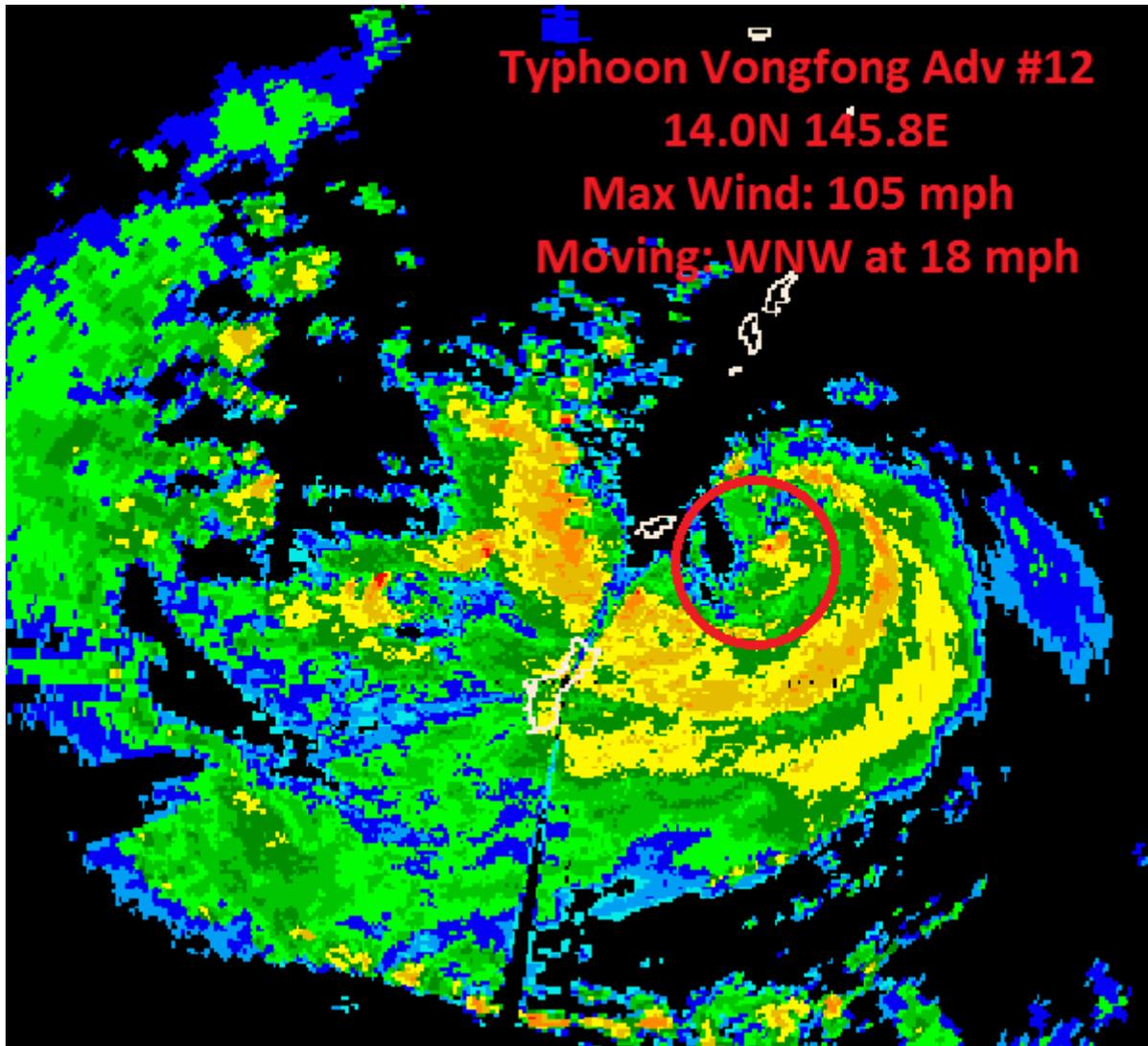


MEMBER REPORT

ESCAP/WMO Typhoon Committee
9th Integrated Workshop



United States of America
Pacific Region

Bangkok, Thailand
20 – 23 October 2014

Cover caption: WSR-88D 0.5 degree Reflectivity image of Typhoon Vongfong approaching the Tinian channel.

