



**MAGIC LAB**

MICRONESIAN AREA GEOSPATIAL INFORMATION CENTER

# Growing

WITH THE FLOW

FY2025 HIGHLIGHT REPORT



UNIVERSITY OF GUAM  
LAND  
GRANT  
AGRICULTURE RESEARCH CENTER



Partner







# Table of Contents

<b>INTRODUCTION</b>	<b>5</b>
<b>ABOUT OUR LAB</b>	<b>6</b>
<b>BY THE NUMBERS</b>	<b>7</b>
NASA Guam Space Grant	<b>8</b>
NASA Guam EPSCoR	<b>9</b>
Pacific Islands Climate Adaptation Science Center	<b>10</b>
Advancing Markets for Producers	<b>11</b>
<b>THE LAND</b>	
Work with Southern Soil	<b>12</b>
Augmenting Soil (Biochar)	<b>14</b>
Conservation & Collaboration	<b>16</b>
Coral Conservation Area	<b>18</b>
<b>THE WATER</b>	
Hånom Fresko yan Acho' Tåsi	<b>20</b>
Coral Reef Mapping Campaign	<b>22</b>
Seed Grant: Twilight Reefs	<b>24</b>
Student Feature: SURF Program	<b>25</b>
<b>REGIONAL KNOWLEDGE SHARING</b>	
<b>26</b> CNMI Campaign	
<b>28</b> Pohnpei Campaign	
<b>30</b> Collaboration with University of Miami	
<b>CAPACITY BUILDING</b>	
<b>32</b> UOG Drone Corps	
<b>34</b> Geospatial Resource & Workshops	
<b>36</b> CARM Fellowship	
<b>38</b> NASA Guam Space Grant Internships	
<b>OUTREACH</b>	
<b>40</b> Conference on Island Sustainability	
<b>42</b> STEM Saturday	
<b>44</b> Conference Highlights	
<b>46</b> Outreach Highlights	
<b>48 THE TEAM</b>	
<b>51 OUR PARTNERS</b>	

# Håfa Adai!

In the past year, the UOG MAGIC Lab entered a transformative era amid transitions within the U.S. government. Despite these changes, we remain committed to bringing actionable science, fruitful collaborations, and local opportunities to Guam and Micronesia. While we have supported coastal and ocean-related sciences with technologies relatively new to local natural resource agencies, we are also venturing more inland to aid forestry and agriculture. This mirrors the current administration's refocused priorities in the nation, which ultimately affect the priorities of the federal grants and programs we partake in.

The theme of this impact report, "Growing with the Flow," reflects the MAGIC Lab's adaptability in continuing the work we do, no matter where the river flows. Along the way, we are grateful to meet and network with numerous partners – local, regional, and national – who have supported our work and, in kind, accepted our resources for their needs. As we navigate a transitioning landscape, we remain committed to carrying out our lab's goals. This means providing support to agricultural producers and natural resource managers, offering resources to researchers and public officials, creating opportunities for student enrichment, and engaging with the local community.

Si Yu'os ma'åse' to everyone who has networked and collaborated with the UOG MAGIC Lab. We would not have been able to achieve what we have without your support! Biba!



**Romina King, PhD**

**Leslie Aquino, PhD**



# AN INTRODUCTION TO THE UOG MAGIC Lab

The University of Guam **Micronesian Area Geospatial Information Center (MAGIC) Lab** is proud to release its FY2025 Highlight Report, showcasing our research and achievements over the past fiscal year.

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

## LAB GOALS



### Geospatial Data

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



### Place-based Research

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



### Innovative Technology

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



### Informed Dialogue

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



### Collaboration & Opportunity

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

BY THE NUMBERS

(OCT. 1 2024 - SEP. 30, 2025)

**50+**  
NEW ORTHOMOSAIC  
DATASETS PRODUCED

**13**  
NEW REMOTE PILOTS  
CERTIFIED

**75+**  
FLIGHT MISSIONS  
COMPLETED

**14**  
UNDERGRADUATE STUDENTS  
SUPPORTED

**10**  
GRADUATE STUDENTS  
SUPPORTED

**1.6K+**  
OUTREACH  
AUDIENCE

**80+**  
OUTREACH  
HOURS





## GRANT OVERVIEW

# NASA Guam Space Grant

### PROJECT INFORMATION

**Grant Number:** 80NSSC20M0039 (UH MA1550)

**Funding Amount:** \$750K

**Project Duration:** 04/01/2020 - 04/29/2025

**Principal Investigator:** Romina King, PhD

### KEY PROJECTS

**Undergraduate Internships:** Through its research, professional, and teaching pathways, students can pursue original research projects, build professional and technical skills, and contribute to local workforce capacity.

**STEM Saturday:** A K-12 STEM education program that educates students about a diverse range of complex STEM topics through enjoyable, creative, and hands-on activities.

**UOG Drone Corps:** A drone training and certification program that produces FAA Part 107b-licensed remote pilots.

**35+**

**5K+**

**55**

INTERNSHIPS AWARDED

STUDENTS REACHED

REMOTE PILOTS CERTIFIED

### About the Program

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.



@nasaguamspacegrant



[www.uog.edu/nasa-guam-space-grant](http://www.uog.edu/nasa-guam-space-grant)



## GRANT OVERVIEW

# NASA Guam EPSCoR



## About the Program

The Established Program to Stimulate Competitive Research, or EPSCoR, creates partnerships with government, higher education, and industry that are designed to affect lasting improvements in a state or region's infrastructure, research, and development capacity. NASA EPSCoR supports the NASA Earth and Ocean Science Mission at a local level, with research addressing critical challenges such as coral reef conservation, terrestrial land change, water security, and biodiversity in the Pacific Islands. The NASA EPSCoR program focuses on jurisdictions that have not participated equitably in competitive aerospace and aerospace-related research activities.

NASA Guam EPSCoR is housed within UOG and is focused on research that aligns with NASA missions and/or technologies and is relevant to Guam and the region.

  @nasaguamepscior

 [www.uog.edu/nasa-guam-epscor](http://www.uog.edu/nasa-guam-epscor)



## PROJECT INFORMATION

### Research Infrastructure Development (RID)

**Grant Number:** 80NSSC22M0052

**Funding Amount:** \$1M

**Project Duration:** 5/2/2022 to 5/1/2027

**Principal Investigator:** Leslie Aquino, PhD

**Hånom Fresko yan Acho' Tåsi (NOFO)**

**Grant Number:** 80NSSC21M0324

**Funding Amount:** \$715K

**Project Duration:** 10/01/2021 - 09/30/2025

**Principal Investigator:** Romina King, PhD

## KEY PROJECTS

**HFAT:** This project utilizes UAVs, remote sensing, and NASA technology to closely examine the Northern Guam Lens Aquifer, which supplies 90% of the island's drinking water, and produce critical data and tools for resource management.

**Building geospatial capacity:** NASA Guam EPSCoR aims to develop a robust geospatial resource hub for Micronesia by supplying equipment and software to the MAGIC Lab and the UOG Drone Corps.

**Jumpstarting local research:** Through seed grants from the RID grant, NASA Guam EPSCoR is contributing to UOG's scientific research capacity for local environmental issues.

4

SEED GRANTS  
AWARDED

3

MASTER'S STUDENTS  
SUPPORTED



## GRANT OVERVIEW

# Pacific Islands Climate Adaptation Science Center

### PROJECT INFORMATION

**Grant Number:** G19AC00087 (UH MA1537)

**Funding Amount:** \$250K

**Project Duration:** 2019-2025

**Principal Investigator:** Darren Lerner, PhD  
UOG Lead - Romina King, PhD

### KEY PROJECTS

**Climate Adaptation for Resource Management:** PI-CASC's Climate Adaptation for Resource Management (CARM) program is a fellowship and continuing education opportunity for natural resource managers and professionals in Guam to bolster their professional capacity through higher learning in academia.

**Reports and assessments:** PI-CASC at UOG has been instrumental in ensuring that climate and environmental issues surrounding Guam are brought to light in regional and national reports, including the Pacific Islands Regional Climate Assessment and the National Climate Assessment.

6

2

1

GRADUATE  
STUDENTS

UNDERGRAD  
STUDENTS

CARM FELLOW  
GRADUATED

### About the Program

The Pacific Islands Climate Adaptation Science Center (PI-CASC) at UOG works with federal and local partners to support climate adaptation and sustainability research in Micronesia. UOG serves as a key research institution in the Pacific with many research capabilities relevant to PI-CASC, including environmental sciences, geographic information systems (GIS), marine sciences, natural resource management, and Micronesian and social science research on impacts of climate and land-use changes on island communities.

