

**MEMBER REPORT**  
**United States of America**  
**Pacific Region**

ESCAP/WMO Typhoon Committee  
12th Integrated Workshop  
Jeju, Republic of Korea  
30 October – 3 November 2017

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## I. Overview of tropical cyclones which have affected/impacted Member's area since the last Committee Session

The Pacific Region of the United States of America (USA) National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) encompasses both the western North Pacific Islands in Micronesia (except Kiribati) and the Central Pacific areas. In Micronesia, the USA tropical cyclone activities involve the NWS Pacific Region and the Department of Defense Joint Typhoon Warning Center (JTWC) located at Pearl Harbor, Hawaii. The NWS Weather Forecast Office (WFO) on Guam provides weather forecasts, watches, warnings and advisories within its area of responsibility (AOR) (see Figure 1). The WFO Guam AOR roughly expands from 130 Degrees East Longitude to the International Date Line and covers an ocean area of more than 4 million square miles (about 10.4 million square kilometers) and more than 2000 Micronesian islands. It includes the Commonwealth of the Northern Mariana Islands, Republic of Palau, Federated States of Micronesia (FSM), Republic of the Marshall Islands, and the U.S. Territory of Guam. The FSM is composed of the States of Chuuk, Yap, Pohnpei, and Kosrae.

When tropical cyclones occur, WFO Guam is the interface between the JTWC and the civilian sectors in Micronesia. The WFO Guam uses track, intensity and wind distribution information provided by JTWC to produce plain language forecast and warning products informing the general public and governmental agencies of impending severe weather.