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I. Overview of tropical cyclones which have affected or impacted Member's area in 2014

1. Meteorological Assessment (highlighting forecasting issues/impacts) Western North Pacific (130E to 180, north of the equator) Overview

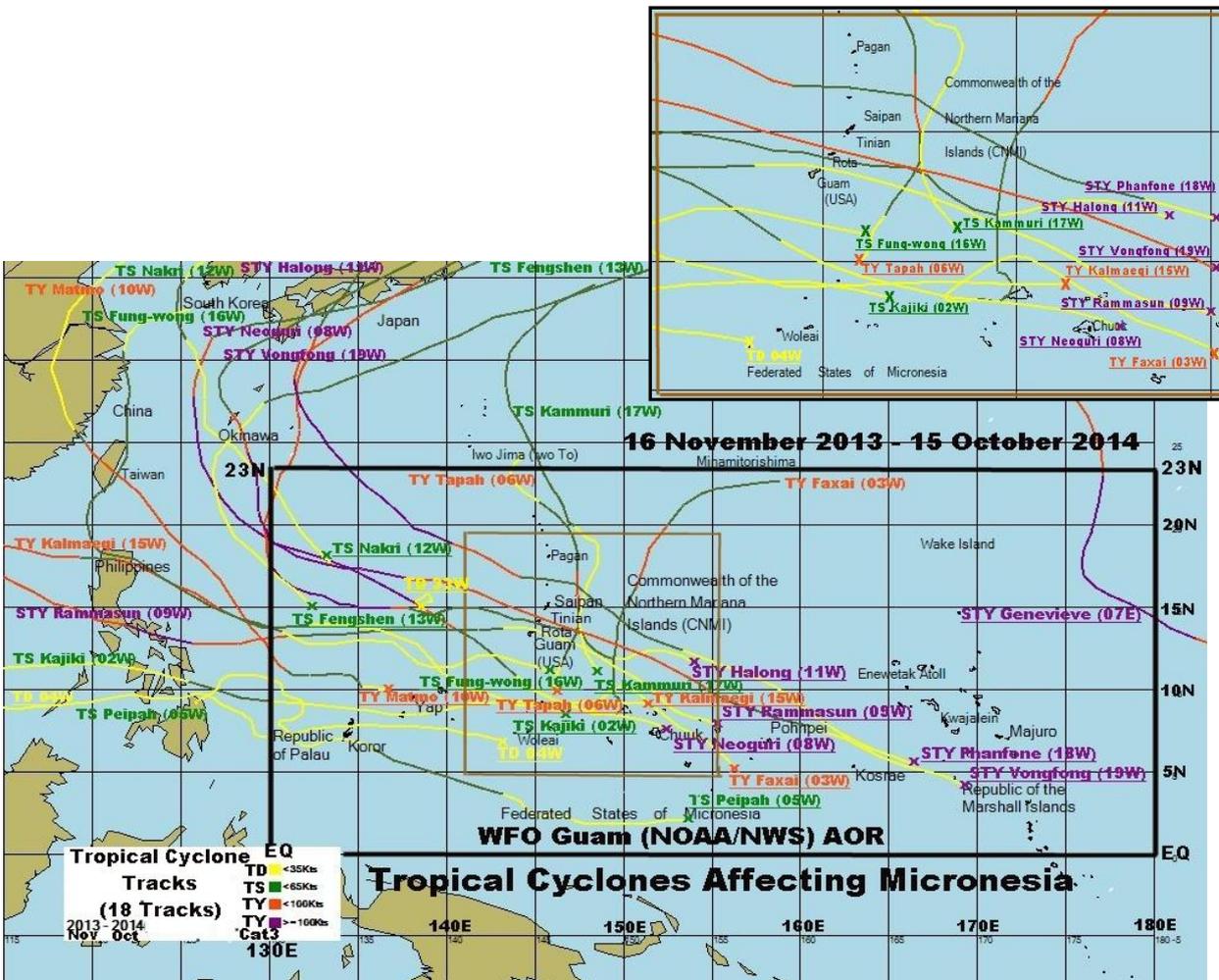


Figure 1: Tropical Cyclones affecting Micronesia from 16 November 2013 through 15 October 2014 with inset over central area.