@pacificcasc

[www.pi-casc.soest.hawaii.edu](http://www.pi-casc.soest.hawaii.edu)



## GRANT OVERVIEW

# Advancing Markets for Producers

*(Formerly Partnerships for Climate Smart Commodities)*



## About the Program

The Advancing Markets for Producers (AMP) project addresses greenhouse gas (GHG) emission reductions in Pacific Island agriculture and forestry systems and seeks to improve affordable food and nutrition security of disadvantaged, at-risk, island communities through an interdisciplinary, culturally sensitive approach by working with local farmers and forestry managers. Potential outcomes include a reduction of GHG emissions, improved soil health, and increased agricultural yield of climate-smart commodities demanded by the current island markets.

## PROJECT INFORMATION

**Grant Number:** NR243A750004G018

**Funding Amount:** \$4.9M

**Project Duration:** 2023-2028

**Principal Investigator:** Romina King, PhD

## KEY PROJECTS

**Farmer incentive program:** The farmer incentive program supported farms from Guam and CNMI, collectively, per year with a max stipend of 10,000USD. Farmers may use the stipends at their discretion to cover the production costs of climate commodities which will include utilities (e.g. water, power), seeds, fertilizers, tools, labor, and fuel.

**Biochar production:** To improve soil health for farmers, the USDA Partnerships for Climate Smart Commodities began production of biochar at the Yigo Triton Farm. This soil amender is being distributed to select farmers to assess if biochar will increase quality of crops.



9

F FARMS SUPPORTED ON  
GUAM AND SAIPAN



**Above:** UOG Drone Corps pilot Andrea Velasquez flies a drone over a farm.  
**Left:** A farmer gives a walkthrough of his farm in Saipan.



# Southern Soil

## Supporting farmers and their lands

The University of Guam Drone Corps partnered with the Southern Guam Soil and Water Conservation District (SGSWCD) to support local farmers with high-quality aerial maps of their lands, so that they can identify areas to improve land and soil health.

SGSWCD first identifies member farmers within its jurisdiction who can participate in long-term land sustainability practices. The UOG Drone Corps then visits the farm properties to conduct a series of uncrewed aerial vehicle (UAV) sensing flights to produce a trio of maps, each with different readings. These maps include:

- a high-resolution RGB map to give a top-down view of the property;
- a normalized difference vegetation index (NDVI) map to assess vegetation health and density; and
- a light detection and ranging (lidar) map that can display topographic information of the land.

With these datasets, SGSWCD can work with local producers to determine the best course of action for efficient farming methods, soil treatment, and landscape preservation.

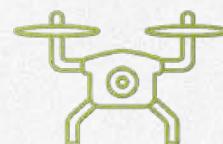
**"The project focuses on mapping SWCD member farms and project sites, giving producers a clearer view of their land and identifying areas where conservation practices can improve long-term land health."**

UOG Drone Corps is working towards mapping 76 properties in the southern villages, as of August 2025. This partnership highlights the continued efforts of community-oriented support that the UOG Drone Corps provides, as part of its overall mission in promoting drones as a viable technology in research and natural resource management.



### Collaboration & Opportunity

Connect with farmers and understand environmental challenges with farming



### Innovative Technology

Support farmers with drone technologies and resources to monitor their farm health

#### PROGRAM SNAPSHOT

#### A MOVE TO A GREENER GUAM

This project is part of the National Association of Conservation Districts' Readiness and Environmental Protection Integration grant, under the U.S. Department of Defense. It is also a collaboration between SGSWCD and the Guahan Sentinel Landscapes Partnership (GSLP) to enhance land conservation and build a network of agricultural producers in Guam.

71

DATASETS

25

PROPERTIES MAPPED



A team from the UOG College of Natural and Applied Sciences' Soil Laboratory set up a biochar kiln.

## What is biochar?

Biochar is a charcoal-like substance derived from biomass, using pyrolysis, which is converted into a more stable form of carbon. Biomass refers to any organic and renewable materials, including plants, trees, and animal waste. Biochar sequesters carbon into the soil and neutralizes soil acidity by raising pH, thereby improving soil fertility.

## A growing experiment

PI-CASC Climate Adaptation for Resource Management fellow Patrick Keeler conducted research on the effects of biochar for reforestation efforts, as part of his master's thesis.

Keeler's thesis examined whether biochar could potentially improve growth of reforestation efforts in southern Guam's savannah grasslands. His research specifically looked at biochar's impact on soil, seedling mortality, and seedling growth on a sample size of tree species used for reforesting. After one year of experiments, Keeler found that one of the two tree species that was treated with biochar, *Acacia auriculiformis*, showed a decrease in mortality and an increase in growth.



PI-CASC Climate Adaptation for Resource Management fellow Patrick Keeler takes measurements at his field site in southern Guam.

# Augmenting soil

## Assessing the benefits of biochar

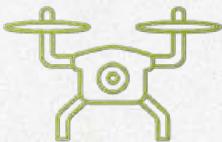


Under a U.S. Department of Agriculture project known as the Advancing Markets for Producers initiative (formerly known as the Partnerships for Climate Smart Commodities grant), soil researchers are looking into the positive effects of biochar on crop yield and soil health. The team, led by Dr. Romina King, is connecting with farmers around the island to distribute biochar for use on their farms.

In testing biochar on island and teaching local farmers how to use it, the project has begun an important effort to reduce vulnerability of farms in Pacific Island communities. The use of biochar in agriculture has the potential to improve poor soil conditions and crop yields

in a sustainable and eco-friendly manner while also increasing the islands' capacity to help combat climate change.

The team is currently maintaining Guam's first and only biochar kiln, located at the Yigo Triton Farm, which can produce up to 1,200 pounds of biochar in a week.



### Innovative Technology

Monitoring of farmers' crops and overall farm health using drone technology



### Place-based Research

Soil and gas emissions data to determine how to better manage their farms

“

I hope to share the knowledge of using conservation practices for the benefit of not only the farmer, but the environment as well.

**GLENN TAKAI**  
**TALO'FO'FO' FARMER**

Workers check on a biochar kiln recently installed at the Yigo Triton Farm.

# Conservation & Collaboration

Working together with partners



## FEATURED COLLABORATION TAGUAN LIMESTONE FOREST

UOG Drone Corps supports the diligence and dedication of Tåno, Tåsi, yan Todu for Guam's natural resources. As part of our collaborative efforts, our pilots are working with their biologists to conduct periodic aerial surveying of the limestone forest of Taguan, one of their primary surveying sites. In this area, their team works to remove invasive plants and raise and outplant native forest species.

To supplement this endeavor, UOG Drone Corps provides the nonprofit with high-resolution orthomosaics to help them determine where they set out. With lidar,

they can pinpoint where forest gaps are and strategically determine where restoration activities are most needed.

The Taguan project is funded by the Readiness and Environmental Protection Integration (REPI) Program and administered by the National Fish and Wildlife Foundation.



### Collaboration & Opportunity

Connect with local partners to provide high-resolution imagery

#### Ugum - June 12, 2025

Velasquez, A., Borja, J., King, R., & Aquino, L. (2025). Ugum NFWF 1 (RGB) Orthomosaic June 12 2025 [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.15750864>





## FEATURED COLLABORATION THE UGUM WATERSHED

The Guam Restoration of Watersheds (GROW) project, led by the University of Guam Sea Grant program, plays a vital role in reforestation and erosion control in southern parts of the island. To support UOG Sea Grant's objectives, UOG Drone Corps conducts quarterly surveys of the Ugum watershed to give a view of their progress over time.

UOG Sea Grant uses the quarterly surveys of the Ugum Watershed to analyze the efficiency of the GROW project. With the drone images, they can view the reforestation progress over the years and measure the

change of land cover, from barren soil to vegetation. They also use the normalized difference vegetation index (NDVI) for change detection, determining where photosynthesis didn't use to occur and where it occurs now. That way, they can quantify the effectiveness of the planting activities.

“

Thanks to the drone images, we are able to view the reforestation progress over the years and measure the change of land cover: from barren soil to vegetation.

FRAN CASTRO  
ASSOCIATE DIRECTOR, UOG SEA GRANT



#### PROJECT HIGHLIGHT

## MCINTIRE-STENNIS CAPACITY GRANT

The McIntire-Stennis Capacity Grant, funded under the USDA's National Institute of Food and Agriculture (NIFA), aims to increase forestry research in the production, utilization, and protection of forestland; to train future forestry scientists; and to involve other disciplines in forestry research.



