest competition. Planet Forward is a creative environmental storytelling platform founded and coordinated through George Washington University that connects students from across the globe to learn, build relationships, and tell their stories. The Planet Forward StoryFest “highlights the voices of students, seeking to understand and illuminate their own innovations for how to best care for the earth.”

Taijeron participated in the competition’s Best Video by a Non-Media Student category. He claimed a spot in the finals out of hundreds of entries with his video, “When Public Health = Planet Health,” which reflected on his environmental conservation journey of documenting issues that threaten Guam’s natural resources through social media. Although he did not win, he used the opportunity to build his network with other creatives and participate in a panel, “How We Did It: Crafting Narratives from the Field.”





# Climate Adaptation for Resource Management



Bridging the gap between science and management

The Pacific Islands Climate Adaptation Science Center's (PI-CASC) Climate Adaptation for Resource Management (CARM) fellowship is making strides in creating co-production opportunities between the University of Guam and partnering agencies and organizations. Along with our current fellows, PI-CASC

will be welcoming at least two new fellows in the Fanuchånan 2024 semester. Last year, one of our former fellows served as a guide for a drone field mission in Palau. We look forward to expanding this program to aid more natural resource managers.



**Patrick Keeler**

**Major:** Sustainable Agriculture, Good and Natural Resources  
**Project:** Evaluating the effects of biochar on seedling health and survivorship in southern Guam  
**Agency:** Guahan Sentinel Landscape Partnership Program



**Marybelle Quinata**

**Major:** Micronesian Studies  
**Project:** Creating an inclusive visitor services plan for the Guam National Wildlife Refuge  
**Agency:** U.S. Fish & Wildlife Service – Guam National Wildlife Refuge



**Farron Tajeron**

**Major:** Agriculture and Life Sciences  
**Project:** Perceptions of Wildfire and Wildfire Management on Guam  
**Agency:** The Nature Conservancy



**Charles "CJ" Paulino**

Graduated Fanuchånan 2022, now a lead biologist at Tano, Tasi, yan Todu



**Mira Mariur**

Former PI-CASC Fellow who will be working under USDA Partnerships for Climate-Smart Commodities



# Taking Flight

Building Research & Workforce Capacity with UOG Drone Corps



The University of Guam Drone Corps program provides a robust and engaging experience for collegiate-level students by partnering with experts in the drone industry to prepare the students for federal drone pilot certification and guide them with hands-on flight simulations.

Through this summer experience, students become responsible and exceptional drone pilots who can then assist in missions that will benefit the local community.

After finishing the program, students can continue taking on assignments, further enriching their drone flight experiences.

## BY THE NUMBERS

42

FAA-Licensed **Pilots**

2K

Training **Flight Hours**

4

Total **Cohorts**



# PROGRAM OVERVIEW



## Knowledge Course

Students are enrolled in a Knowledge Course that prepares them to pass the FAA Part 107 Remote Pilot written examination. The course consists of a ground school and a practicum.



## Get Licensed

Upon completing the Knowledge Course, students apply their knowledge to take the FAA Part 107 Remote Pilot exam.



## Earn Flight Hours

Members who pass their exam are offered internships with local agencies, where they are able to apply their drone piloting skills to serve the organization's specific needs.



The third cohort of the UOG Drone Corps program.



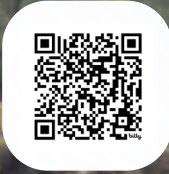
Practical flight training is included in the course.





## Typhoon Mawar Feature

Watch Now



UOG Drone Corps was featured on KUAM News for its efforts in assessing the aftermath of the typhoon.



# Mapping the Aftermath

UOG & NWS Map Typhoon Aftermath with Drones

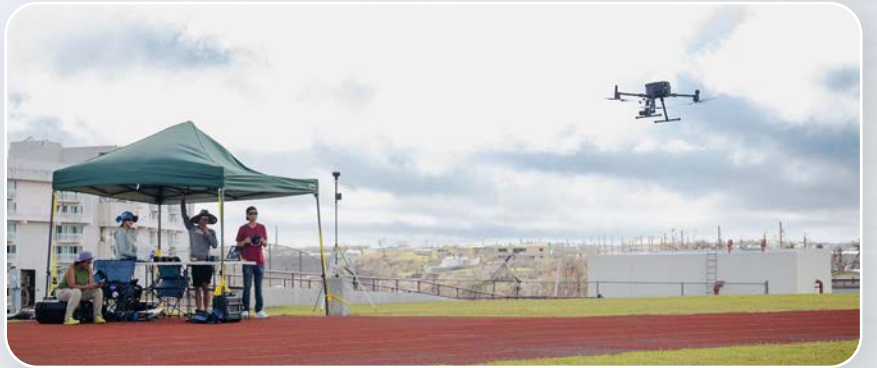


After the devastating impact of Typhoon Mawar on May 24, 2023, the University of Guam, and National Weather Service Guam initiated a collaborative effort to map the storm's damage to the natural and built environment.

