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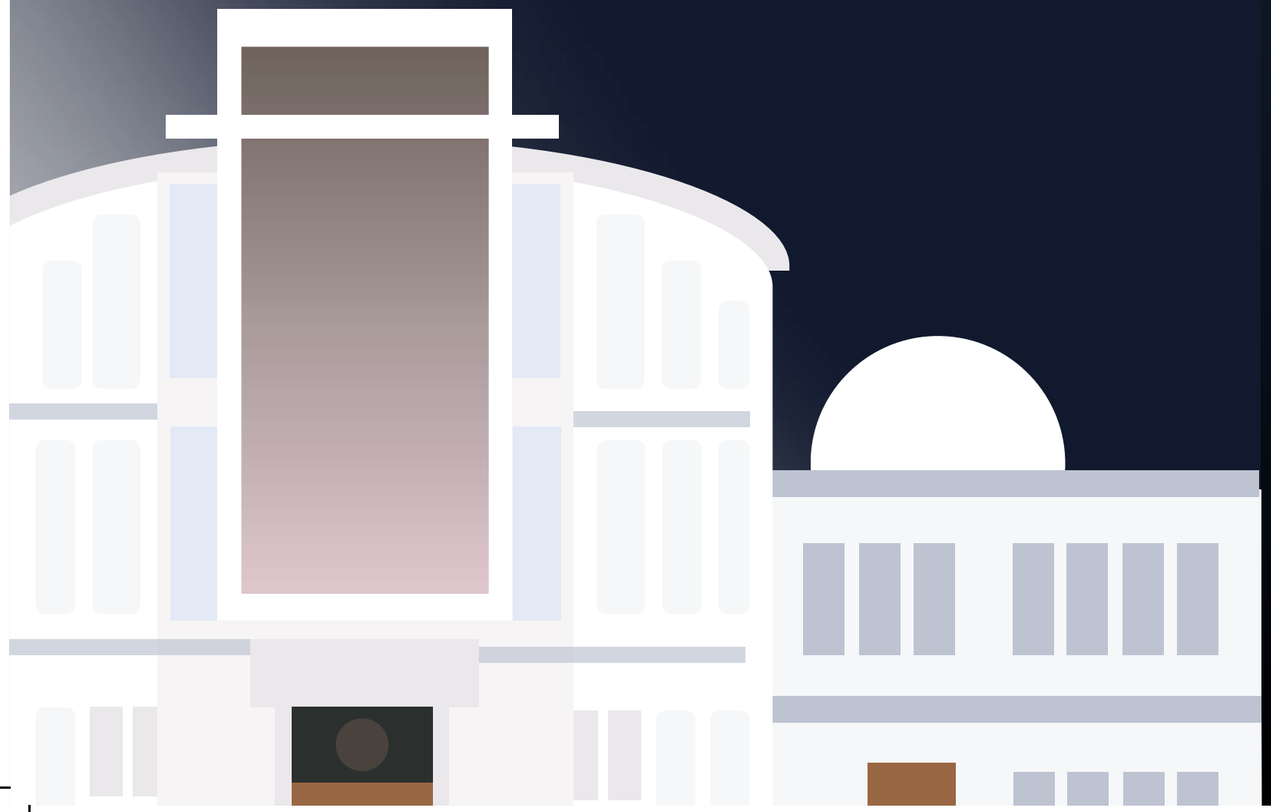

MANILA OBSERVATORY

ECW

HIGH-DEFINITION CLEAN ENERGY, CLIMATE, AND WEATHER FORECASTS FOR THE PHILIPPINES

ANNUAL REPORT
July 2023 to June 2024

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OVERVIEW

Now in its third year of operations (from July 2023 to June 2024), the ECW project focused on the ongoing rehabilitation of the remaining automated weather stations (AWSs) of the Manila Observatory. With renewed access to additional sites in Palawan Province, 23 AWSs were added to the observational network that now totals 116 stations. These stations are clustered around specific areas in the country to enable us to predict climate change at a higher resolution than that provided by global climate models. A perennial challenge has been to improve the timely transmission of data to our central databases for eventual analysis and sharing with others.

On climate and weather prediction, our model forecasts are continually being fine-tuned to generate vital indicators for public health, such as the heat index. This is a work in progress as predicting atmospheric humidity in a warming world can be quite challenging. We have also begun translating the pixelated, i.e. coarse-grained, results of the most recent global climate models into higher resolution pictures of climate change in the country. This work of translation is called downscaling and we are more than halfway done. When finished, we will have a better or more updated sense of how climate change will affect us in the coming decades up to the end of this century.

As a complement to the official advisories of PAGASA, extreme weather bulletins were regularly issued to stakeholders during disruptive events (e.g. Enhanced Habagat in July 2023 and 2024, Trough of LPA which brought flooding and landslides in CARAGA and Davao regions in January 2024, and tropical cyclones Doksuri (Egay), Khanun (Falcon), Soala (Goring), and TD Aghon). Drought updates were also shared with the public every month that El Niño was wreaking havoc on particular regions in our country this past year. In terms of cost in agricultural damages, the provinces of Isabela, Palawan, Iloilo, and Occidental and Oriental Mindoro were most affected by the El Niño of 2023.

A key highlight of this year was building and renewing relationships with LGUs, academic institutions, private enterprises and civil society groups. We aim to sustain these connections to serve the public through our partners who see the value of real-time, 24/7, scientific data and knowledge on climate change and its manifestation in hard-to-predict extreme or disruptive events. We see this ECW project as an opportunity to help people in their efforts to ensure sustainability, operational continuity (e.g. managing supply chains and ecosystem services), and responsive risk management.

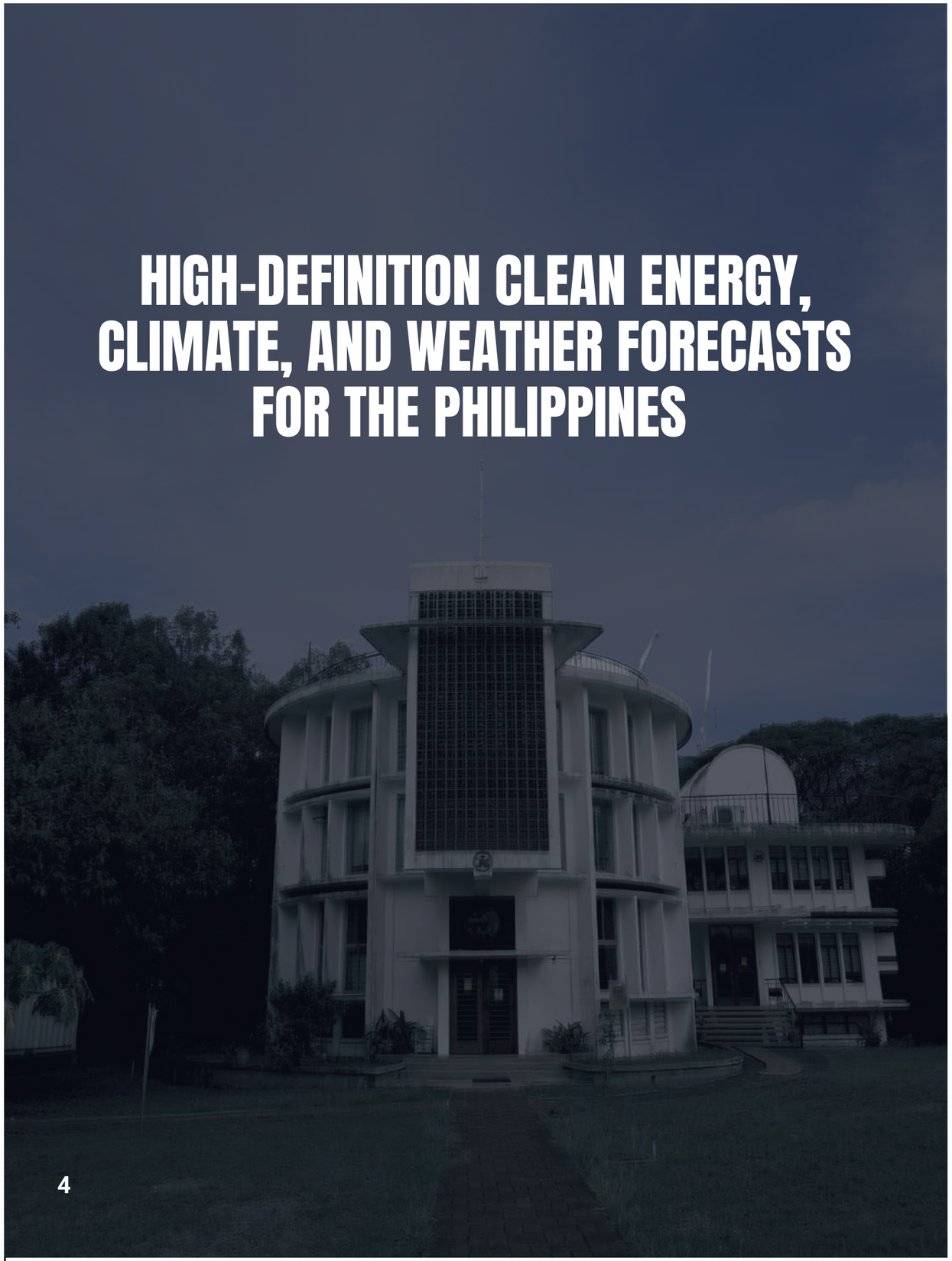
In the course of our work, an overriding concern we continue to meet is the dearth of scientific, specifically climate expertise. An urgent and strategic direction therefore is to improve and strengthen science education in our country. We need to keep training and guiding young people to go into science and engineering. We are able to invest ourselves in this "advocacy" through what we do in this ECW project, which has important spinoffs in data science, high performance computing and AI, sustainability science, and other allied fields of scientific endeavor.

One final note. To our benefactors, we are truly grateful for your assistance. Hope does not come easily to those of us who work in this field of climate change. For all the hand waving and uncertainty that attend this work, the assurance of your commitment to help the Manila Observatory in its scientific and social mission is a source of hope for us. By God's grace, we will apply ourselves to make sure your help will not be in vain.