### Cotal - September 25, 2025

Aerial imagery of a portion of the Cotal Conservation Area shows an abundance of trees and vegetation.



# Nurturing Forests

## Monitoring Cotal Conservation Area



The UOG Drone Corps has been a longtime supporter of the Guam Department of Agriculture's Forestry and Soil Resources Division's efforts in conservation and monitoring. One ongoing project includes regular surveying of one of its largest reserves: the Cotal Conservation Area, located between Yona and Sånta Rita-Sumai in southern Guam.

Through a McIntire-Stennis grant administered by the U.S. Department of Agriculture, the UOG Drone Corps is working with the Forestry team to develop a robust remote pilot forest monitoring program. Drone pilots are currently conducting biannual surveys of the conservation area to produce high-resolution maps that document reforestation progress. Lidar data is also being collected by the drone, providing topographical information of the area. This information will help Forestry determine sites where replanting may be more successful, and other sites that

may need soil amendments to improve reforestation.

An additional component of the project involves monitoring soil health. The Forestry team has planted acacias in the conservation area, as acacias are known to enrich soil with plant-friendly nitrogen and keep soil intact to prevent erosion. Over time, native trees will be planted alongside the acacias, essentially revitalizing a native forest. The UOG College of Natural and Applied Sciences' Soil Laboratory is tasked with conducting soil tests at various points at the site. From there, Forestry can assess which parts of the land are ready for native planting.

This collaboration is a testament to how emerging technologies in science can aid local natural resource management. With drone imagery, the Forestry team can increase efficiency in their surveying efforts without straining its current workforce.



### Collaboration & Opportunity

Support training and professional development opportunities



### Emerging Technologies

Augment surveying techniques with UAV technologies

#### PROGRAM SNAPSHOT

### TRAINING NEXT-GEN PILOTS

The Cotal Conservation Area has served as a training ground for pilots-in-training who want to put in the hours for remote flight. The conservation area's isolated location provides a safe space for trainees to take a drone out and fly without too many stressful factors.

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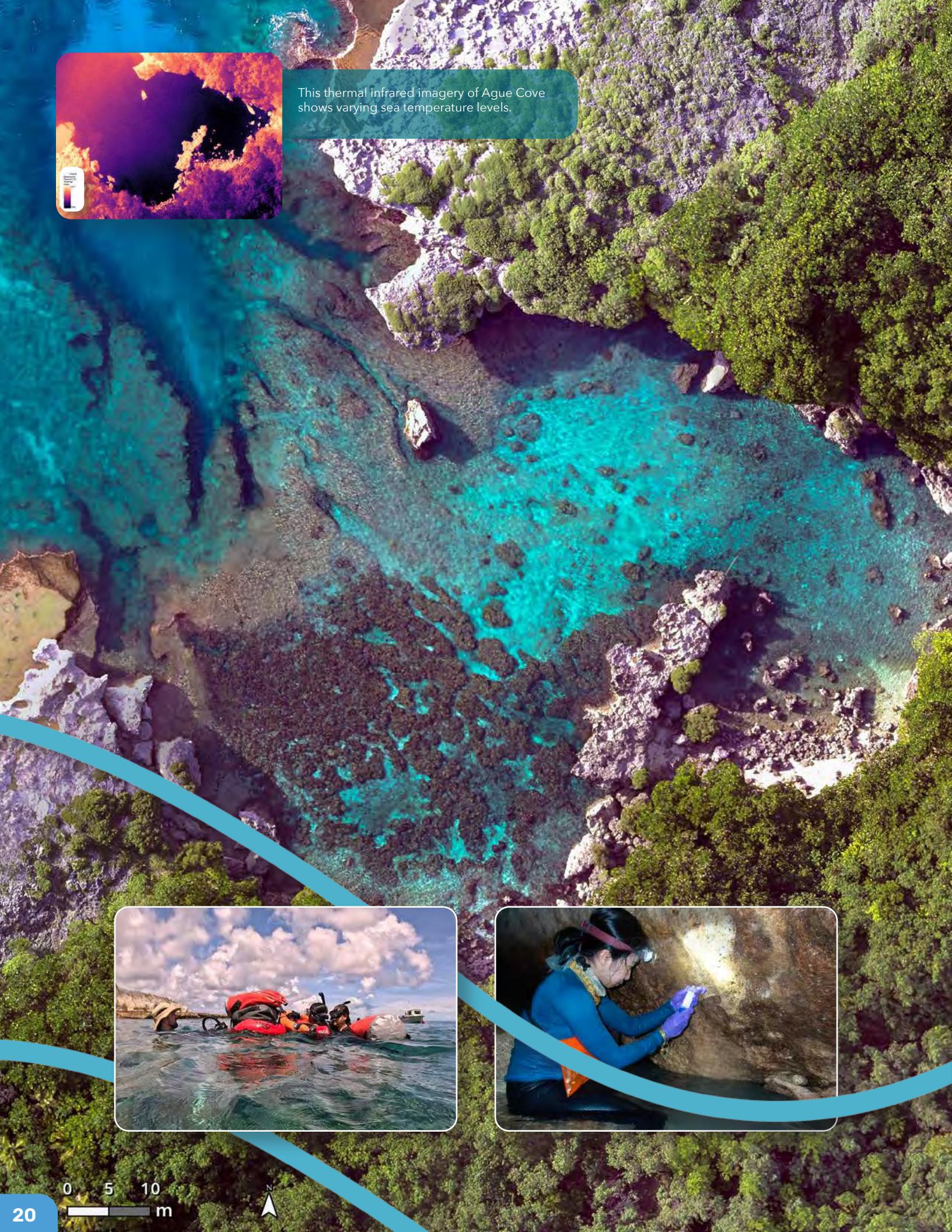
SURVEYS  
CONDUCTED

200

ACRES OF LAND  
MAPPED



This thermal infrared imagery of Ague Cove shows varying sea temperature levels.



# Hånom Fresko yan Acho' Tåsi

## Freshwater & coral



Summer 2025 was field season for NASA Guam EPSCoR's *Hånom Fresko yan Acho' Tåsi* project, and the research team embarked on the island's western coastline to examine freshwater discharge from the Northern Guam Lens Aquifer.

This year, the team looked at how tides, certain landform features, and geologic structures can affect coastal freshwater output. Using ground observations and thermal infrared imagery captured by uncrewed aerial vehicles (UAV), the team determined discharge locations along Tumon Bay where flow or seepage rates and physical water quality tests such as pH, temperature, and electrical conductivity will be collected. These readings are necessary to determine the relationship between coastal discharge fluctuations, geologic

factors, and changing tides that could significantly impact important nearshore marine ecosystems. The team conducted several trial readings over the summer to develop a refined numerical model for the coastal groundwater flow system.

*Hånom Fresko yan Acho' Tåsi*, the CHamoru translation for "Freshwater and Coral," is a project that aims to produce maps of coastal freshwater discharge, help provide a better estimate of the aquifer's water budget and observe impacts of freshwater discharge on surrounding coral reef health. The project is a step towards updating existing information about the aquifer, which provides 90% of Guam's drinking water, to better inform policymaking and management of the reserve.



### Place-based Research

Fine-tune data on our precious aquifer



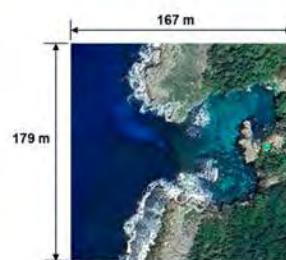
### Geospatial Data

Provide thermal datasets depicting freshwater discharge

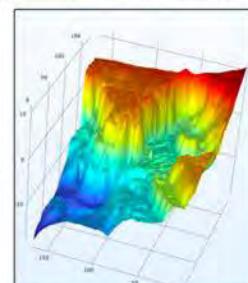
#### PROGRAM SNAPSHOT

## BASELINE MODELING

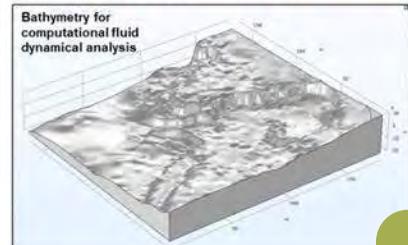
In this study, both 2D and 3D fluid dynamics models were developed within the Laminar Flow and Transport of Diluted Species modules. These models were used to evaluate the mixing processes between fresh groundwater discharge and ambient seawater under various tidal and wave conditions.



