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2021 PMS Annual Convention

Theme: "Disastrous Hydro-Meteorological Events in the Middle of Pandemic: Challenges, Lessons Learned and Way Forward"

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Dense Rainfall and Wide Lightning Observation during Typhoon Ulysses (Vamco)

Hisayuki Kubota[1]*, Yukihiro Takahashi[1], Mitsuteru Sato[1], and Glenn Vincent Lopez[2]

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ABSTRACT

Tropical cyclones (TCs) were very active over the Philippine Sea in 2020 due to La Niña phase condition. Five typhoons landed in the Philippines and seven passed Philippines on the tropical depression stage. Here we focus on Typhoon Ulysses (Vamco) generated on 9 November over the Philippine Sea and landed Philippines on 11 November which caused severe flood in Metro Manila. We installed 35 automatic weather and lightning observation systems called P-POTEKA in Metro Manila and lightning observation network over the western north Pacific using five very long frequency events trigger measurements called V-POTEKA at Palau, Guam, Manila, Okinawa and Serpong Indonesia under the ULAT (Understanding Lightning and Thunderstorm) of SATREPS (Science and Technology Research Partnership for Sustainable Development) project in the Philippines.

When Typhoon Ulysses landed, rainfall amount reached more than 200mm in 48 hours on the eastern side of Metro Manila along Marikina river from 11 to 12 November. Maximum rainfall of 221.5mm was measured at Brgy Nagkaisang Nayon. Heavy rainfall was concentrated from midnight to morning on 12 November. Lightning was active around Typhoon Ulysses over the Philippine Sea when TC was generated on 9 November and before landfall on 11 November. Before landfall lightning were concentrated on the east of the Philippines near the coastal area. We also investigated other TCs on 2020.

Keywords: lightning, SATREPS, Typhoon Ulysses, ULAT, V-POTEKA

Tropical Cyclone Forecasting and Warning During Pandemic

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ABSTRACT

The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) issues tropical cyclone (TC) analyses, forecasts, and warnings over the Philippine Area of Responsibility (PAR). The agency continues to provide these services to the public and stakeholders even during the COVID-19 pandemic. A total of 22 TCs developed within or entered the PAR during the 2020 season. Most of the TCs, roughly 81%, developed within the area of responsibility. A total of 12 TCs made landfall over the archipelago in which 3 TCs made landfall as typhoon and 1 TC as super typhoon. Super Typhoon Rolly (international name Goni), the strongest TC over the western North Pacific, brought catastrophic winds and torrential rains resulting to extensive damages over Bicol Region. This presentation discusses the current tropical cyclone operations of PAGASA, the work setup during the pandemic, the challenges, and concludes with a look ahead at opportunities to improve TC forecasting and warning.

Keywords: tropical cyclone forecasting, PAGASA, western North Pacific 2020 season

Local Early Warning System and Linkages with Partners

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ABSTRACT

Although multiple pathways and sources are readily available to educate and inform the people about the threats and whereabouts of hydrometeorological hazard, there is still the need for a more detailed information to supplement the actions for a continuing prevention and mitigation, preparedness, and response. This gives birth to the establishment of linkages from the warning agency such as PAGASA to the local Disaster Risk Reduction and Management (DRRM) Managers, Stakeholders, and Local Government Units (LGUs). The coordination and cooperation of the main actors in disaster management is one of the key factors in easing and managing the adverse effects of the hazard. The issuance of warnings plays an important role at the early, current, and post stage of an event as it serves as guidance and starting point in conducting disaster operations. This relationship causes the shifting of a reactive management to a proactive management or the integrated approach to reduce disaster risk. Individually, these agencies and local managers have the mandate to observe but collectively with the objective of attaining a disaster resilient community.

Keywords: Disaster Management, Emergency Communication, Pre-Disaster Risk Assessment, Capacity Building

Local Efforts and Challenges Faced during Super Typhoon Rolly in the Province of Albay

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ABSTRACT

The Province of Albay had prepared for the expected impact of Tropical Cyclone Rolly that occurred in October, 2020. The local efforts done by the province was to first developed a scenario, upon its entrance to Philippine Area of Responsibility (PAR), for a direct hit where, at scenario 1, expected impacts to affect the elements-at-risk would be the destructive wind, storm surge, flood, flash flood, mudflow and landslide.

At signal number 1, Albay prepared a scenario-based plan that was discussed in a meeting conducted four days before the impact. In an emergency PDRRMC full council meeting conducted at Signal Number 2, hazard assessment and capability evaluation were taken up. The tracking then of the typhoon was towards Northern Luzon. However, since it was detected a strong one, Albay had concluded that a scenario-based plan be put in place and executed which intention was just to be prepared for a direct hit. As it came closer, APSEMO kept on analyzing and interpreting the data released thru the severe weather bulletin issued by PAGASA which conclusion was to release the real-time warning information on flood, landslide, mudflow. flashflood and debris flow and the decision rule on wind and storm surge for the appropriate preparedness measures at the community level being the first line of defense.