Gratefully,

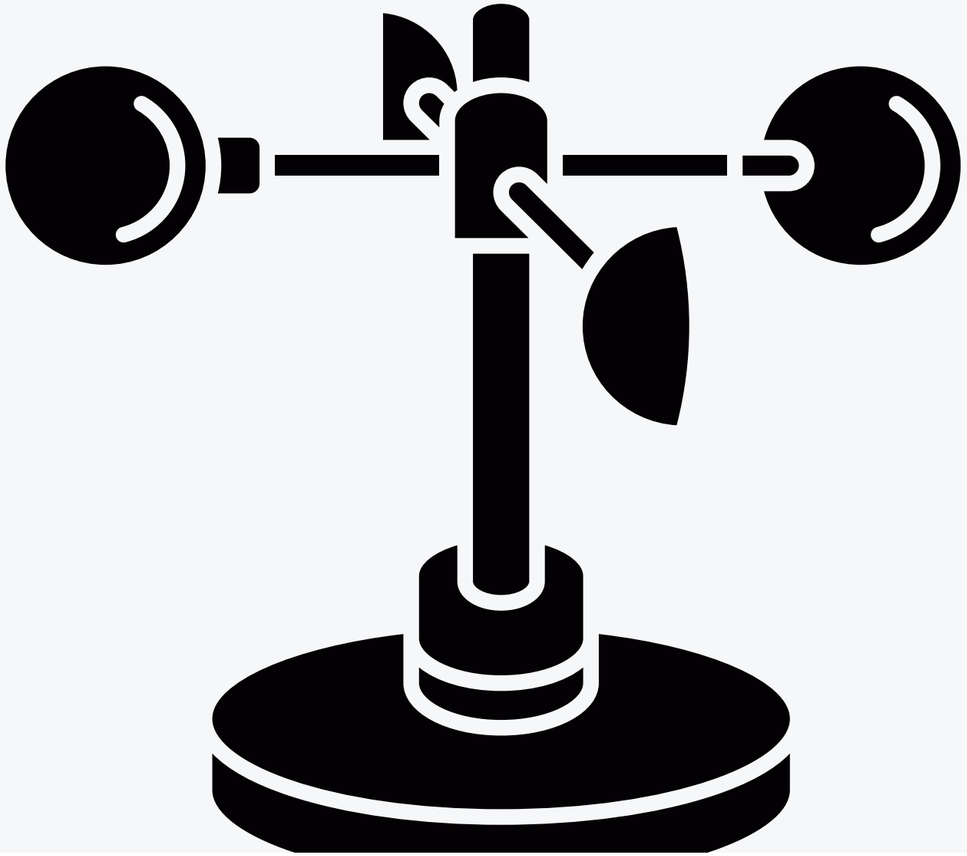
Jose Ramon T Villarin SJ
Executive Director

HIGH-DEFINITION CLEAN ENERGY, CLIMATE, AND WEATHER FORECASTS FOR THE PHILIPPINES



Given the urgency of climate change and in view of its long-standing tradition in the atmospheric and earth sciences, the Manila Observatory sees itself as a climate observatory in this part of the world that is not well-studied or understood, and is at high risk of climate-related disasters.

As a climate observatory, our mission is to observe, understand, and foresee how climate change will affect communities, especially those who are more vulnerable to its adverse impacts. We provide data and information and knowledge that can be transformed into wise decisions and actions that lead to better care of people and our common home.



OBSERVATION NETWORK

A network of Automated Weather Stations throughout the country that monitor the atmosphere 24/7 in real time.

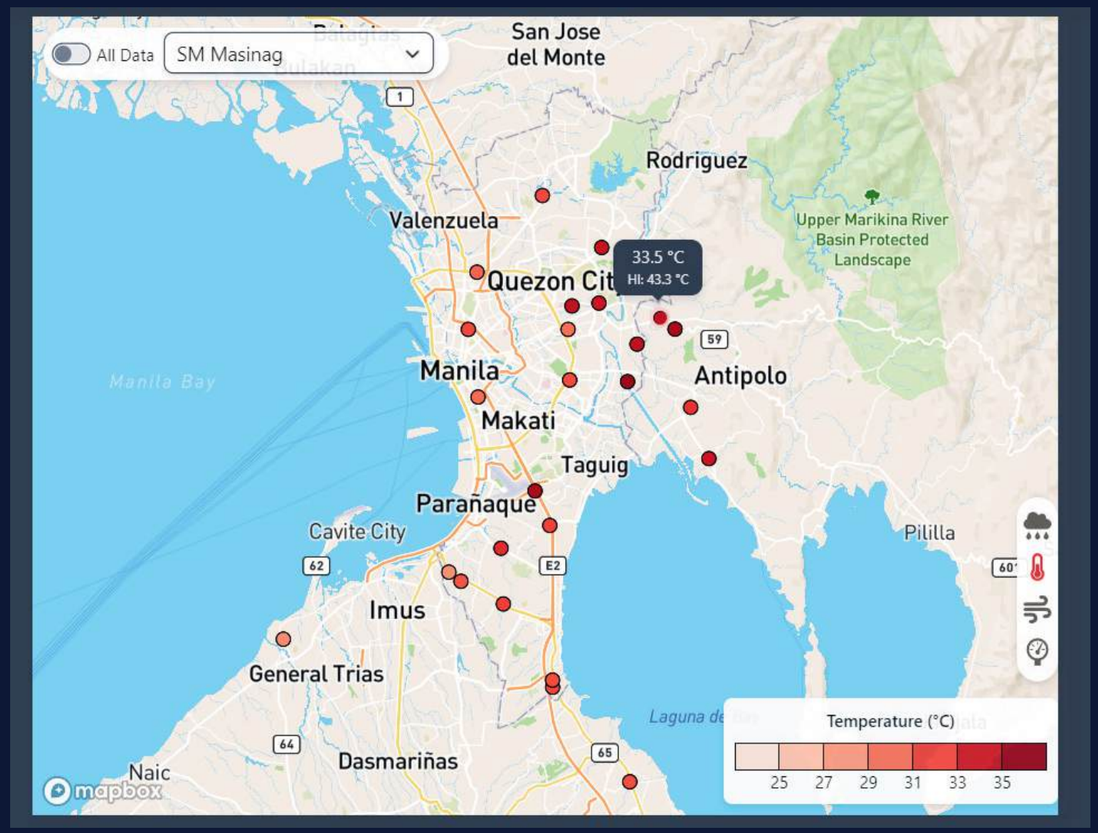
An **Automated Weather Station (AWS)** is an integrated system of sensors that measure and record weather changes without need for constant human oversight. The following parameters are commonly measured: temperature, humidity, rainfall, pressure, wind speed and direction, solar radiation.

Understanding, predicting, and planning for climate change are not possible without observational data from the AWS network.

Figure 1: AWS observation network

AWS NETWORK IN THE PHILIPPINES

MO Panahon Website
https://panahon.observatory.ph



STATION UPGRADES

The AWS sites that were reconditioned at the early part of the project continue to be operational and attempts to reach out to other local government units (LGUs) were made to revive the AWSs once maintained by Weather Philippines Foundation Inc. Much of the efforts in reconditioning the AWSs focused on Palawan Province, made possible through the assistance of Pilipinas Shell Foundation, Inc. and the Palawan Provincial Disaster Risk Reduction and Management Office. Traveling to these far-flung areas was challenging and resource-intensive but the support from the provincial government enabled the Operations and Maintenance Team to get to these areas. Logistical challenges however prevented us from getting to Magsaysay and Cagayancillo this year.

At present, there are 116 AWSs that are operational. However, the connectivity of certain stations (especially those in remote areas) to our central database servers is a problem that has yet to be completely solved.

Improvements to the power system of the AWSs and their repairability have been done so that the batteries and other sensor components could be locally sourced. This would facilitate maintenance and repairs in the field. A redesign of the power system has been made to enable project partners and LGU personnel to do the maintenance themselves.

INSIDE AN AWS

Davis Vantage Pro 2 Plus

DATA CONSOLE
Data Display

WIND VANE
Wind Direction

TIPPING BUCKET
Rainfall

ANEMOMETER
Wind Speed

TEMPERATURE AND RELATIVE HUMIDITY SENSOR

RAIN GAUGE CONE
Rain Collector

SOLAR RADIATION AND UV SENSOR

INTEGRATED SENSOR SUITE
Data Transmitter

RADIATION SHIELD

DAVIS VANTAGE PRO 2 PLUS COMPONENTS

- **Wind Vane:** Indicates the direction of the wind by aligning itself with the wind's bearing.
- **Anemometer:** Measures wind speed using rotating cups. The rotation speed indicates wind speed.
- **Rain Gauge Cone and Collector:** Collects rainwater and channels it into the tipping bucket mechanism for measurement.
- **Tipping Bucket:** Measures rainfall amount. Each tip of the bucket corresponds to a certain amount of rainfall.
- **Temperature and Relative Humidity Sensor:** Measures ambient air temperature and the relative amount of water vapor in the air.
- **Data Console**: Shows live weather data for temperature, humidity, wind speed, wind direction, and rainfall. It stores data and can be set with alarms.
- **Solar Radiation and UV Sensor:** Measures intensity of solar radiation and ultraviolet radiation.
- **Integrated Sensor Suite - Data Transmitter:** Sends data wirelessly to the console.
- **Radiation Shield:** Protects the temperature and relative humidity sensors from direct sunlight to ensure accurate measurement. Allows air to circulate freely around the sensors.