Remote Sensing Analysis for bathymetry



Bathymetry for computational fluid dynamical analysis



# In the Face of Reefs

## Working together with Guam Coral Reef Initiative

Last year, Guam had a coral bleaching scare that prompted natural resource managers to survey priority reefs. Previously, coral reef managers had conducted manual, in-water surveys to assess the extent of the bleaching. While this can provide an accurate description of the impacts, it can also be exhaustive and time-consuming.

To support coral bleaching monitoring efforts, the UOG Drone Corps worked with the Guam Coral Reef Initiative to identify and map key sites where coral bleaching may occur. The orthomosaics were composed with an RGB sensor, and with the right tide conditions and lighting, the quality of the images displayed a pretty clear view of coral heads. This was enough for experts to spot signs of potential bleaching.



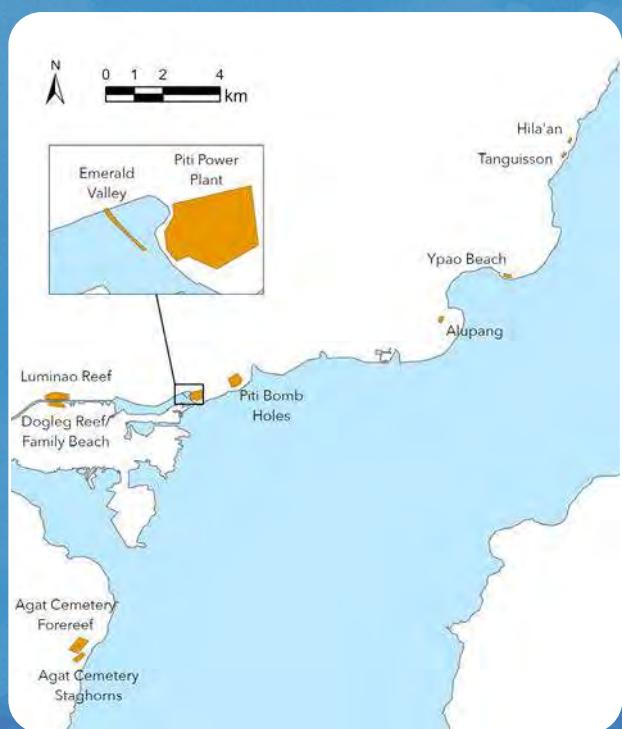
### Informed Dialogue

Visually communicate coral bleaching signs to the public



### Geospatial Data

Establish baseline datasets for coral bleaching monitoring



11

CORAL SITES

Agat Cemetery Fore Reef	Hila'an
Agat Cemetery Staghorns	Tanguisson
Ypao Beach	Gun Beach
Emerald Valley	Dogleg Reef
Piti PowerPlant	Luminao
Piti Fisheye	

### PROGRAM SNAPSHOT

### MAPPING PRIORITY SITES

In the past fiscal year, UOG Drone Corps worked with the Guam Coral Reef Initiative to map 11 priority coral sites identified by local reef experts. These locations are being monitored for potential signs of coral bleaching.



**Piti Fisheye - September 25, 2024**

Sayama, J., Fausto, K., Velasquez, A., Aquino, L., & King, R. (2024). Piti Fisheye (RGB) - September 25, 2024 [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.13937720>

# Twilight Reefs

## A seed grant project



**Tom Schils, PhD**  
University of Guam

A seed grant project funded by NASA Guam EPSCoR's Research Infrastructure Development grant sought to investigate the largely unexplored mesophotic and rariphotic reef systems around Guam using a remotely operated vehicle (ROV). With the underwater drone, Dr. Tom Schils and his team were able to get a closer look at habitat diversity and calcifying red algal species diversity in these deep reef environments.



### Findings:

- The project yielded new species and genus-level records, particularly among red algae.
- Several benthic taxa were found at greater depths than what was previously reported.
- The team documented unreported habitat types across this depth range.
- Documentation of these findings have attracted interest for future collaborations.



### Place-based Research

Supporting research that reveals more about Guam's marine biodiversity



Using an underwater remotely operated vehicle (ROV) Dr. Tom Schils was able to document previously unreported habitats in Guam's rariphotic and mesophotic reefs.

## Student Spotlight

# Biology Student Makes a Splash



“

Through PI-CASC SURF, I was able to immerse myself in coral restoration research under the guidance of one of the best marine laboratories in the Pacific.

**BIANCA BORJA**  
UNIVERSITY OF GUAM

This year, PI-CASC's Summer Undergraduate Research Fellowship (SURF) found its first-ever student from the University of Guam: Bianca Borja, a biology and chemistry major!

For her summer research project, Borja worked on developing a clonal colony of endangered staghorn coral using fragmentation techniques in the coral lab, helping to initiate an ex situ colony of species being cultured in situ, for comparison.

She was mentored by Dr. Laurie Raymundo, director of the UOG Marine Laboratory.



## Collaboration & Opportunity

Supporting student research experiences on Guam

### PROGRAM HIGHLIGHT

#### CLIMATE SCIENCE FOR UNDERGRADUATES

The PI-CASC Summer Undergraduate Research Fellowship (SURF) program is designed to provide promising undergraduates the opportunity to gain valuable research experience, improve their skills in climate science, and expand their knowledge of environmental issues in Hawai'i and Guam.





### Marine Mapping

Corals, seagrass, and mangroves



### Agricultural Mapping

Farm mapping and biochar workshop



### Knowledge Sharing

Presentation at APASEEM Conference



UOG Drone Corps remote pilot Andrea Velasquez assists a farmer with drone surveying in Saipan.

# Shore to Shore

## Mapping in Saipan

Campaigns in June and November 2024 addressed the urgent need for high-resolution coral reef monitoring by deploying a coordinated series of aerial mapping campaigns across key coral reef sites in Guam and Saipan using uncrewed aerial vehicles (UAVs), or drones. These efforts were essential to building a repository of pre-bleaching datasets that allows for direct comparisons once bleaching events occur.

A dedicated interagency team, composed of remote pilots and researchers from NASA Guam Space Grant, NASA Guam EPSCoR, UOG Drone Corps, and the Pacific Islands Climate Adaptation Science Center (PI-CASC), collaborated with natural resource managers from the Guam Coral Reef Initiative and the Commonwealth of the Northern Marianas



Islands' (CNMI) Division of Coastal Resources Management to ensure the campaign aligned with conservation objectives. The project utilized advanced remote sensing technologies to create detailed orthomosaic maps of coral reefs at high-priority locations. The June 2024 campaign focused on mapping priority reef sites in Saipan using NASA fluid lensing technology, while subsequent mapping missions expanded data collection efforts to additional priority sites on both Guam and Saipan using RGB sensors. The orthomosaic datasets produced were then shared with conservation agencies to assist in monitoring and response efforts, providing crucial information needed to assess coral health and implement protective measures.



### Collaboration & Opportunity

Support training and professional development opportunities



### Informed Dialogue

Present Drone Corps model to the Northern Marianas College

#### PROGRAM SNAPSHOT

#### UAV POTENTIAL BEYOND GUAM

The Saipan coral reef mapping campaign builds off of the UOG Drone Corps overall goal of mapping priority sites in Micronesia. The campaign originally started in Guam, where fluid lensing technology was tested to determine accuracy and precision of the drone imagery.



12

DATASETS

2

SAIPAN CAMPAIGNS

# Building Skills in Pohnpei

## Workshop and outreach



Our commitment to building STEM capacity doesn't end at Guam's shores. From July 14 to 18, members of the UOG MAGIC Lab, supported by PI-CASC, NASA Guam EPSCoR, and NASA Guam Space Grant, traveled to Pohnpei to participate in a regional training and knowledge-sharing mission aimed at expanding drone-based mapping capacity across the Pacific.

At the core of the trip was the "Increasing Agroforestry Inventory and Monitoring Capacity and Climate Change Resilience across the Pacific through High-resolution Imagery and Artificial Intelligence" workshop, hosted by the University of Hawai'i at Hilo's Spatial Data Analysis & Visualization (SDAV) Research Lab. Throughout the week, the MAGIC Lab team worked alongside participants from across Micronesia to support drone mission planning, flight safety, and geospatial data processing while sharing insights from UOG Drone Corps' hands-on training approach.

