Unidata Community Equipment Awards Cover Sheet

Proposal Title: Enhancing Applied Learning Opportunities for Students in Meteorology

Date: March 16, 2026

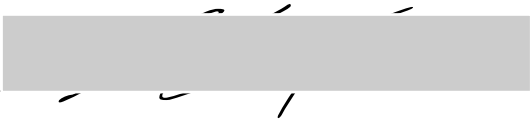
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Enhancing Applied Learning Opportunities for Students in Meteorology

Giovanni Seijo-Ellis
Department of Physics, University of Puerto Rico at Mayagüez

1 Summary

This proposal seeks to acquire ten computers and supplementary teaching hardware to be installed in the Meteorology laboratory classroom at the Department of Physics in the University of Puerto Rico at Mayagüez (UPRM). As a premier Hispanic Serving Institution (HSI) located in a region highly vulnerable to extreme weather and their associated impacts, UPRM plays a critical role as the only institution offering a degree (minor) in atmospheric sciences in Puerto Rico. However, the current computing infrastructure in our department is outdated, creating a bottleneck that limits our students' ability to engage with modern meteorological tools.

These new computers will replace obsolete equipment and become the cornerstone of our applied curriculum. In particular, the equipment will be heavily utilized in the Meteorological Measurements Laboratory course, where we leverage operational software to train students in real-time meteorological data analysis, visualization, and interpretation. Furthermore, core courses such as Synoptic Scale Meteorology will leverage the equipment for multiple lessons bridging theoretical atmospheric dynamics with observational data.

Critically, this acquisition will enable the permanent implementation of new, advanced applied courses: a course in Numerical Weather Prediction (NWP) and an Earth System Modeling laboratory—both the first of their kind at the University of Puerto Rico. During these courses, undergraduate students will learn the fundamentals of numerical modeling through hands-on exercises, ranging from simple single-layer radiative balance models to complex, coupled dynamical systems such as NSF NCAR's Community Earth System Model (CESM). The equipment will also serve as dedicated workstations for students participating in undergraduate research projects, and our local American Meteorological Society (AMS) student chapter will use the technology to conduct their weekly operational "weather briefings." By funding this $16,391.63 hardware acquisition, Unidata will enable a transformative upgrade to our instructional capabilities, ensuring our program can develop a highly trained and skilled workforce of modern meteorologist.

2 Goals of the Proposal

The overarching goal of this proposal is to modernize our educational infrastructure to enable rigorous, hands-on learning and enhance the computational and applied skills of students in the Meteorology Program within the Department of Physics at UPRM. To achieve this, we have established the following specific objectives:

- **Objective 1: Modernize computing infrastructure to modern standards.** By replacing failing hardware with powerful UNIX-based workstations, we will eliminate current software incompatibility issues, and provide reliable machines capable of processing large meteorological datasets locally and interfacing seamlessly with remote servers.
- **Objective 2: Expand curriculum into High-Performance Computing (HPC) and numerical modeling.** The new equipment will provide the necessary local interfaces for students to connect to HPC systems (such as NSF NCAR's Derecho and Casper) and Unidata's Science Gateway resources. This bridges the gap between theoretical classroom knowledge and practical execution of complex models like the Weather Research and Forecasting Model (WRF) and CESM.

- **Objective 3: Cultivate modern data science and visualization skills.** Students will be systematically exposed to state-of-the-art visualization and analysis frameworks. We aim to transition students from passive to active learners who can utilize the Advanced Weather Interactive Processing System (AWIPS), Integrated Data Viewer (IDV), and Python-based libraries (MetPy, Xarray, Cartopy) for atmospheric data analysis.
- **Objective 4: Enhance undergraduate research and professional development.** By providing dedicated modern workstations, we will lower the entry barrier for undergraduate research. Students will have the tools required to investigate regional weather phenomena, preparing them for graduate studies, the private sector, and federal agencies such as the National Weather Service (NWS).

3 Applied Learning Activities

The equipment acquired through this proposal will be integrated across multiple levels of the UPRM meteorology curriculum, supporting a wide array of instructional, research, and extracurricular applications.

3.1 Courses

Meteorological Measurements Laboratory (METE-4007): This course serves as the students' primary introduction to operational meteorology. It provides hands-on experience visualizing and analyzing multiple meteorological data, including surface observations, thermodynamic soundings, satellite imagery, and radar data. The course relies heavily on AWIPS to teach students how to synthesize multiple data streams. New workstations will allow the software to render high-resolution datasets without the debilitating lag currently experienced on our older machines, enabling near-real time analysis of rapidly evolving weather systems, such as tropical cyclones affecting the Caribbean basin. The course will also benefit from modules on Python-AWIPS provided via the Unidata Science Gateway.