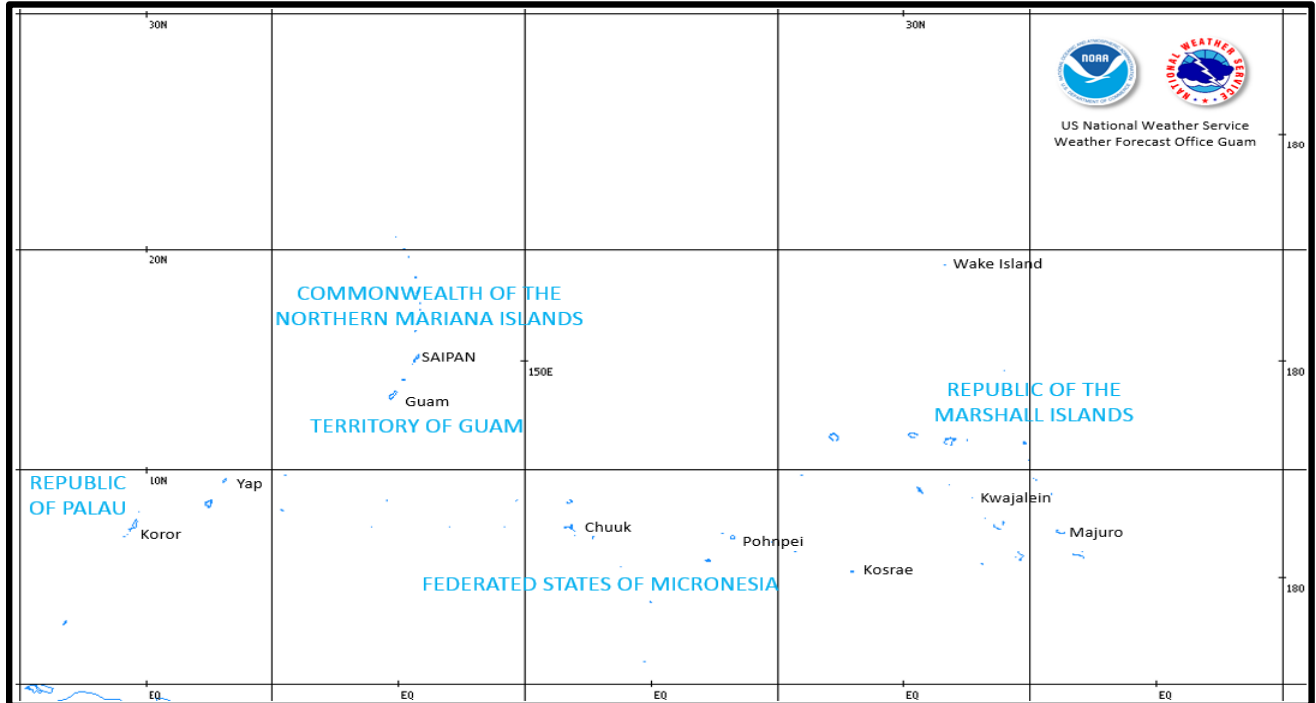
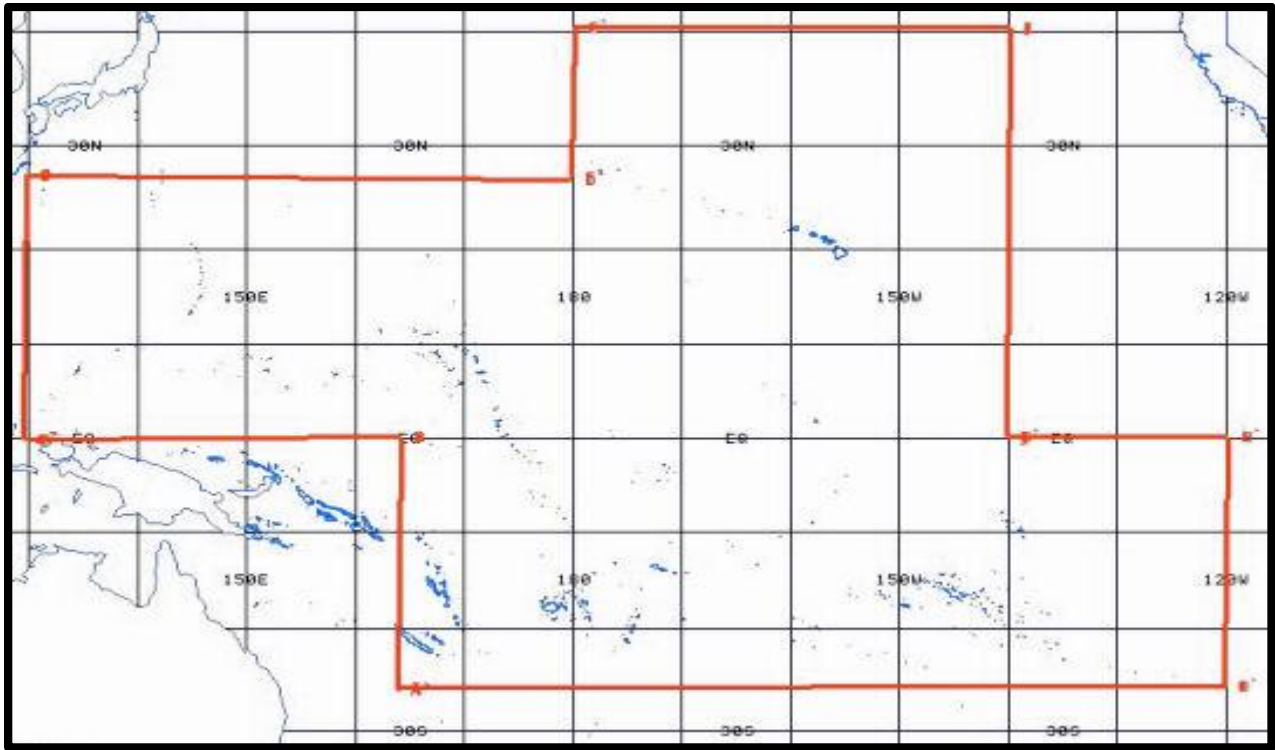


Figure 1: WFO Guam area of responsibility (AOR)

The Central Pacific Hurricane Center (CPHC) is co-located with the NWS Forecast Office in Honolulu. The NWS Forecast Office in Honolulu activates the CPHC when tropical cyclones form in, or move into, the Central Pacific region from the International Date Line to 140 Degrees West Longitude. CPHC is also the Regional Specialized Meteorological Center for tropical cyclones in this region and in this capacity is known as RSMC Honolulu.

The Honolulu Forecast Office area of responsibility covers around 5 million square miles (about 13 million square kilometers) generally from the Equator to 30N between 140W and 160E.