This mission is part of a larger, long-term effort to build a sustainable, homegrown network of geospatial leaders across the Pacific – equipping our island researchers with the tools to map, monitor, and protect the places we call home.



### Collaboration & Opportunity

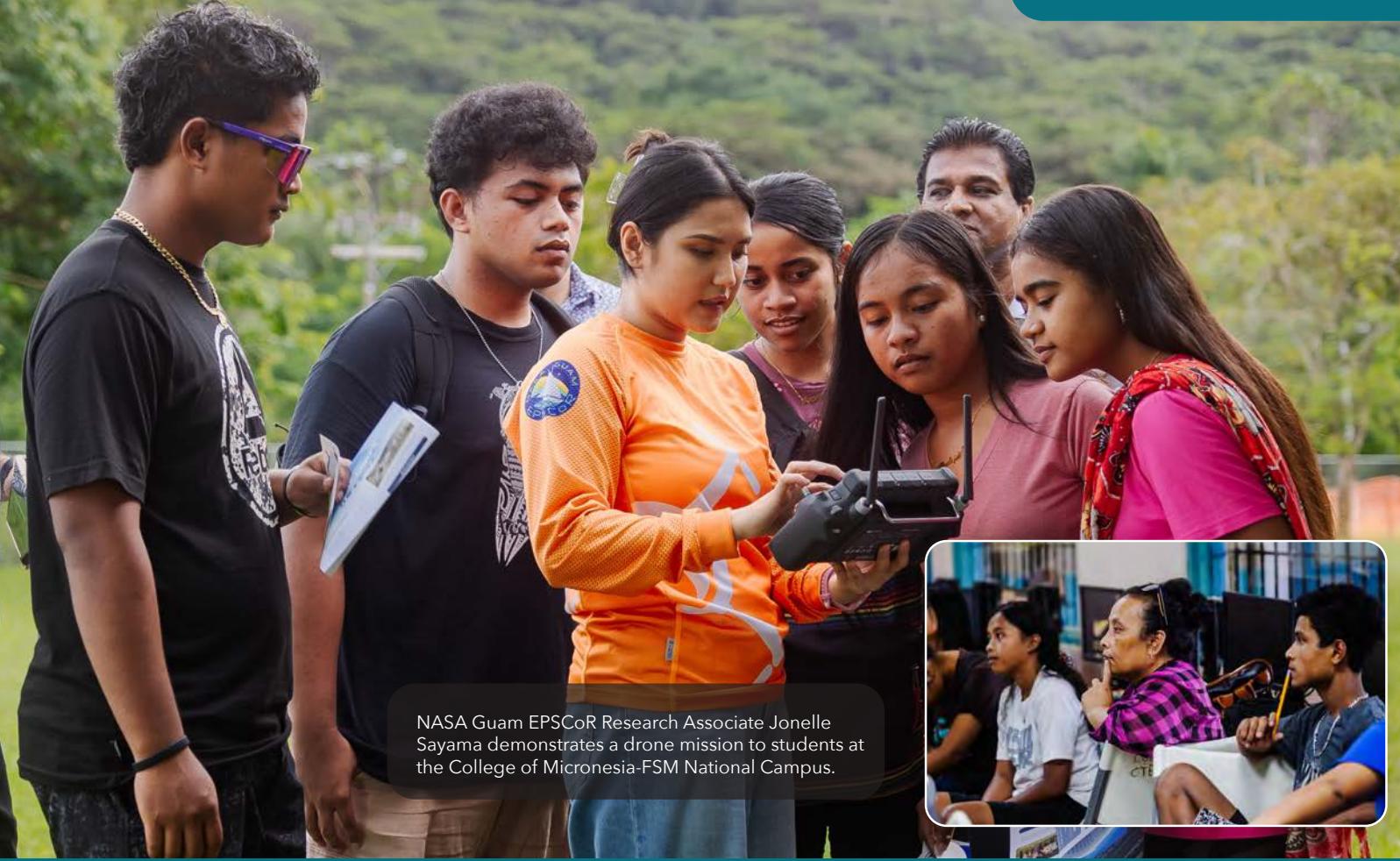
Support training and professional development opportunities



### CAMPAIGN HIGHLIGHT OUTREACH AND MEETINGS

The team also visited the College of Micronesia-FSM, hosting outreach events at both their campuses. These sessions introduced students and faculty to the growing impact of the UOG Drone Corps program and showcased how drone technology is being used to support climate resilience, land management, and research throughout island communities.





NASA Guam EPSCoR Research Associate Jonelle Sayama demonstrates a drone mission to students at the College of Micronesia-FSM National Campus.

#### PROGRAM SNAPSHOT

### KNOWLEDGE SHARING

By sharing skills and resources with partners across the region, the UOG Drone Corps aims to inspire partners to establish their own drone training and mapping program that addresses their island's unique challenges.



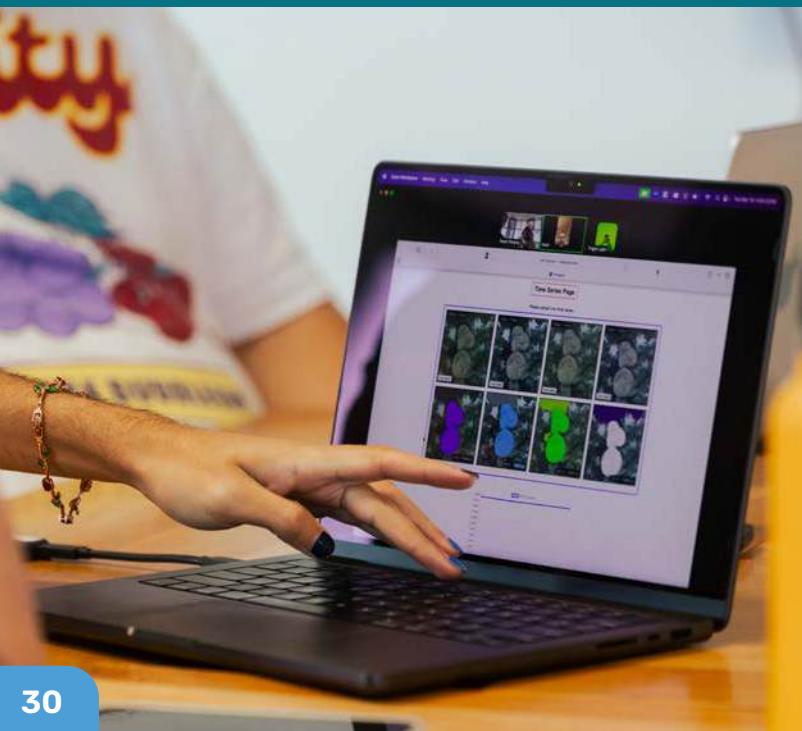


Team members from the UOG MAGIC Lab and ACES gather for a group photo during the last day of the workshop.

#### PROGRAM SNAPSHOT

### A PARTNERSHIP ACROSS OCEANS

Beyond an exploration of PICOGRAM and its capabilities, the workshop created opportunities for students from both UOG and ACES to collaborate on knowledge sharing, data analysis, and writing sessions.





MIAMI

# Brainstorming Innovation

## Partnership with Miami ACES

From March 17 to March 21, students and researchers from the MAGIC Lab partnered with University of Miami's Aircraft Center for Earth Studies (ACES) for a hands-on workshop focused on evaluating the Prediction of Individual Coral Growth, Recruitment, and Mortality (PICOCGRAM) program, a computer-based tool in development by the National Aeronautics & Space Administration (NASA) & the National Oceanic & Atmospheric Administration (NOAA) that uses machine learning to track coral colony size over extended time periods.

The workshop provided a platform to thoroughly investigate PICOCGRAM's applications in monitoring coral colony changes, exchange expertise in remote sensing capabilities, and explore ideas for possible scientific manuscripts related to the collaboration.



### Innovative Technology

Augment surveying techniques with UAV technologies



### Collaboration & Opportunity

Support training and professional development opportunities



### PROGRAM HIGHLIGHT

#### LOCAL DATA FOR GLOBAL IMPACTS

Workshop participants worked with processed datasets gathered from Guam-based drone mapping campaigns, including a yearlong study from local drone pilots that captured fluid lensing datasets of corals in the Piti Bomb Holes Marine Preserve from June 2022 to June 2023.

# UOG Drone Corps Flies Higher with Cohort 5

Staff and partners now welcome!

