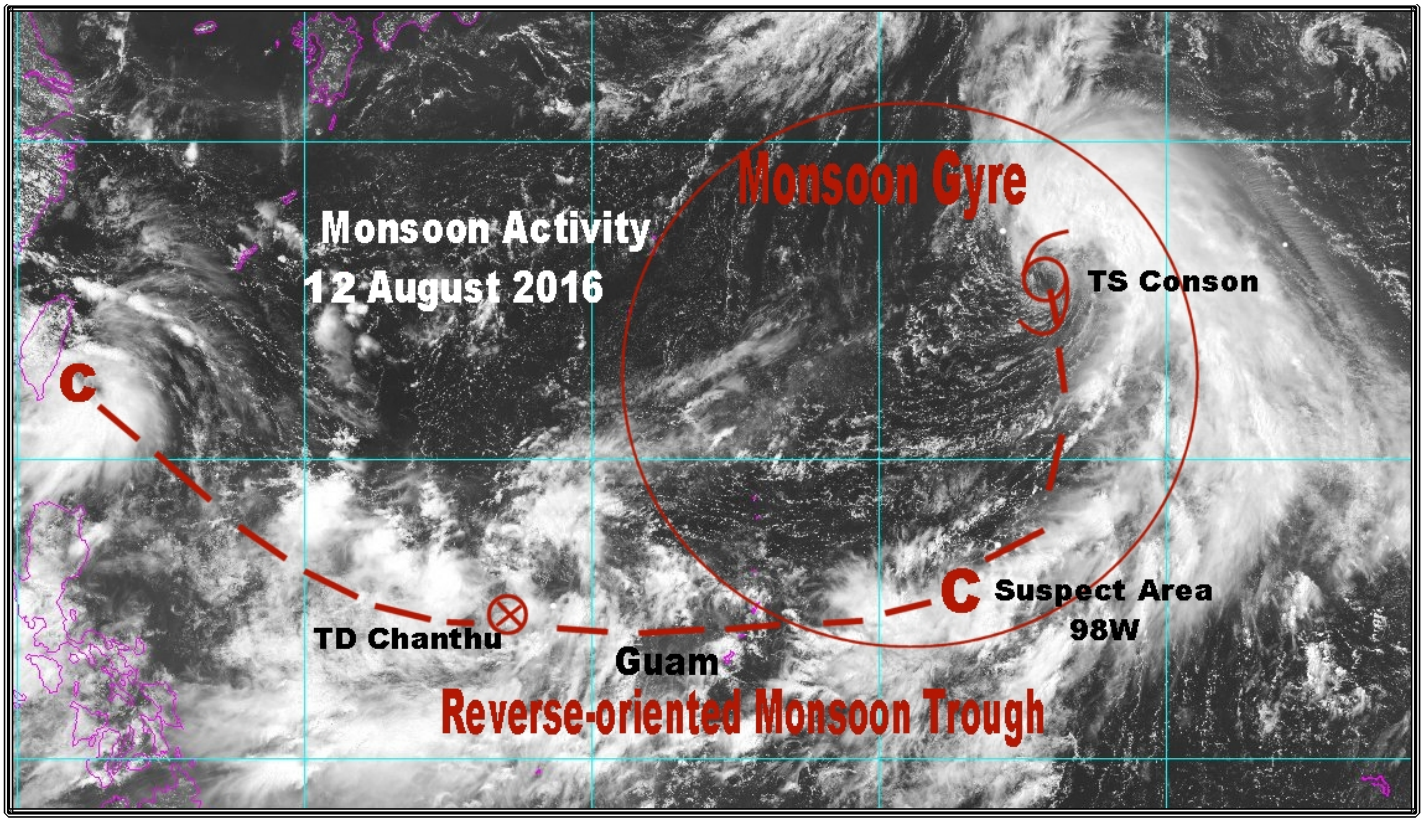
MEMBER REPORT

ESCAP/WMO Typhoon Committee

11th Integrated Workshop



United States of America
Pacific Region

Cebu, Philippines

22 – 26 October 2016

Cover caption: Cover caption: A common feature after a strong El Nino event such as in 2015, a series of high latitude, northward moving tropical cyclones are often found to form in the mid-summer western North Pacific tropical cyclone season. This image from 12 August demonstrates a typical pattern of formation within a reverse-oriented monsoon trough (orientated southwest to northeast versus a more climatological northwest to southeast orientation). A monsoon gyre often forms in the mature stage where a large area of the Pacific shows cyclonic flow, but TC development usually occurs along the periphery of the gyre.

CONTENTS

I. Overview of tropical cyclones which have affected or impacted Member's area in 2016

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 U.S.A. tropical cyclone activities involve the NWS and the Department of Defense's Joint Typhoon Warning Center (JTWC) located at Pearl Harbor, Hawaii. The NWS Weather Forecast Office (WFO) Guam provides weather forecasts, watches, warnings and advisories within its area of responsibility (AOR) (see Figure 1). The Guam WFO AOR 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 includes 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 Office uses track, intensity and wind distribution information provided by JTWC to produce forecast and warning products informing the general public and governmental agencies of impending severe weather. Tropical cyclone support to international aviation is based on products issued by the Japan Meteorological Agency's Regional Specialized Meteorological Center (RSMC) Tokyo-Typhoon Center.

