



# The Front



July 2004

National Weather Service

Volume 3, Number 3

## NWS Honolulu Defines Aviation Mission

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Situated in the middle of the Pacific Ocean, the Hawai'ian Islands are one of the most remote areas on the earth. The islands' topography varies from sea level to near 14,000 feet.

Hawaii consists of eight main islands with a total land area of 6,425 square miles and a population of approximately 1.3 million. Due to its geographic isolation and its multiple island configuration, Hawai'i is immensely reliant on aviation for its social and economic livelihood.

More than 1,200 commercial, military and general aviation flights

takeoff or land in the Hawaiian airspace daily.

Commercial air carriers service the number one industry in Hawai'i, tourism by shuttling tourists and residents between islands and out of the state. In addition, numerous helicopter companies offer tours of the islands.

General aviation pilots take fisherman to spot large schools of fish, shuttle people between neighboring islands, transport private aircraft into and out of Hawai'i, or simply fly for recreation.

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### When's the Next Front?

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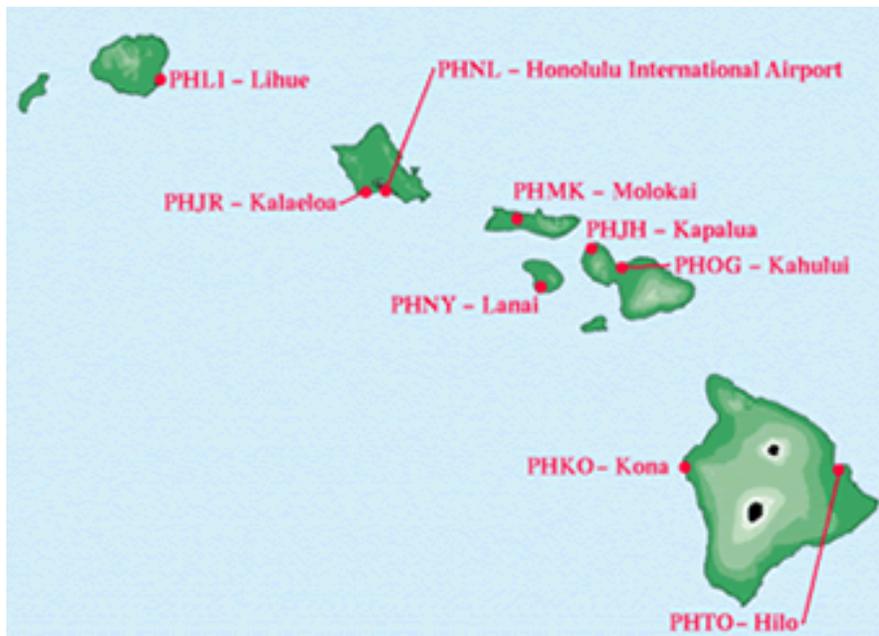


Figure 1. TAF sites within the Hawaiian Islands.

## The Front

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### Mission Statement

To enhance aviation safety by increasing the pilot's knowledge of weather systems and processes and National Weather Service products and services.

While Hawai'i is generally known for its pleasant climate year round, the topography, prevailing winds, and the location in the Pacific Ocean foster a wide variety of weather-related aviation hazards.

Weather and climate wise, Hawai'i is one of the most diverse areas in the world. Aviation forecasters in Hawai'i are constantly monitoring rapidly changing weather patterns over the Pacific for their possible effects on the islands. Weather systems include snow-fall atop the summits of Mauna Kea and Mauna Loa, tropical cyclones, high winds and heavy rains.