The province has to maintain the Zero Casualty Objective hence, it applied the formula using real-time warning, communication protocol and evacuation procedures, consistent to its principle that, warning and evacuation is better than rescue.

The full support of the community remains as the main challenge. Their refusal to listen to official advisories will certainly result to casualty.

Keywords: APSEMO, disaster management, hazard assessment, preparedness measures

DOST-PCIEERD: DRR-CCA Call for Proposal Topics for FY 2023 Funding

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ABSTRACT

The Philippines, because of its location, is vulnerable to numerous natural disasters and climate change causes which result to catastrophic loss of lives and property each year. To help address this, the Department of Science and Technology-Philippine Council for Industry, Energy and Emerging Technology Research and Development (DOST-PCIEERD) will be opening the Disaster Risk Reduction and Climate Change Adaptation (DRR-CCA) Call for Proposals for possible FY 2023 funding on May 2021 with the general objective to alleviate the effects of seismic, hydrometeorologic and climate change-related hazards through enhancing the current methodologies, technologies and capabilities of the mandated agencies such as PAGASA, PHIVOLCS and DENR-Mines and Geosciences Bureau (DENR-MGB). The DRR-CCA program's R&D Initiatives are generally categorized into three (3) sub-programs namely, 1. Multi-Hazard Assessment Tools and Systems, 2. Vulnerability Assessment, Risk and Warning Communication Systems and 3. Localization of Observation and Forecasting Tools & Monitoring Networks. Under the Disaster Risk Reduction (DRR) Call for Proposal theme, R&D initiatives should address the identified research areas on Seismic Hazards such as tsunami, earthquake, volcanic lahar and/or landslides while Hydrometeorological Hazards topics should preferably focus on urban and river flooding as well as typhoons and thunderstorms. Lastly, under the Climate Change Adaptation (CCA) Theme, topics should cover Climate-related Hazards.

Keywords: DOST-PCIEERD Call for Proposals, Disaster Risk Reduction and Climate Change Adaptation (DRR-CCA)

Development of Impact-Based Forecasting and Warning System in the Philippines

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ABSTRACT

In the recent years, the occurrence of high-impact weather events has become more frequent and severe. Despite accurate and reliable warning information, significant impacts have still been recorded. This leads us to question, "why do good forecast result in a poor response"? Conventionally, warning centers primarily provides warnings based on meteorological thresholds and information are quite technical and general which do not necessarily provide specific guidance for a particular circumstance. The development of Impact-Based Forecasting (IBF) attempts to translate hazard information into potential impacts thus shifting information from what the weather will be to what the weather will do which effectively supports disaster managers and local stakeholders in instituting proper and appropriate response mechanisms during significant weather events. The system integrates information on risk (hazard, exposure and vulnerability) and likelihood of hazard determined through ensemble and probabilistic forecast which account for the information of forecast uncertainty. The strong partnership with the Local Government Units (LGUs) and other critical stakeholders resulted to development of impact table and standard operating procedures (SOPs) on IBF and enabled smooth data sharing activity necessary to design impact-based warning. The system utilizes a color-coded (green, yellow, orange, red) risk matrix which contains information on the likelihood of potential impacts. Despite the promising result of study, findings from pilot testing activities suggest the need for further refinement of impact tables and tailor-fit other information to anchor the need for local-based early warning services and for effective local disaster risk reduction and management.

Keywords: impact-based forecast, impact table, risk analysis, risk matrix

Probabilistic Assessment of Tropical Cyclone Severe Wind Hazard in the Philippines

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ABSTRACT

Tropical cyclones (TCs) are among the most catastrophic natural hazards that can cause disasters in the Philippines. Among the hazards brought about by TCs, severe winds pose a great potential threat to life, property, and infrastructure. The Tropical Cyclone Risk Model (TCRM), a statistical-parametric model developed by Geoscience Australia was utilized to generate the wind field for each TC event. It was calculated using a radial profile method to translate pressure to wind, and a boundary layer scheme to account for surface friction and wind field asymmetry. Regional wind speeds with a range of annual exceedance probability (AEP) or RPs were generated and translated into local wind hazard using site multipliers developed from land cover data and resampled 20-meter Interferometric Synthetic Aperture Radar (IfSAR) digital elevation dataset. This is to incorporate the effects of topography, geographic terrain, and shielding effects of structures. It can also determine the wind swath of a tropical cyclone event using an event-based wind hazard assessment. Results showed that the eastern seaboard of Luzon and Visayas and the northern part of Cebu Province are more susceptible to experience higher wind magnitude. There is an increase in the actual wind speed in the mountainous region, while reduction was found in densely built-up areas, such as Cebu City and neighboring coastal municipalities. Probabilistic severe wind hazard outputs are useful for engineers in updating the wind zoning map for building design, and for disaster managers and planners to identify areas that are most likely to suffer significant TC severe wind damage and to understand its potential danger thus improving the resilience of the community.