**Figure 2: The Honolulu Weather Forecast Office AOR, including the Central Pacific Hurricane Center. This is approximately 11 million square miles (around 28.5 million square kilometers)**

# 1. Meteorological Assessment (highlighting forecasting issues/impacts)

## Western North Pacific (130E to 180, north of the equator) Overview

A total of 19 tropical cyclones entered or formed in the WFO Guam AOR from October 2016 to September 2017. Being a La-Nina/ENSO-neutral year, the genesis area for most of these stayed well to the west and north of the area. Except for the passage of Super Typhoon Haima (25W) in October 2016 and Super Typhoon Nock-ten (30W) in December 2016, no other tropical storms or typhoons required warnings or watches for any of the 37 island warning points within the WFO Guam area of responsibility during the past year.

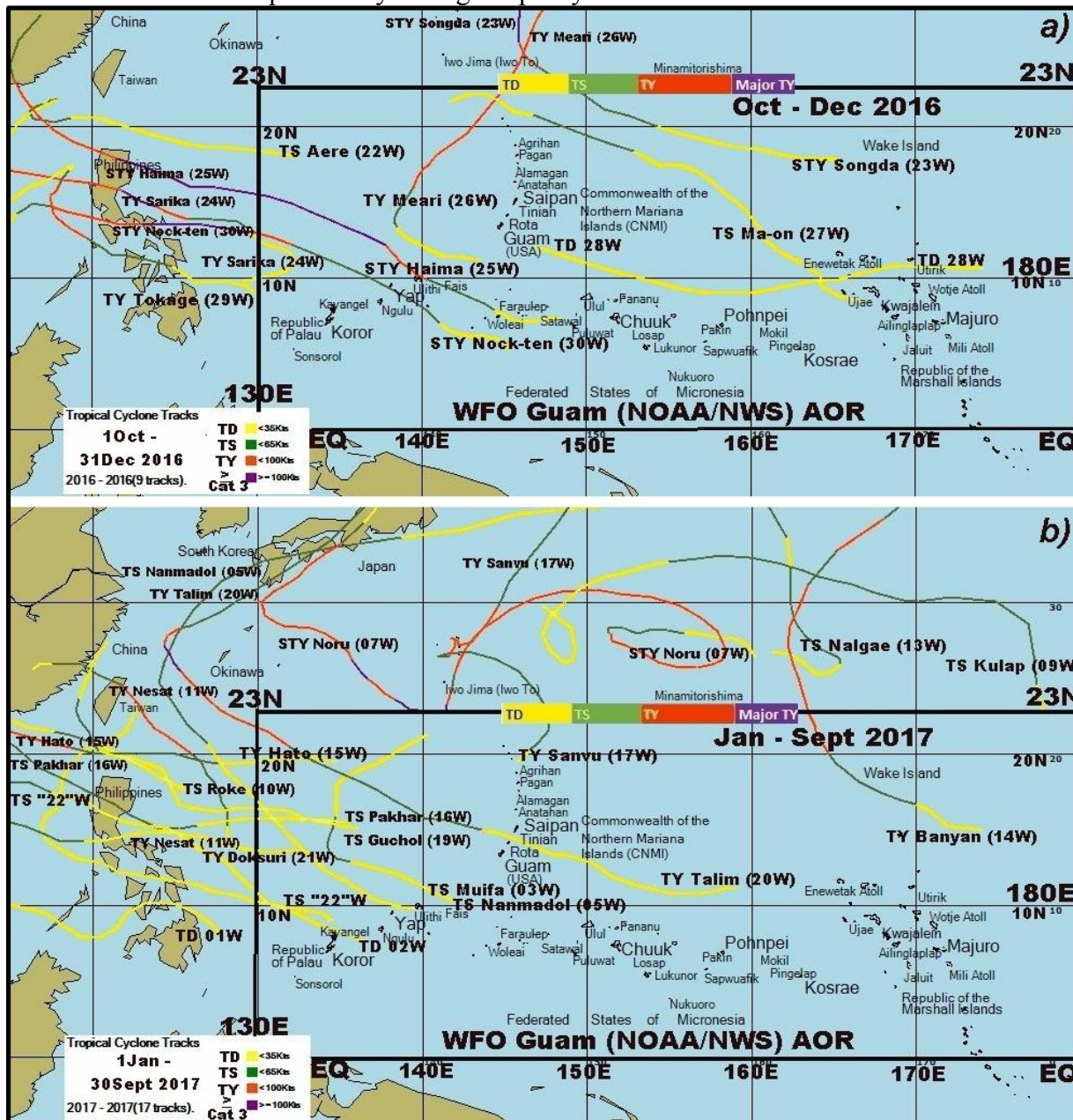


Figure 3. Tropical cyclones affecting Micronesia: a) October 1 to December 31, 2016 and b) January 1 to September 30, 2017. Color scheme represents the intensity along the track.