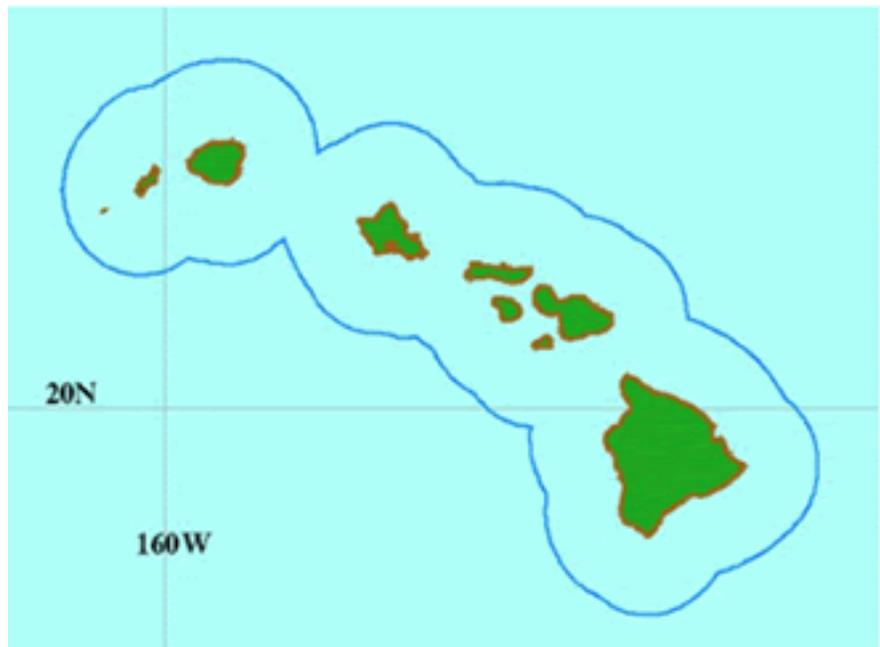
NWS Honolulu is co-located with the University of Hawai'i, School of Ocean and Earth Sciences and Technology, Department of Meteorology. The strong partnership between WFO Honolulu staff and the university aids operations and research activities for both partners.

WFO Honolulu is unique within the NWS infrastructure. In addition to normal WFO responsibilities, WFO Honolulu also serves international aviation customers with Significant Meteorological Information (SIGMETs) for the large portion of the Pacific Ocean covered by the Oakland FIR. See the SIGMET section below and **Figure 3** for further explanation.

## Aviation Products

The aviation forecaster handles the full suite of products issued by WFO Honolulu but specifically is responsible for the following:

- ◆ TAFs
- ◆ Wind/temperature aloft forecasts
- ◆ Area Forecasts (FAs)
- ◆ Route Forecasts (ROFORs)
- ◆ SIGMETs
- ◆ Airman's Meteorological Advisories (AIRMETs).
- ◆ Aviation forecasts



**Figure 2.** *Hawaiian Islands Area Forecast boundary.*

The full suite of products can be seen at <http://www.prh.noaa.gov/hnl>.

## Terminal Aerodrome Forecasts (TAFs)

As of October 1, WFO Honolulu will issue TAFs for nine airports in the Hawai'iian Islands, along with Midway Island and Pago Pago, American Samoa in the South Pacific.

TAF responsibility will move from the current WFO Honolulu for the following locations:

- ◆ Johnston Island will be discontinued due to closure of the airfield
- ◆ Wake Island will become the responsibility of the DOD Air Force
- ◆ Kwajalein, Majuro and Kosrae will become the responsibility of WFO Guam.

For more details on the transfer of duties, see the article on Page 13. The locations of the sites are illustrated in Figure 1.

## Wind and Temperature Aloft Bulletins

After September 14, NCEP will run automated Wind and Temperature Aloft Bulletins for current and additional locations in and around the Hawai'iian Islands. WFO Honolulu will produce the Upper wind and temperature forecasts available for Lihue, Honolulu, Kahului and Hilo.

## Area Forecasts

Area Forecasts provide an overview of weather conditions impacting aviation operations. They serve as aids for flight planning and pilot weather briefings.

NWS Honolulu produces an Area Forecast for the main Hawai'iian Islands and coastal waters out to 40 nautical miles (See **Figure 2**). The forecast includes a synopsis of the overall weather pattern, a description of the expected conditions over a 12 hour period, and an abbreviated outlook section covering the 12 to 18 hour time frame. The FA contains specific information for different geographic areas.

## SIGMETs

As a designated a Meteorological Watch Office (MWO), WFO Honolulu is responsible for issuing SIGMETs in the portion of the Oakland Oceanic Flight Information Region (FIR) south of 30N (**Figure 3**).

SIGMETs inform in-flight aviators of potentially hazardous weather occurring or expected to occur along flight routes and aids in preflight weather briefings. SIGMETs for levels at or below FL530 will be issued for:

- ◆ Active thunderstorms
- ◆ Tropical cyclones
- ◆ Severe line squall
- ◆ Severe turbulence
- ◆ Heavy hail
- ◆ Severe icing
- ◆ Marked mountain waves
- ◆ Widespread sand/dust storm
- ◆ Volcanic ash cloud
- ◆ Tornado (local procedure)

NWS issues SIGMETs for phenomena at levels above FL530 for

Moderate or severe turbulence, hail and volcanic ash cloud.