Remote pilots from various UOG programs, including UOG Drone Corps, NASA Guam Space Grant, NASA Guam

EPSCoR, and the Pacific Islands Climate Adaptation Science Center, conducted assessments from May 27 to June 8, 2023. The data collected during this endeavor enabled meteorologists and natural resource managers to make detailed analyses of the typhoon's winds and coastal inundation, contributing to a better understanding of such events.

View the datasets at [www.bit.ly/nasagudata](http://www.bit.ly/nasagudata)





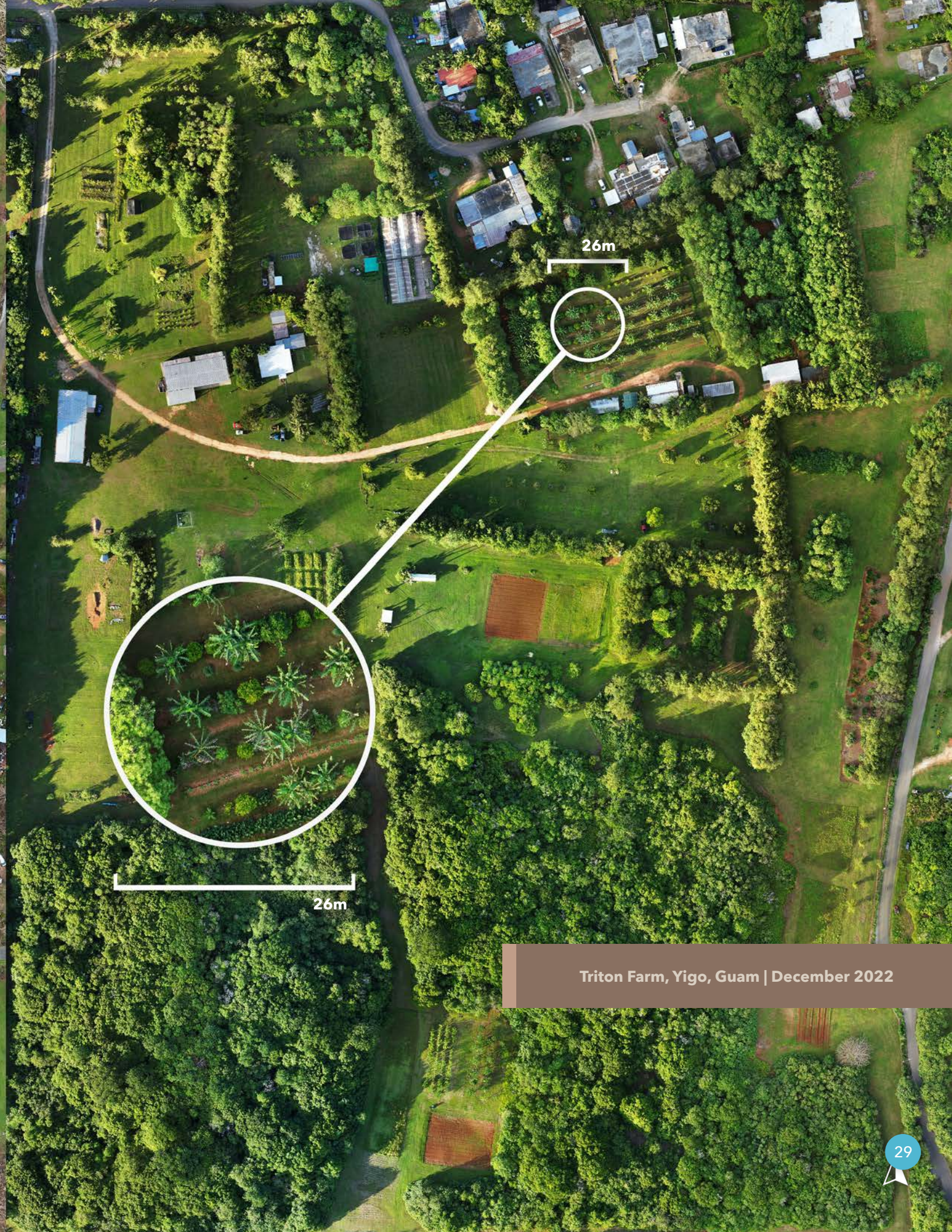


### Triton Farm, Yigo, Guam | June 2023

This image shows the devastation of the farm following Typhoon Mawar's impact. The University of Guam partnered with the National Weather Service Guam Forecast Office to determine and document sites that showed signs of heavy impact, such as ravaged trees, damage to urban infrastructure, and coastal inundation.







Triton Farm, Yigo, Guam | December 2022



# Above Scorched Landscapes

UOG & Guam Forestry Map Wildfire Aftermath

The University of Guam Drone Corps worked with the Guam Department of Agriculture's Forestry team to document the burns at the As Gadao Reforestation Site, following a major wildfire event in March 2024.

The fires ravaged the site, which was home to years of tree planting efforts

intended to reforest the land and prevent soil erosion from running off into the ocean. The visual datasets obtained from this excursion will help natural resource managers understand the extent of the fire and determine what strategies can be formulated to prevent further damage to these fire-susceptible sites.





🔍 A CLOSER LOOK



On March 2024, the As Gadao Reforestation Site in Merizo was ravaged by a wildfire. Together with the Guam Department of Agriculture, remote pilots from the University of Guam Drone Corps mapped the area to produce this high-resolution orthomosaic.





# Beyond Shores & Skies

Knowledge Exchange with Palau Community College



In October 2023, personnel from the University of Guam Drone Corps embarked on a capacity-building mission to Palau. Their purpose was clear: to share knowledge, ignite inspiration, and to set the stage for the Palau Community College to establish its own drone training program.

