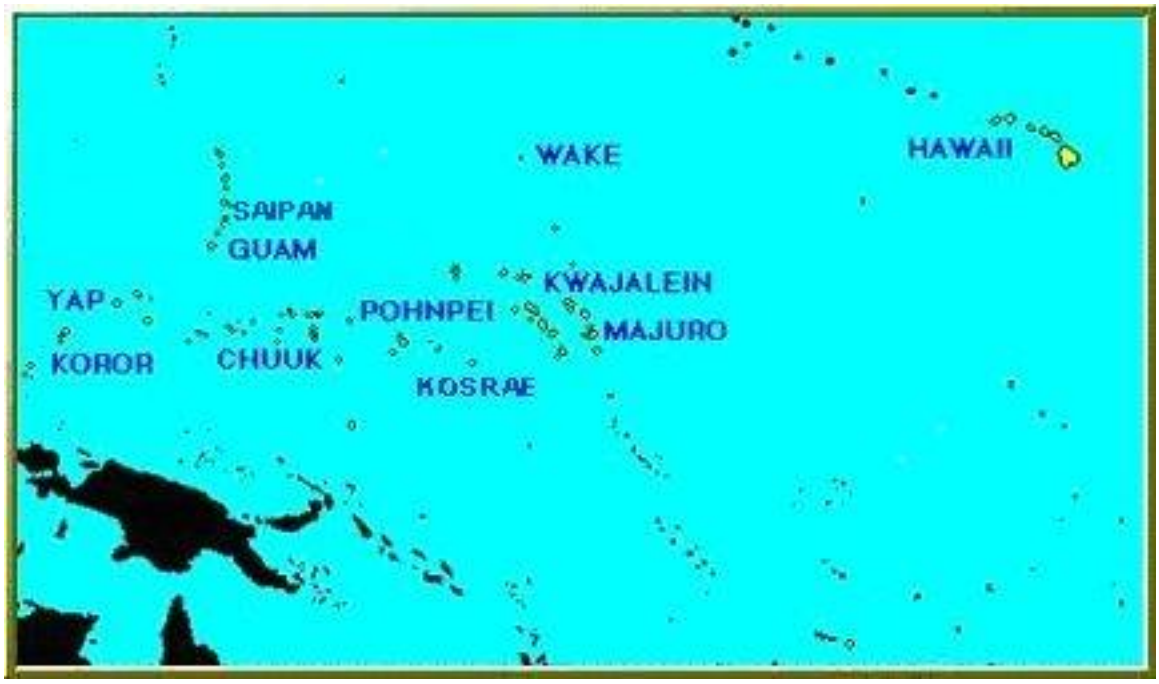
MEMBER REPORT



ESCAP/WMO Typhoon Committee
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Cover caption: Map depicting RSMC Honolulu/Central Pacific Hurricane Center (CPHC) (west of 140E and east of the International Date Line, north of Equator) and Weather Forecast Office (WFO) Guam (west of the International Date Line to 130E, north of Equator to 21N), Areas of Responsibility.

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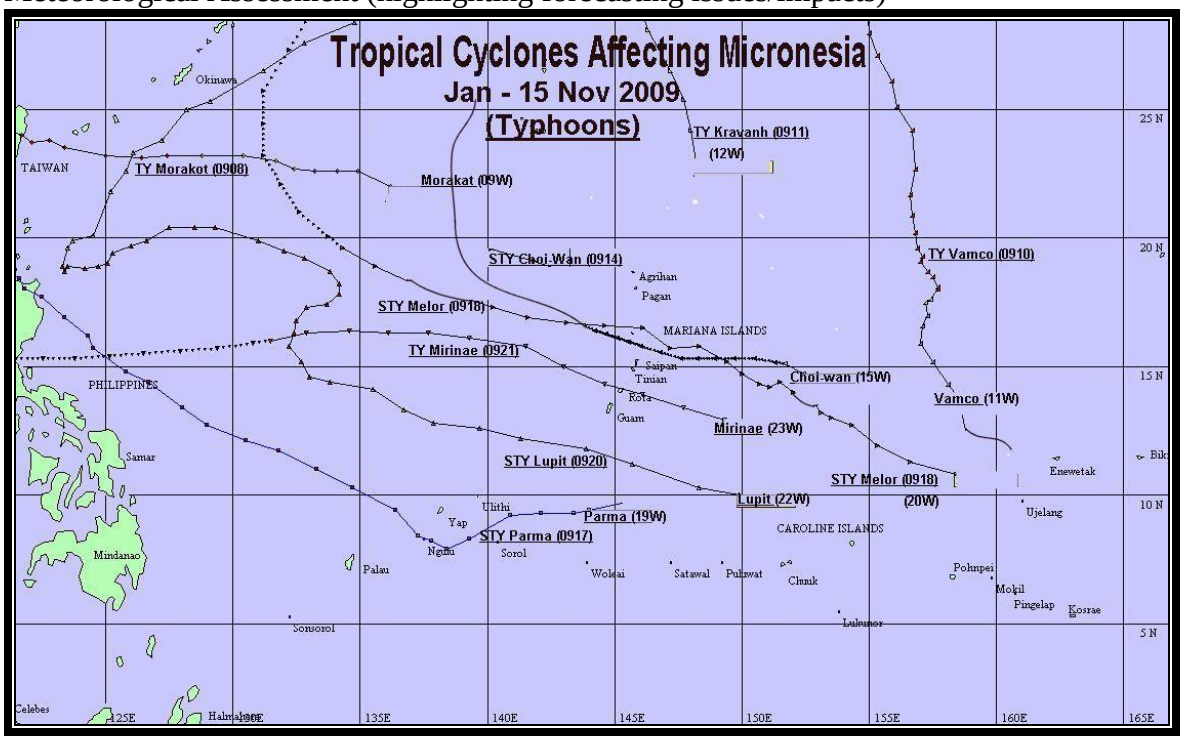

Figure 1: Tracks of Typhoons affecting Micronesia from 1 January to 15 November 2009 (partial tracks shown).