Keywords: hazard modeling, severe wind, probabilistic assessment, tropical cyclones, return period

Neural Network Based Rainfall Prediction in Mactan, Cebu Using Synoptic Observation Data

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ABSTRACT

Predicting rainfall is one of the most difficult tasks in meteorology. In this study, the proponents use neural networks to predict rainfall using synoptic observation data. Synoptic data from 2000 to 2020 in Mactan Station in Cebu, Philippines were used in the study. The proponents used two different neural network architectures; one layer, and three layers feedforward multilayer perceptron neural networks. The proponents experimented with different input-output configurations, and different temporal resolutions (6-hourly, daily, monthly). Results show that longer input history produces better model fit, and longer output time steps produces worse model fit. Also, the models at temporal resolution of daily and below cannot produce decent outputs only reaching coefficient of determination less than zero and correlation coefficient less than 0.1 while reaching correlation coefficient greater than 0.5 and coefficient of determination greater than zero on the monthly temporal resolution. The results suggest that using only synoptic observation data is not sufficient to predict rainfall on temporal resolutions less than a month.

Keywords: feed forward neural networks, rainfall forecasting, multilayer perceptron

Extreme Temperature and Precipitation Events in Quezon Province: A Comparative Analysis for Alabat, Infanta, and Tayabas Stations

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ABSTRACT

The Quezon Province has diverse topography condition where lands are adjacent rivers, mountain, an island, a strait, facing the ocean, forests, and rural and urban community. This study aims to examine the trend in extreme precipitation and temperature events in Alabat, Indanta, and Tayabas, Quezon. The data used were derived from the Prediction of Worldwide Natural Resources (POWERLARC) from 1990-2019. The data undergone a quality control from rClimDex statistical tool using the variables precipitation and minimum and maximum temperature. Overall, results show that Quezon Province experiences significant nighttime warming in all stations considered and daytime warming in Infanta. Furthermore, a significant increase in warm days were found in Infanta and Tayabas and significant increase in warm nights in all stations considered with highest trend found in Alabat Station.In terms of cool days, a significant decrease in trend was found in stations near bodies of water (Alabat and Infanta). Moreover, all stations show significant decrease in trends in terms of number of cool nights, most specially in Alabat Station, followed by Infanta, then Tayabas. In terms of extreme precipitation events, all stations showed a significant increase in very wet days (95^{th} percentile), especially in Infanta, and significant increase in extremely wet days (99^{th} percentile), particularly in Tayabas. In spite of the differences in the significant trends in extreme temperature and temperature events, only trends in warms nights had significant differences in all stations. Differences in trends of extreme climate events showed sensitivity of the location on the changes of its environment and its impact of different climate drivers.

Keywords: rClimDex, trend, extreme events, climatology

Climate Variability of Small-Islands in the Philippines: An Analysis for Basco, Batanes, Virac, Catanduanes, and Coron Palawan

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ABSTRACT

Small islands are susceptible to climate change and vulnerable to extreme events due bodies of water nearby. This study sought to find the climatology, trend, and difference on precipitation, temperatures (mean, minimum, and maximum), and wind speed in three selected islands: Basco, Batanes, Coron, Palawan, and Virac, Catanduanes from January 1989 to December 2019. The 31-year daily data were taken from NASA Langley Research Center (LaRC) POWER Project and were statistically analyzed by using monthly time series graphs and trends and using ANOVA for the statistical comparison of the stations. The findings of the study show there is an increasing trend on precipitation and temperatures of the three stations. Furthermore, the wind speed in Basco is increasing while Coron and Virac is decreasing implying. Also, results showed a significant difference in precipitation, temperatures (mean, minimum, and maximum), and wind speed of Basco, Batanes, Coron, Palawan, and Virac, Catanduanes. This implies that precipitation, temperatures (mean, minimum, and maximum), and wind speed varies depending on the location. Due to the changes in the climate, there are several impacts that cause disturbances and destructions in the location. The risk of continuous and intense climate should be controlled. Mitigating the effects and impacts of climate change by studying and understanding the behavior should further researched in order to recover and stop the loses

Keywords: Statistical Analysis, Trend, Climatology, Climate Variability

Climate Difference Between Elevated Cities in the Philippines: A Case Study for Malaybalay, Tayabas, and Baguio City