environmental sites in Palau, showcasing the limitless potential of drone technology for coral reef monitoring and invasive species damage assessment. This partnership is a story of collaboration, shared wisdom, and the incredible possibilities that occur when knowledge takes flight.

As part of their journey, the team conducted mapping missions at key



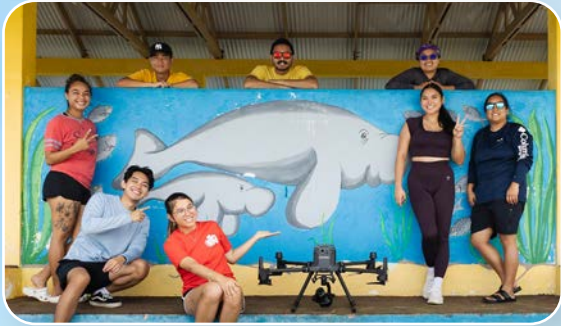
**Mission Overview Video**

Watch Now



In this highlight video, students and staff from the University of Guam speak about their experiences embarking on a drone mapping and capacity-building mission to Palau.





A team of eight members from the UOG MAGIC Lab traveled to Palau to demonstrate the use of unmanned aerial vehicles for research and conservation purposes.

## Connections Across the Sea

Former PI-CASC CARM fellow Mira Mariur (right) was instrumental in the success of this Palau visit. Along with her advisor Dr. Chris Kitalong, Mariur established a connection between the University of Guam and the Palau Community College and assisted in identifying vulnerable coconut rhinoceros beetle sites in Palau for UOG Drone Corps to survey. She will continue working as a member of the UOG Magic Lab after transitioning into the USDA Partnerships for Climate-Smart Commodities.





MISSION OBJECTIVES

To address greenhouse gas (GHG) emission reductions in Pacific Island agriculture and forestry systems and seek to improve affordable food and nutrition security. This project aims to:



Develop a better understanding of the impact of local agricultural and forestry systems and trade on GHG emissions in Micronesia



Advance Guam and the CNMI toward United Nations' Sustainable Development Goal 2 ("End Hunger") with place-based, affordable solutions by developing local agriculture and analyzing market demand



Build local capacity in the Western Pacific region to efficiently measure GHG emissions in agriculture and forestry systems



Evaluate the costs and benefits of climate-smart agricultural commodities and practices for effective GHG emission reduction, more fertile soil, increased agricultural yield, and improved food quality and affordability.