DATA TRANSMISSION

Data Receiver

IP Logger

Internet Router

Weatherlink Cloud

DATA TRANSMISSION

Data Receiver

SMS Gateway

Server

Panahon Website

LUFFT COMPONENTS

- **Solar Radiation Sensor**: Measures the intensity of solar radiation which is valuable in knowing solar energy availability and evaporation.
- **Ultrasonic Anemometer:** Utilizes ultrasonic technology to measure wind speed and direction with high accuracy and no moving parts.
- **Radiation Shield**: Protects temperature and humidity sensors from direct solar radiation; allows air to pass freely around the sensors.
- **Temperature and Relative Humidity Sensor**: Measures ambient air temperature and water vapor with solid state detectors.
- **Data Logger (SMS-based):** Collects and stores data from all sensors; transmits via SMS to a central server or any mobile device for remote monitoring and analysis.
- **Solar Panel**: Provides power to the data logger and sensors, ensuring continuous operation even in remote places without electricity.
- **Rain Gauge Cone and Collector**: Collects rainwater and funnels it into the tipping spoon mechanism.
- **Tipping Spoon Mechanism:** Measures the amount of rainfall. Each tip of the spoon represents a certain amount of rainfall.

INSIDE AN AWS

Lufft

DATA LOGGER
SMS Based

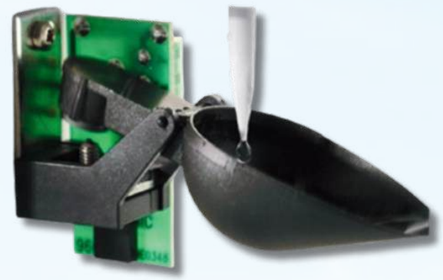
SOLAR RADIATION SENSOR

ULTRASONIC ANEMOMETER
Wind Speed and Direction

TEMPERATURE AND RELATIVE HUMIDITY SENSOR

RADIATION SHIELD

RAIN GAUGE CONE
Rain Collector



TIPPING SPOON MECHANISM
Rainfall

SOLAR PANEL

Automated Weather Station at the Tacloban City Disaster Risk Reduction Management Office

QUALITY CHECK

Quality control and quality assurance checks are regularly performed to ensure that the data used for dissemination and forecasts are acceptable and sound. A monthly summary of these weather observations is also generated to monitor the status of every station and its data.

AWS DATA QUALITY CHECK PROCESS

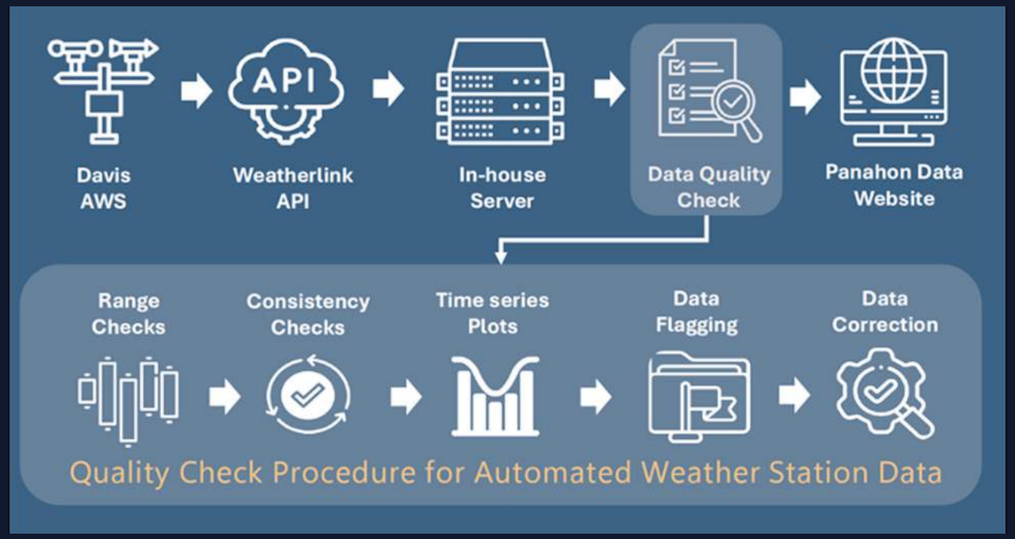


Figure 2: AWS data quality check process

Bañares, E. N., Bañaga, P., Gozo, E., Lorenzo, G. R., Topacio, X. G. V., Llorin, A. G., Avila F., Cruz, F. A., Simpas, J. B., Uy, S. N, Villarin, J. R. T. (2024, June 23-28). "Current Practices and Challenges in Managing Automated Weather Station Data and Networks in Philippine Cities" [Poster Presentation - AS36]. Asia Oceania Geosciences Society (AOGS) 21st Annual Meeting, Gangwon-do, South Korea.

DATA REQUESTS

Data from the AWS network are available upon request. We provide these through bilateral agreements on the fair use of AWS data. We also encourage research collaboration through this sharing of data. A number of these initiatives are shown in the table below:

UNIVERSITY/COMPANY	POSITION/ COURSE & YEAR	NAME OF PROJECT/ TITLE OF THE RESEARCH
University of the Philippines Diliman	MS Energy Engineering, 2nd year	Energy Audit
Ateneo De Manila University/PAGASA/Academia Sinica	MS Graduate Fellow, Career Incentives Program	2-month Internship in Academia Sinica under the Taiwan International Graduate Program
University of Tsukuba	Masters in Engineering Mechanics and Energy I	Analysis of extreme weather events over Philippine urban centers under historical and future urbanization and climate scenarios (tentative)
The Department of Science and Technology (DOST) - Philippine Atmospheric, Geophysical, and Astronomical Services Administration(PAGASA)	Weather Specialist I	Observational Analysis of Hail-storm Occurrences over Metro Manila Philippines
The Department of Science and Technology (DOST) - Philippine Atmospheric, Geophysical, and Astronomical Services Administration(PAGASA)	Project Technical Assistant IV	Evaluation of a Radar-based Nowcasting System for Quantitative Precipitation Forecast (QPF) in Metro Manila, Philippines
National Central University	Student / MSc Atmospheric Physics, 1st year	To determine possible case studies for convective events using radar.
SM Supermalls - SM City Masinag	Engineering Operations Manager	Construction of Rain Water Treatment Facility
Xavier University - Ateneo de Cagayan	Student / Bachelor of Science in Civil Engineering, 4th Year	Noise Level Investigation Along Port Area Of Cagayam De Oro, Barangay Macabalan, Cagayan De Oro City
Ateneo de Manila University	Economics Lecturer	Electricity Demand and Climate Change relationships
Environmental Management Bureau - Department of Environment and Natural Resources	Science Research Specialist II	Acid Deposition Monitoring Network in East Asia (EANET)
University of the Philippines - School of Urban and Regional Planning	School of Urban and Regional Planning, 2nd year Student	A monthly spatiotemporal analysis of dengue case clusters in Quezon city for strategic healthcare planning
Xavier University - Ateneo de Cagayan	Student | BS Civil Engineering - 3rd Year	Development of Bioretention Cells System using SWMM in Barangay Bayabas, Cagayan de Oro City

FORECASTING SYSTEM

A fully automated weather forecasting system has been operational since 2021 to assist in clean energy predictions, specifically for solar and wind energy, in the Philippines.

As prediction is more difficult now especially in view of climate change, this system is continually improved with better methodologies and data on the ground.

SYSTEM IMPROVEMENTS

With the automated weather forecast system already in place, the modeling group this year focused on improving forecast skill. For example, in times of extreme heat, the influence of initial and boundary conditions (ICBCs) on temperature, humidity and heat index was investigated to reduce further the systematic biases in our forecast model. The group also identified which parameters and inputs are more crucial for the accurate simulation of rainfall and other atmospheric variables.

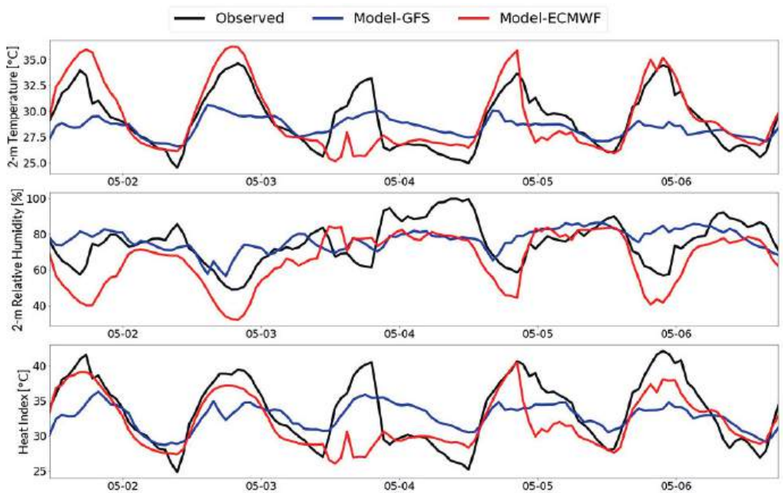


Figure 3: *Time series of forecast surface temperature, relative humidity, and heat index from the WRF model initialized at 8am on 2 May 2024 using two different initial and boundary conditions, which are the Model-GFS (blue) and Model-ECMWF (red) and the observed of z actual data (black) from the SM Davao station (125.59°E, 7.05°N).*

Figure 3 shows five-day forecasts of surface temperature, relative humidity, and heat index using two different ICBCs from Model-ECMWF (or European Centre for Medium-Range Weather Forecasts) and Model-GFS (or Global Forecast System). Results show that the forecast is sensitive to the ICBC, with Model-ECMWF overestimating temperature and underestimating relative humidity. The Model-GFS was unable to simulate the observed peaks in surface temperature and dips in relative humidity. Our results show that for the Philippines, the forecast Heat Index seems to be better simulated by the Model-ECMWF. This model then will be incorporated in the forecasting system as soon as feasible.

The team also tested the impact of changing the value of a parameter (p parameter) that controls the vertical exchange of momentum and energy from the surface to the atmosphere. Results show that the vertical profiles of potential temperature, mixing ratio, relative humidity and wind speed are sensitive to this p parameter. For a case study on May 8, 2024 over Davao City as shown in Figure 4, the results show that the nighttime profiles of the above-mentioned variables are improved when a higher value of this parameter than the default was used. This new value of the p parameter will be incorporated in the forecasting system as soon as feasible.