### ***Central North Pacific (140W to 180, North of the Equator) Overview***

Two tropical cyclones entered into, or were generated in, the central North Pacific during the period from January 1 through September 30, 2017. These were: Tropical Storm Fernanda, and Tropical Depression Greg.

Tropical Storm Fernanda entered the central North Pacific about 900 miles east of Hilo, Hawaii on July 20, 2017. Fernanda weakened over the next few days as it move westward, and was tracked until July 22, 2017 when it was declared a post tropical remnant low about 500 miles east of Hilo, Hawaii. No weather impacts were felt in Hawaii from Fernanda's remnants.

Tropical Depression Greg entered the central North Pacific as a weakening tropical depression about 965 miles east of Hilo, Hawaii on July 26, 2017. Greg continued to rapidly weaken and was declared a post-tropical remnant low later that same day.

The remainder of the season has remained largely quiet for tropical cyclone activity with persistent, but disorganized convection developing along the Intertropical Convergence Zone in the persistent northern hemisphere easterlies.



**Figure 4: Central North Pacific Tropical Cyclone tracks: Jan 1-Sept. 30, 2017**

## **2. Hydrological Assessment (highlighting water-related issues/impact)**

### ***Western North Pacific (130E to 180, north of the equator) Overview***

The start of 2017 was declared ENSO-neutral in Micronesia. Very dry conditions, however, persisted in Eastern Micronesia causing a serious drought over the Republic of the Marshall Islands. Drought Information Statements (DIS) were provided by the WFO Guam on a bi-weekly basis and more frequently when needed. By April, the President of the Republic of the Marshall Islands declared a State of Emergency for the northern atolls of the area. Residents were able to withstand much of the damage due to proper planning. When extreme conditions peaked in June, several islands had already implemented reverse osmosis systems. Yet the local vegetation and food sources continued to suffer and wells continued to remain salty. Drought conditions gradually improved with occasional rains bringing some relief to the islands and by October, the drought was considered over. A total of twenty-two Drought Information Statements for the Republic of the Marshall Islands and five for the Federated States of Micronesia were issued during this period.

In early September, interaction between a tropical disturbance passing south of Guam and a Tropical Upper Tropospheric Trough (TUTT) to the north caused torrential rain across the island. Nearly 4 inches or 104 mm of rain fell in 3 hours over northern Guam. Serious urban flooding occurred in the villages of Yigo and Dededo, one of the junior high schools sustained water damage in several classrooms. An Urban and Small Stream Flood Advisory was issued by WFO Guam.

### ***Central North Pacific (140W to 180, North of the Equator) Overview***

The main Hawaiian Islands experienced generally below to much below normal rainfall resulting in a return of drought conditions across the state. By October 2017, Moderate or worse drought covered 65% of the state, with severe to extreme drought conditions experienced over 15% of the main Hawaiian Islands. Impacts were reported by the agriculture sector, as well as an increase in wildfire activity. Local voluntary water restrictions were put in place for portions of Big Island and Maui County.

## **3. Socio-Economic Assessment (highlighting socio-economic and DRR issues/impacts)**

### ***Western North Pacific (130E to 180, north of the equator) Overview***

WFO Guam conducted formal presentations for emergency managers and military decision makers that included representatives from the Federal Emergency Management Agency or the United States (US) Agency for International Development, the two key US agencies for emergency recovery and relief. The WFO also conducted more than two hundred radio and television interviews and more than 100 outreach educational events that in-part addressed tropical cyclones. WFO Guam also utilized social media to greatly increase its reach to the general public.