# Sustainable Agroforestry



USDA Partnerships for Climate-Smart Commodities

The University of Guam was awarded \$5 million from the U.S. Department of Agriculture Natural Resources Conservation Service to work with forestry managers and farmers to produce commodities using more environmentally friendly and sustainable practices. Through this grant, UOG will provide voluntary incentives and technical support to producers to facilitate the adoption of climate-smart practices.

The initial pilot projects will include

one conservation area managed by the Guam Department of Agriculture, seven private farms, and one agricultural experiment station on Guam. A team of researchers, soil experts, agricultural specialists, and economists at UOG and government of Guam agencies will support the farmers in implementing climate-smart practices and monitoring greenhouse gas emissions. In addition, the project will also develop solutions to make local commodities more marketable and affordable for island communities.

UOG Drone Corps pilots recently surveyed farm plots in Saipan.







# A Resource Hub for Micronesia

## Products & Datasets from the MAGIC Lab

Across the grants and programs affiliated with the MAGIC Lab, a common theme is found: data collection. The MAGIC Lab aims to be a central repository for a wide range of datasets and resources in the region, across a variety of topics. Whether it is information on climate data, remote sensing and geographic information systems, or lesson plans

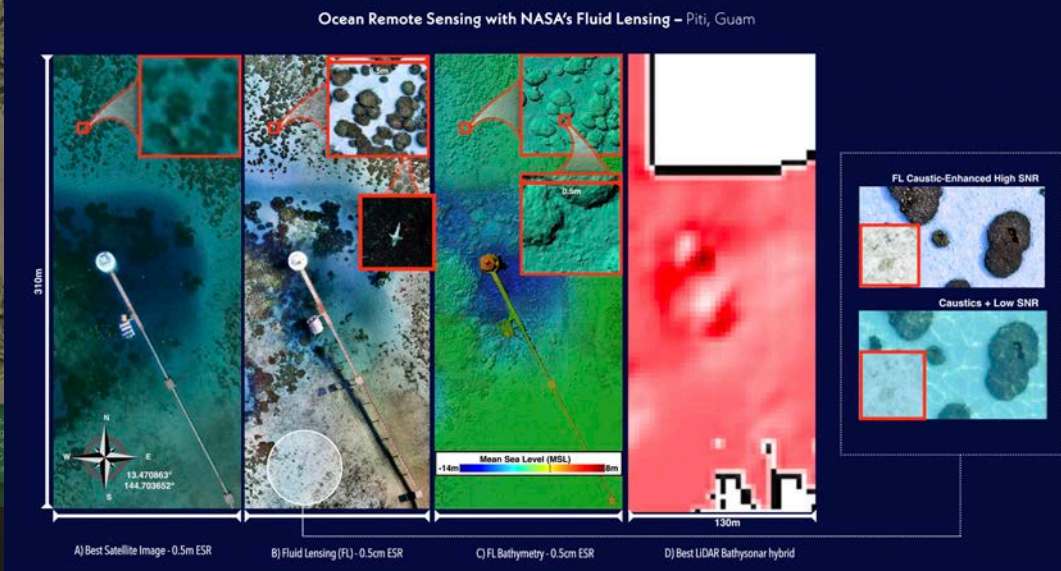
to teach STEM in the classrooms, the MAGIC Lab strives to create and promote high-quality, locally relevant products for the region. This is a lofty goal, but one that can be accomplished through local partnerships as well as the constant support of the University of Guam.

### INVASIVE THREATS: IMPACTS OF COCONUT RHINOCEROS BEETLES



Coconut rhinoceros beetles have been a threat to Guam since 2007, causing significant damage and

### Ocean Remote Sensing with NASA's Fluid Lensing - Piti, Guam



This orthomosaic thanks to a big rhinoceros beetle University of Guam technology

A) Best Satellite Image - 0.5m ESR  
B) Fluid Lensing (FL) - 0.5cm ESR  
C) FL Bathymetry - 0.5cm ESR  
D) Best LiDAR Bathymetry hybrid

Next-Generation Ocean Biosphere Remote Sensing with Fluid Lensing: New maturing technologies, such as fluid lensing, permit multispectral 3D benthic imaging without ocean wave distortion and caustic noise at increased SNR, effective spatial resolution (ESR), and depth. This example from an airborne 2019 fluid lensing campaign mapping Guam's coral reefs provides an example of the capability of such evolving tools (A & D vs B & C), which permit the georectification of underwater environments in 3D (B & C) and reveal fauna, such as the reef shark (B inset), detected as moving in relation to sessile benthic surface.