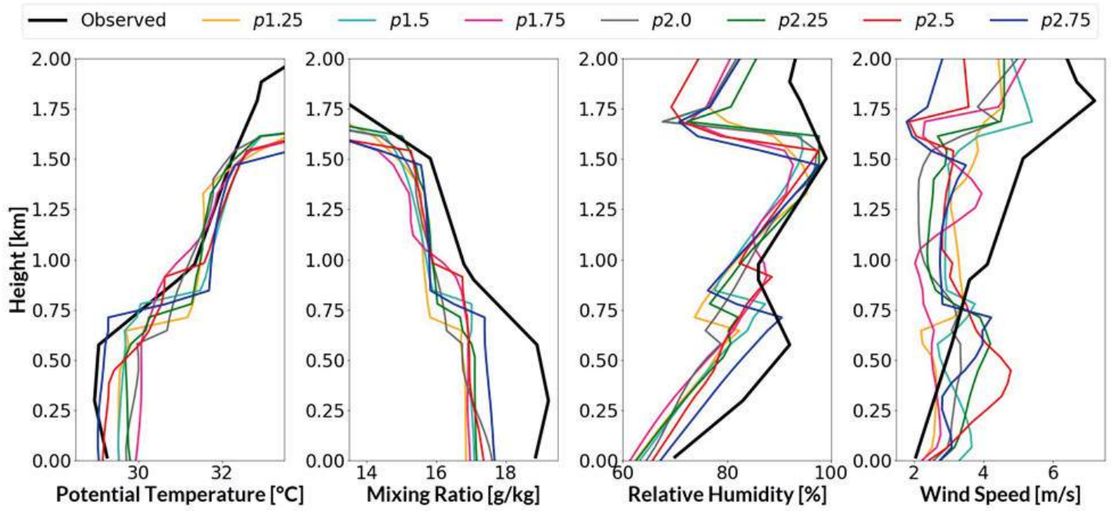


Figure 4: *Vertical profile of potential temperature, mixing ratio, relative humidity, and wind speed for the different values of the shape exponent for momentum diffusivity coefficient (p parameter) in the ACM2 PBL scheme of WRF and sounding observations (black) from Davao Airport station (125.65°E, 7.11°N; https://weather.uwyo.edu/upperair/sounding.html) on May 8, 2024 at 8PM LST.*

The team conducted a number of experiments to determine the most critical parameters and their optimal values for the simulation of rainfall during the Habagat 2012 and 2013 over Metro Manila (Figure 5). The results show that the parameters related to the cumulus physics schemes are most critical for the simulation of rainfall. The optimized experiments improved the overall root mean square error of rainfall amount over Metro Manila by 42% and 27% for Habagat 2012 and 2013, respectively. Still, the optimized experiments were not able to capture the correct timing of the rainfall enhancements, suggesting that other settings in the WRF model such as the domain and resolution needs to be tuned to improve the forecasts.

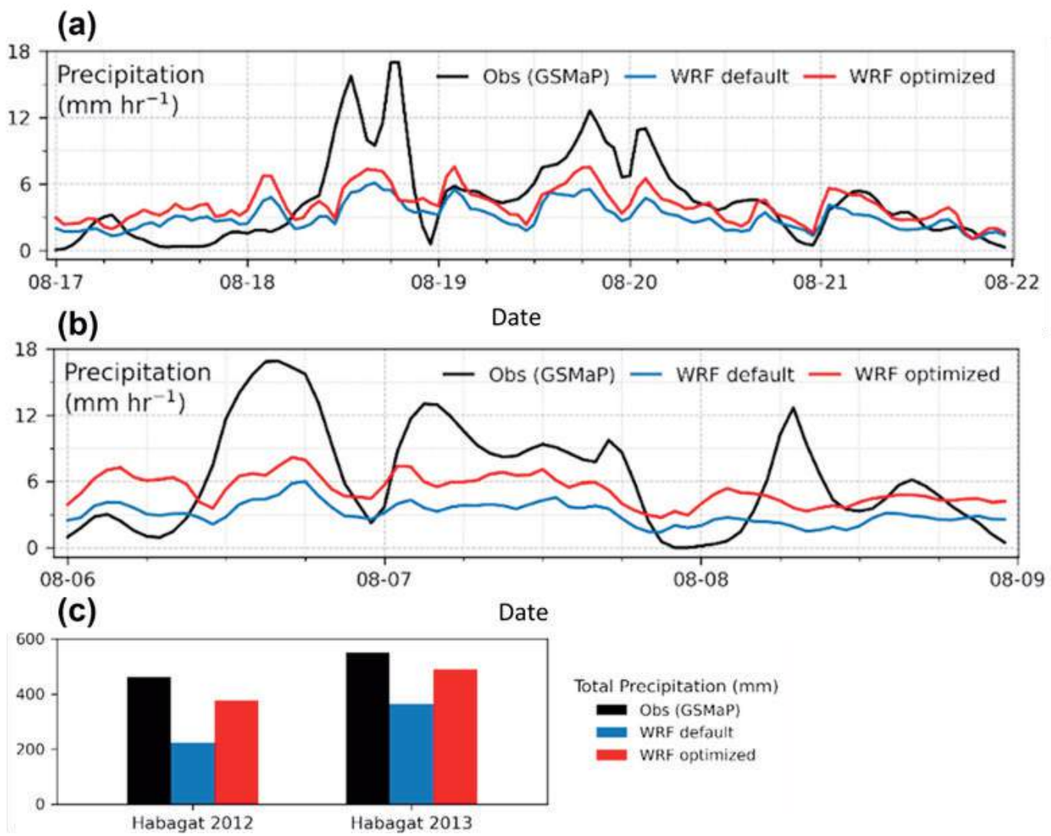


Figure 5: *Time series of hourly precipitation area-averaged over Metro Manila for the observed (black), default model settings (blue), and optimized model settings (red) for the (a) Habagat 2012 and (b) Habagat 2013. (c) Comparison of accumulated precipitation averaged over Metro Manila for the simulation days in both cases.*

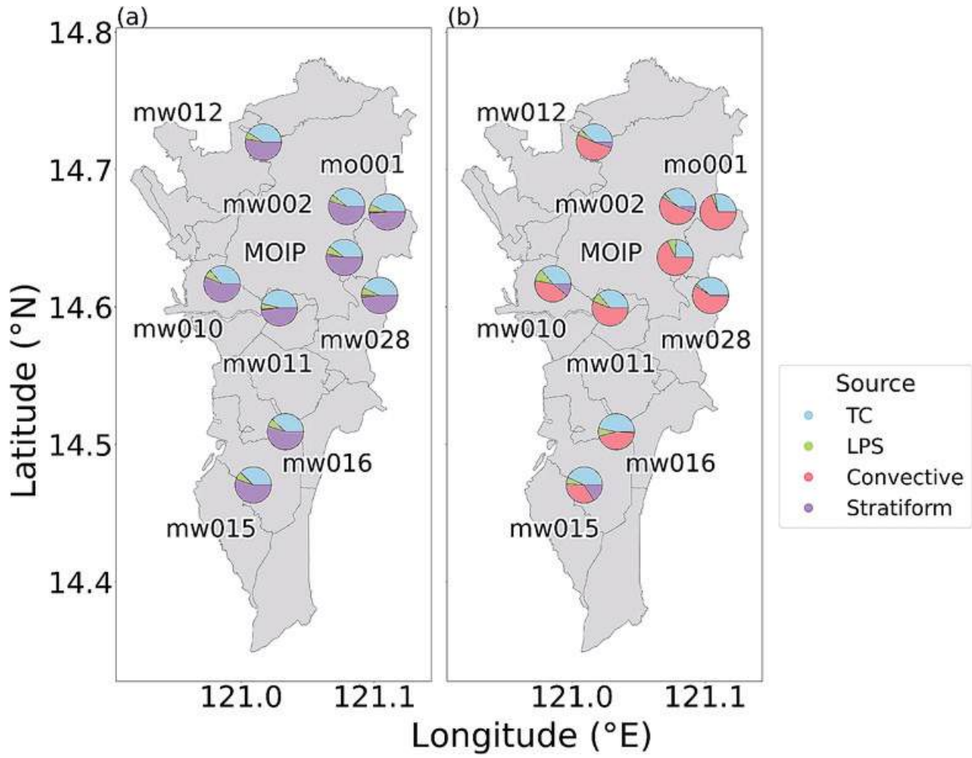


Figure 6: *Percentage (%) contribution of Tropical Cyclones (TCs; light blue), Low Pressure Systems (LPSs; green), Convective (red), and Stratiform (violet) rainfall events to the frequency of (a) Hourly Heavy Rainfall (HHR) events and (b) Extreme Hourly Rainfall (EHR) events during the Habagat season over Metro Manila from 2012 to 2019.*

Moreover, with the availability of AWS data over Metro Manila, the team also investigated the contribution of tropical cyclones, low pressure systems, convective and stratiform rainfall events to the frequency of Hourly Heavy Rainfall (HHR) and Extreme Hourly Rainfall (EHR) events in Metro Manila (Taña et al. 2024), as shown in Figure 6. The results show that majority of the HHR events are due to stratiform rainfall, while the majority of the EHR events are by convective systems. This finding has been published in Theoretical and Applied Climatology (Springer) and was presented at the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) last February 2024.