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ABSTRACT

Understanding the climate on mountainous sites is vital as areas like mountain system is considered to hold complex and diverse ecosystem, have a great contribution on the hydrological systems, and is found to be more sensitive and vulnerable to climate change. Utilizing the 32-year long (1988-2019) of daily data of temperature and precipitation from NASA LarC POWER Project as well as the monthly wind speed and direction from NASA PSL, the study is focused on determining the climatological, annual, trend and variability of temperature and precipitation, the seasonal wind speed and direction of some elevated cities in the Philippines (Malaybalay, Tayabas and Baguio) as well as the climate difference between the stated locations. One-way Analysis of Variance was used to determine the significant difference on temperature and precipitation between stations. All of the area is seen to experience and observed warmest months during the months of April to June and coldest months during December to February. Climatological precipitation on Malaybalay is well distributed throughout the year. While the climatological precipitation in Tayabas and Baguio is prominent on the months of October to Decmeber and of May to October respectively. All of the location exhibits an increasing trend in both annual temperature and precipitation. Most prominent positive anomaly on temperature was observed during the year of 1998 on Malaybalay, Tayabas and Baguio when the strongest El Niño of all time occurred. Overrun of precipitation during the 2008 was caused by the intense Madden-Julian Oscillation. Prominent winds on DJF were coming from northeast while southwest winds were prominent during JJA. Difference in temperature was seen between all of the locations; Tayabas as the warmest and Malaybalay as the coldest. Difference in precipitation showed that Malaybalay experience a lower precipitation compared to the two stations.

Keywords: Climatology, Precipitation, Temperature, Statistical Analysis

An Analysis on Climate Trends in Mindoro Island

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ABSTRACT

The orographic effect of the mountain range in Mindoro may cause differences in climate within it. This study aimed to differentiate climate trends on the opposite sides of the Mindoro Island using the Calapan Station in the northeast side and San Jose Station in the southwest.30-year data from January 1990 to December 2019 were downloaded from from NCEP/NCAR Reanalysis 1 for wind data and POWER Release-8 (Powerlarc NASA) for average, maximum, and minimum temperature, relative humidity, wind speed, and rainfall. Correlation analysis were used to establish linkage of mentioned variables to the effect of ENSO and further analysis for the orographic effect of the mountain range.Wind rose was used for the analysis of wind intensity and direction, linear regression analysis was used for trends and variabilty of different climate variables. The orographic effect of the mountain range has caused the climate of both stations to differ between seasons and is most observed in boreal winter (DJF) and boreal summer (JJA). Trends of the variables except for wind speed are increasing and interannual variability of the meteorological variables are correlated to intense ENSO events. A 5-6-month lag of ENSO is also observed to the variables of the two stations. Furthermore, Calapan experiences hotter daytime temperature and colder nighttime temperature while San Jose experiences hotter average temperatures. During winter monsoon, Calapan has higher relative humidity and rainfall while during summer monsoon, San Jose receives higher relative humidity and rainfall and Calapan with hotter Max temperature. Finally, San Jose has stronger wind speeds than Calapan.

Keywords: topography, orographic effect, ENSO, mountain range

Extreme Temperature and Rainfall Profile in Highly Urbanized Cities in the Philippines: A Case Study for the Cities of Manila, Angeles City (Pampanga), Baguio City, and Olongapo City

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ABSTRACT

As urbanization continues to grow, the weather events on highly urbanized areas are being affected causing changes in extreme weather event frequenct. In this study, four highly urbanized cities in the Philippines were studied namely; Baguio City, Olongapo City, Angeles City and Manila to observe the trends on the temperature and precipitation anomalies and extreme temperature and rainfall events. The climate data used was acquired from NASA Langley Research Center (LaRC) POWER Project from January 01, 1989 to December 31, 2018. Results showed that there is a significant increase in temperature animalies in Baguio City, Olongapo City, Angeles City, and Metro Manila. Furthermore, an increase in warm nights were found in all cities involved and highest trend were found in Angeles City, followed by Baguio City, Manila City, then Olongapo City. However, warm days are found to be not significantly changing. Frequency of cool days and nights were found to be significantly decreasing, except Metro Manila during cool days. Olongapo City is found to be highest in decrease in trend in both cool days and cool nights. In terms of extreme precipitation events, only Manila showed a significant increase in extremely wet days. The significant decrease in cold nights and increase in warm nights suggest that the Urban Heat Island (UHI) effect on these cities is significantly affecting them. These highly urbanized cities are consistent in the growth of urbanization, the extreme events must be monitored to mitigate impacts of changing climate.