### ***Central North Pacific (140W to 180, North of the Equator) Overview***

Regional Specialized Meteorological Center (RSMC) Honolulu conducted over 50 tropical cyclone related outreach events, several hundred broadcast and print media interviews, and over 50 formal emergency manager briefings. Also in 2017, RSMC Honolulu presented onsite

Hurricane Preparedness for Decision Makers training at the various federal, state and county emergency management agencies in coordination with U.S. Federal Emergency Management Agency (FEMA). This approach resulted in a larger outreach to the various emergency management functions in each agency. In addition, RSMC Honolulu participated in two separate week-long hurricane exercises by providing maps, advisories and briefings. For all events, RSMC Honolulu emphasized that a direct landfall is not necessary to produce major damage and impacts, as well as new products and services.

#### **4. Regional Cooperation Assessment (highlighting regional cooperation success and challenges).**

None.

## **II. Summary of Progress in Priorities supporting Key Result Areas**

### **1. NOAA Weather Ready Nation Ambassador Initiative**

#### **Main text:**

Striving for community resilience at a national scale is a major goal for the NOAA National Weather Service. Since embarking on the Weather Ready Nation program and expanding it to include the Ambassador Initiative, NOAA and its partners are moving forward with a program to make the public weather-smart.

In 2014, another program designed to bring attention to and prepare for weather hazards was the Weather Ready Nation Ambassador™. The Weather-Ready Nation Ambassador™ initiative is the National Oceanic and Atmospheric Administration's (NOAA) effort to formally recognize NOAA partners who are improving the nation's readiness, responsiveness, and overall resilience against extreme weather, water, and climate events. As a WRN Ambassador, partners commit to working with NOAA and other Ambassadors to strengthen national resilience against extreme weather. Throughout 2017, the WRN Ambassador initiative helped and continues to help unify the efforts across government, non-profits, academia, and private industry toward making the nation more ready, responsive, and resilient against extreme environmental hazards. This year alone, WFO Guam registered 140 Ambassadors on Guam and in the CNMI.

#### **Identified opportunities/challenges, if any, for further development or collaboration:**

NWS will continue to use the opportunity to engage in multilateral forums and engage with partners in international agreements to help infuse the global weather enterprise with our new weather and climate information, new science, and innovative technology and seek opportunities to learn best practices from other countries to improve our technology and service delivery. We will expand our partnerships to help improve and sustain observing and communications networks essential for early warnings.



**Priority Areas Addressed:**

Strengthen typhoon-related disaster risk reduction activities in various sectors, including increased community-based resiliency with better response, communication, and information sharing capability.

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**2. Annual Tropical Cyclone Exercises****Main text:**

It is critical to maintain a level of skill and situational awareness when dealing with tropical cyclones. That is the reason behind annual tropical cyclone exercises conducted by the Government of Guam, Government of the CNMI, and the State of Hawaii with participation by US National Weather Service Offices at Honolulu and Guam and the US Federal Emergency Management Agency.

WFO Guam participated in the island-wide typhoon exercises for Guam and for the CNMI in June. RSMC Honolulu participated in two statewide annual tropical cyclone exercise in Hawaii. Both annual hurricane exercises, one coordinated by Hawaii Emergency Management Agency (HEMA) in partnership with the NWS Forecast Office in Honolulu, the other by the Hawaii National Guard, were held in June and July.

**Identified opportunities/challenges, if any, for further development or collaboration:**

With staff turnovers affecting every agency, it is important to maintain these exercises such that all persons remain skilled and ready in the event of a real disaster.

**Priority Areas Addressed:**

Enhance capacity to generate and provide accurate, timely and understandable information using multi-hazard impact-based forecasts and risk-based warnings, watches, and advisories. Strengthen typhoon-related disaster risk reduction activities in various sectors, including increased community-based resiliency with better response, communication, and information sharing capability.

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### 3. National Weather Service StormReady and TsunamiReady Programs



StormReady is a program designed by the National Weather Service to help communities and counties implement procedures and supplemental programs to reduce the potential for disastrous, weather-related consequences. StormReady helps communities evaluate their current levels of preparedness for and response to extreme weather-related events. These communities demonstrate a strong commitment to saving lives and protecting property when hazardous weather strikes. By participating in StormReady, local agencies can earn recognition for their jurisdiction by meeting guidelines established by the NWS in partnership with federal, state and local emergency management professionals. TsunamiReady is a similar program that expands preparedness and response of coastal communities to tsunami threats.