COMMUNICATION AND OUTREACH

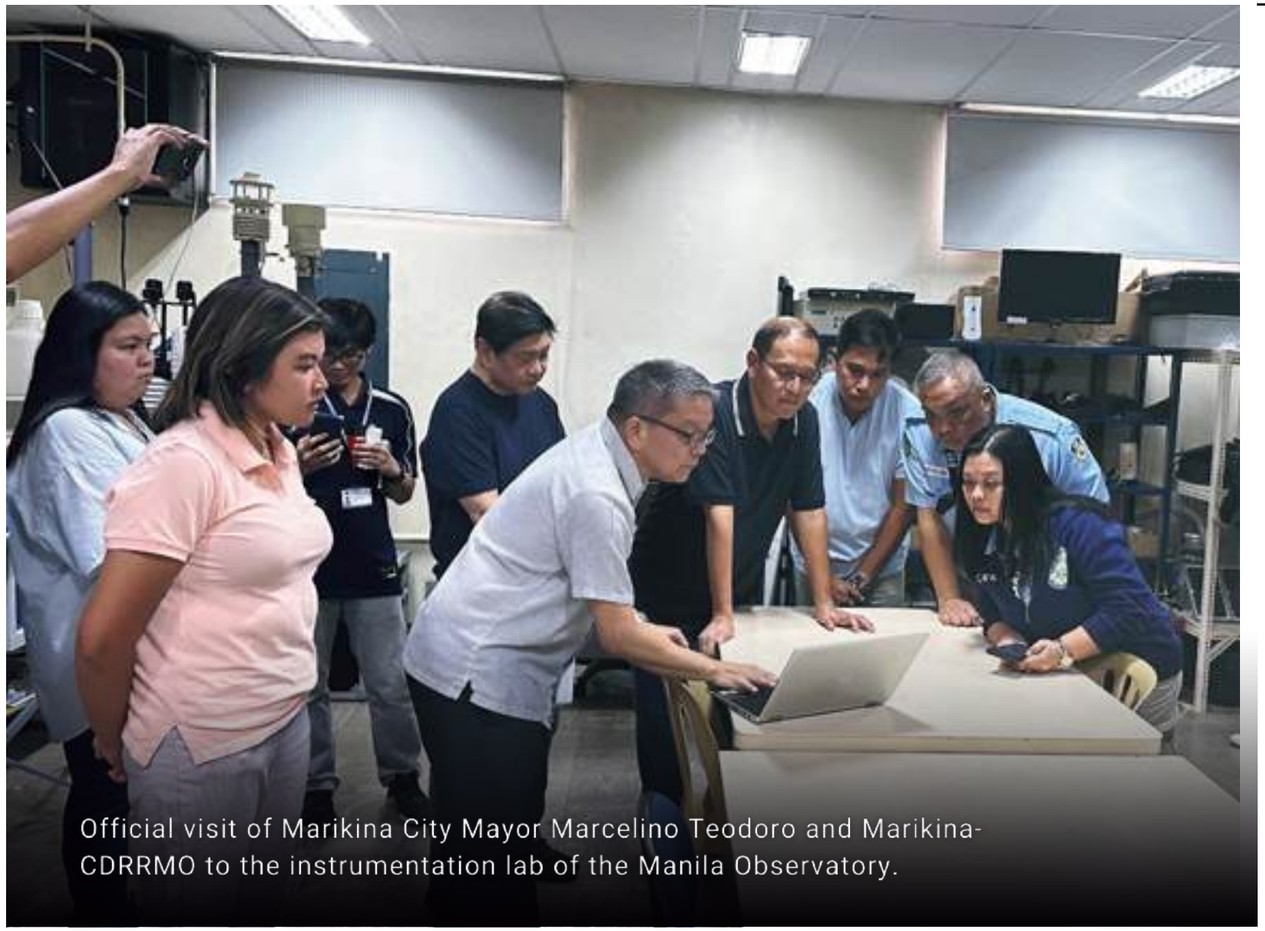
To bring science to bear on society, the Observatory actively engages with local governments, civil society (including academe), the private sector and other stakeholders as partners.

Science is continually communicated through regular Extreme Weather Bulletins and because of El Niño this year through Drought Watch Bulletins. The potential impacts of extreme weather and climate are shared with partners for possible anticipatory action.

PARTNERSHIP WITH CORDEX-SEA

We have already begun the dynamical downscaling of the latest global climate models (i.e. CMIP6 or the sixth version of the Climate Model Intercomparison Project) using the updated Shared Socioeconomic Pathway (SSP) scenarios. This exercise, which is more than halfway through already, covers Southeast Asia and is done in collaboration with other regional climate modeling groups in a network called CORDEX (or Coordinated Regional Downscaling Experiment) Southeast Asia. The Manila Observatory now leads the latest initiative of the network called CARE for SEA megacities project which aims to generate policy-relevant information on future climatic impact-drivers for Southeast Asian megacities.

Manila Observatory co-organized the CARE for SEA Megacities Training Workshop in Kuala Lumpur, Malaysia.



Official visit of Marikina City Mayor Marcelino Teodoro and Marikina-CDRRMO to the instrumentation lab of the Manila Observatory.

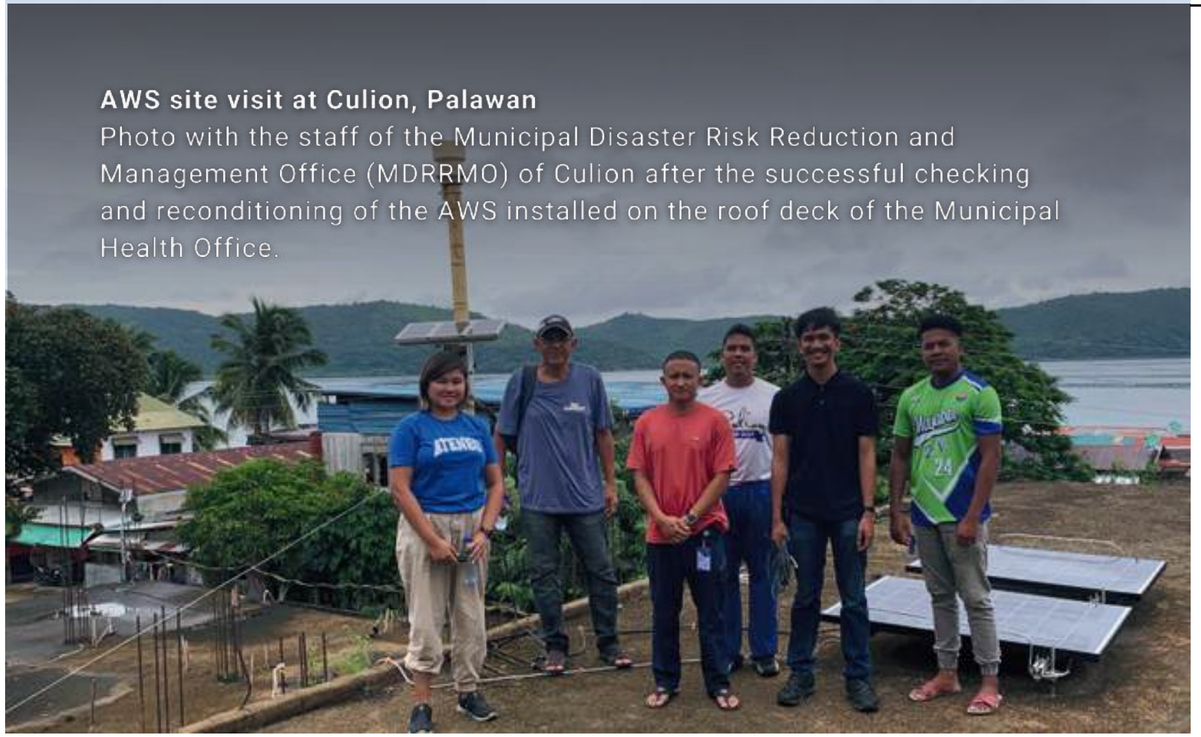
PARTNERSHIP WITH LOCAL GOVERNMENT UNITS

To widen the reach of science and ensure sustainability, efforts were made to engage local governments, civil society (including academe), and private sector entities who could become new partners of the Observatory.

This year for instance, we established a working partnership with Marikina and Iloilo on the operation and maintenance of their weather stations. We formalized these through agreements that are mutually beneficial and could help build local capacity and strengthen the cities' early warning systems.

Partnerships were also signed with academic institutions and private sector partners. In coordination with the Xavier University Engineering Resource Center (XUERC) in Cagayan de Oro (CdO) City, the continued operation and maintenance of the AWS network in CdO is now possible. This partnership, which also led to site visits to other AWSs in Region X, has opened up the possibility of the Observatory's greater involvement in Northern Mindanao. These activities demonstrate the sustained collaboration with XU since the signing of the MOU in 2022.

Manila Observatory and XUERC teams prior to AWS site visits



AWS site visit at Culion, Palawan
Photo with the staff of the Municipal Disaster Risk Reduction and Management Office (MDRRMO) of Culion after the successful checking and reconditioning of the AWS installed on the roof deck of the Municipal Health Office.

The team from Manila Observatory, in collaboration with the MDRRMO of Culion, was able to recondition two stations, one of which is located at the Culion National High School. This involved knowing the working condition of the sensors, replacement of solar panels, deployment of new power supplies and backup batteries to ensure continuous operation.

Loyola College of Culion in Palawan has likewise expressed interest in being part of the Observatory's AWS network. The College has helped us reach out to LGUs in Culion that have stations in need of repair and upgrades.

A new agreement has also been formalized with Visayas State University (VSU) whose faculty members now work with the Observatory in the operation and maintenance of AWSs in Leyte and Samar provinces. Two BS Meteorology interns from VSU were also hosted by the Observatory, with our scientists serving as panelists for their final thesis defense.

During their internship, the VSU students helped the AWS team in diagnosing aRQ data loggers used for the Lufft AWS. They also joined us in site visits to Cavite Province.

VSU student interns performing diagnostics to aRQ data loggers (left) and assisting with preventive maintenance of AWS during site visits.

Baybay, Leyte. Demonstration for VSU on AWS training.

In collaboration with Visayas State University, the Manila Observatory shared its technical expertise through training on the maintenance of the Automated Weather Station. This training enhanced local expertise and ensured the proper maintenance of the existing weather stations. The session focused on best practices for maintaining the AWS, troubleshooting issues, and improving overall operational knowledge, thereby supporting ongoing weather monitoring efforts in the region.

In addition to these linkages with local government and academe, we have also established new partnerships with the private sector, an example of which is our present engagement with UC1 Corporation. Their weather stations at Parasat Cable TV, Seven Seas Waterpark, and Dahilayan Adventure Park are now part of the Manila Observatory's AWS network. We are encouraged by such partners who see how vital the real-time, 24/7, scientific observations are to enterprise continuity and the climate risk resilience of the local communities served by these private entities.