Keywords: Urbanization, Extreme Events, Trends

Analysis of Different Weather Parameters Between Laoag City and Baguio City

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ABSTRACT

Different geographical areas of a large metropolis have varied impacts on weather. The purpose of this study was to analyze the different weather parameters of Laoag City and Baguio City using a 31-years daily data obtained from Global Summary of the Day (GSOD). Trend analysis, correlation analysis, and comparative analysis were employed in the study. Results shows a significant increase of temperature for both stations with notable increase duing the 1998 El Niño event. Moreover, rainfall and windspeed were found to be significantly increasing. Comparing the two stations, significantly higher trend was found in Baguio City for the increase in temperature and rainfall. In contrary, Laoag City was found to have significant increase in trend in nighttime temperature and wins speed while a decreasing trend in Baguio City. Difference in location and environment, results to difference in behaviour of weather parameters. It is important to thoroughly understand changes in weather condition within different settings in order to recognize the risk potential from natural disasters and to take effective countermeasures.

Keywords: Climatology, Statistical Analysis, Trends

Comparative Analysis in Climate of the Provinces in Panay Island, Philippines from 1989-2018

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ABSTRACT

Climate change is likely to have a significant impact on water resources in the Philippines in general, and in Panay River Basin, in particular. This study analyzes the rainfall and temperature (maximum, minimum, and average) in the four (4) provinces, namely Aklan, Antique, Capiz, and Iloilo situated in Panay Island, Philippines. The climate data used were derived from the Prediction of Worldwide Energy Resources (POWER) of the National Aeronautics and Space Administration (NASA). This study employed comparative statistics determine the existence of variability weather parameters in Panay island using climatology, trend analysis, and analysis of variance (ANOVA). Result showed that generally Panay Island has a unimodal rainfall pattern with a pronounced dry and wet season. For the maximum, minimum, and average temperature, Panay experiences the highest during MAM (March April and May) and lowest during DJF (December January and February). The result revealed that Antique receives the most amount of rain in the Island while Iloilo receives the least. For the maximum temperature, Iloilo experiences the highest and Aklan has the lowest. In terms of average temperature and minimum temperature, Antique has the highest in Panay while Iloilo has the lowest for the two parameters. Thus, the annual trend of precipitation, average temperature, minimum temperature and maximum temperature in the island are expected to rise gradually in the upcoming years except only for the maximum temperature in Iloilo which is slowly declining. Differences in temperature for different areas are caused by differences in altitude, distance from the sea, cloud cover, types of land surfaces, etc. Nevertheless, adaptation strategies to climate change and variability in Panay Island as a whole would be effective.

Keywords: Climatology, Statistical Analysis, Trends

Investigating the Climatology of Precipitation and its Influencing factors under Aparri, Cagayan and Virac, Catanduanes from 1994 to 2019

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ABSTRACT

Coastal towns are highly vulnerable to the effects of climate change. Areas near bodies of water experience unusual and troubling changes in their environment's weather patterns. This study was made in order to investigate the change in behavior of precipitation, temperatures (maxima, minima and mean), and windspeed and the influencing factors of precipitation in Aparri, Cagayan and Virac, Catanduanes for 25-year period (1994-2019). Daily data of temperature, windspeed, and precipitation were downloaded from the Global Summary of the Day of National Oceanic and Atmospheric Administration's National Climatic Data Center (NCDC/NOAA). ENSO indices and PDO index were downloaded from NOAA Physical Science Laboratory (PSL) and Japan Meteorological Agency (JMA) websites, respectively. Simple linear regression was employed to determine trend and Pearson Correlation was used to determine which global climate drivers mostly influenced climate variables. Results show that precipitation, temperature minima and mean temperature of Aparri is increasing while its temperature maxima and windspeed is decreasing. Whereas, Virac's precipitation, temperatures (maxima, minima and mean) are increasing while its windspeed decreases. Both of the areas' monthly precipitation anomaly were influenced by SOI and ONI (ENSO indices) and temperatures maxima and minima. This paper contributes to a better understanding of the climate variability over Aparri and Virac and its predictability.

Keywords: Climatology, Statistical Analysis, Trends

Analysis on Trend and Differences of Climate on Coastal Areas near Strait

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ABSTRACT

Analyzing historical temperature and precipitation is essential in making weather and climate prediction for it will be beneficial for everybody. The purpose of this study is to analyse the trend on historical temperature and precipitation in Iloilo City, Infanta, and Tagbilaran in terms of its climatology and variability. The daily data of maximum temperature, minimum temperature and precipitation from the year 1990 to 2019 were gathered from the datasets of NASA POWERLarc 8. Results shows that all location shows a minimal increase in mean temperature and minimum temperature, and only Infanta shows a minimal increase in maximum temperature for both Iloilo and Tagbilaran shows a decreasing trend. In terms of precipitation, all location has an increasing trend. High amount of precipitation was observed during JJA and SON in all location, however, DJF also shows a high amount of precipitation in Infanta. Precipitation during JJA and SON is due to the southwest monsoon and TCs, and northeast monsoon causes precipitation in Infanta during DJF. Since these locations are lies near the coast, they are vulnerable to flash floods. Thus, an earlier action plan to reduce the effect of flash floods is recommended to prevent a massive destruction of properties and loss of lives. Result of this study will be beneficial for the adoption of measures in preparation for the possible impact of climate change in the areas.