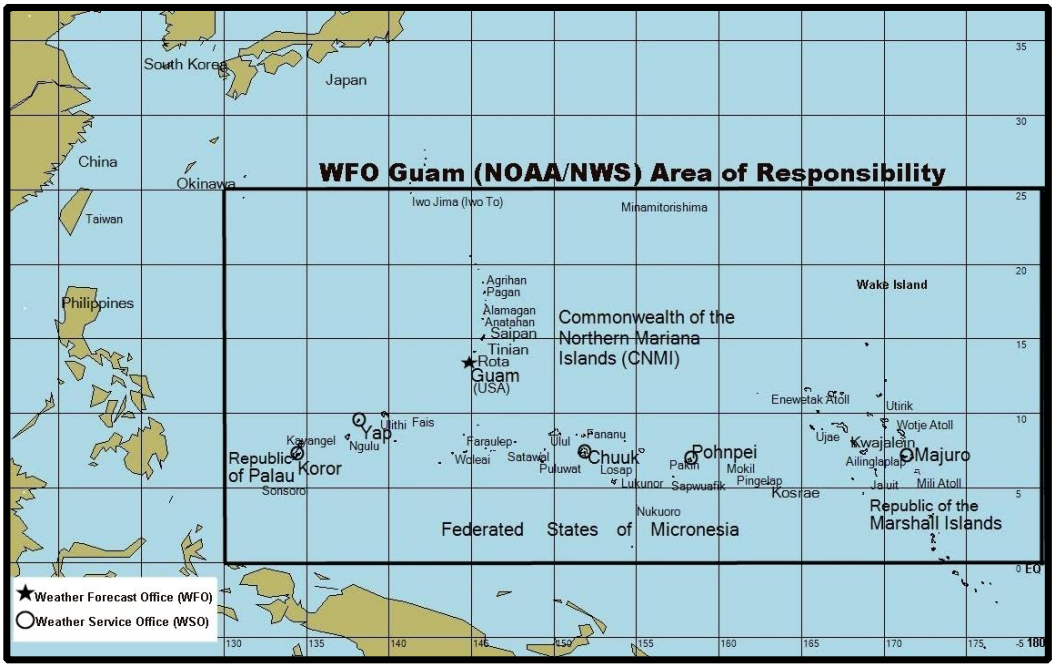


Figure 1: WFO Guam area of responsibility (AOR)

The Central Pacific Hurricane Center (CPHC) issues tropical cyclone warnings, watches, advisories, discussions, and statements for all tropical cyclones in the Central Pacific from 140 Degrees West Longitude to the International Dateline. The National Weather Service Forecast Office in Honolulu activates the CPHC when: (1) a tropical cyclone moves into the Central Pacific from the Eastern Pacific, (2) a tropical cyclone forms in the Central Pacific, or (3) a tropical cyclone moves into the Central Pacific from the West.

The area of responsibility covers around 5 million square miles (about 13 million square kilometers) generally from the Equator to 30N between 140W and 160E. The Marine high seas area covers nearly 11 million square miles or about 28.5 square kilometers of the Central North and South Pacific.