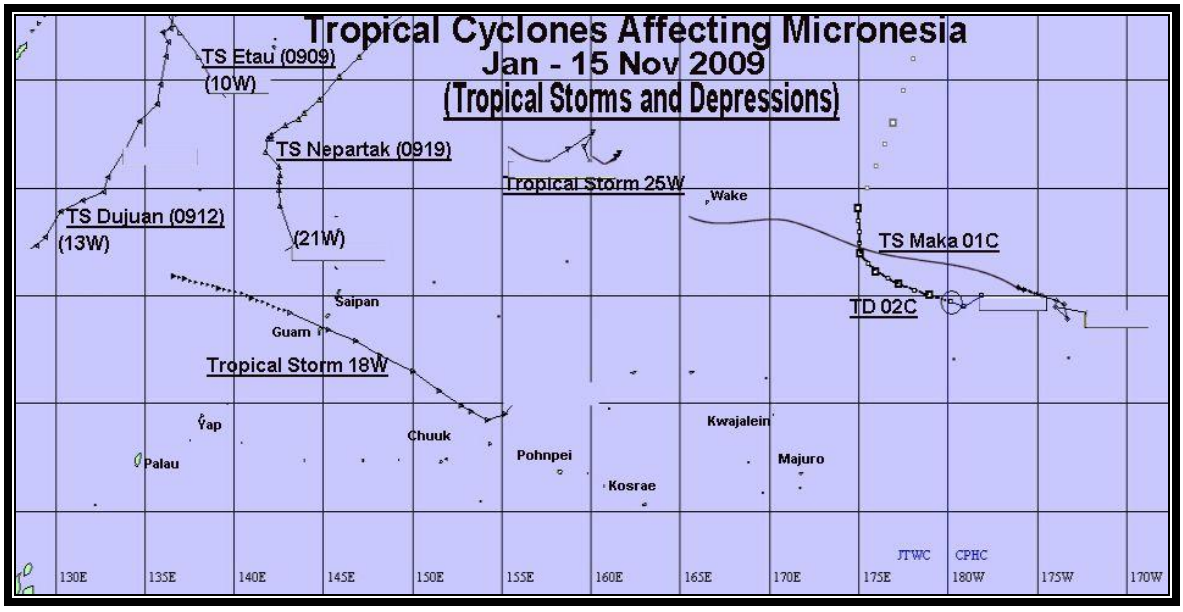

Figure 2: Tracks of Tropical Storms and Depressions affecting Micronesia from 1 January to 15 November 2009 (partial tracks shown).

Tropical Cyclone activity in the Micronesian portion (area between the Equator and 21N from 130E to 180, not including Kiribati) of the western North Pacific from 1 January 2009 through 15 November 2009 was near the norm of 18 to 20 tropical cyclones per year for this region. A total of 13 cyclones originated in this region and two crossed over from the Central Pacific (see Figure 1). An early-season La Nina pattern gave way to an El Nino pattern by late summer. This shifted most tropical cyclone development from western Micronesia to more eastern regions. This subjected Micronesian locations to a longer duration of tropical cyclone tracks and to stronger tropical cyclones. Sustained winds referenced in this report are 1-minute averaged winds.

Typhoon Morakot (09W) developed southeast of Okinawa and 815 miles northwest of Guam on 4 August. Morakot moved westward out of the Guam Area of Responsibility (AOR) as a tropical storm on 6 August without affecting any Micronesian islands or atolls in the region.

A few days later, Tropical Storm Etau (10W) formed northwest of the Marianas or about 710 miles north-northwest of Guam. Etau moved northwest quickly and exited the Guam AOR before reaching tropical storm intensity.

Tropical Storm Maka (01C) originated in the Central Pacific on 10 August and weakened. After crossing the International Date Line, it regenerated northeast of the Republic of the Marshall Islands (RMI) or about 500 miles north-northeast of Majuro, RMI on 15 August. Maka took a north-northwestward track and eventually dissipated about 365 miles southeast of Wake Island.

Typhoon Vamco (11W) developed 1050 miles east-southeast of Guam on 16 August and took a west-northwest track. It intensified into a tropical storm in 24 hours and then into a typhoon the following day. Vamco peaked at 105 KT but kept on a path that did not affect any of the Micronesian Islands. Vamco exited the Guam AOR on 22 August.

Typhoon Krovanh (12W) formed northeast of the Marianas chain on 28 August or about 655 miles north-northeast of Guam in a location not affecting any of the Micronesian islands. Krovanh left the AOR as a tropical storm a few days later.

Tropical Depression Two-C crossed the International Date Line from the Central Pacific Ocean basin on 6 August. It continued to move westward, well north of the RMI and dissipated within 24 hours.

Tropical Storm Dujuan (13W) developed west-northwest of Guam on 4 September and moved north-northeast out of the AOR, not affecting any Micronesian islands.