Keywords: Climatology, Statistical Analysis, Trends, Coastal Areas

Climate Analysis of Coastal Areas: A Case Study for Aparri, Calatagan, Dingalan and Zamboanga

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ABSTRACT

Coastal area is the location where there is a transition area between land and sea and often may experience different weather conditions compared to the inland locations. This paper studied the climate, trend and variability of each parameter of Aparri, Cagayan; Dingalan, Aurora; Calatagan, Batangas and Zamboanga City, Zamboanga del Sur and find the similarities and/or differences of coastal climate with respect to their direction towards the sea and later on compared the results to all the locations. Dataset for temperature and precipitation were gathered fromNASA Langley Research Center (LaRC) POWER and NOAA NCEP for the wind speed and direction. Results show that the trend of average temperature for all location increased at a minimal rate and that Dingalan has the lowest 30-year average temperature while Zamboanga City has the highest. The monthly precipitation trend of all locations increased at a moderate amount for 30 years. Dingalan receives the most rainfall amount while Zamboanga receives the least. The temperature normal of all locations show a nearly identical flow of temperature except for Zamboanga City. While for the precipitation normal, the four locations show a nearly same pattern of rainfall amount. The highest wind speeds for all locations mostly blows from north and northeast. On a seasonal cluster, DJF, MAM, JJA, SON, the wind blows dominantly from different directions. During DJF the prevailing wind direction is northeast due to the presence of Northeast Monsoon which carries dry and cold air. On the other hand, during JJA prevailing winds are blowing from west and southwest due to the presence of Southwest Monsoon which carries warm and humid air with wet weather.

Keywords: Climatology, Statistical Analysis, Trends, Coastal Areas

Trends in Temperature, Windspeed, and Precipitation in Central Luzon

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ABSTRACT

There are limited studies regarding the effect of different weather parameters to the agricultural sector of Central Luzon, studies like such are important in understanding farther effects of change in climate to the agricultural sector of Central Luzon. This study employed the time series of temperature (maximum, minimum, and mean), windspeed, and precipitation over the period of 1995-2019 to analyze and compare annual averages and trends of Central Luzon with the location Cabanatuan, Dagupan, and Iba. In this study, the temperature (maximum, minimum, and mean) and precipitation of the three locations were found to have an increasing trend. One way ANOVA (analysis of variance) is used to test the significance of the weather parameters used in the study with different locations. The temperature (maximum, minimum, and mean) of Cabanatuan, Dagupan, and Iba was found to have a statistically significant difference. There is variability between the average values of the three locations, while there is no significant difference in terms of precipitation.

Keywords: Climatology, Statistical Analysis, Trends

On the Spatio-Temporal Characteristics of the Dry Rainy Season During 2020 over Luzon Island, Philippines

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ABSTRACT

In this study, we investigate the characteristics of the southwest monsoon season (i.e., JJAS) during 2020 over Luzon Island, which is the driest season on record since 1979. Previous studies have demonstrated that a weak southwest monsoon season in the Philippines is typically preceded by an El Niño event and followed by a La Niña event in the ensuing fall and winter. Indeed, a weak El Niño developed from the October to November season of 2019 through the February to April season of 2020 and a La Niña developed starting from the JAS season of 2020. Therefore, the prolonged dry weather condition during the JJAS season of 2020 was expected.

The statistical analyses of rainfall show that the majority of the days during the JJAS season of 2020 have rainfall amounts that are less than 5 mm day^{-1} and fewer occurrences of days with rainfall amounts above 20 mm day^{-1} compared with other years, which makes this year rather unusual. The Tropical Cyclone (TC) activity was suppressed with only one TC in June that crossed the country or came within 100 km from the coast. Further analyses of the large-scale circulation features show enhanced western North Pacific Subtropical High (WNPSH) and weak monsoon westerlies that contributed to the suppressed rainfall during 2020. The enhanced WNPSH can be attributed to the La Niña conditions and warmer sea surface temperatures over the tropical Indian Ocean and Maritime Continent.