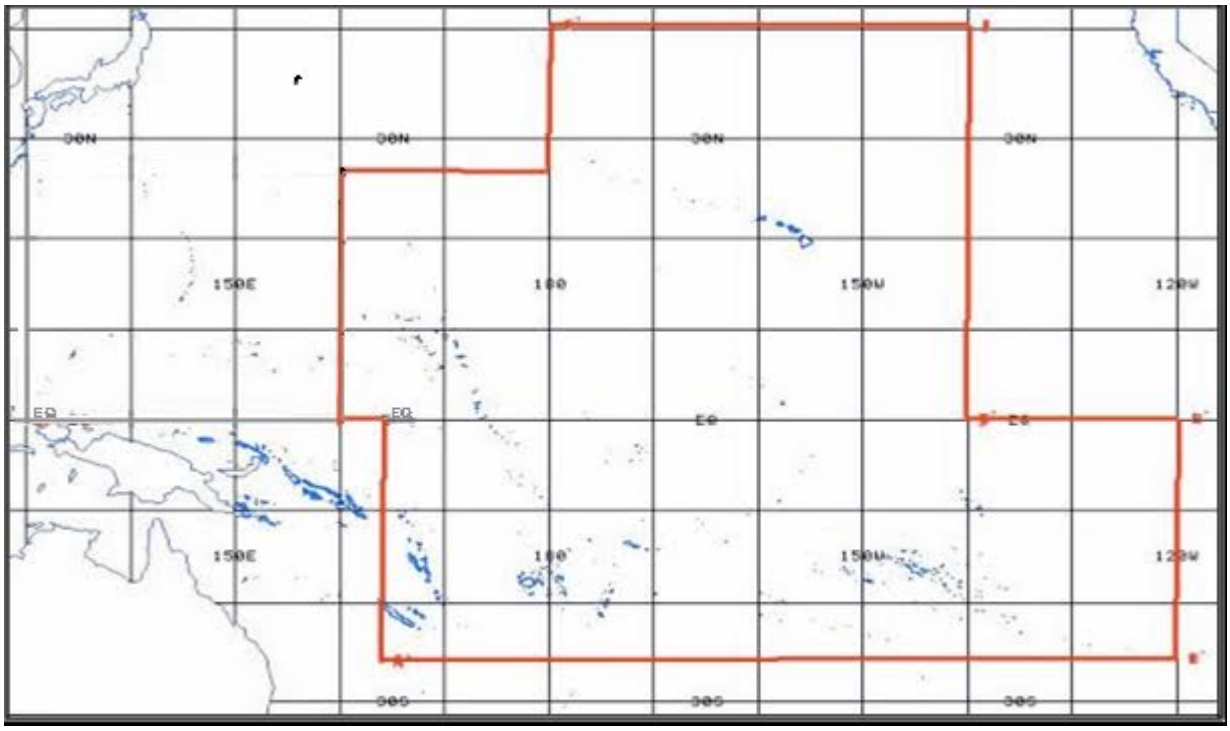


Figure 2: The Honolulu Weather Forecast Office AOR, including the Central Pacific Hurricane Center.

1. Meteorological Assessment (highlighting forecasting issues/impacts)

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

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 1 October 2015 through 30 September 2016 showed a classical swing in activity similar to that during the last two strong El Nino events, from the El Nino to Post-El Nino years, or 1997-1998 and 1982-1983. The 2015

season ended with eight additional long-tracked tropical cyclones crossing much of Micronesia to add to the twenty-one tropical cyclones that had already moved across Micronesia since the first of the year. Fortunately, typhoon warnings and watches were only required for two of these systems, Typhoon Champi and Typhoon In-fa, both for portions of the Marianas. Then, January 2016 marked the start of the El Nino decay, where persistent low latitude easterly surface winds return to the western North Pacific and extreme drought conditions often occurs. With virtually no organized convective activity occurring in the WFO Guam AOR during the first six months of the year, 2016 matched 1998 with no tropical cyclones requiring warnings until July (similarly, in 1983, the first tropical cyclone of the year did not form until the end of June).

However, once the tropical cyclone season started in earnest by the end of July, the numbers quickly increased, giving WFO Guam a total of 24 tropical cyclones in the AOR during the 12-month period of this report. Of note were the number of higher latitude, weaker tropical cyclones with northward tracks that occurred, particularly in August, when many generated from either monsoon gyres or a reverse-orientated monsoon trough (which is a condition where the monsoon trough is oriented from the southwest near Asia to the northeast beyond the Bonin Islands, northeast of the Marianas). September ended with four, more typical tropical cyclone tracks, all of which moved in a general west-northwest direction and all eventually becoming major tropical cyclones. So far for 2016, WFO Guam has only been required to issue Tropical Storm watches and warnings for four systems, Supertyphoon Nepartak, Tropical Storm Mindulle, Tropical Storm 14W and Supertyphoon Chaba. Each of these developed farther to the west than those in 2015, and each moved out of AOR before significantly developing.