## AIRMETs

AIRMETs serve the same purposes as SIGMETs, but have lower thresholds. AIRMETs may be important for any pilot, but are key to pilots sensitive to AIRMET criteria and to those without instrument ratings (VFR pilots).

WFO Honolulu issues AIRMETs along interisland air routes and flight areas within 40nm of the main Hawai'ian Islands, up to and including Flight Level 450.

While AIRMETs are normally issued when the flight hazard is expected to cover a 3000 square mile area, they also are issued for significant areas of mountain obscuration even if the area is less than 3000 square miles. NWS issues AIRMETs for the following:

- ◆ Moderate icing
- ◆ Moderate turbulence
- ◆ Sustained surface wind speeds of 30 knots or more.
- ◆ Ceilings less than 1,000 feet and/

or visibility less than 3 miles affecting more than 50 percent of an area at any one time.

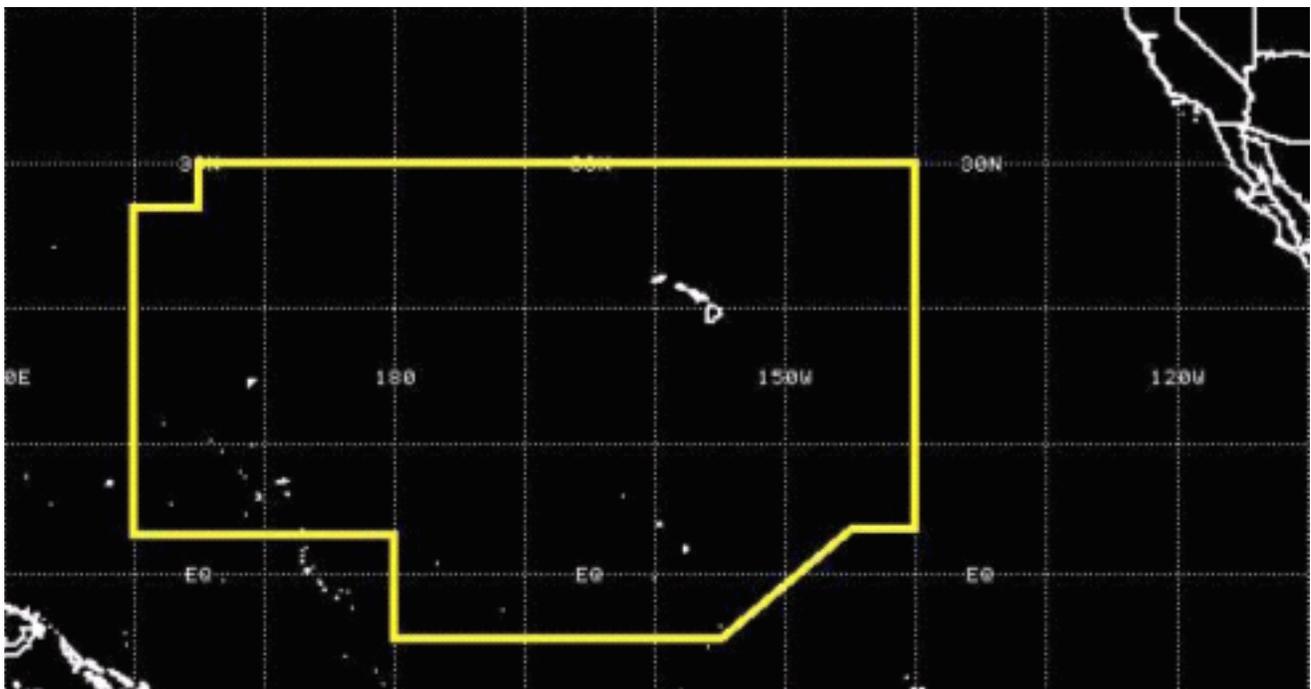
## Coded Route Forecasts (ROFORs)

Aviation forecasters prepare coded ROFORs for regularly scheduled flights and upon request. These forecasts are issued several hours in advance of a scheduled departure. Currently, WFO Honolulu routinely issues four ROFORs:

- ◆ Santa Barbara to Honolulu
- ◆ San Francisco to Honolulu
- ◆ Majuro to Kwajalein (Republic of Marshall Islands)
- ◆ Majuro to Tarawa, Kiribas

## Outreach Efforts

WFO Honolulu provided over two dozen presentations last year to customers about aviation hazards in Hawai'i. These included seminars during new and recurrent pilot and dispatcher training classes, presentations to general aviation organizations, and



**Figure 3.** WFO Honolulu SIGMET area of responsibility.

talks to various other user groups.