Tropical cyclone activity in the Micronesian portion (area between the Equator and 23N from 130E to 180, not including Kiribati) of the western North Pacific from 16 November 2013 through 15 October 2014 was similar to last year's increased activity now at near-normal activity levels after a trend of several years below normal activity. Seventeen tropical cyclones, including one weak tropical depression formed up to October 2014. All of these events either developed within or were initiated within the US National Weather Service (NWS) Weather Forecast Office (WFO) Guam's Area of Responsibility (AOR). In

addition, major Hurricane/Typhoon Genevieve moved into the AOR after passing through both the Eastern Pacific and Central Pacific AORs. While Micronesia was still dominated by tropical cyclones that intensified in the western half of the AOR, storms did form a little more east this year and closer to Guam (see the inset), and thus had an effect on a greater number of inhabited islands. The period of this report included six super typhoons (130-knot, 1-minute sustained wind), only four typhoons and an unusual number of six tropical storms that failed to intensify to typhoons. The period also had some unusual spurts in activity with six numbered tropical cyclones before the end of April, very low activity in May and June and an increase in activity during the month of July. The month of August, normally the busiest month of the year, however, was highly unusual with no new cyclone forming during the month in the entire western North Pacific basin, with two cyclones forming at the end of July that affected the AOR in early August, and Genevieve that moved in from another basin. Activity was again near normal for September and early October and included the two super typhoons, Phanfone and Vongfong that formed within a week of each other well to the east of the earlier activity in the Marshall Islands.

During this reporting period, WFO Guam issued tropical cyclone watches and warnings on six tropical cyclones and special weather advisories on seven additional cyclones that had effects on the islands in its AOR.

Central North Pacific (140W to 180, north of the equator) Overview

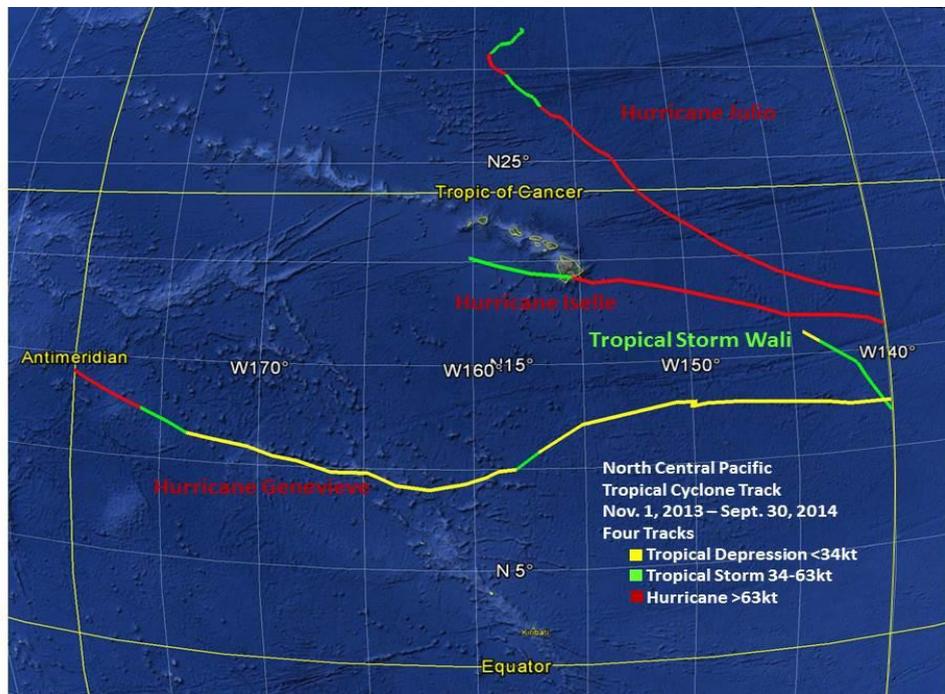


Figure 2: Tropical Cyclones affecting the central North Pacific from November 2013 through September 2014