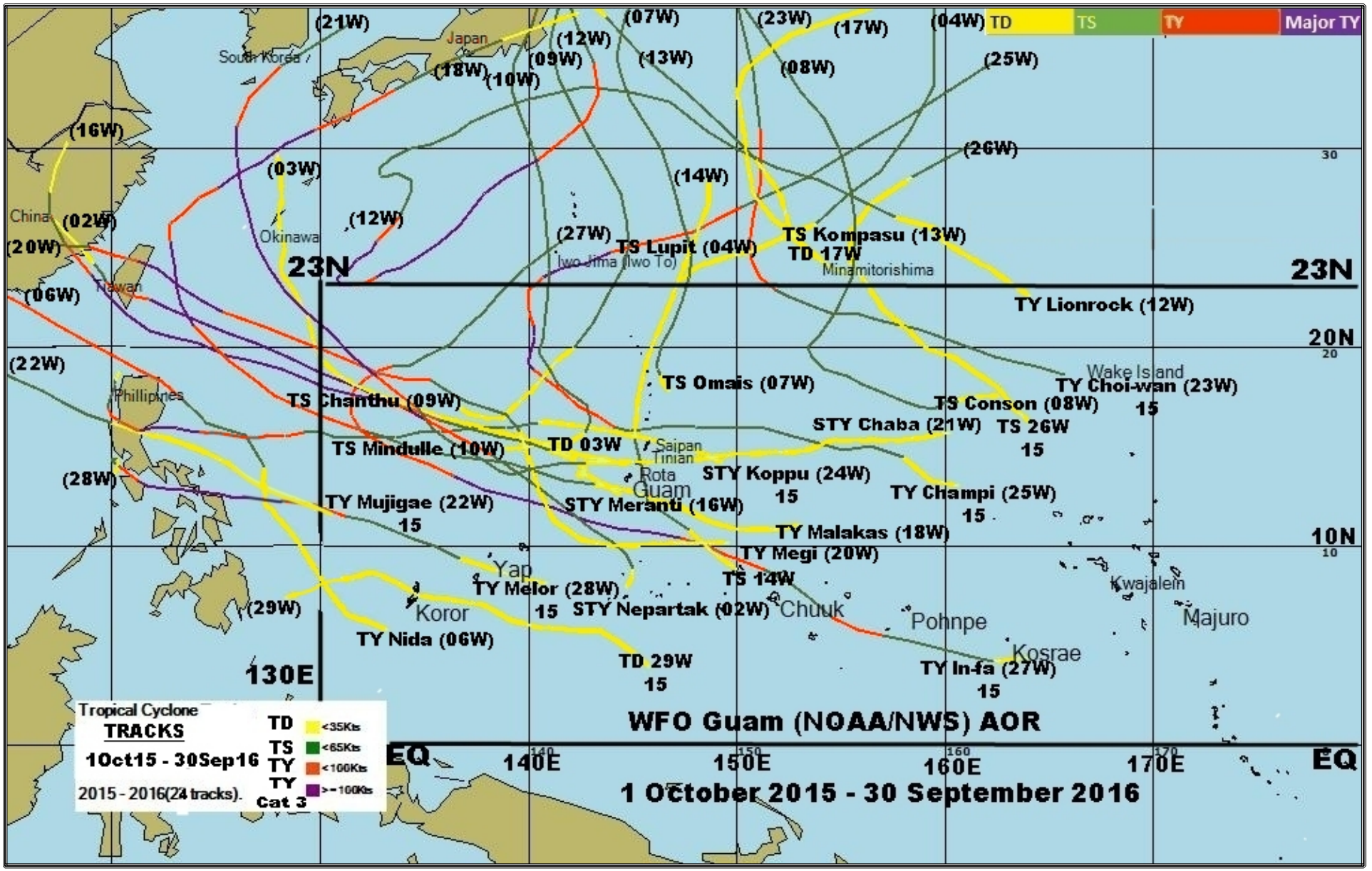


Figure 3: Tropical cyclones affecting Micronesia from 1 October 2015 through 30 September 2016. Color scheme is for the highest intensity with the WFO Guam AOR. Starting and ending tracks are indicated.

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

Eight tropical cyclones entered into, or were generated in, the central North Pacific during the period from January 1 through September 30, 2016. Of these eight tropical cyclones, three became hurricanes and two became major hurricanes (Madeline and Lester), while the remaining five attained only tropical storm status while in the central North Pacific. Two of the most notable tropical cyclones during the season were: 1) Tropical Storm Darby, which made landfall near Pahala on the southeastern side of the Big Island (Hawaii Island), very close to the landfall point of Tropical Storm Iselle in 2014; and 2) Hurricane Ulika which began in the eastern North Pacific, then moved westward and was named in the central North Pacific, then eventually moved east back into the eastern North Pacific and became a hurricane. Ulika then turned toward the northwest and re-entered the central north Pacific once again, which marked its noteworthy third basin crossing.