Synoptic Scale Meteorology (METE-4075): This course bridges the gap between atmospheric dynamics and observed weather patterns. It provides students with a theoretical examination of the underlying equations that describe synoptic flows (e.g., Quasi-Geostrophic theory, frontogenesis) paired with applied exercises. Using the new workstations, students will manipulate model outputs, reanalysis data, and weather forecasts. They will use Python and MetPy to generate custom diagnostics to verify theoretical concepts against actual synoptic weather development. We expect to leverage Unidata's Science Gateway to access Jupyter Hub resources and educational modules for these exercises such as the MetPy module for Quantitative Analysis of Meteorological Data which explores Quasi-Geostrophic Theory.

Numerical Weather Prediction (Special Topics Course): During the Fall 2025 semester, we developed a new course in Numerical Weather Prediction in collaboration with the State University of New York at Albany and the computational support of NSF NCAR through a "classroom allocation" on the Derecho and Casper HPC systems. If this proposal is funded, we expect the new hardware will allow us to permanently implement this course into our curriculum. The lectures are combined with intensive laboratory exercises that train students on the numerical representation of weather phenomena, grid structures, parameterization schemes (e.g., microphysics, boundary layer turbulence), experiment design, and model limitations. The new lab computers will serve as the main tool for students to establish SSH connections to remote supercomputers to execute weather models and analyze the output. Furthermore, students will be introduced to emerging technologies, including artificial intelligence weather emulators, and running simple AI examples.

Earth System Modeling Laboratory (New Course): Our program is actively developing a novel laboratory course in Earth System Modeling. The current outlined curriculum begins with the physics of the Earth's energy balance and transitions into the complex numerical representation of mass, momentum, and

energy fluxes across the coupled atmosphere, ocean, land, and cryosphere systems. We will utilize an intensive active-learning teaching style to instruct students on the architecture and application of CESM. Students will design and execute their own experiments—such as altering greenhouse gas emission scenarios or modifying land-use boundary conditions—to model climate impacts. The new hardware will facilitate these exercises by allowing students to efficiently download, process, and visualize NetCDF outputs generated by their CESM runs on NCAR's HPC classroom allocations. We will also coordinate with staff at the CGD laboratory to provide virtual guest lectures.

3.2 Research Opportunities

As an emerging research institution that was recently granted R2 status by the Carnegie Commission on Higher Education, our program heavily emphasizes undergraduate research credits completed under faculty mentorship. Currently, hardware limitations force many students to rely on their personal computers, which creates inequities and limits the scope of their research experience. The proposed workstations will act as dedicated research hubs, equipped with the necessary public and licensed software, compilers, and other tools required for scientific computing. The equipment will facilitate access to vast cloud-based and remote datasets via Unidata technologies such as Siphon and the THREDDS Data Server. Students researching regional phenomena—such as Caribbean marine heatwaves, boundary layer dynamics, Saharan dust transport, or diurnal island convection—will have the computational power to handle high-resolution GRIB and NetCDF files, executing complex analyses using IDV and Python. This would accelerate in-house research opportunities for our students that often rely on summer internships elsewhere to develop their research skills.

3.3 Other Activities

Beyond the formal curriculum, the hardware will directly support the UPRM AMS student chapter, which organizes numerous extracurricular academic activities. A cornerstone of their programming is the weekly "weather briefing". During these sessions, an alternating group of students takes responsibility for retrieving operational meteorological data and maps from the NWS San Juan forecast office to present a comprehensive weekly forecast to their peers and faculty. A 65-inch TV unit, requested as part of this proposal, will serve as the primary display for these briefings. This activity allows students to practice their operational forecasting and science communication skills.

4 Benefits

4.1 Education and Research

The modernization of our laboratory hardware addresses a critical bottleneck in our educational mission. The current computers frequently malfunction and struggle to run modern versions of essential software, severely limiting workstation availability and forcing students to share machines. This proposal resolves these operational constraints, expanding our capacity to teach with cutting-edge technology and analysis techniques.