MOA signing between Manila Observatory and ASEAN Center for Biodiversity

MO AND THE ASEAN CENTRE FOR BIODIVERSITY

The Manila Observatory and the ASEAN Centre for Biodiversity recently signed a memorandum of agreement to examine together the impact of climate change on biodiversity in the country and Southeast Asian region. The link between climate change and biodiversity in Southeast Asia remains to be understood, given the richness of marine and terrestrial life in the region.

PARTNERSHIP WITH BARMM

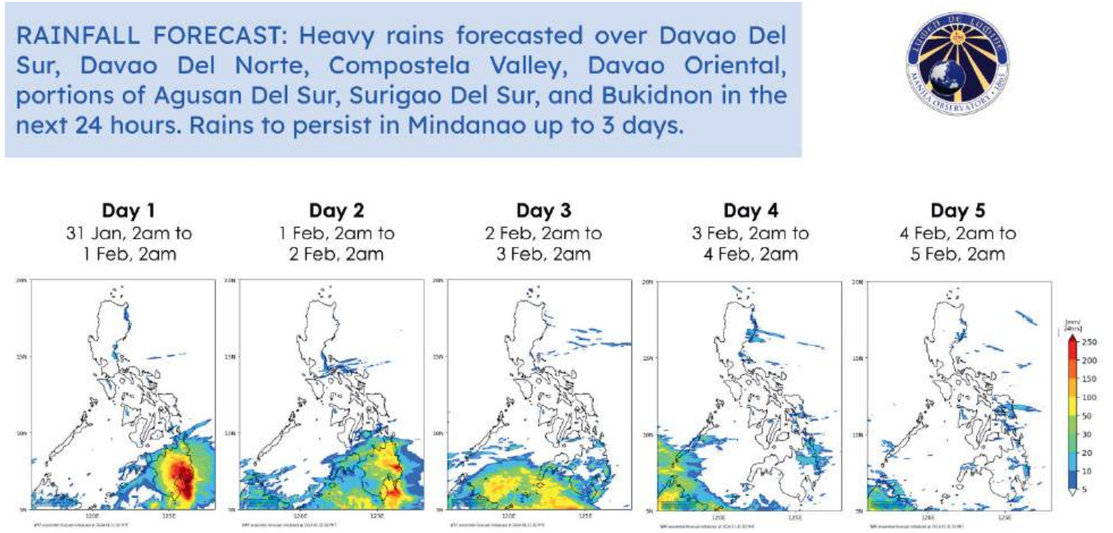
The Manila Observatory, together with consortium partners in the SUPREME BARMM (or Strengthening Resilience through Early Warning System, Enhanced Anticipatory Actions and Multi-risk Landscape Approach in Bangsamoro Autonomous Region in Muslim Mindanao) project, has been tasked to develop triggers for Anticipatory Action (AA) for Drought, Flood and Tropical Cyclones.

The project aims to strengthen pre-disaster policies and protocols in the region as well as foster collaboration among stakeholders in the Mindanao River Basin (MRB). This effort is directed toward enhancing resilience to transboundary, multi-risk extreme events.

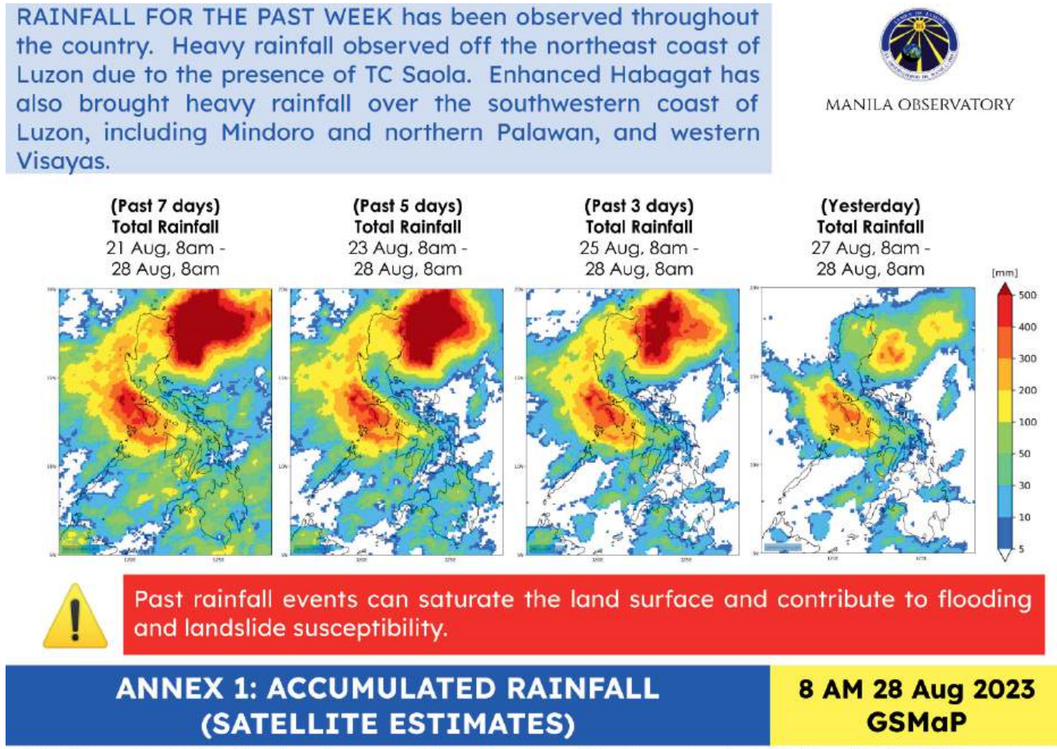
The consortium is led by Oxfam Pilipinas (OPH) and funded by the European Civil Protection and Humanitarian Aid Operations (ECHO). The project entails collaboration with many partners including the Bangsamoro Rapid Emergency Action on Disaster Incidence (READi) and the newly-formed Mindanao River Basin Management Council (MRBMC).

EXTREME WEATHER BULLETINS

Several short-duration extreme rainfall events interrupted the large-scale but slow-evolving El Niño-induced drought in the country. Extreme Weather Bulletins were issued on Tropical Storm (TS) Mawar (Betty) and TS Guchol (Chedeng) in June 2023; Typhoon (TY) Doksuri (Egay), TS Khanun (Falcon) and the Enhanced Habagat in July 2023; TY Saola (Goring) in August 2023. Other EWBs were also released for the Low Pressure Area (LPA) in January 2024 which brought flooding and landslides in CARAGA and Davao regions; and for Tropical Depression Aghon in May 2024.



NOTE: This report (website) contains information on potential impacts based on multiple data sources and scientific information. For official updates and warnings, please refer to PAGASA and other government agencies.



NOTE: This report (website) contains information on potential impacts based on multiple data sources and scientific information. For official updates and warnings, please refer to PAGASA and other government agencies.

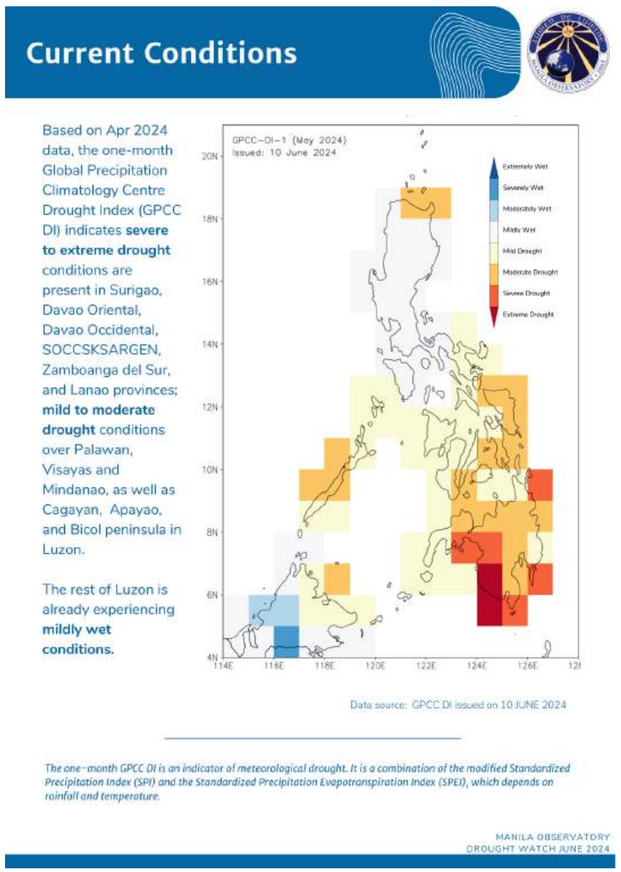
EWBs are shared with our partners to supplement the official information provided by PAGASA. These include the Tropical Cyclone tracks and intensity, five-day extreme rainfall forecasts, and accumulated rainfall, all of which are important in assessing the severity of these extreme events.