Super Typhoon Choi-wan (15W) started around 500 miles east of the Mariana Islands on 12 September. This particular system caused major concerns for the Marianas as forecasts predicted typhoon strength winds and a track towards the island chain, mainly Saipan, Commonwealth of the Northern Marianas (CNMI). Tropical Storm Watches and Warnings were issued for Guam and for Rota, CNMI, and Typhoon Watches and Warnings were issued for Tinian, Saipan, and the northern islands of Agrihan, Pagan and Alamagan in the CNMI. By the afternoon of 13 September, Choi-wan's forecast track posed a greater threat to the northern CNMI islands of Agrihan, Pagan and Alamagan than to Saipan and Tinian. Choi-wan intensified further, becoming a typhoon and then a super typhoon as it passed over the island of Alamagan. Severe typhoon conditions pelted that island for nearly 12 hours. Because of the remoteness of the island, Navy helicopters were dispatched after the typhoon's passage to evacuate a family of six, including a newborn, to the Saipan hospital. The Navy also delivered food, water and supplies to the remaining residents. After high seas abated, a chartered vessel was sent to Alamagan to evacuate the remaining 8 residents.

Figure 3: Devastation of Alamagan. Note the twisted crowns of the coconut palms.

Tropical Storm 18W developed 900 miles east-southeast of Guam on 27 September. With Choi-wan still fresh in the minds of the public, all eyes were on 18W, which remained a tropical depression for two days and then was upgraded to tropical storm when it was only one day away. A Tropical Storm Warning was issued for Guam and Rota. Forecasts called for minimal tropical storm-strength winds as 18W approached Guam. However, 18W weakened and quickly dissipated northeast of Guam. No significant damage was recorded.

Super Typhoon Parma (19W) developed south of the Marianas during the same time period as tropical cyclones 18W and 20W. Parma was forecast to move westward through Yap State in the Federated States of Micronesia (FSM). Tropical Storm Watches and Warnings were issued for the various islands and atolls in its path. Parma reached tropical storm intensity on 29 September and

became a typhoon near Ngulu Atoll in Yap State, FSM on 30 September. It then continued to track northwest toward the Philippines and out of the AOR.

Super Typhoon Melor (20W) formed north of Pohnpei, FSM on 29 September. It was forecast to move towards the Marianas within two days, and therefore, Watches and Warnings were issued for Guam, Rota, Tinian and Saipan. Melor passed 90 miles northeast of Saipan, near the uninhabited volcanic island of Anatahan, with 120 KT sustained winds. The peak wind recorded on Rota was 40 KT and on Saipan was 42 KT. WFO Guam conducted a wind assessment on Saipan, which revealed that winds on the exposed northwest coastal areas of Saipan experienced winds that were near typhoon–force. Melor moved out of the AOR on 6 October.

Tropical Storm Nepartak (21W) formed west of the Marianas on 8 October and moved northward and then northeastward, exiting the AOR by 12 October. No island in Micronesia was affected.

Super Typhoon Lupit (22W) was the next threat to the Marianas. Lupit formed north of Chuuk, FSM or about 560 miles east-southeast of Guam and moved westward. Although expected to stay south of Guam, tropical storm-force winds likely extended north into Guam coastal and offshore waters. Tropical Storm Watches were issued on 14 October. Peak wind recorded on Guam was 53 KT. Lupit continued moving westward passing between northern Yap State islands and the Marianas. Typhoon intensity was reached on the evening of 16 October. Lupit peaked at super typhoon intensity (130 KT) two days later, after passing the Marianas. It continued its movement out of the AOR and towards the Philippines.

Typhoon Mirinae (23W) developed east-southeast of the Marianas on 26 October. As a tropical storm, Mirinae maintained a steady track towards Guam, Rota, Tinian and Saipan. It passed just north of Rota as a minimal tropical storm. Peak wind on Rota was 54 KT. Mirinae reached typhoon strength on 28 October and continued westward toward the Philippines.

Tropical Storm 25W developed northeast of the Marianas on 7 November, posing no threat to any islands in Micronesia. It moved northeast and dissipated on 9 November.