The fifth cohort of the University of Guam Drone Corps has officially taken flight – this time, with a broader and more diverse cohort of drone pilots! Initially launched as a student-focused initiative, the UOG Drone Corps has since expanded its membership to include university research staff and natural resource partners, all working towards a common goal: building a cadre of Federal Aviation Administration (FAA)-certified remote pilots who can use drones as a tool to collect high-resolution data across Guam and the region.

Funded by NASA Guam Space Grant, NASA Guam EPSCoR, and the Pacific Islands Climate Adaptation Science Center (PI-CASC), this year's cohort marks the program's most collaborative and interdisciplinary group to date. In addition to students, the cohort now includes participants from university-based research institutions and professionals from local agencies and nonprofits dedicated to environmental stewardship. In 2025, the program welcomed 13 new FAA Part 107-licensed remote pilots.

We are building a generation of responsible UAV remote pilots.

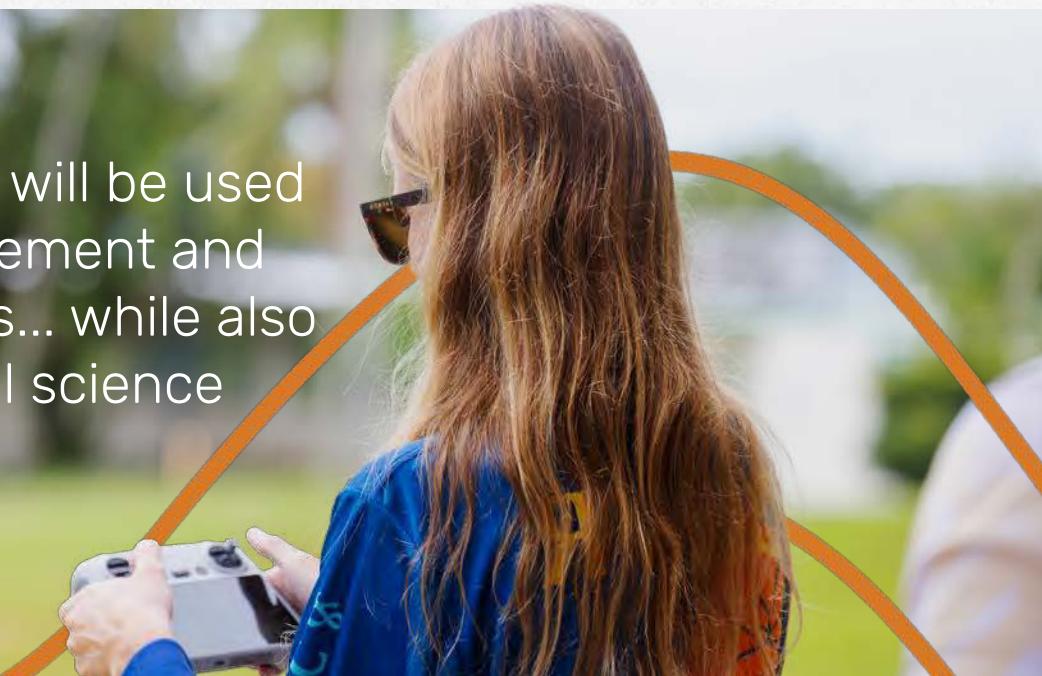
Throughout the summer, all of the UOG Drone Corps members participated in an immersive knowledge course hosted by partners at 2cofly, a local drone service provider. As part of the training, students and professionals alike received hands-on flight experience and developed key skills in drone maneuvers, mission planning, and data processing.



“

Aerial drone imagery will be used to inform our management and restoration strategies... while also serving as a powerful science communication tool.

NATALIE SCOTT  
GUAM CORAL REEF INITIATIVE





Members of the fifth cohort of the UOG Drone Corps on the first day of their knowledge course alongside course instructors from 2cofly.

#### PROGRAM SNAPSHOT

### KEEPING GUAM'S AIRSPACE SAFE

Since the program was established in 2021, UOG Drone Corps has produced 55 remote pilots. Through this workflow, the program aims to equip all participants with the skills necessary to apply drone technology into real-world missions that can serve the community such as post-typhoon assessments, coral reef monitoring, wildlife mapping and more.

**55**  
TOTAL PILOTS  
SINCE 2021

13 PILOTS CERTIFIED IN 2025

**100%**  
PASSING RATE  
FOR COHORT 5



**Innovative Technology**  
Augment surveying  
techniques with UAV  
technologies



**Collaboration & Opportunity**  
Support training and professional  
development opportunities

Partners in this cohort include members from the following:



NORTHERN GUAM  
SOIL & WATER  
CONSERVATION DISTRICT





#### FEATURED WORKSHOP

### INTRODUCTION TO GIS FOR DOAG FORESTRY

In a collaborative opportunity with the Guam Department of Agriculture's Forestry team, UOG MAGIC Lab introduced participants to core GIS skills and how to use them in working with forestry datasets.



### CONFERENCE ON ISLAND SUSTAINABILITY (CIS) WORKSHOPS

#### GIS @ CIS

At our 2025 NASA Guam Research Symposium, participants learned how to access and manipulate data using ESRI software, while exploring real-world applications of GIS.



#### WATERSHED MODELING

Participants had a hands-on look into NASA Guam Space Grant's STEM Saturday program, including a live STEM activity in which attendees crafted their own watershed model while learning about its significance to our island.



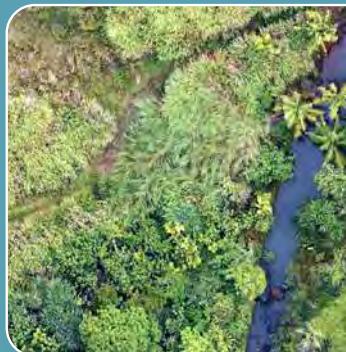
#### Cotal Conservation

FEBRUARY 2025



#### Piti Bomb Holes

SEPTEMBER 2024



#### Ugum Watershed

JUNE 2025



#### Yigo Triton Farm

SEPTEMBER 2024

# Geospatial Tools & Resources

Area

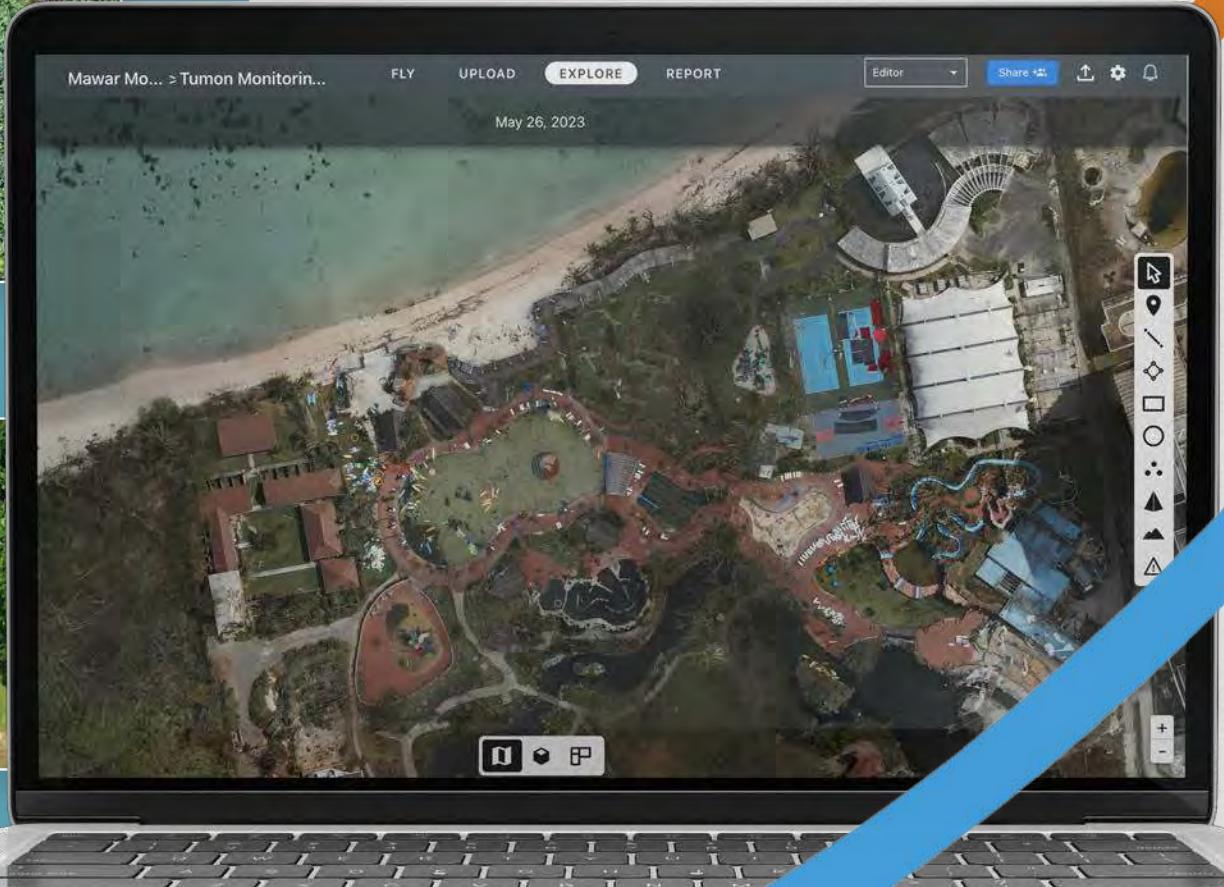


FEATURED ORTHOMOSAICS

View aerial datasets of key areas across Guam and the region, including relevant metadata. Access to these images is granted for educational and research purposes. Each request will be carefully reviewed and approved to ensure responsible usage.