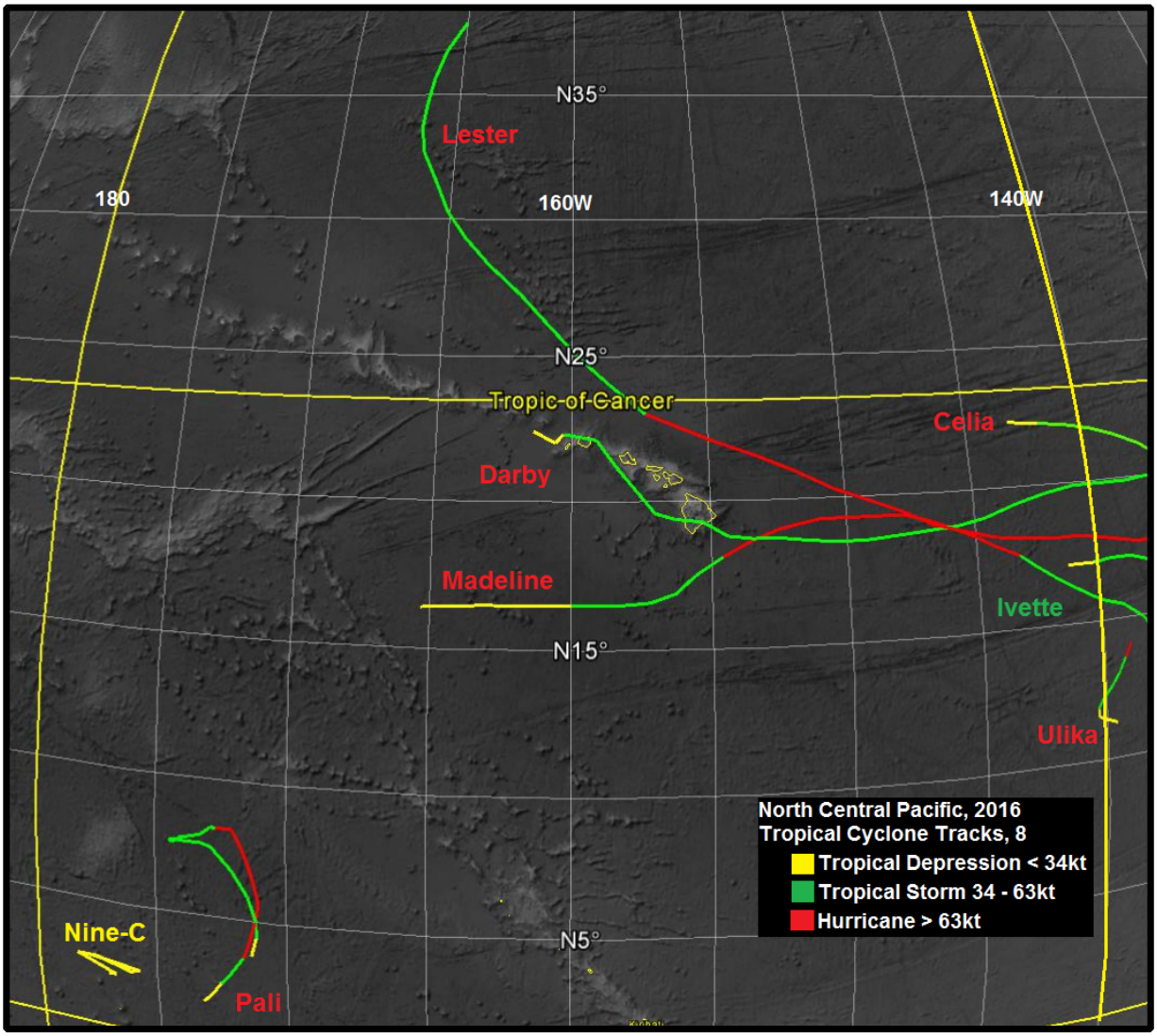


Figure 4: Central North Pacific Tropical Cyclone tracks: 1 January to 28 September, 2016

Tropical Storm Darby made landfall on the Big Island as a 35-knot system on June 23rd around 2 PM HST. After crossing the southern flank of 13,678 foot Mauna Loa volcano, Darby emerged over the Pacific Ocean near Keokea and moved northwest over open waters south of Maui and Oahu, and through the Kauai Channel to a point just offshore of the northeast Kauai Island coastline. Impacts from Darby during its passage across the Big Island were limited to sporadic power outages, tree damage, local coastal inundation, and minor flooding along the southeast and east side of the Big Island. Peak wind gusts reached 60 mph in the north side of the Big Island, where the island terrain amplified wind speeds most. Elsewhere in the state, the Island of Oahu reported heavy flash flooding across the eastern third of the island as a band of heavy thunderstorms remained in place for several hours. Rainfall totals up to 12 inches were recorded on Oahu, mainly from this band of thunderstorms. Additional high surf impacts were seen from the nearby passage of Hurricanes Lester and Madeline, missing the state to the northeast and southeast respectively. The largest surf was produced by Lester, affecting the eastern shores of the islands, and local coastal erosion and inundation effects hampered transportation and closed beaches in some coastal locations of Oahu, Maui and the Big Island.

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

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

After experiencing an active El Nino-induced tropical cyclone and monsoon season in 2015, very dry conditions persisted over the Republic of Palau, Yap in the Federated States of Micronesia and over the Republic of the Marshall Islands beginning in January 2016. In the ensuing months, these drought conditions developed over the rest of Micronesia and caused serious impacts to nearly every populated island by March. Drought Information statements were provided by the WFO Guam on a bi-weekly basis and more frequently when needed. Drought conditions ended by mid-July with the return of the monsoon trough over Micronesia.

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

A vast majority of the stations on the main Hawaiian Islands experienced above normal rainfall relieving drought conditions across the state. The only pockets of severe drought remaining are on the leeward sides of the islands of Maui and Kauai. In addition, the leeward sides of Molokai and Lanai are abnormally dry as well as the islands of Niihau and Kahoolawe.

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 often 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 45 tropical cyclone-related outreach events, several hundred broadcast and print media interviews, and over 20 formal Emergency Manager Briefings. This year's outreach to the emergency management community included a new tool for storm surge. The island of Oahu now has output from the SLOSH Surge Model, which is run from the National Hurricane Center. The results include the Maximum Envelope of Water (MEOW) and Maximum of the MEOWs (MOM), which provide decision makers inundation information for planning. Also, RSMC Honolulu participated in an annual hurricane exercise by providing mock advisories. For all events, RSMC Honolulu emphasized that a direct land-fall is not necessary 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

Item 1: **US National Weather Service heads the Strategic Plan 2017-2021 development**

At the 47th Session of the Typhoon Committee held in Bangkok, Thailand, the process of revising/updating the Typhoon Committee's Strategic Plan 2012-2016 commenced.

The Strategic Plan identifies key results areas (KRAs), strategic goals, and activities which the Committee wants to achieve in 2017-2021 with the intent of producing meaningful results for saving lives and mitigation of damage from typhoon-related events. At the 48th Session in Honolulu, Hawaii USA, Mr. Ken Kleeschulte (USA) was assigned the task of leading the team updating the Strategic Plan. Since that time, thirteen Members had identified their Focal Points responsible for collecting input and conducting reviews of the Strategic Plan within their respective countries. Inputs provided by the Member Countries addressed changes to the vision and mission statements and were based on the latest Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report (AR5).

Once the Key Results Areas (KRAs) are decided, Working Group Chairs will update their associated activities to correspond with these KRAs. A Final Draft of the Strategic Plan 2017-2021 will be developed and presented at the 11th Integrated Workshop in Cebu, Philippines.

It has been over a decade since the Committee restructured itself from the Regional Cooperation Programme Implementation Plan (RCPIP) to its current format as a means to better reflect the Key Results Areas and Strategic Goals of the group.