Four tropical cyclones entered into, or were generated within, the central North Pacific

during the period from November 1, 2013 through September 30, 2014. Of these four tropical cyclones, three became hurricanes while the fourth attained only tropical storm status. The tropical cyclone with the most significant impact was Hurricane Iselle, which moved across the Big Island (also known as Hawaii Island) of the main Hawaiian Islands. Hurricane Iselle was lowered to Tropical Storm strength just before moving across the Big Island. The center of Tropical Storm Iselle made landfall at about 1230 UTC on August 8. As Tropical Storm Iselle moved across the Big Island it began to weaken and became disorganized. However, strong winds and heavy rain spread across the other main Hawaiian Islands with the Big Island, Maui and Kauai receiving the greatest impacts. The most extreme impacts were to the Big Island where power outages, wind damage and up to an eight foot storm surge/wave run up occurred. A multitude of trees were blown down and power outages lasted more than a week. Multiple rainfall gauges on the Big Island reported totals above ten inches with the greatest rainfall report at 15.25 inches (387 mm). Flooding was reported on the Big Island. The other tropical cyclones in the area remained away from populated areas. However, the northwest Hawaiian Islands, which are not populated but host research teams, were evacuated due to large waves associated with Hurricane Julio.

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

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

Hydrologic events ranged from a severe drought over the northern Marshall Islands, north of 10°N, to above normal rainfall over most of Micronesia and the Mariana Islands, including a few record setting rainfall events. WFO Guam issued several hydrologic products over the past year, including Hydrologic Outlook Statements, Urban and Small Stream Flood Advisories, Flash Flood Warnings and Special Weather Statements to address these events. As in previous years, the monsoon trough emerged as a major rainmaker, generating several tropical disturbances and cyclones. The region began the year in ENSO-neutral conditions and currently remains in ENSO-neutral with an El Niño Watch in effect.

Several tropical cyclones brought periods of heavy rainfall to most islands west of 155E, including portions of Chuuk and Yap States, The Republic of Palau, Guam, and the Commonwealth of the Northern Mariana Islands. This included heavy rainfall events in July from Typhoon Rammasun as it passed over Guam as a Tropical Depression; and Typhoon Halong that brought 14.53 inches (369 mm) to the airport and 16.69 inches (424 mm) to Andersen Air Force Base. Typhoon Vongfong brought an estimated 6.50 inches (165 mm) to portions of northern Guam and Rota on October 5 – 6, 2014.

Central North Pacific (140W to 180, north of the equator) Overview

The main Hawaiian Islands experienced near to above normal rainfall since the beginning

of the year. This has helped to relieve much of the drought conditions across the state. However, Hawaii remains abnormally dry with two areas in Maui County experiencing moderate drought conditions. These two locations are the central valley of Maui Island and west-central Molokai.

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

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

From December 2013 through May 2014, the northern Republic of the Marshall Islands experienced a severe drought. The drought affected most of the atolls north of 8N latitude. Low rainfall and high sea levels resulted in high levels of salt in the wells, making the water at many locations undrinkable. The salt water and the low rainfall also caused the normal food crops, such as coconut, tapioca, breadfruit, and taro, to dry up. The Government of the Marshall Islands sent multiple shipments of water and food supplies to the islands. After a U.S. Presidential Disaster Declaration was issued, the U.S. Agency for International Development's Office of Foreign Disaster Assistance (USAID/OFDA) coordinated many relief efforts. The total cost of this drought was approximately \$7 million. Accurate forecasts and quick Governmental actions prevented any deaths and minimized suffering.

On 4 July, Tropical Storm Neoguri was located southwest of Guam. Despite being 170 miles (274 km) away winds north of the storm caused minor tree damage across Guam. The winds also helped produce isolated power outages across the island. Observations across Guam showed that winds gusted to between 62 mph (100 km/hr) and 67 mph (108 km/hr). On the morning of 5 July, Neoguri became a typhoon. At this time the system was west of Guam. Neoguri was associated with a surge in the monsoon. The surge produced a large area of higher winds across the Western Pacific. These winds generated ocean swells that moved towards the Marianas. These swells from the surge and from Neoguri damaged two docks, at a cost of about \$1.5 million dollars. Buoys NW of Guam and WNW of Saipan showed 16 to 17-foot (5.2 m) seas. This produced an estimated surf of 18 to 20 feet (5.8 to 6 m) surf across the shore lines of the Marianas. This produced up to 5 feet (1.5 m) of inundation in some areas. The surf was reported to have been large enough to cause some waves to ride up the 100-foot (30.5-m) high cliffs of Orote Point and crash over several houses on the Navy Base in Guam.