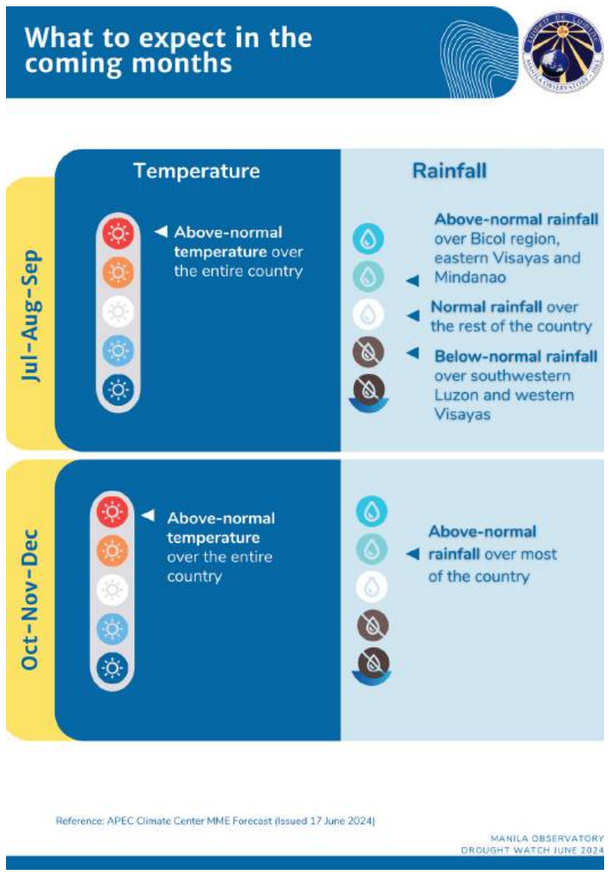
DROUGHT WATCH

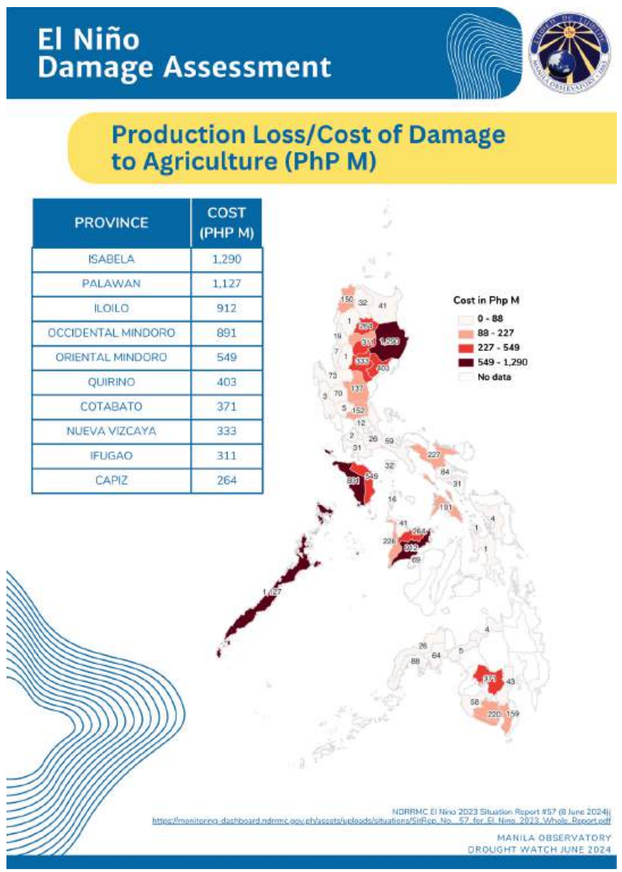
In anticipation of drought conditions due to the 2023 El Niño event, the Manila Observatory released monthly Drought Bulletins starting in April 2023, when the El Niño "Watch" level was raised by the APEC Climate Center (APCC). The bulletin included information on the status of the El Niño-Southern Oscillation in the Pacific, current drought conditions, forecast rainfall and temperature for the incoming six months and associated risks for each province. The prototype risk forecast was simply based on the predicted rainfall anomaly (hazard), affected population density (exposure) and poverty incidence (vulnerability).

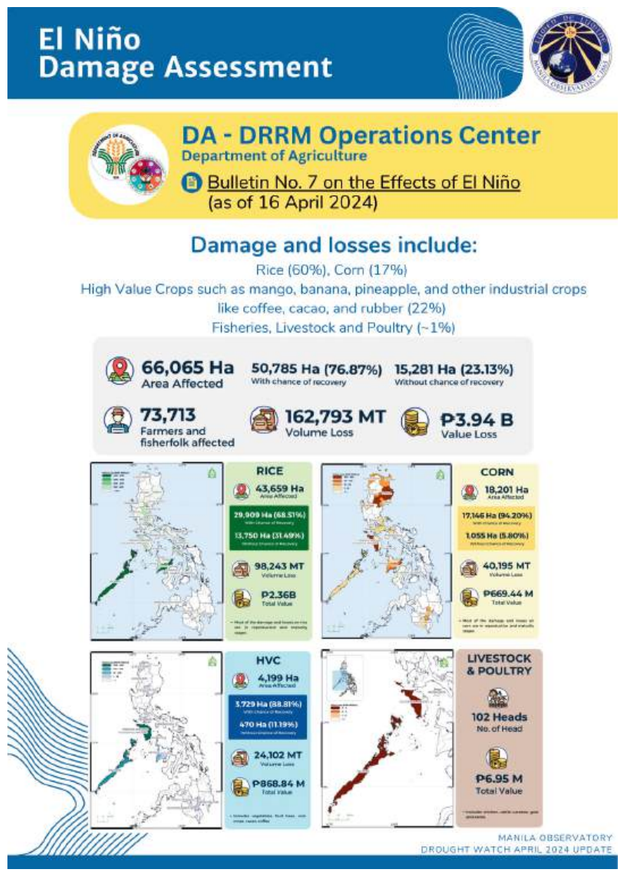
The drought bulletin also featured an infographic of possible response measures during the El Niño event, as well as additional information on ENSO, including historical drought events and their impacts, and other sources of data and information. In January 2024, supplementary information on historical impacts to agriculture, food security, economy and health were highlighted. By May 2024, reported impacts from the current episode were included in the report, e.g. rise in heat-related illnesses, fire incidents, increase in power demand, water supply disruptions and damage to agriculture and fisheries.

The last bulletin was released in June 2024, when a La Niña "Watch" level was raised by the APCC. This included the latest available data from the NDRRMC* and DA*, listing the damage and losses attributed to the drought event.



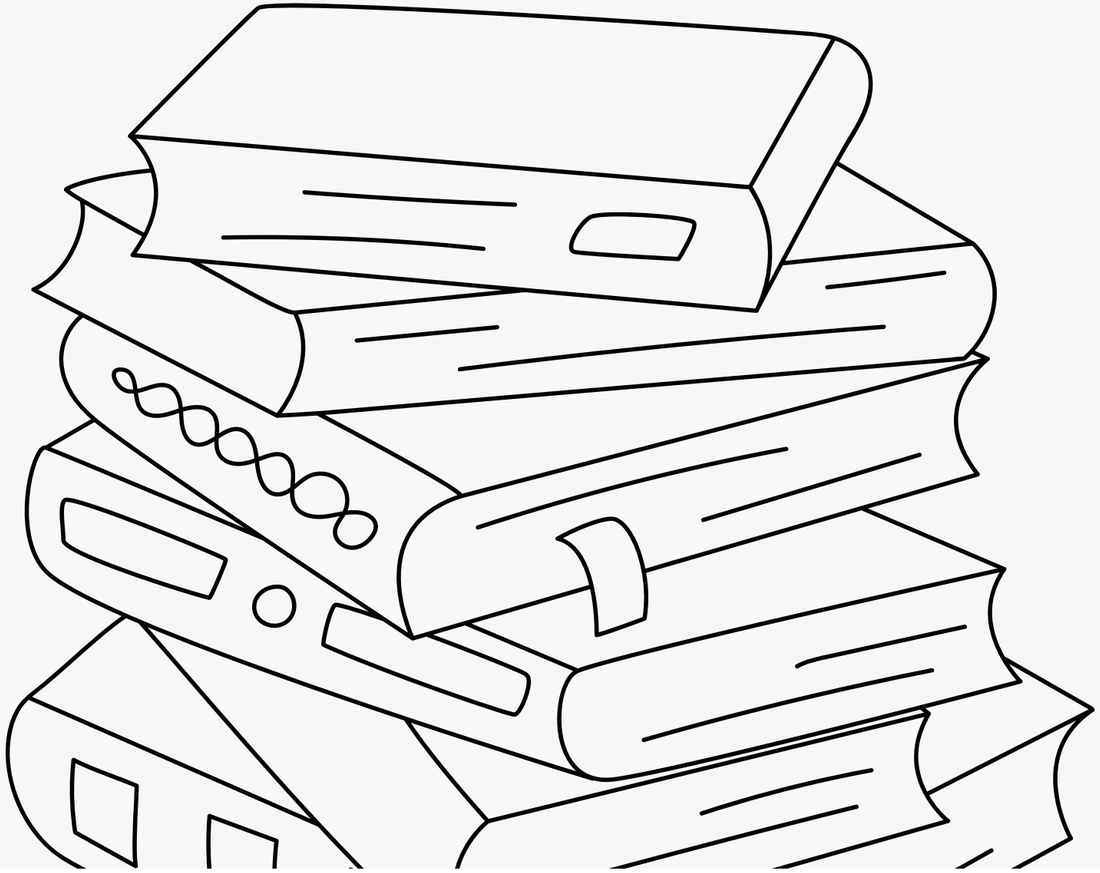






** National Disaster Risk Reduction Management Council*
** Department of Agriculture*

PUBLICATIONS AND PRESENTATIONS



SCIENTIFIC ARTICLES / REPORTS

Olaguera LMP, Manalo JA, Bathan A and Matsumoto J. 2024. Quantifying the influence of the Madden–Julian oscillation on rainfall extremes during the northeast monsoon season of the Philippines. Atmospheric Science Letters, p.e1232. https://doi.org/10.1002/asl.1232

Tana EA, Olaguera LMP, Llorin AG, Dado JM, Cambaliza MO, Cruz FA, Villarin JRT, Matsumoto J. 2024. Patterns and Drivers of Heavy and Extreme Hourly Rainfall Events over Metro Manila, Philippines. Theoretical and Applied Climatology (Springer), 155: 5015-5029. https://doi.org/10.1007/s00704-024-04899-6

Chung JX, Juneng L, Santirisirisomboon J, Ngo Duc T, Phan-Van T, Trinh-Tuan L, Cruz F, Dado J, Srisawadwong R, Gunawan D, McGregor JL, Sasaki H, Murata A, Ngai ST, Singhruck P, Faisal Modh MS, Aldrian E, Salimun E, Tangang F. 2023. Future changes in mean and extreme precipitation over Peninsular Malaysia using CORDEX-SEA 5 km simulations. APN Science Bulletin, 13(1). https://doi.org/10.30852/sb.2023.2348