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

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

Member:	USA	Name of contact for this item:	Raymond Tanabe Ken Kleeschulte
	+808-725-6001		raymond.tanabe@noaa.gov
Telephone:	+671-472-0944	Email:	ken.kleeschulte@noaa.gov

Item 2: **US National Oceanic and Atmospheric Administration and the Republic of Indonesia sign an international agreement on joint activities on ocean observations and climate service support capacity building program.**

At the American Meteorological Society Conference that was held in New Orleans, Louisiana on January 20, 2016, the governments of the USA and Republic of Indonesia signed an international agreement with the objective to provide the mechanism for NOAA to provide "hands-on" practical technical assistance to the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG) in climate forecast training in exchange for ship time to maintain the Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction (RAMA) array as part of the Global Ocean Observing System (GOOS) and to deliver in-situ oceanic and atmospheric data to the Indonesian Program Initiative on Maritime Observations and Analysis (InaPRIMA). NOAA intends to help facilitate BMKG staff in obtaining scholarships in a formal postgraduate degree program in a U.S. university. NOAA intends to provide ocean observations equipment (RAMA buoys and instrumentation). In exchange BMKG intends to provide annual Indonesian ship support to maintain moorings at five RAMA sites in the eastern tropical Indian Ocean within the region 16°S to 8°N latitude and 90°E to 95°E longitude.

This agreement continued at "The 11th Annual Indonesia - U.S. Ocean and Climate Observation, Analysis and Application Partnership Workshop" from 13 to 17 May 2016 in Manado, Indonesia. The theme for this workshop was "The Role of Ocean Observation for Improving Climate Services through Enhancing the Capability of Using Prediction Tools". Goals were to: (1) Develop practical knowledge on existing NOAA products and services available to be used in Indonesia; (2) Demonstrate the crucial role of ocean observation for understanding and predicting regional weather, ocean and climate; and, (3) Understand ocean process; climate drivers and climate services development.

The collaboration between BMKG and NOAA started formally when the MoU between both agencies in the field of meteorology and climatology was signed in 2012.

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							X

Resource mobilization or regional collaboration							X

Member:	USA	Name of contact for this item:	Raymond Tanabe
Telephone:	+808-725-6001	Email:	raymond.tanabe@noaa.gov

Item 3: **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;
- a scale that relates tropical cyclone wind speed to damage and storm surge;
- applications tutorial for applying the scale; typhoon risk and vulnerability;
- tropical cyclone decision making for individual islands and states; and
- WFO Guam website products.
- general climate familiarity, climate variability, and climate change;
- El Niño /La Niña and their effects, impacts and status;
- Other subjects addressed are tsunamis and volcanoes; rip currents, currents, and tides; earthquakes, and local communications capabilities.

In 2016, WFO Guam conducted workshops on Guam, Saipan in the Commonwealth of the Northern Mariana Islands, and on Yap, Chuuk and Pohnpei in the Federated States 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 to disaster managers, and weather spotter and surf observer training. The WFO also interfaces with local Non-Government Organizations and US Embassies. The tailored PowerPoint presentations for each location are being expanded to include comprehensive notes to allow a broader number of lecturers to use them.

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

Member: USA

Name of contact for this item: Chip Guard

Telephone: +671-472-0946

Email: chip.guard@noaa.gov

Item 4: **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 2016, RSMC Honolulu participated in annual tropical cyclone exercises. This statewide annual hurricane exercise, coordinated by Hawaii State Civil Defense (SCD) in partnership with the NWS Forecast Office in Honolulu was held in June.

On Guam, the annual Typhoon Preparedness exercise did not take place due to several real-time events during the year. However, in 2016 Guam hosted the 12th Festival of Pacific Arts and Culture. This major cultural event, held every four years since 1972, brings together artists and cultural practitioners from around the Pacific region for two weeks of sharing their cultures with one another. This Festival includes 27 Island Nations from Micronesia, Melanesia, and Polynesia, and from Australia and New Zealand. Guam Homeland Security Office of Civil Defense, the Guam Governor's Office, other key Government agencies, and WFO Guam conducted a Table-top Exercise, which was designed around a major typhoon approaching the islands prior to and during this event.

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				X	X		

Member: USA

Name of contact for this item: Tom Evans, Genevieve Miller

	+808-973-5273		tom.evans@noaa.gov
Telephone:	+671-472-0944	Email:	genevieve.miller@noaa.gov

Item 5: **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.

In October 2016, the island of Saipan, CNMI was re-evaluated and re-recognized for another three years as a StormReady and aTsunamiReady location. The island had a direct hit from Typhoon Soudelor in 2016. Its ability to address cyclones and provide accurate and timely warnings prevented any death and serious injury, and kept damage to a minimum.

RSMC Honolulu assisted the communities of Ewa Beach and Hauula, as well as the Counties of Kauai and Maui in renewing their designations as StormReady and TsunamiReady in 2016. RSMC Honolulu ensured the community had disaster action plans in place and held outreach events to convey a preparedness message. Six entities were assisted in achieving this designation.

As of October 2016, there were 2538 StormReady Communities in the United States, of which, 20 are in the Pacific Region. There were also 197 TsunamiReady communities, of which 19 were in the Pacific Region. All of the six locations within the WFO Guam AOR are both StormReady and TsunamiReady.