Central Pacific Overview

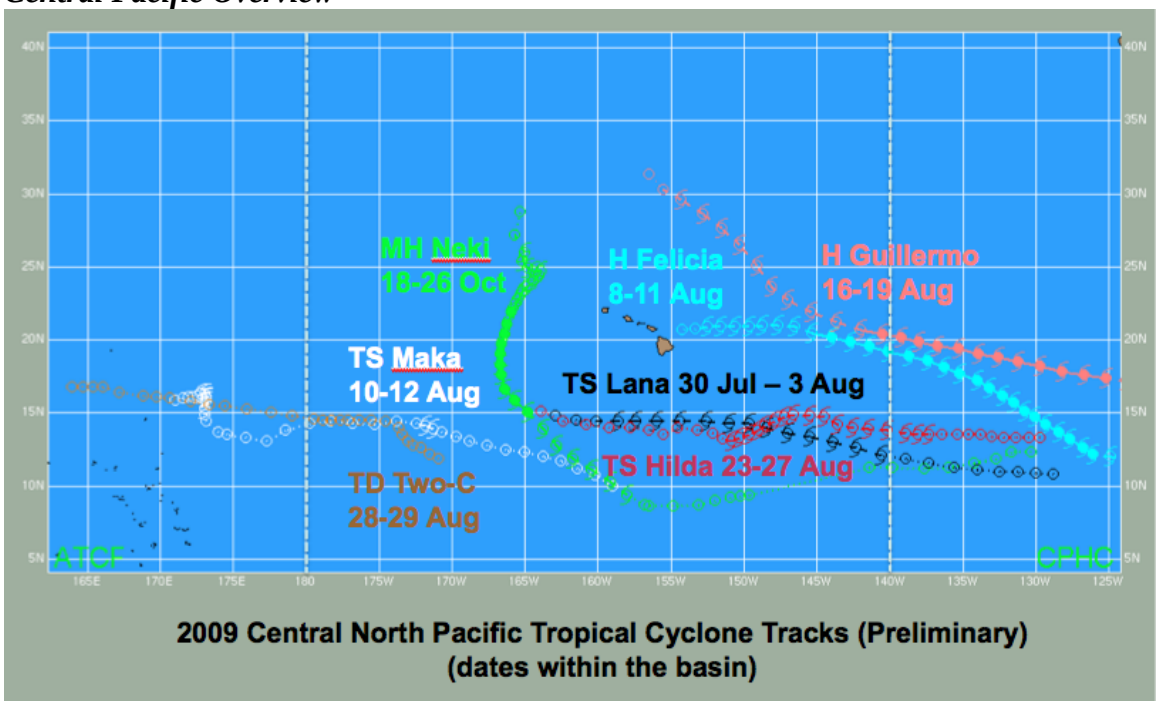

Figure 4: Tracks of Tropical Cyclones affecting the Central North Pacific

1. Meteorological Assessment (highlighting forecasting issues/impacts)
   Developing El Nino conditions across the equatorial Pacific Ocean in 2009 translated into above normal tropical cyclone activity in the Central North Pacific. From 1 January 2009 through 31 October 2009, and with one month left in the tropical cyclone season, seven tropical cyclones formed within or moved into the Central North Pacific. An active MJO (Madden Julian Oscillation) phase contributed to five tropical cyclones around the month of August, which is typically the most active month as well. The normal for the basin is four to five tropical cyclones each year.

   Tropical Storm Lana kicked off the 2009 tropical cyclone season for Regional Specialized Meteorological Center (RSMC) Honolulu on 31 July. Lana started out as a tropical depression nearly 1200 miles southeast of Hawaii and quickly intensified to its peak intensity of 55 KT. Lana passed safely to the south of Hawaii before dissipating into a remnant low on 4 August.

   Hurricane Felicia formed in the Eastern Pacific on 3 August and moved into the Central North Pacific on 8 August. For the next few days…the entire State of Hawaii watched anxiously as tropical storm watches were issued and Felicia continued on a westward track aimed directly at the islands. Both low and high altitude reconnaissance aircraft (Air Force Reserve WC-130 and NOAA Gulf Stream) flew multiple missions and provided critical information to RSMC

Honolulu forecasters. As forecast, wind shear and cool SSTs eventually took their toll and Felicia weakened into a remnant low just east of Hawaii.

Maka was a short lived tropical cyclone which formed near the date line on 10 August. Maka spun up into a minimal tropical storm on 11 August and just as quickly spun down into a remnant low on 12 August.

Hurricane Guillermo formed in the Eastern Pacific on 12 August and entered the Central North Pacific on 16 August. Guillermo took an unusual track north of the Hawaiian Islands. At its closest point of approach…Guillermo passed several hundred miles northeast of Hawaii. Guillermo dissipated over 700 miles north of Hawaii on 19 August. There were no significant wind or rain impacts. Swell generated by Guillermo produced advisory level surf across the east facing shores of several islands.

Tropical Storm Hilda entered the Central North Pacific on 23 August and maintained a westward track well south of Hawaii. Hilda reached a peak intensity of 55 KT on 24 August before gradually spinning down and eventually dissipating on 28 August.

Tropical Depression Two-C was a very short-lived tropical cyclone which formed just east of the International Date Line on 29 August. Two-C lasted less than 24 hours and RSMC Honolulu issued only 4 forecast bulletins before Two-C dissipated into a trough.

Hurricane Neki formed just over 700 miles due south of the Hawaiian Islands on 18 October. Hurricane Neki reached a peak intensity of 105 KT on 22 October. The track of Neki necessitated a Hurricane Watch for Johnston Island and Hurricane Watches and Warnings for portions of the Papahanaumokuakea National Monument (Northwestern Hawaiian Islands). While Johnston Island was uninhabited, remote U.S. Fish and Wildlife Service camps on Laysan Island, Tern Island, and French Frigate Shoals had to be evacuated. The NOAA ship Oscar Sette safely evacuated 7 people from Laysan Island and a Coast Guard C-130 safely evacuated 10 people from Tern Island and French Frigate Shoals. There were no impacts to the main Hawaiian Islands.

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

For the two land-falling tropical cyclones in Micronesia during 2009, no significant hydrological event resulted. WFO Guam issued a few hydrologic products such as the Urban and Small Stream Flood Advisory for an active shear line that pushed over Guam on 4 January and brought up to 6 inches of rain to some locations on the island.

Otherwise, drought conditions occurred from January to March 2009 and again resurfaced as a problem in July for eastern Micronesia. In general, monthly

Special Weather Statements were issued for Majuro and the other islands of the Republic of the Marshall Islands during the winter months. These advisories allowed the Government to get fresh water resources to the most affected islands. Additional Special Weather Statements were issued on 15 June, which advised the conservation of fresh water resources due to the observed and expected sparse rainfall over the area. The statements continued until 24 July.

The remnants of Hurricane Felicia produced the only significant tropical cyclone related flooding in Hawaii between 1 January and 31 October. Residual moisture and instability combined to produce widespread 3 to 6 inches of rain across several islands and flash flooding on Oahu. The highest rainfall amounts recorded were 13.46 inches and 14.63 inches over the mountains of Kauai and Oahu, respectively.

Several minor flooding events took place over the first few months of 2009, the majority related to typical wintertime frontal passages. The most significant event started off on 7 March, when a strong upper level trough induced a surface trough that helped trigger heavy rainfall across windward areas of the state. At Hilo Airport on the Island of Hawaii, over 18 inches of rain in two days broke daily rainfall records for 7 and 8 March. Flooding resulted in the closure of some secondary roads in the Hilo area but otherwise did not produce significant damages or injuries. Hanalei River on the island of Kauai briefly overflowed during the night of 8 March and into the early morning hours of 9 March. Over windward Oahu, 5 to 8 inches of rain on the night of 9 March prompted the issuance of a flash flood warning and forced the closure of the Kamehameha Highway off-ramp on the H-3 Freeway.