The Aviation Program Leader is frequently in contact with a variety of customers in the aviation community. This contact includes the FAA Honolulu Automated Flight Services Station AFSS whose staff provides Pilot Weather Briefings (PWBs) throughout the Pacific and is the only such facility in the nation that provides both International and Domestic PWBs.

A special email address, **W-HFO.aviation@noaa.gov**, was created specifically for aviation users' requests, comments and questions.

### WFO Honolulu's Future in Graphics.

Aviation customers in Hawai'i and nationwide have expressed the need for graphical forecast. The Aviation Weather Center (AWC) in Kansas City has been leading the nationwide effort for graphics aviation forecasts.

WFO Honolulu is working closely with the AWC to ensure future graphical applications and products will be consistent nationally and adequately serve the needs of the Pacific. WFO Honolulu is scheduled to begin production of Graphical Area Forecasts in January 2006.

In the future, the NWS gridded aviation database will provide a seamless database of information relevant to the local, national, and international aviation community. Pilots will be able to produce a customized forecast on their own for any flight at any time.

For now many Pacific Island countries have not benefited from the information explosion. Most of these small countries have outdated, slow equipment, limited communications, and unstable power sources in which to send and receive data. Therefore, text products will remain an integral part of the office's forecast suite of products. ➔

## Tracking Volcanic Ash In the Mariana Islands

By Michael G. Middlebrooke, Senior Forecaster, WFO Guam  
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*It Began as a Quiet Shift. . .*

At WFO Guam, the evening shift of May 10, 2003, was fairly quiet until 1030Z. At that time, the forecaster on duty noted that infrared (IR) satellite imagery showed a rapidly-growing cloud mass near Anatahan, a small volcanic island 80 miles north of Saipan in the Northern Mariana Islands.

The upper part of the cloud was moving southward, while the lower portion was moving west. Puzzled at first, the forecaster called WFO Honolulu, then placed a call to the Volcanic Ash Advisory Center (VAAC) in Washington, DC.

At 1225Z, WFO Guam issued a volcanic ash SIGMET—the first of over 250—on the only eruption of Anatahan recorded in modern times:

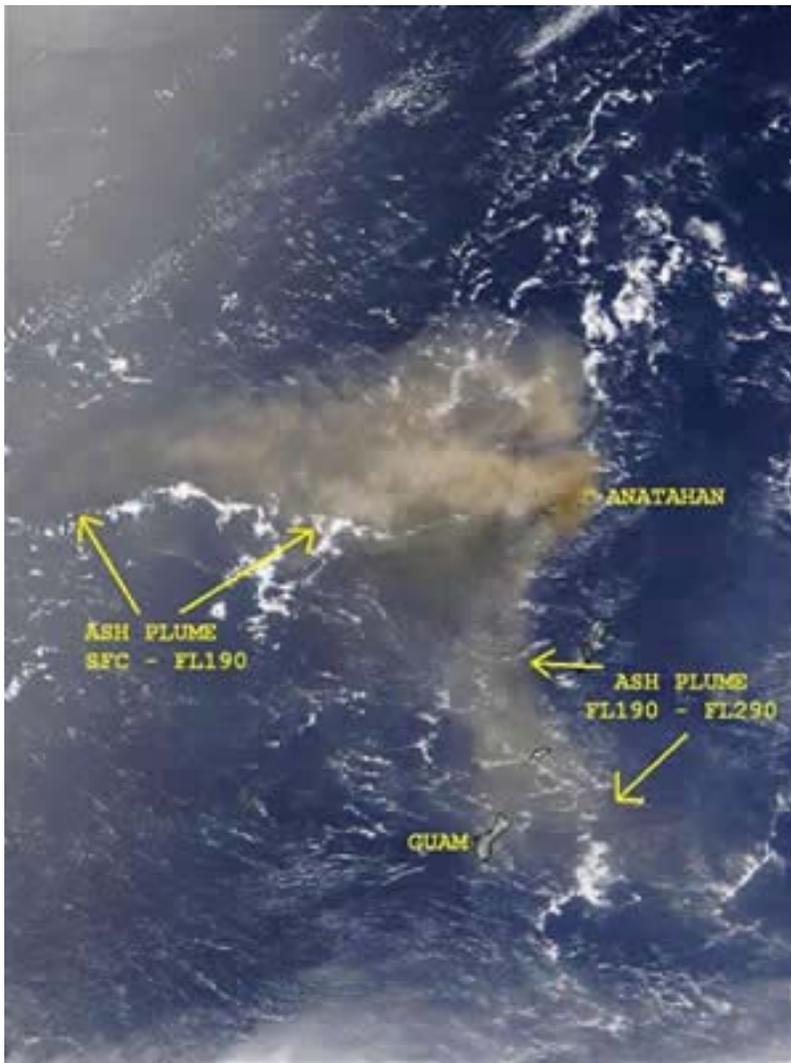
WVPQ21 PGUM 101227  
WSVPQ1

KZOA SIGMET NOVEMBER 1 VALID  
101225/101625 PGUM-  
OAKLAND OCEANIC FIR. VOLCA-  
NIC ASH CLOUD FM ANATAHAN  
VOLCANO BASED ON SAT OBS.  
HIGH LEVEL CLOUD AND ASH  
PLUME IN AREA BOUNDED BY  
N1630E14550 TO N14E146 TO  
N14E145 TO N1630E14510. LOW  
LEVEL CLOUD AND ASH PLUME IN  
AREA BOUNDED BY N1630E14550  
TO N1630E14430 TO  
N16E14430 TO N1630E14550.  
MAX TOPS FL350. HIGH LEVEL  
PLUME MOV S 25 KT. LOW LEVEL  
PLUME MOV W 20 KT. INTSF.

The following day, the eruption continued full force, as shown in



**Figure 1.** Anatahan on May 11, 2003, the morning after the eruption began. This view is looking toward the southwest. The ash cloud reaches as high as 35,000 feet.



**Figure 2.** View from NASA's Terra satellite of Anatahan and its ash plume on May 11, 2003. The upper-level plume brought volcanic haze aloft to the skies of Guam and Rota.

**Figure 1**, taken from a research ship, and **Figure 2**, taken from space by NASA's polar-orbiting Terra satellite. The upper-level plume in **Figure 2** brought hazy skies to Guam and Rota, but no ash falls.

### Tracking the Plume

Over the next two months, WFO Guam continued to issue volcanic ash SIGMETs every 6 hours on Anatahan as the intensity of the eruption and the level of ash production slowly declined, relying on satellite imagery to track the position and extent of the ash plume.

Through May and most of June, visible and IR imagery from NOAA's geostationary GOES-9 satellite provided good coverage of the plume. **Figure 3**, for example, is a GOES-9 visible image from the morning of May 23, showing the plume as it was blown south over Guam and Rota by the circulation around Typhoon Chan-hom. This produced a light fall of ash on both islands, and resulted in the cancellation of several commercial flights into and out of Saipan. In **Figure 4**, from the morning of June 11, Guam time, the plume is still visible, stretching out west from

Anatahan in easterly trade wind flow.

In late June and July, the ash content of the plume diminished until it was no longer visible in GOES-9 images (see **Figure 5**). At this point, WFO Guam turned to polar orbiter imagery, from NOAA's polar orbiters and the Air Force's DMSP satellites.

The advantage of these satellites is their lower orbits, resulting in much higher resolution than the GOES satellites. The main disadvantage is the fact that the polar orbiters have limited coverage, restricted to several times a day at any one spot in the tropics.

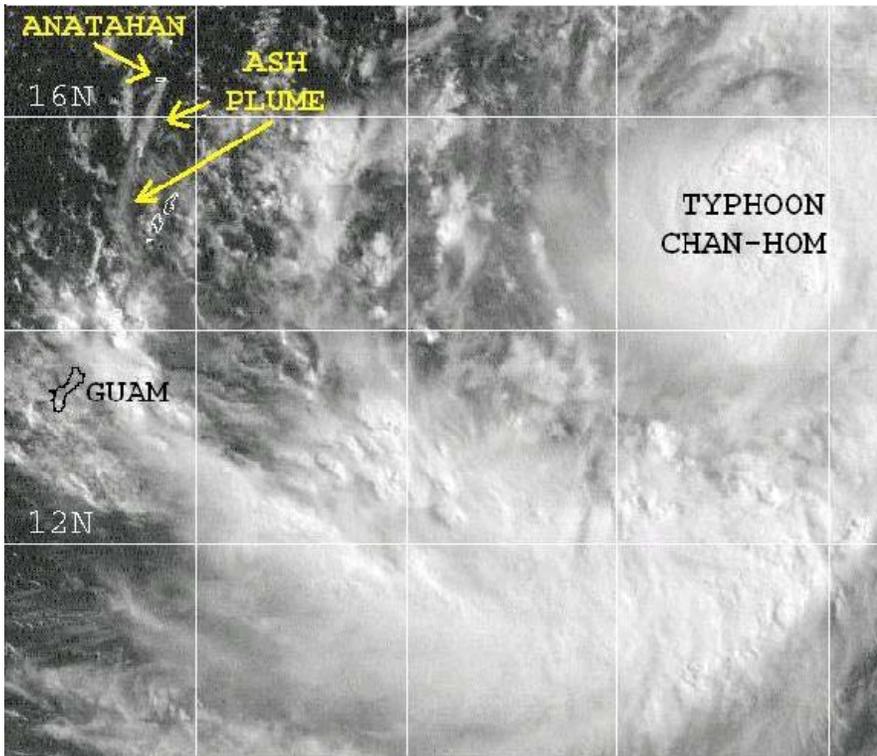
In **Figure 6**, a DMSP image from early on the morning of 19 July still shows a plume, but only because of the low sun angle, and then only after enhancing the image's contrast.