REQUEST ACCESS TO DATASETS AT

[www.bit.ly/magiclabdata](http://www.bit.ly/magiclabdata)





PI-CASC Climate Adaptation for Resource Management fellow Farron Taijeron won an opportunity to travel to the Galápagos Islands.



#### STUDENT SPOTLIGHT

### FARRON TAIJERON AT PLANET FORWARD

University of Guam student and PI-CASC Climate Adaptation for Resource Management fellow Farron Taijeron was in the national spotlight after being a finalist in two video categories in Planet Forward's StoryFest 2025 – and earning the top spot for one of them. Taijeron's personal project, "Swimming with snakes: The backyard science of an invasive species in Guam," beat out six other finalists for the Best Short Video award. His other finalist entry, which highlighted his PI-CASC project on the perceptions of wildfire and wildfire management on Guam, was up for Best Social Media Video.

### 2025 CARM FELLOWS



**Ajalyn Omelau**  
Environmental Science MS  
Guam Department of Agriculture

*Using UAV Imagery to Monitor Forest Ecosystem Recovery from Wildland Fires*



**RoCelia Paulino**  
Environmental Science MS  
Research Corporation of the University of Guam USGS Brown Tree Snake Project

*Assessing climate change impacts on the presence and survivability of brown tree snakes*



**Melanie Mendiola**  
Environmental Science MS  
Guam Environmental Protection Agency

*Updating Guam's Wetland Inventory using GIS and Remote Sensing*



**Juliette Fujihira**  
Environmental Science MS  
Guam Environmental Protection Agency

# Support for Managers

## New CARM fellows awarded

The PI-CASC Climate Adaptation for Resource Management (CARM) program saw an influx of new fellows within the past fiscal year, along with a graduation for one of our earliest recruits.

The CARM program scouts potential fellows by engaging with natural resource agencies to identify managers and employees who would be interested in returning to academia to earn their master's degree. The program welcomed five new graduate students - four environmental science majors and one biology major - who will take on research projects relevant to climate adaptation science that will be beneficial for their respective agencies. We are excited to



### Congratulations, Patrick!

Patrick Keeler earned his Master of Science degree in Sustainable Agriculture, Food, and Natural Resources. He is the second natural resource manager to complete the CARM program since its inception in 2021!



### Jessica Fernandez

Biology MS  
Naval Facilities Engineering Systems  
Command Pacific (Marianas)

*Investigating the effects of depth and fishing pressure on protogynous hermaphroditism in reef fish*



### Informed Dialogue

Communicate climate adaptation to natural resource managers



### Marybelle Quinata

Micronesian Studies MA  
US Fish & Wildlife Service  
Guam National Wildlife Refuge

*Inclusion of Community Feedback in Natural & Cultural Resources: A Case Study of Litekyan*



### Collaboration & Opportunity

Support training and professional development opportunities

# From Campus to Career

## NASA Guam Space Grant internships

At NASA Guam Space Grant, we believe in preparing students not just for graduation but for their careers. Through our internship programs, we open doors for undergraduate students at the University of Guam and Guam Community College to immerse themselves in real-world STEM experiences that directly contribute to NASA's goals as outlined in their Science Mission Directorate. Through our three internship tracks - research, professional, and teaching - students explore career paths, collaborate with mentors, and build skillsets that will define their futures.

In 2025, we welcomed six new undergraduate interns! Coming from a diverse range of educational backgrounds, these talented students worked on unique research projects and gained experience working alongside local industry professionals to gain new and sought-after skills.

Through these opportunities, the program aims to provide interns with practical experience in professional settings, equipping them with the skills they need for their future careers.



### Collaboration & Opportunity

Support training and professional development opportunities



“

NASA Guam Space Grant will not only provide the opportunity for my mentor and I to conduct this research, but also aid in my time as an undergraduate in funding my tuition and other necessities.

**IVAN ROSELL**  
NASA GUAM SPACE GRANT INTERN





NGSG Interns Cyril Concepcion and Amber Pineda set up a ground control point alongside 2cofly mentor Javier Garrido.

## PROGRAM SNAPSHOT

### REAL-WORLD EXPERIENCE

NASA Guam Space Grant interns have the opportunity to apply the skills they learn in real-world field missions. As part of their experience, Spring 2025 interns Amber Pineda and Cyril Concepcion conducted a land feasibility study using drones. They compared lidar and photogrammetry scanning techniques for producing high resolution maps.

### 2025 NASA GUAM SPACE GRANT INTERNS



**Cyril Concepcion**  
Professional Intern, 2cofly (SP25)

Cyril is a civil engineering major honing her skills in drone operations, including lidar scanning and 3D modeling.



**Ivan Rosell**  
Research Intern, Dr. E. Guades (SP25)

Ivan is a civil engineering senior developing a MATLAB model to analyze the structural performance of recycled plastics in construction.



**Amber Pineda**  
Professional Intern, 2cofly (SP25)

Amber is a civil engineering major who focused her research on examining the accuracy and precision of lidar and photogrammetry sensors as tools for mapping Guam's environment.



**Liam McManus**  
Teaching Intern, Dr. L. Aquino (SP25)

Liam studied mathematics and graded assignments for "Differential Equations" and "Introduction to Statistics" while helping lead the re-opened Math Tutor Lab as head tutor.



**Nehemiah Villanueva**  
Professional Intern, DOAG Forestry (FA25)

Nehemiah is an accounting major who is working on developing a "Community Wildfire Prevention Toolkit" as part of her internship.



**Kyle Bailey**  
Teaching Intern, Dr. R. Jolley (FA25)

Kyle is an accounting major merging his skills in numbers with environmental science to assist fellow students in biostatistics.



# Solutions for our Future

## Pre-conference symposia at CIS 2025

### SYMPOSIUM ONE

#### NASA GUAM RESEARCH SYMPOSIUM

NASA Guam Space Grant and NASA Guam EPSCoR hosted their 4th Annual NASA Guam Research Symposium on April 7, celebrating all the important NASA-aligned research happening in the region from students and established researchers. At the forefront of the symposium was a special keynote presentation featuring Dr. Kamuela Yong, the first Native Hawaiian to earn a Ph.D. in applied mathematics. During his virtual talk, he drew a connection between how mathematics can be used intuitively and practically in indigenous seafaring and celestial navigation

practices. Dr. Yong also engaged in a guided conversation with Pwo navigator Larry Raigetal about how mathematics is embedded in Micronesia's own ancestral knowledge of seafaring. The symposium also featured research-focused presentations from students and faculty supported by the NASA Guam grants, as well as two skill-building workshops focused on introducing participants to core lessons in geographic information systems and STEM education.

### SYMPOSIUM TWO

#### PI-CASC GRADUATE STUDENT SYMPOSIUM

The Pacific Islands Climate Adaptation Science Center (PI-CASC) hosted its Graduate Student Research Symposium on April 8 at the Hyatt Regency Guam, as a pre-conference event for the University of Guam (UOG) Conference on Island Sustainability. Students from UOG, the University of Hawai'i at Mānoa, and the University of Hawai'i at Hilo presented their research projects across a range of topics relative to climate adaptation and sustainability, including coral reef management, native bird populations, wetlands monitoring, and remote sensing technologies to aid natural resource management. The symposium highlighted the extent of PI-CASC's educational opportunities, focusing on three of its graduate student programs: the PI-CASC Graduate Scholars Program based primarily at UH Mānoa, the Manager Climate Corps (MCC) at UH Hilo, and the Climate Adaptation for Resource Management (CARM) program at UOG.