Tropical Storm Halong passed through the Rota Channel during the afternoon of July 30th. Winds gusted as high as 61 mph (98 km/hr) at the automated weather station on Guam. The tropical storm was also brought heavy rainfall and flooding across the Mariana Islands. Between July 27 and 31, the NWS office recorded 14.53 inches (369 mm) of rain. The winds and rains also caused sporadic power outages across the island of Guam. These same winds and rain caused trees to be uprooted across Guam. During the height of the storm, a 49-foot Japanese fishing vessel, the *Take Maru 55*, went aground on the west side of Cocos Island (southern Guam) with six crew members aboard. The crew members had to swim to Cocos Island to seek shelter from the effects of Tropical Storm Halong. The swells also pushed a dead 38-foot (11.6 m), 20-ton Baleen whale ashore on the shores of Agat on August 2nd.

At the time of this report, an assessment is yet to be made for the effects of Typhoon Vongfong as it passed very close to the northeast coast of Rota in October 2014.

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 in 2014. The highlights of these outreach events were the visits to each of the Civil Defense Agencies throughout the main Hawaiian Islands by Central Pacific Hurricane Center (CPHC) Hurricane Specialists. During these visits a four hour training session was conducted based on the Federal Emergency Management Agency (FEMA) course entitled "Hurricane Preparedness for Decision Makers." This course was attended by emergency managers, police, fire, homeland security, and other decision makers. For all events, RSMC Honolulu emphasized that it only takes one hurricane to strike Hawaii to produce major damage and impacts.

4. Regional Cooperation Assessment (highlighting regional cooperation successes and challenges)
None.

II. Summary of progress in Key Result Areas

Title of item:

NOAA Weather-Ready Nation

Building community resilience to reduce vulnerability to extreme weather and water events is the aim of NOAA Weather-Ready Nation initiative. The National Weather Service is transforming its operations to work more closely with its public and private sector partners to help them to make fast, smart decisions to save lives and livelihoods. While recent extreme weather and water events have affected the U.S.A., the Weather-Ready Nation concept has reduced vulnerability and increase resiliency in communities.

Some of the devastating impacts of extreme events can be reduced through improved community readiness, which is why the Weather-Ready Nation initiative is so important. Through operational initiatives, NOAA's National Weather Service is transforming its operations to help America respond to all kinds of severe weather. After successful implementation of the initiative, emergency managers, first responders, government officials, businesses, and the public will be empowered to make faster, smarter decisions that can save lives and livelihoods.

The initiative includes improvements in a wide range of societal benefit areas such as support management of the nation's water supply, understanding of climate-related risks, improve economic productivity, and promote healthy communities and ecosystems.

Weather Ready Nation focuses on five major areas:

- Impact Based Decision Support Services
- Communications and Outreach
- Science and Technology Advances
- Information Delivery
- Innovative Partnerships

The goal of the dialog is to support the mission of the National Weather Service by reducing risk and increasing community resilience for future extreme events.

All of these actions fall under the umbrella of Weather-Ready Nation, and all support the same end goal: better information for better decisions.

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

NWS will use the opportunity to engage in multi-lateral 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

KRA =	1	2	3	4	5	6	7
Meteorology		X		X	X		
Hydrology		X		X	X		
DRR		X		X	X		
Training and research							
Resource mobilization or regional collaboration							

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Title of item:

Annual Tropical Cyclone, Disaster Preparedness and Climate Workshops

A primary WFO Guam outreach event each year for the major Micronesia islands is the Annual Tropical Cyclone, Disaster Preparedness and Climate Workshop. These two-day, 18-module Workshops are tailored for each island and designed for decision makers in the local, state, and national governments and agencies.