**Dr. Ved Chirayath**  
Aircraft Center for Earth Studies (ACES)  
Department of Ocean Science  
Rosenstiel School of Marine & Atmospheric Science

**Dr. Romina King**  
Pacific Islands Climate Adaptation Science Center  
Western Pacific Tropical Research Center | Micronesian Area Research Center  
NASA Guam Space Grant | NASA Guam EPSCoR

This project was partially funded by "Mapping of Guam's Priority Coral Reefs" CR-GU-16-017AP00069

### NASA GUAM EPSCoR

The NASA Guam Established Program to Stimulate Competitive Research (EPSCoR) is focused on research that aligns with missions and technologies that are relevant to Guam and the

#### FOSTERING ISLAND INNOVATION

As one of the 28 NASA EPSCoR jurisdictions across the United States, NASA Guam EPSCoR provides resources to help local companies, research, industry and academia to focus areas of interest to NASA. Our program works with local and federal resources to foster innovation and research in the University of Guam and other local institutions for local community, economic, and policymaking.

In the program's active history, funding from NASA Guam EPSCoR has supported efforts to use remote sensing and geographic information system technologies to monitor forest and fisheries for natural resource management and conservation, provide scientific research opportunities to university of Guam and national faculty, and staff and contract Guam with national faculty and researchers to foster collaboration for future projects.

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### CARM Climate Resource

#### WHAT IS CARM?

The CARM program is a fellowship opportunity for natural resource professionals in Guam to foster their expertise through collaboration and higher learning in academia.

While a traditional graduate fellowship bridges a student's education from the undergraduate level to the graduate level, or graduate level to doctoral level, the CARM program seeks to assist natural resource agencies to seek out individuals with substantial field experience who can benefit from receiving advanced education and further build technical capacity of the agency they serve.

CARM students transform their work into their thesis project. This co-production effort allows them to develop and hone effective communication techniques in collaboration, among scientists, natural resource management, and academic.

**USGS** **PACIFIC ISLANDS** **GUAM**

### NASA Guam

#### Overview

NASA Guam Space Grant aims to inspire and train future generations of professionals in areas connected with the understanding, utilization, exploration, and investigation of both space and earth, which includes our regional land environments, through research and innovation. Our program is housed within the Micronesian Area Research Center at the University of Guam and history includes the National Space Grant College and the University Research Institute.

STEM is the key to our future.

Our program offers educational opportunities for University of Guam undergraduates and graduates by awarding Space Grant scholarships and fellowships to train them in research to help us reach our goals.

**Romina King, Ph.D.**  
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Associate Director  
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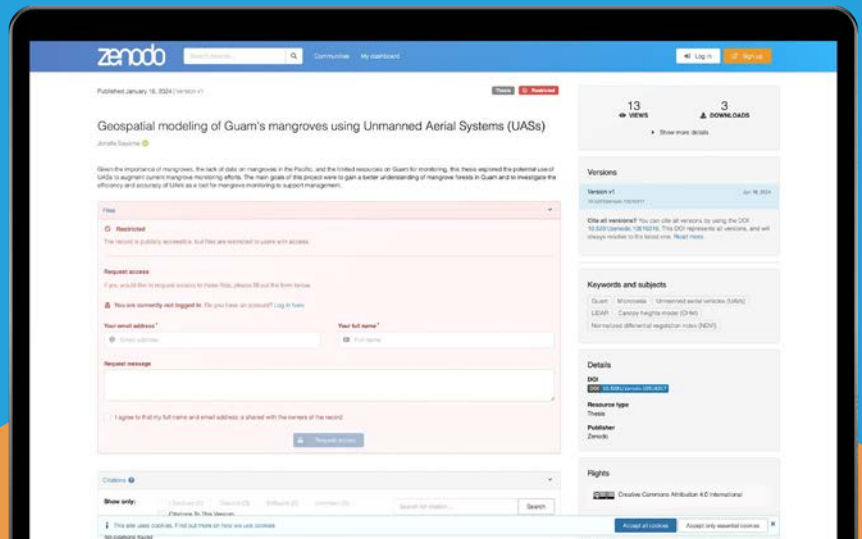


# Science for All

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View the datasets at  
[www.bit.ly/nasagudata](http://www.bit.ly/nasagudata)



**OBJECTIVES**

NASA Guam EPSCoR office to conduct research relevant to Guam and the region, in alignment with NASA missions.

Increase education and workforce development, with a focus on STEM fields, indigenous education, and supporting local businesses.