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

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

Member:	USA	Name of contact for this item:	Chip Guard Tom Evans
Telephone:	+671-472-0946 +808-973-5273	Email:	chip.guard@noaa.gov tom.evans@noaa.gov

Item 6: **Advanced Weather Interactive Processing System (AWIPS) II**

AWIPS is the engine running the NWS Weather Forecast Office operations. It is an interactive computer system that integrates all meteorological, hydrological, satellite, and radar data into a single computer workstation. First implemented in 2001, AWIPS provides an efficient and effective means for forecasters to prepare and issue timely, accurate forecasts and warnings. It allows forecasters the interactive capability to view, analyze, combine, and manipulate large amounts of graphical and alphanumeric weather data.

In 2016, NWS continued to implement and refine the newest and most ambitious upgrade to the program—AWIPS II. AWIPS-II is a more robust system that implements a modern Services-Oriented Architecture (SOA) infrastructure.

This modernized platform utilizes a new object-oriented architecture and scalable design to implement new display technology and data interrogation techniques. The enhanced capability is important for meteorologists as they face an unprecedented volume of decision-influencing observations and model output fields, while striving to increase lead times and accuracy for dangerous weather events. One of the contributors to the influx of new, useful observations will be the Geostationary Operational Environmental Satellite (GOES) R-Series. The challenge is to allow for gainful information to be ascertained by the forecaster without requiring a significant amount of time for assessment or compromising the details in the data. Both WFO Guam and WFO Honolulu currently use the Himawari satellite imagery.

The increased functionality of AWIPS II is in part due to a re-engineered, service-oriented architecture and multi-platform Java codebase. These upgrades improve system performance and streamline the enhancement process for new features while limiting the need for significant incremental upgrades and maintenance releases.

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

In the future, AWIPS II will likely contain intuitive user controls, which communicate directly with the graphical processing unit to quickly render displays.

KRA =	1	2	3	4	5	6	7
Meteorology				X			

Hydrology				X			
DRR				X			
Training and research							
Resource mobilization or regional collaboration							

Member:	USA	Name of contact for this item:	Genevieve Miller Tom Evans
	+671-472-0944		genevieve.miller@noaa.gov
Telephone:	+808-973-5273	Email:	tom.evans@noaa.gov

Item 7: **Outreach/Education Activities**

- *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 (PEAC) Center, which issues Special Updates, if warranted. WFO Guam also provides input to the National 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 2016 Central Pacific Hurricane Season Outlook on 26 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 was National Disaster Preparedness Month for 2016. 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 Disaster Preparedness Month Proclamation signing by the Governor of Guam, several awareness activities, and the Grand Finale Display at a local Shopping Center complex.

- *University Course Enhancement.* WFO Guam hosted the University of Guam Environmental Biology and Physical Geography classes in March providing facility tours and seminars on tropical cyclones, ENSO, and Climate Change. This provided education to nearly 200 students majoring in such topics as nursing, education, criminal justice, and biological sciences.

- *Guam Island Youth Preparedness Program.* Educating our youth has been a primary focus in 2016 for the Federal Emergency Management Agency (FEMA). It's Youth Preparedness Council enlisted youth leaders from across the country who are highly interested and engaged in advocating youth preparedness and making a difference in their communities. The Council members were selected based on their dedication to public service, their efforts in making a difference in their communities, and their potential to expand their impact as national advocates for youth preparedness. WFO Guam was a strong supporter of this

program and participated in all three Saturday events sponsored by the Guam Youth Preparedness Program and FEMA.

- *University of Guam Conference on Island Sustainability*. The 7th Conference on Island Sustainability sponsored by the University was held 12-14 April with the objective to inspire change, facilitate action, and provide a venue for sharing, networking, and collaboration of sustainability issues related to the economic, social/cultural, educational, and environmental or energy solutions. WFO Guam Warning Coordination Meteorologist provided a presentation on extreme events in the Pacific concentrating on droughts, typhoons and El Nino and provided an evaluation on downscaled products.

- *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 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, tropical cyclone, and safe boating brochures.

- *FEMA Western Pacific Islands Typhoon Readiness Planning Workshop for Guam and Saipan.* WFO Guam Warning Coordination Meteorologist provided vital information to the FEMA Typhoon Readiness Planning Workshop that was held on June 13 to 15. This Workshop included 1-hour presentations on a comprehensive typhoon scenario for a new Catastrophic Typhoon Plan and on the regional impacts likely to occur due to Climate Change. These impacts were primarily associated with projected changes in tropical cyclone activity, sea level rise and rainfall distribution.

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

None.

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

Member: USA

Telephone: +671-472-0946
+808-973-5273

Name of contact for this item: Chip Guard
Tom Evans

Email: chip.guard@noaa.gov
tom.evans@noaa.gov

Item 8: **Pacific International Training Desk**

The Pacific International Training Desk (PITD), funded by the USA National Weather Service as part of the US contribution to the WMO Voluntary Cooperation Program (VCP), and is managed by the University of Hawaii, Telecommunications and Social Informatics (TASI) Research Program. The training is intended to prepare weather observers to understand the forecast process, learn fundamental variables and skills required for forecasting, and provide an opportunity for basic hands-on work with meteorological analysis and prediction.

The PITD provides one-on-one basic weather forecast training with an emphasis on the tropics. The training program is focused on operational forecasting to enable its participants to prepare and disseminate locally-produced meteorological, hydrologic and climate products for their home countries. In 2016, the PITD was conducted from two locations, Honolulu, Hawaii and Guam.