The Workshops cover a plethora of topics such as:

- tropical cyclone behavior, structure, and hazards;
- the WFO Guam tropical cyclone program, products, and timing of products;
- tropical cyclone plotting and speed-distance-time computations;
- typhoon risk and vulnerability; a scale that relates tropical cyclone wind speed to damage and storm surge;
- tropical cyclone decision making for individual islands and states; and
- WFO Guam website products.
- In addition, topics on general climate familiarity, climate variability, and climate change; El Niño /La Niña and their effects, impacts and status are covered. Other subjects addressed were tsunamis and volcanoes; rip currents, currents, and tides; and earthquakes upon the request of the participants.

In 2014, WFO Guam conducted workshops in Tinian and Saipan, CNMI, and on Guam. Scheduling difficulties and travel restrictions prevented the WFO Guam staff from achieving total visitation to all of Micronesia.

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

In addition to conducting the workshops, WFO Guam also provides seminars at the local colleges, training at the meteorological service offices, and training to disaster managers when specifically requested.

KRA =	1	2	3	4	5	6	7
Meteorology							
Hydrology							
DRR				X	X		
Training and research							
Resource mobilization or regional collaboration							

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Title of item:

Annual Tropical Cyclone Exercises

It is always important to have procedures in place for dealing with tropical cyclones. Even more important is testing and evaluating these programs. In 2014, both WFO Guam and RSMC Honolulu participated in annual tropical cyclone exercises.

On Guam, the annual Typhoon Preparedness Exercise called Exercise Pakyo was held from 23 to 27 June. Pakyo is the native word in Chamorro (language of the Marianas Islands) for strong winds. The annual exercise involved agencies from the Government of Guam, the Joint Region Marianas (military), and the Government of the CNMI. WFO Guam developed the scenario, produced the products and provided live heavy weather briefings to the participants. The live exercise was a 5-day event beginning with a developing system southeast of the island chain heading northwestward and becoming a supertyphoon just before reaching Guam and the southern CNMI.

Similarly, RSMC Honolulu participated in a statewide annual tropical cyclone drill, MakaniPahili, in Hawaii. Also meaning "strong wind" in Hawaiian, the annual MakaniPahili exercise, coordinated by Hawaii State Civil Defense (SCD) in partnership with the NWS Forecast Office in Honolulu was held in June.

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

None.

KRA =	1	2	3	4	5	6	7
Meteorology							
Hydrology							
DRR				X	X		
Training and research							
Resource mobilization or regional collaboration							

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Title of item:

National Weather Service StormReady and TsunamiReady Programs



StormReady is a National Weather Service program that began in 1999 to help America's communities and counties implement procedures and supplemental programs to reduce the potential for disastrous, weather-related consequences. By participating in StormReady, communities can earn recognition for their jurisdiction by meeting guidelines established by the NWS in partnership with federal, state and local emergency management professionals. To be considered StormReady, a community would need to:

- Establish a 24-hour warning point and emergency operations center
- Have more than one way to receive severe weather warnings and forecast and to alert the public
- Create a system that monitors weather conditions locally
- Promote the importance of public readiness through community seminars
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises.

Because of the success of this program, the National Weather Service expanded the same program to address a different natural disaster- specifically tsunamis. Since June 2001, TsunamiReady has helped community leaders and emergency managers strengthen their local operations. TsunamiReady communities are better prepared to save lives through better planning, education and awareness. These two NOAA/National Weather Service (NWS) programs provide a platform recognizing that these communities have achieved the high level of preparedness and response capability for severe storms and for tsunamis required by the programs.

In March 2014, Andersen Air Force Base on Guam was officially recognized as StormReady and TsunamiReady. Because the military base functions as its own community, it was an important recognition for the Department of Defense. This distinction among other military bases emphasized the readiness and preparedness of the installation.

WFO Guam worked with the island of Tinian in the Commonwealth of the Northern Marianas Islands to renew its StormReady and TsunamiReady designations. This recognition is the third for the Island and is good for a three-year period.

RSMC Honolulu assisted the communities of Honolulu County and Joint Base Pearl Harbor-Hickam, both on the island of Oahu; and Hawaii County in renewing their designations as a StormReady and TsunamiReady Community. RSMC Honolulu ensured the community had disaster action plans in place and held outreach events to convey a preparedness message.

As of October 2014, there were 2245 StormReady Communities in the United States, of which, 17 are in the Pacific Region. There were also 177 TsunamiReady communities, of which 17 were in the Pacific Region.