Keywords: dry weather conditions, southwest monsoon, western North Pacific Subtropical High, La Nina

Severe Wind Risk Assessment for Cebu City, Philippines

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ABSTRACT

Severe wind hazard caused by tropical cyclones (TC) is among the most devastating hydrometeorological hazards that contribute to loss of lives and damages to infrastructure in the Philippines. In this study, risk assessment was conducted for Cebu City, Philippines, by measuring the physical damage, structure damage, and affected population of event-based and probabilistic-based TC-induced wind. Severe wind risk is estimated as a function of the interaction among wind hazard, building exposure and the vulnerability of building structures. Local wind speeds reflecting effects of land cover, shielding and topography of Cebu City were utilized as hazard data to accurately estimate potential damages. Population and buildings exposure data were adapted from the Philippine Statistics Authority (PSA) census and the Rapid Earthquake Damage Assessment System (REDAS) surveyed data managed by the Philippine Institute of Volcanology and Seismology (PHIVOLCS). Lastly, vulnerability and fragility curves developed by the University of the Philippines - Institute of Civil Engineering (UP-ICE) based on improved building typologies were employed to determine possible damage states of exposed structures. The vulnerability curves were used to compute for floor area damage per building type, which estimates economic loss. Meanwhile, the fragility curves are translated into damage states to calculate the number of damaged houses, which estimates affected population. Damage for each structure type is aggregated down to the barangay level. Risk information derived from the risk calculation is used to generate severe wind risk maps for Cebu City. Risk map outputs show that damages vary spatially, while barangays with houses predominantly made of wood or makeshift materials suffer greatest damage at any return period. In particular, barangays with light wood, bamboo and concrete frames like Buhisan, Busay, and Guba were estimated to have the greatest floor area damage and number of completely damaged houses.

Keywords: severe wind risk assessment, tropical cyclones, the Philippines, Cebu City

Statistical assessment of CMIP5 GCMs in simulating precipitation, surface air temperature, and teleconnection to ENSO in the Southeast Asia region

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ABSTRACT

The reliability of downscaled regional climate model (RCM) outputs is influenced by the inherent systematic bias acquired from the forced large-scale global climate models (GCMs). This study employed various statistical methods to determine which among the fifth Coupled Model Intercomparison Project (CMIP5) models perform best over Southeast Asia in terms of simulating precipitation and temperature over the period from 1986-2015. Temperature simulations exhibit notable coherence with the observed in terms of annual variability showing systematic cold bias over China during the winter season. Rainfall simulations also follow the annual cycle of the observed but deviate largely depending on the season. The models tend to simulate summer convective and tropical cyclone rainfall poorly but overestimate during the winter season. The Empirical Orthogonal Function (EOF) analysis was also employed to examine possible spatial modes and variability of large-scale systems. The first EOF mode (Mode 1) of the ERA5 precipitation explains 9.8% of the total variance. The principal component of Mode 1 (PC1) characterizes a strong signal of El Niño Southern Oscillation (ENSO) with correlation values of -0.51 and -0.71 for two (2) ENSO indices; ENSO-Modoki (EMI) and Oceanic Niño Index (ONI). This signal is apparently found dominant in the winter season. The spatio-temporal pattern of ERA5 were also manifested in the GCMs like CCSM4, GFDL-ES-M2M, HADGEM2-CC, and HADGEM2-ES which had the least relative errors of winter rainfall correlation to Niño 3.4. Applying two (2) ranking methods such as M_1 score and relative errors statistics, top-performing GCMs include CESM1-CAM5, CCSM4, CESM1-BGC, GFDL-ES-M2M, and MIROC5 are recommended for downscaling. However, ENSEMBLE mean still outranks the individual models' performance.

Keywords: global climate models, model evaluation, Empirical Orthogonal Function, Southeast Asia, ENSO

Society Profile

The **Philippine Meteorological Society, Inc.** (PMS) is a non-stock, non-profit governmental organization dedicated to the advancement of the atmospheric sciences and related disciplines in the Philippines.

Objectives of the Society

- Formulates, implements and coordinates projects to strengthen education, research and development in the atmospheric and related sciences;
- Establishes linkages with universities/colleges, operational forecast centers/offices, meteorological societies, non-government organizations and the private sector;
- Conducts research and extension services in various sectors impacted by climate change;
- Conducts training, seminars, workshops, symposia, etc. on atmospheric science and related disciplines;
- Publishes and distributes results of research and other scientific information on atmospheric and other related fields;
- Promotes meteorology, hydrology, climatology, agrometeorology, and astronomy as a profession; and
- Administers gifts, grants and donations of cash, property and services that will redound to the benefit of the society.