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

Super Typhoon Choi-wan's passage over the island of Alamagan, a volcanic island located 170 miles north of Saipan, in September brought widespread damage and forced the evacuation of the island's 14 residents to Saipan. A family of six was first airlifted from the island the day after Choi Wan decimated the island. Evacuation of the remaining residents, however, had to wait for a chartered vessel and calmer sea conditions.

Figure 5: Helicopter evacuation of some of the Alamagan residents.

Later that month, Tropical Storm Parma passed directly over Ngulu, an atoll 50 miles southwest of Yap. Reports from Yap Emergency Management Office indicated winds in excess of 60 mph that caused damage to four residential homes. Food and emergency supplies on the remote atoll were sufficient to last for three weeks but rainwater catchment tanks may have been contaminated with salt spray from the high winds.

A comprehensive tropical cyclone outreach program for the 2009 Central Pacific Hurricane Season generated a heightened awareness of emergency preparedness in the State of Hawaii. The theme of the 2009 campaign, *Hawaii's First Responders are Prepared, Are You?*, focused on maintaining awareness of tropical cyclone hazards, preparing emergency kits, and developing action plans for individuals, families, and businesses. The possibility of developing El Nino conditions and the consequent increase in tropical cyclone activity was a key talking point in the RSMC Honolulu awareness campaign.

4. Regional Cooperation Assessment (highlighting regional cooperation successes and challenges).

II. Summary of Progress in Key Result Areas

1. Progress on Key Result Area 1: Reduced Loss of Life from Typhoon-related Disasters.
   a. Meteorological - Achievements/Results
   - Active coordination between RSMC Honolulu forecasters, NOAA Marine Fisheries, NOAA Office of Marine and Aviation Operations, the U.S. Coast Guard, and the U.S. Fish and Wildlife Service resulted in the successful evacuation of three remote islets in the Papahanaumokuakea National

Monument (NW Hawaiian Islands) in advance of Hurricane Neki. A total of 17 people were safely evacuated.

b. Hydrological – Achievements/Results
c. Disaster Prevention and Preparedness - Achievements/Results
d. Training, Research, and Other – Achievement/Results

- RSMC Honolulu hosted a three-day class for 19 Emergency Managers and First Responders on 14-16 April. The three-day pilot course was a specialized training opportunity to build the capacity of the civil defense/emergency manager to understand hurricanes and make effective protective action decisions during a hurricane threat. Through hands-on and interactive instruction with specialists at RSMC Honolulu, the course provided participants with an intensive instruction on all aspects of tropical cyclone forecasts and products, along with local National Weather Service forecast office products.

e. Regional Cooperation – Achievement/Results
f. Identified Opportunities/Challenges for Future - Achievements/Results

2. Progress on Key Result Area 2: Minimized Typhoon-related Social and Economic Impacts.
   a. Meteorological - Achievements/Results
   b. Hydrological – Achievements/Results
   c. Disaster Prevention and Preparedness - Achievements/Results
      - FM Radio Station on Chuuk, FSM. An FM Weather Radio station was installed at the Chuuk, FSM Weather Service Office (WSO) in 2007 and gave the island the capability of reaching 75 percent of its population. In 2008, a repeater was installed on Weno that gave the broadcast an even greater coverage. However, in 2009, the FM station was severely affected by the frequent power outages on the island. To better cope with this, a heavy duty power supply was purchased. A similar FM radio station installed at the Majuro WSO in March 2008 will also be upgraded to maintain its service time. Because of the remoteness of the many atolls/islands in this region, broadcasting weather information on FM radios provides vital weather information and warnings to a population that is limited in its communication systems and is a step toward achieving an early warning system for these islands.
   d. Training, Research, and Other – Achievement/Results
   e. Regional Cooperation – Achievement/Results
   f. Identified Opportunities/Challenges for Future - Achievements/Results

3. Progress on Key Result Area 3: Enhanced Beneficial Typhoon-related Effects for the Betterment of Quality of life.
   a. Meteorological - Achievements/Results
   b. Hydrological – Achievements/Results
   c. Disaster Prevention and Preparedness - Achievements/Results
   d. Training, Research, and Other – Achievement/Results
   e. Regional Cooperation – Achievement/Results

f. Identified Opportunities/Challenges for Future - Achievements/Results

4. Progress on Key Result Area 4: Improved Typhoon-related Disaster Risk Management in Various Sectors.
   a. Meteorological - Achievements/Results
      - New Tropical Cyclone Products. RSMC Honolulu implemented several new tropical cyclone products and changes to current products for the 2009 Central Pacific Hurricane Season. The first was the addition of a three-tiered and color-coded scheme to describe the probability of development for areas described in the graphical Tropical Weather Outlook. The second was the tropical cyclone Wind Field Graphic which displays the areas affected by tropical storm and hurricane force winds. A graphical display of Tropical Cyclone SIGMETS was also added to the RSMC product suite. Finally, the Maximum Wind Speed Probability Wind Table was extended from 72 hours to 120 hours.
      - WFO Guam worked with the University of Guam's (UOG's) Water and Environmental Research Institute (WERI) to produce up-to-date tropical cyclone risk and return period charts and climatologies for each of the 37 islands for which WFO Guam issues Tropical Cyclone Watches and Warnings. These new station climatology materials have been distributed to many of the Micronesian islands.
   b. Hydrological – Achievements/Results
   c. Disaster Prevention and Preparedness - Achievements/Results
      - 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 and 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.
      - 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 2009 meeting.
      - RSMC Honolulu staff was a contributing member in the development of the Hawaii Catastrophic Hurricane Readiness Response Plan. The catastrophic event was a strong Category 4 hurricane making landfall near Ewa Beach on the island of Oahu. The Operations Plan provides specific and detailed strategies to execute a joint State, local, Federal, Non-Governmental Organizations, and Private sector preparation and response in this situation. (See section 6d).
   d. Training, Research, and Other – Achievement/Results