Identified opportunities/challenges, if any, for further development or collaboration:
None

KRA =	1	2	3	4	5	6	7
Meteorology					X		
Hydrology							
DRR	X						
Training and research							
Resource mobilization or regional collaboration							

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Title of item:

Outreach/Education Activities

- *RSMC Press Conference.* RSMC Honolulu hosted a press conference to announce the 2014 Central Pacific Hurricane Season Outlook on 21 May.
- *RSMC Honolulu media interfaces.* RSMC Honolulu conducted numerous media interviews, teleconferences and press briefings during Hurricane Iselle from 5 to 8 August in order to provide decision makers with useful and timely information about developing hazards.
- *National Disaster Preparedness Month.* September was National Disaster Preparedness Month for 2014. The Emergency Management Offices on Guam and in the CNMI took the leads and arranged the events. On Guam, several events and numerous activities such as school presentations and a Grand Finale event at a major shopping center showcased the Preparedness Month. WFO Guam participated in the proclamation signing by the Governor of Guam, several awareness activities, and the Grand Finale Display at a local Shopping Center.
- *Marine Users Workshop.* WFO Guam staff held a Marine Users Workshop in 2014. The workshops are a part of the WFO Guam outreach events. Because each event has a different audience, it was important to emphasize the tropical cyclone issues for the Mariners.
- *El Nino briefings.* WFO Guam played a major role in producing products that explain El Nino influences on western North Pacific tropical cyclone activity, rainfall, and sea level through the Pacific ENSO Applications Climate (PEAC) Center's *Pacific ENSO Update* newsletter and through specifically prepared updates provided to senior leadership during WFO Guam visits to Micronesia.
- *Tailored outreach materials.* Despite a temporary reduction in tropical cyclone training, WFO Guam developed new products for the islands. These include specifically tailored rip current, flash flood/flood, mud slide, and tropical cyclone brochures.
- *Research.* WFO Guam people also participated in research that resulted in several refereed journal articles and also refereed/reviewed several articles for major meteorological and climate journals.

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

Research the impact of Social Media as a means of outreach before and during events.

KRA =	1	2	3	4	5	6	7
Meteorology					X		
Hydrology					X		
DRR					X		
Training and research							
Resource mobilization or regional collaboration							

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Title of item:

Pacific International Desk

The Pacific International Training Desk (PITD), funded by the USA National Weather Service as part of the U.S. contribution to the WMO Voluntary Cooperation Program (VCP), is now operating. The PITD is managed by the University of Hawaii, Telecommunications and Social Informatics (TASI) Research Program. The new Desk has 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 on-site training program carried out at the US Weather Forecast Office in Honolulu;
- 3) training on use of communications equipment needed for early warning systems, also to be funded by the VCP: and
- 4) on-Island workshops focusing on severe weather event topics.

By 10 October, three cohorts will have completed the course, a total of nine students.

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

None.

KRA =	1	2	3	4	5	6	7
Meteorology						X	X
Hydrology							
DRR							
Training and research						X	
Resource mobilization or regional collaboration							

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Title of item:

International Cooperation Efforts

- *Micronesia Intern Program.* As part of the capacity-building in smaller island nations, the NWS Pacific Region established the Micronesia Meteorologist Intern Program. This program recruits students from the Federated States of Micronesia (Yap, Chuuk and Pohnpei), the Republic of Palau and the Republic of the Marshall Islands to pursue a Bachelor of Science degree in Meteorology from the University of Hawaii at Manoa. Since the inception of the program in 1996, eight students have received their degrees. Upon graduation, Interns are temporarily assigned to the WFO Guam for a period of at least 4 months focusing on tropical meteorology, satellite interpretation and local climatological studies. In 2014, two graduates of the program, Mr. Boyd Mackenzie from Chuuk, FSM and Ms. Kikuko Mochimaru from the Republic of Palau completed their internships at the WFO Guam and are now applying their newfound skills at their respective countries forecast offices.
- *Annual WGDRR meeting.* NWS Pacific Region participated in the annual meeting of the Working Group on Disaster Risk Reduction in Seoul, Korea in May 2014. In addition to reviewing the Annual Operating Plan, the group also focused on strengthening International cooperation for Disaster Risk Reduction. During the meeting, each Member gave a report of DRR activities in their respective countries. Also, NWS Pacific Region Acting Director provided a presentation on NOAA's Weather-Ready Nation
- *WGDRR Expert Mission.* In September 2014, the WGDRR Expert Mission visited the Guam Homeland Security Office of Civil Defense and provided presentations on the Typhoon Committee web-based Tropical Cyclone Disaster Information System.