Provide research-related training opportunities to support faculty and provide resource management and studies in Guam and Micronesia.

Engage and maintain a strong pipeline of students, faculty, and service as a data science hub.

Encourage research in order to support and sustain economic resilience (EOR).

Facilitate collaboration and partnerships between Guam and NASA researchers to meet the challenges of the region.

Support education and partnerships between Guam and NASA researchers to meet the challenges of the region.

**STAY CONNECTED**

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**Space Grant**

2023 is our ninth year of partnership with the National Science Foundation as part of the National Space Grant program. The University of Guam was awarded the full amount of \$2,500,000 (50% of the total) to support the program and administration of the program.

**Background**

In 2014, NASA allocated money specifically to the United States territories as part of their National Space Grant program. The University of Guam was awarded the full amount of \$2,500,000 (50% of the total) to support the program and administration of the program.

**Success & Research**

- UAS: Drone Corps program partners with National Weather Service to map National Weather Service.
- NASA Guam Space Grant team: Susan Pineda, Director for the area through NASA Langley Research Center.
- NASA Guam Space Grant Associate Director: Dr. Barbara King, contributor to NASA's special research area featuring Guam's UAS.
- NASA Guam Space Grant: Follow-up study: Special area studies to study mangroves and reefs.

www.bit.ly/nasaguguarum





# Outreaches

## Building Research & Workforce Capacity

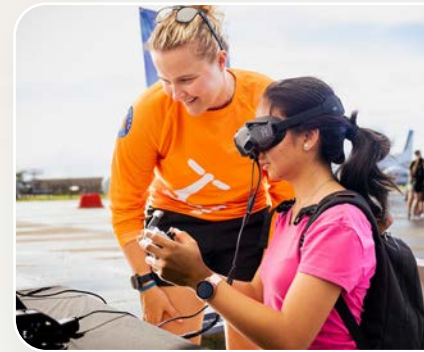
To fulfill our objective of promoting STEM engagement with the community, MAGIC Lab actively participated in a series of outreaches aimed at introducing our programs and NASA-related projects. Since January 2023, we have reached approximately 510 participants across various education levels, ranging from elementary school students to college-level teachers.

Notably, we participated in several "Career Day" events, enlightening elementary and high school students about the exciting career paths of environmental research associates and remote pilots.

These outreaches took the form of in-person workshops, conference booths, and field visits.







Interested in an outreach? Contact  
[magic@triton.uog.edu](mailto:magic@triton.uog.edu)





# Conferences & Workshops

Knowledge Sharing in the Region & Beyond

FEB  
2024

## NASA Congressional Visit Washington, D.C.

Dr. Leslie Aquino and Dr. Romina King, representing NASA Guam EPSCoR and NASA Guam Space Grant, attended the EPSCoR/IDEA Coalition and Foundation Annual Meeting in Washington, D.C., to promote the programs and advocate for more funding and support for Guam. Part of this effort included visiting the office of Guam Congressman James Moylan to share updates about the progress that the programs are making towards advancing research and workforce capacity.



## American Geophysical Union

Dr. Romina King joined other authors of the Fifth National Climate Assessment's Chapter 30 team in California to promote the resource.

DEC  
2023



## Pacific Islands Forestry Workshop

Dr. Romina King and Keanno Fausto shared information on the UOG Drone Corps program with forestry personnel in Hawai'i.

DEC  
2023





**APR  
2024**

**American Association of Geographers**  
 Jonelle Sayama presented her mangrove research at the annual meeting, which was held in Hawai'i this year.



**NOV  
2023**

**NASA OSTEM Better Together**  
 Communications Coordinators John Borja and Keanno Fausto represented the NASA Guam programs in California.



**SEP  
2023**

**NASA Space Grant Directors Meeting**  
 As part of the Hawai'i Space Grant Consortium, Dr. Romina King and Keanno Fausto shared updates on NASA Guam Space Grant.



**FEB  
2024**

**Mariana Islands Conservation Conf.**  
 Dr. Romina King and Jonelle Sayama presented on the Fifth National Climate Assessment and mangroves research, respectively.





# SI YU'OS MA'ÅSE TO OUR PARTNERS



GUAM CLIMATE CHANGE  
RESILIENCY COMMISSION



RESEARCH CORPORATION  
OF THE UNIVERSITY OF GUAM



# The Team

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# MAGIC LAB

MICRONESIAN AREA GEOSPATIAL INFORMATION CENTER