WFO Guam assisted the islands of Guam and Tinian in renewing their designations as StormReady and TsunamiReady in 2017. RSMC Honolulu assisted the Hawaii County and the City and County of Honolulu, as well the Joint Base Pearl Harbor Hickam, in renewing their designations as StormReady and TsunamiReady in 2017. Their assistance ensured the community had disaster action plans in place and held outreach events to convey a preparedness message.

**Identified opportunities/challenges, if any, for further development or collaboration:**

The number of StormReady and/or TsunamiReady communities in 2017 increased across the US to 2765. Seven were in the Honolulu and Guam AOR.

**Priority Areas Addressed:**

Strengthen typhoon-related disaster risk reduction activities in various sectors, including increased community-based resiliency with better response, communication, and information sharing capability.

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### 4. Outreach/Education Activities

**Main text:** Numerous outreach and education activities conducted in 2017 include:

- *Expanded Pacific Hydrology Discussions.* Both WFO Guam and RSMC Honolulu provide input into the quarterly *Pacific ENSO Update* newsletter produced by the Pacific

ENSO Applications Climate Center, which issues Special Updates, if warranted. WFO Guam also provides input to the Climate Prediction Center's Monthly *ENSO Diagnostics Discussion* and employs the use of more comprehensive and targeted products--the *Hydrologic Outlook* product for extreme rainfall events and the *Drought Information Statement* for drought events. Finally, WFO Guam and RSMC Honolulu assist in preparing a popular quarterly two-page color product called the *Hawaii and U.S. Pacific Islands Climate Impacts and Outlook*.

- *RSMC Press Conference.* RSMC Honolulu hosted a press conference to announce the 2017 Central Pacific Hurricane Season Outlook on 24 May.
- *RSMC Honolulu media interfaces.* RSMC Honolulu conducted in the neighborhood of a thousand media interviews, teleconferences and press briefings throughout the season as several of the tropical cyclones had impacts to the Hawaiian Islands in order to provide decision makers with useful and timely information about developing hazards.
- *National Disaster Preparedness Month.* September is declared National Disaster Preparedness Month in the USA. WFO Guam participated in outreach activities sponsored by the Guam Homeland Security and the CNMI Homeland Security. These events provide the opportunity to conduct face-to-face meetings with the general public and provide important information on typhoons and preparedness and their impacts. Water safety is also addressed as rip currents are the number one natural killer in Guam and the CNMI.
- *University Course Enhancement.* WFO Guam hosted six University of Guam Environmental Biology and Physical Geography classes in the month of May. Facility tours were given as well as seminars on tropical cyclones, ENSO, and Climate Change. This provided education to nearly 300 students majoring in such topics as nursing, education, criminal justice, and biological sciences. RSMC Honolulu hosts twice weekly weather discussions involving students and professors of the University of Hawaii (UH) Department of Meteorology, which engages the students in operational weather application focusing on societal impacts. At least three forecast personnel and management have been invited as guest instructors at university classes at UH and Leeward Community College. On Guam, several forecasters were also invited speakers at the University of Guam, Guam Community College, and the University of Maryland extension.
- *FEMA 2017 Service Learning, Youth and Community Preparedness Summit*". A series of seminars were held in 2017 by the FEMA Youth Preparedness Council and the Guam Youth Preparedness Program. These seminars covered a gamut of disaster-related topics. WFO Guam provided the lectures on climate and climate change and tropical cyclones and preparedness. The Guam Youth Preparedness Program that sponsored this event focuses on emergency and disaster preparedness with community action that focuses specifically on youth readiness for disasters and related events. It is coordinated by a group of young adults, preparedness advocates and support individuals and organizations committed in the delivery of youth preparedness education,

community outreach campaign activities and technical assistance. Their motto is “equipping and empowering the youth of today, makes a more resilient and better prepared island of Guam tomorrow.”

- *Weather Ready Nation Open Houses.* Two Open-House events were held to welcome and recognize the partners and Ambassadors of the NWS Weather Ready Nation Ambassador Program. One was held on Guam with a tour of the facility and included several island Senator and Mayors. The other was held on Saipan, and included a video tour of the WFO Guam facility. Official certificates and signage were presented to the Ambassadors.

**Priority Areas Addressed:**

Strengthen typhoon-related disaster risk reduction activities in various sectors, including increased community-based resiliency with better response, communication, and information sharing capability.