### SYMPOSIUM THREE

#### PACIFIC CLIMATE-SMART COMMODITIES SYMPOSIUM

The Pacific Climate-Smart Commodities Symposium and DIY Biochar Workshop, held on April 8 and April 12, was hosted by the U.S. Department of Agriculture's Advancing Markets for Producers project (formerly known as Partnerships for Climate Smart Commodities). The two-day farmer focused event brought together agricultural producers and researchers to discuss innovative practices and provide hands-on training in biochar production. The symposium highlighted practical strategies for sustainable farming, including biochar applications, greenhouse gas emissions monitoring, and the role of climate-smart commodities in strengthening food security in the Pacific region.

### PROGRAM SNAPSHOT

#### CIS OUTREACH ACTIVITIES

In addition to the symposia, the UOG MAGIC Lab hosted a booth where attendees got to solve our large jigsaw puzzle – demonstrating how orthomosaic maps are produced by our Drone Corps pilots.





# STEM in Action

## K-12 program empowers young scientists

What began as an initiative to introduce Guam's youth to science, technology, engineering, and math (STEM) through hands-on, locally grounded activities has grown into one of the University of Guam's (UOG) most impactful outreach programs. NASA Guam Space Grant's STEM Saturday continues to evolve - expanding in scope and reach to inspire the next generation of STEM innovators.

In 2025, the program took a leap forward with new themed modules: Exciting Engineering, Creative Chemistry, Civil Engineering in Action, Marvels of Marine Biology, Cooking with Chemistry, and Science of Soil. Each session is carefully curated by our education coordinator Danielle Lee to encourage students to think creatively in solving real-world problems, which connect to local issues and align with NASA's Science Mission Directorate goals.

In the chemistry modules, students explored acids, bases, and chemical reactions - using

baking soda and vinegar to launch mini boats and rockets. Engineering modules challenged them to design projects like functional catapults and load-bearing towers using simple materials, introducing key concepts like leverage and structural integrity - all within the context of Guam's landscape.

This year, the program also expanded beyond UOG's campus, reaching younger students through partnerships with schools and groups like the Guam Girl Scouts and UOG's Upward Bound-TRIO College Preparation program. To further empower local youth, NASA Guam Space Grant partnered with the STEM Ambassador program, a joint initiative with UOG and the University of Utah. Ambassadors helped lead STEM Saturday events, serving as mentors and role models. In standout sessions hosted by STEM Ambassadors Cyril Concepcion and Ava Suba, students learned about civil engineering and marine biology on Guam.



### Collaboration & Opportunity

Support training and professional development opportunities



### Informed Dialogue

Spread the joy of STEM to students in our island communities

#### PROGRAM SNAPSHOT

#### ABOUT STEM SATURDAY

Launched to introduce local students to complex STEM concepts through fun, hands-on activities, NASA Guam Space Grant's (NGSG) STEM Saturday program has become a key initiative in fostering curiosity and engagement in young students. The program uses modules from the National Informal STEM Education (NISE) Network alongside supplemental activities adapted to fit Guam's local context, helping students relate abstract scientific concepts to challenges in their own environment.







**CASC Futures Forum**  
San Diego, CA | Nov. 2024



**International Agribusiness Symposium**  
Mangilao, GU | April 2025



**Conference on Island Sustainability 2025**  
Tumon, GU | April 2025



**Mariana Islands Conservation Conference**  
Tumon, GU | March 2025



**US Climate Alliance Learning Lab**  
Washington, DC | March 2025

# Global Voices

## Meetings & conferences

At the MAGIC Lab, we always seek opportunities to share our work and research with the broader scientific community on both a regional and global scale. These confer-

ences give our team members the opportunity to learn, share, and connect with fellow students and scientists.



**6th Federal Users UxS Conference**  
Albuquerque, NM | Sep. 2024



**First Guam Agricultural Symposium**  
Hagåtña, GU | Oct. 2024



**NASA Space Grant Western Regional Meeting**  
Seattle, WA | Oct. 2024



**2024 APASEEM Conference**  
Saipan | Nov. 2024



**AGU24 Annual Meeting**  
Washington, DC | Dec. 2024



**Coastal Geotools 2.0**  
Wilmington, NC | Jan. 2025



**National Council of Space Grant Directors**  
Washington, DC | Feb. 2025



**Oceania Chondrichthyan Society**  
Queensland, Australia | June 2025



**2nd UOG Research Forum**  
Mangilao, GU | Sep. 2025

# Outreaches

## Engaging with community

We enjoy interacting with you! In the past year, we have had numerous opportunities to go out into the community and share our resources with people, from students to natural resource managers to private sector professionals.

If you are interested in hearing a presentation from us, please reach out via email at [magic@triton.uog.edu](mailto:magic@triton.uog.edu).

### FEATURED ACTIVITIES

**3rd STARBASE STEM Day**  
September 2024

**F.B. Leon Guerrero Middle School Math Day**  
November 2024

**Guardians of the Reef Workshop**  
January 2025

**GDOE Service Learning Summit**  
January 2025

**Liguan Elementary School Career Day**  
February 2025

**Oceanview Middle School Career Day**  
February 2025

**FB Leon Guerrero Middle School Science Expo**  
February 2025

**University of Guam Charter Day**  
March 2025

**STEM Saturday for Guam Girl Scouts**  
March 2025

**Kurason I Sengsong Reforestation Project**  
June 2025

**UOG Drone Corps Demo for Kookmin University**  
July 2025

**UOG Drone Corps Demo for Ryukoku University**  
August 2025



### OUTREACH BY THE NUMBERS (2025)

**1,600+**  
AUDIENCE REACH

**80+**  
HOURS



# Meet the Team

## THE FACES OF THE MAGIC LAB

### Leslie Aquino, PhD

Executive Director  
NASA Guam EPSCoR



#### Animal sidekick?

A corgi. Or a Pikachu!



### Romina King, PhD

Associate Director, NASA Guam  
Space Grant & NASA Guam EPSCoR

UOG Lead, PI-CASC



### Shannon Ada

Extension Associate  
NASA Guam EPSCoR



#### Dream destination?

Genovia



### John I. Borja

Communications Coordinator  
NASA Guam EPSCoR & PI-CASC



#### Soundtrack to your life?

"We Can All Be Friends"



### Kat Delos Angeles

Research Associate  
NASA Guam EPSCoR



#### Go-to fiesta food?

Lechon



### Daniel Encio

Research Associate  
USDA PCSC



#### Animal sidekick?

Crow



### Keano Fausto

Communications Coordinator  
NASA Guam Space Grant



#### Favorite movie?

Coraline



### Logen Flem

Research Associate  
NASA Guam EPSCoR



#### Dream destination?

Coastal Norway



## Ronald Fuellas

Communications Coordinator  
USDA AMP



## Ferdinand Galsim

Research Associate  
USDA AMP

Go-to fiesta food?  
Chicken kelaguen



## Danielle Lee

Outreach and Education  
NASA Guam Space Grant

Animal sidekick?  
My husky, Klara!



## Marcel D. Higgs II

Extension Associate  
NASA Guam EPSCoR

Favorite movie?  
Oliver and Company



## Annisa Lujan

Project Associate  
USDA AMP

Dream destination?  
Dubai



## Frank G. Lujan II

Research Associate  
NASA Guam EPSCoR

Soundtrack to your life?  
"Happier" - DOUBLECAMP



## Mira Mariur

Research Assistant  
USDA AMP

Go-to fiesta food?  
Finadeni!



## Jonelle Sayama

Research Associate  
NASA Guam EPSCoR

Animal sidekick?  
Snow Leopard or Irid Dragon



## Kaya Taitano

Research Assistant  
Southern Guam SWCD

Favorite movie?  
Waterworld



## Andrea Velasquez

Research Associate  
Southern Guam SWCD

Dream destination?  
Rome





# Partners

SI YU'OS MA'ÅSE!



## Writing

John Borja  
Keanno Fausto

## Layout & Design

John Borja  
Keanno Fausto

## Photography

John Borja  
Keanno Fausto  
Logen Flem  
Ronald Fuellas  
Kat Delos Angeles  
Maria Villareal



# MAGIC LAB

MICRONESIAN AREA GEOSPATIAL INFORMATION CENTER