In Hawaii, participants were members of National Meteorological and Hydrological Services (NMHS) of the Regional Association V (RA V) of the World Meteorological Organization (WMO). These Cohorts were from Papua New Guinea, Tuvalu, Solomon Islands, Tokelau, and Vanuatu.

On Guam, the first one-month long PITD course for US-Affiliated western North Pacific Weather Service Office personnel was delivered at the NOAA/NWS Weather Forecast Office in January to February 2016. Subsequent courses were taught in March and May. Participants for the Guam PITD were Weather Service Specialists from Weather Service Offices in the Federated States of Micronesia (Chuuk, Pohnpei and Yap), the Republic of Palau, and the Republic of the Marshall Islands.

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

In addition to materials taught by a contract instructor from Hawaii, WFO Guam forecasters also provided tailored training in earthquakes and tsunamis, in ENSO behavior, in satellite imagery interpretations, and in regional forecasting techniques.

Discussions are underway for a phase two of the program in Micronesia. Recipients have expressed their desire to learn more about meteorology and have requested additional training and/or refresher training once all staff members in each office are trained.

KRA =	1	2	3	4	5	6	7

Meteorology						X	X
Hydrology						X	X
DRR						X	X
Training and research						X	X
Resource mobilization or regional collaboration							

Member:	USA	Name of contact for this item:	Genevieve Miller Tom Evans
Telephone:	+808-973-5273	Email:	genevieve.miller@noaa.gov tom.evans@noaa.gov

Item 9: **International Cooperation Efforts**

- *48th Annual Session.* The 48th Annual Session of the ESCAP/WMO Typhoon Committee was hosted by the United States in Honolulu, HI on 22-15 February 2016. The Session was attended by **68** participants from 10 of 14 Members of the Typhoon Committee. Observers from the Joint Typhoon Warning Center (JTWC), University of Hawaii, Sun Yat Sen University of China and Tohoku University of Japan also attended.

- *Annual WGDRR meeting.* The 11th annual WGDRR Meeting was held in Ulsan, Republic of Korea in 24 to 27 May 2016 at the kind generosity of the National Disaster Management Institute. This year's theme, "Promoting Knowledge Sharing within the WGDRR" was prominently featured in members' presentations. Objective of the meeting was to share the information of Members' typhoon-related disaster management, their lessons learned and efforts in reducing risks of future disasters.

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

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

Member: USA

Telephone: +808-725-6001
+671-472-0944

Name of contact for this item: Raymond Tanabe
Ken Kleeschulte

Email: raymond.tanabe@noaa.gov
ken.kleeschulte@noaa.gov

Item 10: **Technological Improvements**

- *GOES-R project and Initial Views from the Himawari Satellite.* RMSC Honolulu and WFO Guam have been participating in both the examination of the new high resolution data now available from the new Japanese Himawari geostationary satellite as well as through the on-going GOES-R project. 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 platforms. One of those sensors is onboard the Suomi NPP satellite and it plays a critical role in helping to locate 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 onboard the International Space Station (ISS) had been a welcome addition (until halted in June 2016) to ocean surface wind vector coverage over the tropical oceans; we are still waiting to see if it will return. 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 37GHz 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 and monsoon activity in the AOR.

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							

Member:	USA	Name of contact for this item:	Robert Ballard Roger Edson
Telephone:	+808-973-5274 +671-472-0948	Email:	robert.ballard@noaa.gov roger.edson@noaa.gov

Item 11: **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. RSMC Honolulu Personnel provided a hurricane presentation to the group during the July 2016 meeting.

- *RSMC Coordination.* There were no tropical cyclones that move between RSMC Honolulu and RSMC Tokyo. However, when Hurricane Pali was near 180, RSMC Honolulu and RSMC Tokyo communicated on the possible transition across areas of responsibilities.

- Hurrevac improvements for 2016. The following features have been added for use by Emergency Management Partners: Watches and Warnings (including breakpoints) for the Marianas are now displayed on the map; public advisories issued by WFO Guam are available under the Advisory tab; multiple time zones can now be displayed in the storm labels for handling emergency; and base maps have been adjusted to improve island label placement to the Marianas.

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							

Member:	USA	Name of contact for this item:	Tom Evans Genevieve Miller
Telephone:	+808-973-5273 +671-472-0944	Email:	tom.evans@noaa.gov genevieve.miller@noaa.gov

Item 12: **Resource Mobilization During Extreme Events**

RSMC Honolulu supported onsite Emergency Operations Center functions with a deployed meteorologist who worked side by side with the state of Hawaii Emergency Management team during the response to Tropical Storm Darby and Hurricanes Madeline and Lester. In addition RSMC Honolulu conducted dozens of Emergency Management Briefings through the 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.

WFO Guam Warning Coordination Meteorologist (WCM) was detailed to the Guam Emergency Operations Center during Typhoons In-fa and Chaba, and for developing systems that becamse Typhoon Malakas, Tropical Storm 14W, and Typhoon Mindulle 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 and tailored PowerPoint presentations to the Government of the Commonwealth of the Northern Mariana Islands for these and other 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		

Member:	USA	Name of contact for this item:	Tom Evans Chip Guard
Telephone:	+808-973-5273 +671-472-0946	Email:	tom.evans@noaa.gov chip.guard@noaa.gov