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**5. Pacific International Training Desk**

**Main text:**

The Pacific International Training Desk (PITD) was established on the campus of the University of Hawaii at Manoa in 2001 by the US NOAA/NWS at the Weather Forecast Office (WFO) Honolulu. The Pacific Desk is one of NOAA’s contributions to the World Meteorological Organization (WMO) Voluntary Cooperation Program (VCP). The Pacific Desk began by offering two-month training internships to visiting students from the Regional Association V (RA V) of the WMO in March 2001 and later expanded the training opportunity briefly to developing countries from WMO RA II nations in east and Southeast Asia, who were also members of the ESCAP/WMO Typhoon Committee. In 2016, the PITD training expanded to include the Weather Service Offices in Micronesia and as of 2017, a total of 32 students in six different cohorts completed the training. The courses were taught on-site at the WFO Guam facility by a dedicated instructor familiar with the region. WFO Guam personnel participated in part of the training modules.

The PITD consists of four components: 1) basic forecaster training, to be implemented through use of e-learning modules that will be readily available to anyone; 2) a month long, instructor led onsite training program carried out at RSMC Honolulu and/or WFO Guam; 3) training on use of communications equipment, also to be funded by the VCP; and 4) in-Island workshops on severe weather event topics.

**Identified opportunities/challenges, if any, for further development or collaboration:**

Cohorts were pleased with the training received at these courses and recommended further training in the field of forecasting and meteorology. Therefore, the PITD is looking to advance its curriculum a step above basic forecaster training in the near future.

**Priority Areas Addressed:**

Enhance capacity to generate and provide accurate, timely and understandable information using multi-hazard impact-based forecasts and risk-based warnings.

Enhance Typhoon Committee’s Regional and International collaboration mechanism.

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## **6. Resource Mobilization During Extreme Events**

**Main text:**

RSMC Honolulu conducted several Emergency Management Briefings during 2017 hurricane season through video teleconferencing. These briefings included personnel at Emergency Operations Centers from the State level to the local level with the State Governor and County Mayors participating at times.

RSMC Honolulu supported continuity of operations protocol to assist RSMC Miami during a close passing tropical cyclone (Hurricane Irma) which risked disrupting dissemination. Two specialist forecasters mobilized to the National Center of Environmental Prediction (NCEP) in College Park, Maryland to spin up forecast operations on Hurricane Jose in the Atlantic Ocean basin, and stand by to assist should RSMC Miami lose communications from Hurricane Irma.

The WFO Guam Warning Coordination Meteorologist deployed to the Guam Emergency Management Office to brief the island leadership on potential tropical cyclone threats. He also prepared tailored briefing slides for the CNMI leadership and the Emergency Management Office, then provided an accompanying telephonic briefing on those slides.

**Identified opportunities/challenges, if any, for further development or collaboration:**

Cross training opportunities between offices and regions must continue.

**Priority Areas Addressed:**

Enhance capacity to generate and provide accurate, timely and understandable information using multi-hazard impact-based forecasts and risk-based warnings

Strengthen typhoon-related disaster risk reduction activities in various sectors, including increased community-based resiliency with better response, communication, and information sharing capability.

Enhance Typhoon Committee's Regional and International collaboration mechanism.

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## 7. Improved Typhoon-related Disaster Risk Management in Various Sectors

**Main text:**

- *Tropical Weather Outlook graphic.* During the tropical cyclone season, RSMC Honolulu prepares and transmits a text and two graphical *Tropical Weather Outlook* that illustrates the probability of tropical cyclone development in the next 48 hours and 5 days respectively.
- *Hawaii State Hazard Mitigation Forum.* The Hawaii State Hazard Mitigation Forum, of which RSMC Honolulu is a member, is tasked with maintaining and updating the Hawaii State Hazard Mitigation Plan. Forum members met regularly to discuss hazard threat, risk assessment, and actions which can be taken to mitigate the hazard risk to protect lives and property from loss and destruction during a natural hazard.
- *Hawaii Emergency Preparedness Executive Consortium (HEPEC).* RSMC Honolulu is a member of the Hawaii Emergency Preparedness Executive Consortium (HEPEC). HEPEC is comprised of emergency managers and disaster mitigation personnel from local, state, and federal agencies. HEPEC meets quarterly to provide updates on current and outstanding threats, both natural and manmade, to the State of Hawaii. RSMC Honolulu Personnel provided a hurricane presentation to the group during the July 2017 and October 2017 meetings.
- *Software improvements for Emergency Managers.* Hurrevac (software for emergency managers to gather critical hurricane forecast information) improvements were implemented in 2017.
- *Catastrophic Typhoon Plan.* Several Government agencies on Guam and in the CNMI worked with the FEMA to update the Catastrophic Typhoon Plan for each location. WFO Guam played an important role, both on Guam and in the CNMI to ensure that the information was correct and up-to-date. WFO Guam also participated with FEMA and the appropriate participants on both Guam and Saipan to add a climate change component to the All Hazards Response Plan of Guam and the CNMI.