The impact of this upgrade extends far beyond the Physics Department. The meteorology curriculum was designed to allow students from a variety of majors to take the courses and obtain a federal meteorologist certification (GS-1340). Because atmospheric science is inherently interdisciplinary, our meteorology curriculum consistently attracts students from a wide range of majors, including Mechanical Engineering, Electrical Engineering, Industrial Engineering, Civil Engineering, Mathematics, and Geology. By providing robust computing resources, we enhance the technical training of a wide cross-section of STEM students at

UPRM.

Furthermore, the specific skills fostered by this equipment—such as navigating Linux environments, utilizing HPC systems, writing Python scripts for geospatial data, and executing numerical models—are in incredibly high demand. These competencies are essential for students pursuing graduate school, careers in the renewable energy sector, risk assessment, environmental consulting, and federal employment with agencies like NOAA and NASA. By granting our students access to the same tools used by top-tier research institutions, we are actively closing the opportunity gap for students in the geosciences.

The updated workstations will also allow us to leverage educational resources via the Unidata Science Gateway to assist in our curriculum review and modernization. The numerous Jupyter notebook examples and training modules leveraging AWIPS, MetPy, Machine Learning will be incorporated across courses to enhance the learning experience of our students.

4.2 Academic Community Benefit

This proposal supports the broader mission of Unidata by fostering a highly capable generation of data-literate scientists. The implementation of modern, active-learning courses utilizing numerical models and HPC resources at an HSI serves as a valuable case study. We are committed to documenting our curriculum development process, pedagogical strategies, and the technical workflows used in our new modeling courses. We aim to present our lessons learned at AMS or AGU education symposiums, providing a blueprint for other primarily undergraduate institutions looking to integrate advanced computational tools and state-of-the-art software into their programs without requiring massive institutional computing clusters.

5 Timeline & Milestones

The hardware will be purchased immediately upon receipt of the award. The first course utilizing the new hardware is regularly taught during the Fall semester. This means that as early as August 2026, the new equipment could be in full use, assuming no delays in purchase and delivery. The hardware will be installed in the existing Meteorology laboratory classroom (F-450), meaning no new space or furniture is required. The only dependency will be removing the old hardware and installing the necessary software on the new equipment, which will be executed with support from UPRM IT and PI Seijo-Ellis. In the case of unexpected delays (purchase, delivery, and/or installation) that make it impossible for the equipment to be in use by Fall 2026, the equipment would be ready for use by the Spring 2027 semester.

6 Requested Resources, Proposed Budget, and Justification

We are requesting funds to acquire (10) Apple Mac Mini computers and peripherals, (5) surge protector, (1) 65 inch TV, and (1) TV mount. The computers are identical and feature the following specifications: Apple M4 chip with 10-core CPU and 10-core GPU, 16GB, 256GB SSD, and a Gigabit Ethernet connection. These machines meet the computational and memory requirements necessary to run the software required for the different courses they will support, as well as the additional extracurricular and research activities described in this proposal (see Section 3). The computers peripherals are: (10) Apple Magic Keyboards, (10) Apple Magic Mouse, and (10) DELL 27 inch P2725H monitors. We are also requesting to acquire (4) surge protectors which are required to protect the new computers from unexpected power outages. Finally (1) 65 in TV with (1) wall mount. This TV will serve as the main screen for instructional purposes.

6.1 Budget Justification

- **(10) Apple Mac Mini computers:** These will replace the existing, obsolete workstations in the Meteorology laboratory space. Apple computers have the advantage of a UNIX-based operating system, which is generally more user-friendly for many of the required meteorological applications compared

to machines running a Windows Operating System. This includes easier secure-shell (SSH) connections to supercomputers and remote servers, code compilation, and running research analysis tools.

- **(10) Apple Care+:** Extended warranty for the Apple Mac Mini
- **(10) Apple Mice:** These are part of the necessary peripherals for the computers.
- **(10) Apple Keyboards:** These are part of the necessary peripherals for the computers.
- **(10) Dell P2575H Monitors:** These are part of the necessary peripherals for the computers.
- **(5) APC Back UPS Pro BX1500VA:** Required by UPRM to protect computers and other equipment from unexpected power outages.
- **(1) Samsung 65in TV:** Large TV for classroom instructional purposes.
- **(1) Adjustable TV Wall mount:** Required to properly mount the TV on the classroom.
- **(1) Supplies:** We are requesting $2000.00 to cover unexpected costs of supplies during installation of the new hardware and/other instructional costs.

This hardware expands the computational resources available to students and professors within the Physics Department. This aligns directly with current efforts to modernize and upgrade existing hardware throughout the department to improve the educational experience of our students, an initiative clearly outlined in both the Department Chair's vision and the Chancellor's Efficiency and Academic Transformation plan. The ten computers to be purchased represent 100% of the instructional-purpose computers for the Meteorology and Atmospheric Sciences program.