Society's mission

- To develop and disseminate knowledge of meteorology and related hydrologic sciences (hereinafter referred to as "Meteorology")
- To promote and advance the professional application of Meteorology
- To encourage collaboration amongst Members of the Society, individuals, bodies both corporate and non-corporate who may share the Society's interest in Meteorology
- To promote among the public an understanding of weather and an appreciation of the value of Meteorology and its applications

Society's Structure

The Society's affairs are run by an elected Board of Trustees, within the constraints of the By-laws of the Society. The Society is served by Executive officers composed of a President, a Vice-President, Secretaries, a Treasurer, an Auditor and a Business Manager duly appointed by the Board of Trustees. In addition, the Board of Trustees appointed members to serve certain committees such as the Membership and Awards Committee.

Services Offered by the Society

- Consultancy (weather, climate, hydrology, air pollution and water quality assessment)
- Client-customized weather forecasts and extended outlooks
- Wind and wave forecast
- Capacity building in the mitigation of impacts of extreme weather and climate
- Conducts lectures, seminars and conference on current environmental issues

Past Activities of the Society

In order to meet its responsibilities and challenges, the PMS has sponsored a number of symposia both local and international.

- 2020 PMS Annual Convention – 21-23 July 2020
  Theme: “Current Trends, Challenges and Opportunities in Meteorology”
- METeorology for YOUng Scientists (MET4YOU) – 6 March 2020
- 5th Pag-Asa Para sa mga Bata: A blood-letting Activity – 26 June 2019
- IEC to PAGASA Non-Technical Personnel (in line with the celebration of the 2019 Typhoon and Flood Awareness Week) 19 June 2019
- Essay Writing Contest (in line with the celebration of the 2019 Typhoon and Flood Awareness Week) 19 June 2019
- 4th Pag-Asa Para sa mga Bata: A blood-letting Activity – 26 March 2019
- Mangrove Tree Planting – 23 March 2019, Pagbilao Mangrove Experimental Forest, Pagbilao, Quezon
- 2019 PMS Annual Convention – March 20, 2019
  Theme: “Leveling up Meteorological Service to Meet Societal Needs”
- 2018 PMS Annual Convention – March 15, 2018
  Theme: “Recent Advances in Philippine Weather, Climate, and Hydrologic Information
- 12th National Meteorological Hydrological Convention – March 2, 2017
  Theme: “Shaping the Future of Philippine Meteorology and Local Governance”
- 11th National Meteorological Hydrological Convention – February 17-18, 2016
  Theme: "The Role of Meteorology in Disaster Prevention and Mitigation"
- 10th National Meteorological Hydrological Convention – November 19-20, 2014
  Theme: "Extreme Weather and Climate: Impacts and Preparedness"
- 9th National Meteorological Hydrological Convention – February 20-21, 2014
  Theme: “State-of-the-Art Technologies in response to Extreme Weather Climate Events”
- 8th National Meteorological Hydrological Convention – February 21-22, 2013
  Theme: “Today’s Meteorologists: Scaling up Effective Early Warning Services (EWS)”.
- 7th National Meteorological Hydrological Convention – November 17-18, 2011
  Theme: "Dots, Isobars and Meteograms: Understanding the Science of Meteorology"
- 6th National Meteorological Hydrological Convention - November 18-19, 2010
  Theme: “Adaptation Strategies: Building Blocks for a Climate Change Resilient Phil.”
- 5th National Meteorological Hydrological Convention – November 19-20, 2009
  Theme: “Understanding the Climate Change Issues: A Key to a better planning and investment.” Makati Convention Hall
- 4th National Meteorological Hydrological Convention – November 27-28, 2008
  Theme: “Connection and Fusion: Coping with Winds of Change.”
- Co-Organized the Symposium titled “Rediscovering Philippine Setting: Meteorology and Mineralization and Tectonics” – October 2-4, 2008
- 3rd National Meteorological Hydrological Convention – March 26-27, 2008
  Theme: “Climate Change: Local, Regional and Global Initiatives”
- 2nd National Meteorological Hydrological Convention – November 27-28, 2006
  Theme: “Weather Climate and Water Implication to Sustainable Development.”
- 1st National Meteorological Hydrological Convention – December 12-13, 2005

Theme: “Towards Understanding Weather, Climate and Consequences to Hydrology for Socio-Economic Development”.

- PMS-ADPC National Workshop (May 15, 2003)
- Symposia on Tropical Cyclones in the South China Sea and Western North Pacific Ocean
- Extreme Climate Events (ECE)
- National Symposium on the Application of Weather and Climate information

Aside from the sponsored local and international symposia, PMS also conducted other activities in 2018 as follows:

- "3rd PAG-ASA para sa mga Bata: A Blood Letting Activity" in partnership with Weather Bureau Multipurpose Cooperative (WBMPC) – June 19, 2018
- Information, Education and Communication (IEC) Campaign for PAGASA employees entitled “IEC on PAGASA Products and Services for New PAGASA Personnel” – June 22, 2018

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