- Exercise Pakyo. A two-day exercise sponsored by the Department of Homeland Security/Federal Emergency Management Agency (FEMA) was held on Guam on 9 to 10 June. WFO Guam participated in this exercise and was responsible for devising the scenario of the exercise. The scenario consisted of an intensifying Category 5 typhoon (super typhoon) moving directly over Guam. Local and Federal government agencies and several representatives of the private sector plus international observers from the Philippines participated in the exercise.
- Makani Pahili Hurricane Exercise. The annual Makani Pahili Hurricane Exercise, coordinated by Hawaii State Civil Defense (CD) in partnership with the National Weather Service (NWS) Forecast Office in Honolulu was held from 26 May to 4 June. This year's exercise was the culmination of a year-long effort to develop, exercise, and validates the Hawaii Catastrophic Hurricane Readiness Response Plan. RSMC Honolulu exercised coordination procedures with civil defense and military partners around Hawaii during the event.

e. Regional Cooperation – Achievement/Results
f. Identified Opportunities/Challenges for Future - Achievements/Results

5. Progress on Key Result Area 5: Strengthened Resilience of Communities to Typhoon-related Disasters.
   a. Meteorological - Achievements/Results
      - Monthly Pacific ENSO Discussion. Each month, WFO Guam Warning Coordination Meteorologist (WCM) provides a written discussion on the status of the El Nino-Southern Oscillation (ENSO) and its effects on Micronesia. This discussion is relayed to weather officials, emergency managers, US ambassadors and other agencies in Micronesia. These discussions not only entail the trend of the ENSO but provide information on hydrological and sea level conditions associated with it.
      - Hurricane Presentation to City and County of Honolulu Hawaii and Cabinet. The Director of RSMC Honolulu provided a presentation on hurricane risk and preparedness to the City and County of Honolulu Mayor and his cabinet at their monthly staff meeting. Mayor, Honolulu Police Department, Department of Emergency Management and others expressed appreciation for WFO Honolulu's great partnership and service.

   b. Hydrological – Achievements/Results
   c. Disaster Prevention and Preparedness - Achievements/Results
      - Rota StormReady/TsunamiReady Recognition. The island of Rota, CNMI, was recognized as StormReady/TsunamiReady on 17 March. StormReady and TsunamiReady are two prestigious NOAA programs that recognize locations as being highly prepared to respond to and recover from severe storms and tsunamis. In addition, the island of Guam successfully renewed their recognition as StormReady/TsunamiReady for another three years.
      - Annual Tropical Cyclone and Disaster Preparedness Workshop. These two-day workshops are designed for decision makers in the local and state

governments and agencies cover various topics such as: tropical cyclone behavior, structure and hazards; WFO Guam tropical cyclone program, products and timing of products; tsunamis and volcanoes; rip currents, currents, and tides; tropical cyclone plotting and speed-distance-time computations; climate variability and climate change; typhoon risk and vulnerability; a scale that relates tropical cyclone wind speed to damage and storm surge; El Nino/La Nina and their effects, impacts and status; and tropical cyclone decision making for individual islands/states. WFO Guam conducted workshops at Pohnpei and Chuuk in the FSM, and at Saipan, CNMI and on Guam.

- National Disaster Preparedness Month. September was declared National Disaster Preparedness Month for 2009. The Emergency Management Offices on Guam and in the CNMI took the lead 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 with over 500 contacts, the Grand Finale Display at the local Shopping Center with more than 150 contacts.
- RSMC Honolulu Press Conference for the 2009 Central Pacific Hurricane Season. RSMC Honolulu hosted a press conference to announce the 2009 Central Pacific Hurricane Season Outlook on 20 May. Following opening remarks from the RSMC Honolulu Director, guest speaker Fire Chief Kenneth Silva of the Honolulu Fire Department spoke on the role of first responders in a disaster and keynote speaker Mufi Hanneman, Mayor of the City and County of Honolulu touched on personal responsibility for emergency preparedness. Theme of the week was *"Hawaii's First Responders are Prepared, Are You?"* All four local television stations and the two state-wide newspapers attended the press conference and featured stories that evening and/or the next day on hurricane preparedness and the forecast for an 80 percent chance of a near to below normal season and a 20 percent chance of an above normal season depending on the development of El Nino in the Pacific.
- Hurricane Preparedness Workshops. RSMC Honolulu personnel conducted 17 hurricane related workshops including the annual CPHC Press Conference and staffed booths at 5 emergency fairs. Overall, RSMC Honolulu participated in a total of 111 educational or outreach events to internal partners and external customers at all levels. These included Hawaii Fishing and Seafood Festival (15,000 people attended); Waianae Elementary School Career Day (300); as judges at the Hawaii State Science and Engineering Fair (500); University of Hawaii School of Earth and Ocean Science and Technology Open House (4,000 students).
- Two RSMC Honolulu Hurricane Specialists were interviewed by The Weather Channel for a special documentary on Hurricane Iniki which devastated the island of Kauai, Hawaii, USA in 1992. The documentary, which aired in late 2009, served as a stark reminder Hawaii is very

vulnerable to tropical cyclones in the Pacific, even though they have not experienced a direct hit in nearly 20 years.