As part of UPRM's commitment to this project's success, the university is waiving all indirect costs (overheads) associated with this proposal to ensure the maximum amount of funding is directed toward student-facing equipment. UPRM will also provide IT support to install the workstations as well as ensure their long-term operation. A summary of the budget is presented in Table 1.

Table 1: Budget summary.

Item	**Description**	**Qty**	**Total Cost**
Apple Mac Mini	Apple M4 chip with 10-core CPU and 10-core GPU, 16GB, 256GB SSD, and a Gigabit Ethernet connection	10	$599.99
Apple Care+	Apple care extended warranty	10	$199.00
Apple Magic Mouse		10	$79.00
Apple Magic Keyboard		10	$99.00
APC Back UPS Pro BX1500VA	Surge protectors	5	$227.92
Dell P2725H 27in Monitor		10	$233.75
Samsung TV 65in		1	$850.50
TV Adjustable Wall mount		1	$269.03
Delivery Costs	Modernica (Apple vendor)	-	$35.00

Supplies			$2000.00
		Total:	**$16,391.63**

7 Equipment Quotes

Detailed quotes from UPRM-authorized vendors are included at the end of the proposal.

8 Available Information Technology Support

The Center for Information Technology (CIT) at UPRM is the office responsible for the operation and maintenance of institutional hardware. The CIT will provide all required support for the installation of the equipment, necessary software configuration, and long-term maintenance. Their resources include computer engineers, software engineers, and network administrators. Furthermore, the Physics Department employs a scientific research technician who provides dedicated information technology support within the department. A letter of support from the department technician and the chair is included in the proposal.

Modernica Group Corp.
100 Ave. Gran Boulevard Paseos
Galería Paseos Mall
Local 204
San Juan PR 00926
Phone: 787-273-8080
Fax: 787-273-4928
www.modernicaonline.com

Quote

209534

3/11/2026 2:56PM

Expires: 4/30/2026

Station: 15

Account: 1000004 Code:1000004 By:

W: 787 832-4040

Terms: COD

Juan Carlos

Bill To:

UPR MAYAGUEZ
UPR-Recinto Mayaguez
PO Box 9000
Mayaguez, PR 00681

Ship To:

Universidad De PR - Recinto Mayague
PO Box 9000
Mayaguez, PR 00681

SKU	Description	Quantity	Price	Discount	Total	T
MU9D3LLA	APPLE-MAC MINI M4 (599)	10.00	599.00	0.00	5990.00	N
	Mac mini: Apple M4 chip with 10-core CPU and 10-core GPU, 16GB, 256GB SSD					
AD-1002	HES-2 YR EXT WARRANTY DESKTOP	10.00	199.00	0.00	1990.00	N
	Protection Plan is 3 years total parts & labor.					
MXCL3LLA	APPLE-MAGIC KB SM WHT 99	10.00	99.00	0.00	990.00	N
MXK53AMA	APPLE-MAGIC MOUSE NEW WHT	10.00	79.00	0.00	790.00	N
DC	DC-DELIVERY	1.00	35.00	0.00	35.00	N
GOVE	GOVE-NOTE	1.00	0.00	0.00	0.00	N

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SubTotal: 9,795.00

TOTAL: 9,795.00

X

Caribbean Data Systems

16 Ave. Las Cumbres, Ste. 200, Guaynabo, PR 00969
T: 787-774-6969 • www.caribbeandata.com

QUOTE

Number: CDSQ71200

Date: Mar 16, 2026

Sold To

UPR RECINTO DE MAYAGUEZ
Giovanni Seijo-Ellis
Departamento de Física
259 Alfonso Valdes Blvd
Mayaguez, PR 00680

Phone 787-832-4040
Fax

Salesperson	Quote Due Date	Delivery Time	FOB	Terms
Ana Rivera	3/25/2026	2 to 4 weeks ARO	PUERTO RICO	NET 30

Qty	Mfr Part #	Description	Unit Price	Ext. Price
		SUBASTA ASG 23J-27251-R1		
10	210-BCWK	Linea 1258: Dell 27 Monitor - Dell Pro 27 P2725H	$233.75	$2,337.50
5	BX1500M-LM60	Linea 1326: APC Back UPS Pro BX1500VA, 10 Outlets, AVR, LCD interface, LAM 60Hz - Tower - AVR - 16 Hour Recharge - 120 V AC Input - 120 V AC Output - Stepped Approximated Sine Wave - 10 x NEMA 5-15R - 10 x Battery/Surge Outlet 3 años "On-Site"	$227.92	$1,139.60