Olaguera LMP, Llorin AGA, Magnaye AMT, Cruz FT, Villarin JRT, Topacio XGV. 2023. Observed characteristics and seasonality of the diurnal patterns of precipitation over Metro Manila, Philippines. Theoretical and Applied Climatology 155, 1123–1138. https://doi.org/10.1007/s00704-023-04684-x

[Scientific Report] Zachariah M, Clarke B, Barnes C, Kimutai J, Sivanu S, Ybañez RL, Otto F, Philip S, Arrighi J, Falk K, Cruz FA, Avila F, Olaguera LM, Petilla CE. 2024. Reducing vulnerability and improved land management needed with increasing heavy rainfall in Mindanao Island, southern Philippines. http://hdl.handle.net/10044/1/109543

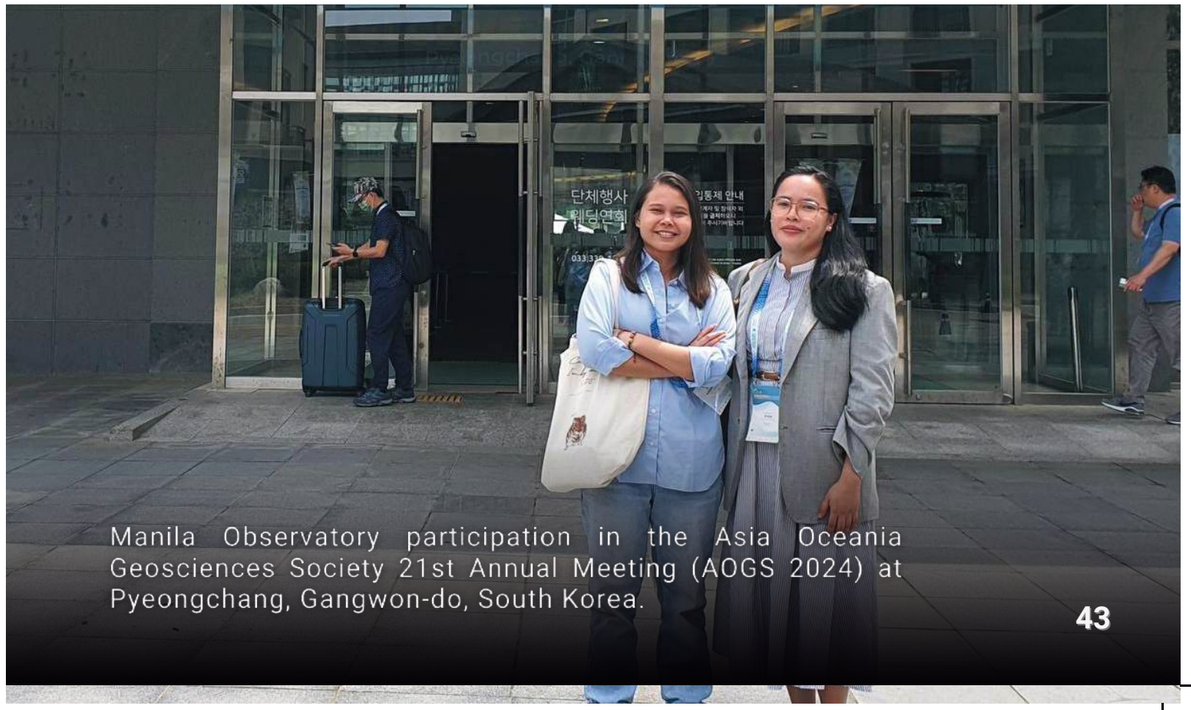
[Web Article: World Weather Attribution] Reducing vulnerability and improved land management needed with increasing heavy rainfall in Mindanao Island, southern Philippines https://www.worldweatherattribution.org/reducing-vulnerability-and-improved-land-management-needed-with-increasing-heavy-rainfall-in-mindanao-island-southern-philippines-2/

CONFERENCE PRESENTATIONS

Loqueloque D, Dado JM, Cruz F, Uy SN, Gozo E, Villarin JRT. “Enhancing Extreme Rainfall Monitoring in the Philippines Using Average Recurrence Interval and Regional Frequency Analysis Approach”. Asia Oceania Geosciences Society (AOGS) 21st Annual Meeting, Gangwon-do, South Korea, June 23-28, 2024

Bañares E, Bañaga P, Gozo E, Lorenzo GR, Topacio XG, Llorin AG, Avila F, Cruz F, Simpas, JB, Uy SN, Villarin JRT. "Current Practices and Challenges in Managing Automated Weather Station Data and Networks in Philippine Cities". Asia Oceania Geosciences Society (AOGS) 21st Annual Meeting, Gangwon-do, South Korea, June 23-28, 2024

Pacheco JA, Olaguera LMP, “Numerical Simulations of the Impact of Laguna Lake on the Diurnal Cycles of Temperature, Relative Humidity, and Winds over Greater Metro Manila.” Oral Presentation, 3rd International Vietnam Conference on Earth and Environmental Sciences, Quy Nhon, Vietnam, November 27-December 1, 2023



Manila Observatory participation in the Asia Oceania Geosciences Society 21st Annual Meeting (AOGS 2024) at Pyeongchang, Gangwon-do, South Korea.

Dr Lyndon Mark P. Olaguera of the Manila Observatory's Regional Climate Systems (RCS) Laboratory at the Typhoon Science and Technology Research Center (TRC) of Yokohama National University, Japan

CONFERENCE PRESENTATIONS

Pascua P, Olaguera LMP, Visaga SM. "Sensitivity of WRF-Solar Forecasts to shortwave radiation and microphysics schemes over the Manila Observatory, Philippines." Oral Presentation, 3rd International Vietnam Conference on Earth and Environmental Sciences, Quy Nhon, Vietnam, November 27-December 1, 2023

Petilla CE, Tonga LP, Olaguera LMP, Matsumoto J. "Changes in intensity and tracks of tropical cyclones crossing the central and southern Philippines from 1979 to 2020: An observational study." Poster, First International Workshop of the Typhoon Science and Technology Research Center, Yokohama Japan, November 8-9 2023

Petilla CER, Olaguera LMP, Cruz FA, Maquiling JT, Villarin JRT. "Numerical simulations on the impact of SST magnitude on the simulated track and intensity of Tropical Storm Washi (2011)." Poster, First International Workshop of the Typhoon Science and Technology Research Center, Yokohama Japan, November 8-9 2023

Dado JM, Cruz F, and co-authors. "Evaluation of rainfall in high-resolution simulations over Mindanao". International Conference on Regional Climate ICRC-CORDEX 2023, Trieste, Italy, September 25-29, 2023

Tibay J, Dado JM, Cruz F, and co-authors. "Sensitivity analysis of RegCM4.7 in simulating TC characteristics over CORDEX-SEA region". International Conference on Regional Climate ICRC-CORDEX 2023, Trieste, Italy, September 25-29, 2023

Henson KC, Olaguera, LMP, Cruz FAT, Villarin JRT. "The sensitivity of extreme rainfall simulations to model parameters in the Weather Research and Forecasting model during two enhanced southwest monsoon events in the Philippines." VII Convective Permitting Climate Modelling Workshop, Bergen Norway, August 29-31, 2023.

Matsumoto J, Olaguera LMP, Manalo J. "The contribution of non-tropical cyclone vortices to the rainfall and extremes during summer and winter seasons in the Philippines." Abstract of the Asia Oceania Geosciences Society Annual Meeting, AS01-AO36, Singapore, July 30 - August 4, 2023

OUTREACH INITIATIVES

F Avila and R Teodoro as resource speakers on “El Niño-induced Drought: Signs and Triggers for Anticipatory Action and Response” in seminar “Facing Drought Together: Understanding and Action” organized by BRAC Philippines, Cotabato City and online, May 21, 2024

F Cruz in “Workshop on Robustness of Climate Change Information for Decisions”, Brussels, Belgium, April 22-24, 2024

F Cruz, J Dado and C Vicente in workshop of ASEAN Climate Change Initiative of MO and Asean Centre for Biodiversity, Los Baños, Laguna, April 11-12, 2024

LM Olaguera as Invited Speaker at JAMSTEC, Yokohama Japan and Typhoon Science and Technology Research Center, Yokohama National University, February 8-22, 2024

Participation of J Pacheco and P Pascua in “3rd International Vietnam Conference on Earth and Environmental Sciences” in Quy Nhon, Vietnam, November 27-December 1, 2023

F Cruz as Resource Person for DENR Brown Bag Session on “Understanding Climate Scenarios for a Safer Tomorrow”, DENR, November 14, 2023

Participation of LM Olaguera, CE Petilla and T Pe in “The First International Workshop of the Typhoon Science and Technology Research Center” in Yokohama Japan, November 8-9, 2023

Participation of LM Olaguera in “The Joint PI Meeting of JAXA Earth Observation Missions FY2023 (GPM, EarthCARE)” in Shinbashi, Tokyo, Japan, November 6-7, 2023

F Cruz as Panelist in “Barangayan para sa Kalikasan at Bayang Matatag” hosted by DENR, SMX Convention Center, October 12, 2023

Participation of J Dado and J Tibay in “International Conference on Regional Climate ICRC-CORDEX 2023” and “11th Workshop on the Theory and Use of Regional Climate Models” hosted by ICTP in Trieste, Italy, September 25-October 6, 2023

J Dado as Invited Speaker for “South-South Climate Information and Services Conference” hosted by GIZ, UP BGC campus, August 10, 2023

Internship of Ms Evalyn Endriga and Ms Jelly Beth Vasquez from Visayas State University with DSD and RCS labs from July 3 - August 11, 2023

Participation of Manila Observatory as an institutional member of the Consultative Group of Experts (CGE) for the development of the Philippines’ National Adaptation Plan (NAP)

Participation of F Cruz as Technical Adviser to the Philippine Delegation to COP28, Dubai, UAE

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