d. Training, Research, and Other – Achievement/Results
   - Aviation Workshop. An Aviation Workshop was held on Guam on 27 August and included presentations on the basic weather in the west Pacific, typhoons and outlook for 2009, thunderstorms, wind shear, ENSO update for aviators, and local aviation issues.
   - University of Guam lectures. Environmental Biology classes at the University of Guam participated in lecture series at the WFO Guam during the spring and fall semesters. WFO Guam WCM gave the 2-hour presentation on basic weather plus hazards such as tropical cyclones, volcanic eruptions and tsunamis.
   - Summer Science Programs. RSMC Honolulu participated in three summer science programs for elementary and high school students. One was for students from the "How to be a Weather Wiz Kid" class at Kamehameha Schools to learn about tropical cyclones and severe weather and the second were students from the "Discovering Science through Aerospace" class at Mid Pacific Institute to learn about tropical cyclones and climate in Hawaii. The third was the Sky and Space Class taught at the University of Hawaii Lab School.

e. Regional Cooperation – Achievement/Results

f. Identified Opportunities/Challenges for Future - Achievements/Results

6. Progress on Key Result Area 6: Improved Capacity to Generate and Provide Accurate, Timely, and understandable Information on Typhoon-related Threats.
   a. Meteorological - Achievements/Results
      - RSMC Honolulu coordinated the deployment of Air Force Reserve WC-130 and NOAA Gulf Stream hurricane reconnaissance aircraft as Hurricane Felicia headed toward the main Hawaiian Islands. The flights provided crucial data which greatly assisted RSMC forecasters.
      - RSMC Honolulu extended the lead time of tropical storm/hurricane watches from 36 hours to 48 hours and the lead time of tropical storm/hurricane warnings from 24 hours to 36 hours.
   b. Hydrological – Achievements/Results
      - Hawaii Rain Gage Collection Network Replacement. NOAA NWS Pacific Region received funding to implement the second year phase to replace the entire rain gage collection network system in the state of Hawaii. The new system is replacing the aging rain gages with new technology and will use HF radio line of sight communication system rather than land or cell phone lines. The project commenced in January 2009 to install the communication infrastructure. Eighteen new gages have been installed to date.
   c. Disaster Prevention and Preparedness - Achievements/Results
      - The Hawaii State CD installed video teleconference (VTC) equipment at RSMC Honolulu on a dedicated circuit. The equipment provides a valuable communication tool to effectively provide coordination during

severe weather events. The equipment complements a VTC system installed by the FEMA in 2007 which is now kept as a backup.

- WFO Guam WCM participated in the 2009 UNESCAP/TCP Roving Seminar held in Nanjing, China from 16-19 November, 2009. His participation included a discussion of the requirements for and content of tropical cyclone warning messages. In this training, the WCM included background and review of the needs of a strong National disaster preparedness program and provided a large selection of tools that could improve tropical cyclone warnings. Finally, a hands-on assessment of warnings of each of the eight participating countries was conducted.
- RSMC Honolulu served on the national HazCollect Implementation Team. HazCollect is a system which allows Emergency Managers to send Civil Emergency Messages directly to NOAA Weather Radio for broadcast in regions of the USA or throughout the entire USA. WFO Honolulu and Hawaii State CD jointly participated in the initial alpha testing starting in late 2008 and was one of the first offices to implement HazCollect operationally in 2009. Guam also implemented HazCollect, which extended the capabilities to the Guam and CNMI Governors and Emergency Managers.
- On two occasions, RSMC Honolulu hosted Forecasters and Typhoon Duty Officers from the Naval Maritime Forecast Center (NMFC) and Joint Typhoon Warning Center (JTWC). The visits were to familiarize NMFC and JTWC staff with RSMC Honolulu operations and forecast software packages and to increase collaboration amongst the two agencies.

d. Training, Research, and Other – Achievement/Results

- In-house seminars. WFO Guam held two seminars for local forecasters and military components on island. The QuikSCAT seminar provided by the WFO Guam Science and Operations Office (SOO), was held on 6 and 14 April. Those in attendance walked away with an understanding of the processes behind QuikSCAT and its strengths and weaknesses. The second seminar was an introduction to the Dvorak Analysis Technique by the SOO and the Guam WCM.
- Tropical Cyclone Conference**.** Commander in Chief US Pacific Fleet (CINPACFLT) held a Tropical Cyclone Conference and the METSAT Conference from 27 April to 1 May at Pearl Harbor, Hawaii. Some highlights from the conference included a discussion on the Automated Meteorological Observing System (AMOS) network, the potential loss of Scatterometer and ocean wave altimetry data, and the civilianization of the JTWC Director and three forecasters to improve continuity and experience. JTWC also celebrated it 50th Anniversary, inviting past JTWC Directors and Navy Commanders to attend the ceremony.
- Mr. Richard Grumm, Science and Operations Officer, NWS State College, Pennsylvania, presented a detailed three-day seminar, 9 to 11 September to WFO Guam personnel on the use of NWP ensemble techniques for improving forecasts in the tropics. His presentations were well received and greatly enhanced all participants' appreciation for the latest NWP

techniques, especially in better understanding the degree of uncertainty and probabilities associated with tropical cyclone track predictions.