SubTotal	$3,477.10
Tax	$0.00
Shipping	$0.00
Total	**$3,477.10**

PRICES SUBJECT TO CHANGE - PRICES BASED UPON TOTAL PURCHASE - ALL DELIVERY, TRAINING OR CONSULTING SERVICES TO BE BILLED AT PUBLISHED RATES FOR EACH ACTIVITY INVOLVED - GENERALLY ALL HARDWARE COMPUTER COMPONENTS PROPOSED ABOVE ARE COVERED BY A LIMITED ONE YEAR WARRANTY, COVERING PARTS AND LABOUR FOR HARDWARE ONLY AND ON A DEPOT BASIS - WE SPECIFICALLY DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OR WITH REGARD TO ANY LICENSED PRODUCTS. WE SHALL NOT BE LIABLE FOR ANY LOSS OF PROFITS, BUSINESS, GOODWILL, DATA, INTERRUPTION OF BUSINESS, NOR FOR INCIDENTIAL OR CONSEQUENTIAL MERCHANTABILITY OR FITNESS OF PURPOSE, DAMAGES RELATED TO THIS

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QUOTE

Number: CDSQ71201

Date: Mar 16, 2026

Sold To
UPR RECINTO DE MAYAGUEZ Giovanni Seijo-Ellis Departamento de Física 259 Alfonso Valdes Blvd Mayaguez, PR 00680 Phone 787-832-4040 Fax

Salesperson	Quote Due Date	Delivery Time	FOB	Terms
Ana Rivera	3/25/2026	2 to 4 weeks ARO	PUERTO RICO	NET 30

Qty	Mfr Part #	Description	Unit Price	Ext. Price
		SUBASTA ASG 23J-27251-R1		
1	UN65DU8000	Linea 1755: Samsung 65" LED HD 4K Smart TV	$850.50	$850.50
1	MI-372	Linea 1919: Full Motion Wall Mount for 42 to 80" Displays	$269.03	$269.03

SubTotal	$1,119.53
Tax	$0.00
Shipping	$0.00
Total	$1,119.53

PRICES SUBJECT TO CHANGE - PRICES BASED UPON TOTAL PURCHASE - ALL DELIVERY, TRAINING OR CONSULTING SERVICES TO BE BILLED AT PUBLISHED RATES FOR EACH ACTIVITY INVOLVED - GENERALLY ALL HARDWARE COMPUTER COMPONENTS PROPOSED ABOVE ARE COVERED BY A LIMITED ONE YEAR WARRANTY, COVERING PARTS AND LABOUR FOR HARDWARE ONLY AND ON A DEPOT BASIS - WE SPECIFICALLY DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OR WITH REGARD TO ANY LICENSED PRODUCTS. WE SHALL NOT BE LIABLE FOR ANY LOSS OF PROFITS, BUSINESS, GOODWILL, DATA, INTERRUPTION OF BUSINESS, NOR FOR INCIDENTIAL OR CONSEQUENTIAL MERCHANTABILITY OR FITNESS OF PURPOSE, DAMAGES RELATED TO THIS

Ana Rivera
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College of Arts and Sciences

Department of Physics
Phone: (787) 265-3844

March 18, 2026

Dr. Giovanni Seijo Ellis
Physics Department
UPR
Mayagüez Campus

Dear Dr. Seijo-Ellis:

We acknowledge and support your proposal "Enhacing Applied Learning Opportunities for Students in Meterology" to acquire ten computers and other educational equipment to modernize the Meterology Laboratory Classroom. We are committed to working with you to integrate these resources into our existing departmental computing facilities and provide any necessary support to ensure proper installation and maintenance.

Best regards,

[redacted]
Samuel Santana (Mar 19, 2026 11:34:09 EDT)

Samuel Santana
Department Chair

[redacted]

Omar Vázquez Mata
Research Technician
Department of Physics

Seijo_Unidata_Proposal_Spring_2026_Final

Final Audit Report 2026-03-26

Created:	2026-03-26
By:	Yarisis Lopez-Colon (yarisis.lopez2@upr.edu)
Status:	Signed
Transaction ID:	CBJCHBCAABAAMf6Lac5mKv6NVUzbOkYEhQSsGa6ylgUI

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