- *NOAA Weather Radio upgrade.* NOAA Weather Radio (NWR) All Hazards is a nationwide network of radio stations broadcasting continuous weather information directly from the nearest National Weather Service office. NWR broadcasts official Weather Service warnings, watches, forecasts and other hazard information 24 hours a day, 7 days a week. The Guam transmitter was given a badly needed upgrade in 2017 and was relocated to a higher, more secure elevation with greater stability, backup generator, and wider point-to-point broadcast area. The system also received an upgrade to its transmitters. This upgrade will allow the broadcast to reach more customers than before.

**Priority Areas Addressed:**

Enhance capacity to generate and provide accurate, timely and understandable information using multi-hazard impact-based forecasts and risk-based warnings

Strengthen typhoon-related disaster risk reduction activities in various sectors, including increased community-based resiliency with better response, communication, and information sharing capability.

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**8. Technological Improvements**

**Main text:**

- *GOES-R project and Initial Views from the Himawari Satellite.* RMSC Honolulu and WFO Guam have been utilizing the new high resolution data now available from the new Japanese Himawari geostationary satellite in operational forecasting as well as training and preparing for the soon to be launched GOES-S satellite. In addition, data continues to be received, analyzed, and evaluated from the multiple sensors and displays coming from a large number of polar orbiting satellite instruments. One of those sensors is onboard the Suomi NPP satellite and it continues to play a critical role in locating positions of tropical cyclones. The Visible Infrared Imaging Radiometer Suite (VIIRS) is able to produce a day-night band allowing forecasters to receive visible images at night. Plans are already underway within the U.S. National Weather Service to restructure its satellite training and forecasting programs in order to take advantage of the new suite of sensors that are now becoming available.
- *Continued evaluation and application of ocean surface wind vector scatterometer instruments (ASCAT, RSCAT and Windsat).* The addition of the RSCAT instrument on board the International Space Station (ISS) has been a welcome addition to ocean surface wind vector coverage over the tropical oceans. These data plus the two ASCAT instruments and the Windsat sensor are made available in near real-time to the operational forecasters

by the European Space Agency (ESA), NOAA/NESDIS and the US Naval Research Laboratory (NRL). Coriolis satellite also provides surface wind data through its Windsat via its 37 GHz microwave instrument. While these instruments are subject to the attenuation effects of heavy rainfall and are somewhat limited under very light and very strong wind conditions, they continue to greatly improve our capability to monitor tropical cyclone development and to observe the structure and intensity of tropical cyclones in the AOR.

- *Reanalysis Project.* At least a dozen Meteorologists/Analyst took the daunting task to conduct a global reanalysis of tropical cyclones project in 2017. The team included WFO Guam Warning Coordination Meteorologist, Chip Guard. The first workshop was held in May 2017 and concluded with detailed discussions of the financial and human resources that would be required to carry out the proposed work. The team laid out a roadmap toward a proposal to create a comprehensive tropical cyclone reanalysis for the benefit of scientific research, forecasting, government, industry, and society in general. Their final work was submitted to the Bulletin of the American Meteorological Society, entitled “Desirability and Feasibility for a Global Reanalysis of Tropical Cyclones” on 12 October 2017.

**Priority Areas Addressed:**

Enhance capacity to generate and provide accurate, timely and understandable information using multi-hazard impact-based forecasts and risk-based warnings

Strengthen typhoon-related disaster risk reduction activities in various sectors, including increased community-based resiliency with better response, communication, and information sharing capability.

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