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

None.

KRA =	1	2	3	4	5	6	7
Meteorology						X	X
Hydrology							
DRR							X
Training and research							
Resource mobilization or regional collaboration							

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Title of item:

Technological Improvements

- *GOES-R project.* RMSC Honolulu and WFO Guam have been participating in the GOES-R project by receiving, analyzing, and evaluating possible sensors and displays of data from polar orbiting satellite imagery. 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 a visible image at night. Plans are also being made 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 will become available on the GOES-R.
- *Continued evaluation of ocean surface wind vector scatterometer instruments (ASCAT and Windsat).* The European Space Agency (ESA) and the NOAA/NESDIS continue to provide near-real time ocean surface wind vector data from the two ASCAT instruments. With the loss of the Indian Ocean Scatterometer, the daily coverage over the tropical oceans is not as great as in the previous year. However, greater use is being made of the Coriolis Windsat data that provides a passive scatterometer data with microwave 37GHz imagery. Again, these instruments are still subject to the effects of strong rainfall rates and are limited under very light and very strong wind conditions, but they continue to greatly improve our capability to monitor for tropical cyclone development and to observe the structure and intensity of tropical cyclones in the AOR.

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

None

KRA =	1	2	3	4	5	6	7
Meteorology						X	
Hydrology							
DRR							
Training and research							
Resource mobilization or regional collaboration							

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Title of item:

Improved Typhoon-related Disaster Risk Management in Various Sectors

- *Tropical Weather Outlook graphic.* During the tropical cyclone season, RSMC Honolulu prepares and transmits a text and graphical *Tropical Weather Outlook* that illustrates the probability of tropical cyclone development in the next 48 hours.
- *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. The RSMC Honolulu Director provided a hurricane presentation to the group during the June 2014 meeting.
- *RSMC Coordination.* RSMC Honolulu and RSMC Tokyo coordinated a seamless transition of one tropical cyclone as it crossed the International Date Line into RSMC Tokyo's area of responsibility.
- *Improvements in the Hurrevac 2014 program for the western North Pacific view.* HURREVAC is the decision support tool of the National Hurricane Program, administered by FEMA, the USACE, and the NOAA National Hurricane Center. WFO Guam has worked with the developers of the HURREVAC program over the past year to improve the display capabilities for the Pacific Region to the United States' primary emergency management decision support tools software program. This software program is designed to aid both Emergency Managers and forecasters with graphical forecast tracks, error distributions, and the intensity and wind field of an approaching tropical cyclone. This year's changes have significantly improved the internet graphics, which are heavily used by the threatened Micronesian populations and the multitude of US Government agencies that support them and the National leadership.

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

None.

KRA =	1	2	3	4	5	6	7
Meteorology				X		X	
Hydrology							
DRR				X		X	
Training and research							
Resource mobilization or regional collaboration							

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Title of item:

Resource Mobilization During Extreme Events

RSMC Honolulu assisted Hawaii State Civil Defense during Hurricane Iselle through video teleconferencing and even placed an Emergency Response Specialist in their Emergency Operations Center during the critical impact time.

WFO Guam Warning Coordination Meteorologist (WCM) was detailed to the Guam Emergency Operations Center during Typhoons Rammusun, Faxai, Neoguri, Halong, Phanfone and Vongfong in order to provide direct input and options to the Governor and his staff during these events. While there, the WCM conducted several briefings for Emergency Operations Staff and Mayors, and provided numerous on-camera updates to the media. He also provided numerous telephonic discussions to the Government of the Commonwealth of the Northern Mariana Islands for the tropical cyclones.

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

None.

KRA =	1	2	3	4	5	6	7
Meteorology							
Hydrology							
DRR							
Training and research							
Resource mobilization or regional collaboration		X		X	X		

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