- WFO Guam SOO participated in a community white paper presented at the OceanObs'09 symposium, Venice, Italy 21-25 September on the satellite-derived surface winds component of the observing system, with applications for operations and for climate prediction.
- From 1 January to 31 October, the Pacific International Desk Training Programme, RSMC Honolulu, Hawaii Islands, USA trained 6 forecasters from 6 different members of WMO Regional Association (RA) V regions, including Samoa, Vanuatu, New Guinea, Philippines, Solomon Islands, and Tonga. Since its inception in 2001, 52 people from 15 Members of WMO RA V and 2 Members from the Typhoon Committee have attended this programme. The USA government, through NOAA NWS funded the training programme.
- FEMA and the Hawaii State CD Catastrophic Disaster Event Planning. FEMA, Hawaii State CD, the University of Hawaii, Pacific Disaster Center, and RSMC Honolulu completed the development, exercise, and validation of the Hawaii Catastrophic Hurricane Readiness Response Plan in 2009. The plan features a strong Category 4 hurricane hitting the most populated area of Honolulu, Hawaii. As part of this planning, the University of Hawaii developed a very sophisticated Storm Inundation model for island communities with coral reefs. RSMC Honolulu developed 12 hurricane tracks with varying tracks, speed of movement, intensity, and size. FEMA executes part 1b of the plan with a hurricane in the central Pacific approaching Hawaii, and 1c either when a watch is issued for the islands or the probability of hurricane force winds are between 10 and 20 percent for any place on the islands. At stage 1b, FEMA expends significant funds by pre-locating people and resources, because of the isolated nature of the Hawaiian Islands.
- As part of the Hollings Scholar program, a student from Florida State University spent 9 weeks at RSMC Honolulu. This scholar along with the Deputy Director of RSMC Honolulu conducted studies of probabilistic tropical cyclone genesis in the central Pacific. All available data on tropical cyclones were used with Dvorak fixes as one of the major data sources. This research continues and in the future may involve RSMC Miami and the Atlantic Ocean.
- RSMC Honolulu continues to advocate for real time ocean vector winds for the future. The Deputy Director is part of the Operations Team associated with the planning, development, and coordination with NASA, Japan, and others on replacements to Quikscat winds.
- Wind probabilities for tropical storm and hurricane force winds out to 120 hours play an important part in the ability of RSMC Honolulu to communicate risks to emergency managers and other decision makers. RSMC Honolulu is working with RSMC Miami on a Joint Hurricane Testbed project to continue to improve the beneficial use of these probabilistic winds.

- Hurricane Specialists and Hurricane Forecasters at RSMC Honolulu completed their annual hurricane and Dvorak technique training.
- WFO Guam worked with the Pacific ENSO Applications Center (PEAC) to issue quarterly newsletters that included 1-year predictions of tropical cyclone activity, rainfall and sea level fluctuation. In coordination with the US Climate Prediction Center, the WFO Guam WCM also produced and issued 1-page Monthly Pacific ENSO Discussions for the Micronesian islands and American Samoa in RA-V.

e. Regional Cooperation – Achievement/Results
- RSMC Honolulu Deputy Director attended two meetings with the Japan Aerospace Agency to collaborate on their next generation of satellites which will provide ocean surface wind vector data similar to current Quikscat data used to assess the strength and structure of tropical cyclones.
- RSMC Honolulu participated in an international test of Tropical Cyclone SIGMET dissemination which was coordinated by the WMO. RSMC Honolulu issued a test Tropical Cyclone Advisory followed by a test Tropical Cyclone SIGMET.

f. Identified Opportunities/Challenges for Future - Achievements/Results

7. Progress on Key Result Area 7: Enhanced Typhoon Committee's Effectiveness and International Collaboration.
   a. Meteorological - Achievements/Results
   b. Hydrological – Achievements/Results
      - USA participated in the Typhoon Committee Integrated Workshop "Building sustainability and Resilience in High-Risk Areas of the Typhoon Committee" in Cebu, Philippines from 14 to 18 September. Technical studies and regional cooperation opportunities concerning flood hazard mapping and debris flows in Micronesia were discussed.
   c. Disaster Prevention and Preparedness - Achievements/Results
      - The US Member of the Typhoon Committee Working Group on Disaster Prevention and Preparedness (WGDPP) participated in 4th annual meeting of the WGDPP in Seoul, Korea on 28 to 29 April. As a result, USA will participate in the Hong Kong pilot project called "Weather Wizard".
   d. Training, Research, and Other – Achievement/Results
      - The US Member of the Training and Research Coordinating Group (TRCG) participated in a one-week Technical Workshop sponsored by the TRCG and held at the new Typhoon Forecast Center, Korea Meteorological Administration (KMA), Jeju Island, South Korea, 12 to 15 May. The emphasis was on ensemble forecasting techniques (the US member helped select the speaker, Dr Russ Elsberry, for this portion of the workshop) and on Typhoon Information Processing Systems (TIPS). The US member also presented a lecture on the use of current satellite-based microwave data techniques to forecast and detect tropical cyclones to the workshop.
   e. Regional Cooperation – Achievement/Results
   f. Identified Opportunities/Challenges for Future - Achievements/Results

III. Resource Mobilization Activities

IV. Update of Members' Working Groups representatives

1. Working Group on Meteorology
    - Mr. Bill Ward
      Pacific Guardian Center
      737 Bishop Street, Suite 2200
      Honolulu, HI 96813-3213
      Phone: 808-532-6415
      Facsimile: 808-532-5569
      bill.ward@noaa.gov

2. Working Group on Hydrology
    - Mr. Michael Ziobro
      3232 Hueneme Road
      Barrigada, GU 96913
      Phone: 671-472-0950
      Facsimile: 671-472-7405
      michael.ziobro@noaa.gov

3. Working Group on Disaster Prevention and Preparedness
    - Ms. Genevieve Miller
      3232 Hueneme Road
      Barrigada, GU 96913
      Phone: 671-472-0944
      Facsimile: 671-472-0980
      genevieve.miller@noaa.gov

4. Training and Research Coordinating Group
    - Mr. Roger Edson
      3232 Hueneme Road
      Barrigada, GU 96913
      Phone: 671-472-0950
      Facsimile: 671-472-7405
      roger.edson@noaa.gov

5. Resource Mobilization Group
    - Mr. James Weyman
      2525 Correa Road, Suite 250
      Honolulu, HI 96822-2219
      Phone: 808-973-5272
      Facsimile: 808-973-5271
      james.weyman@noaa.gov