The following morning, both WFO Guam and the Washington VAAC judged that the plume consisted solely of volcanic smog or "vog," an aerosol produced by the chemical reaction between the volcano's sulphurous gas emissions, oxygen and atmospheric moisture. As a result, WFO Guam issued no further volcanic ash SIGMETs.

### Renewed Aviation Hazard

Volcanic activity in the Mariana Islands is not new. Pagan Island, 120 miles north of Anatahan, had a major eruption in 1981, followed by several minor ash emissions ending in 1994. Since then, Pagan has been quiet, but the awakening of Anatahan shows that a volcanic outburst is possible at any time in the Mariana Islands. Indeed, Anatahan suffered another minor eruption in July 2004.

The danger presented to aviation by volcanic ash has become well-known in the last 20 or 30 years. Jet aircraft engines can fail within minutes of encountering a volcanic ash plume. Volcanic ash is highly abrasive and can severely damage aircraft surfaces, in-



**Figure 3.** GOES-9 visible image for May 22 at 2213Z (May 23, 8:13 a.m., Guam time). The circulation around Typhoon Chan-hom has brought the plume south-southwest over Guam and Rota. On Guam, a light dusting of ash fell and there was a strong smell of sulphur.

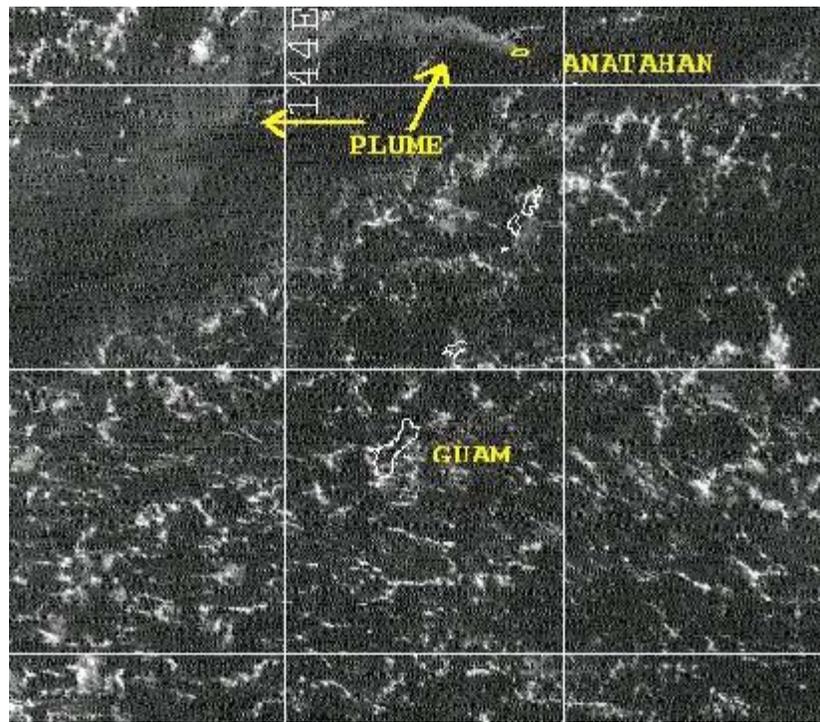
cluding windshields and internal engine surfaces.

### Keeping Informed

Air routes from Hawaii to the Philippines and Hong Kong and between Japan, Guam, Saipan and Australia all pass over volcanoes in the Mariana Islands. In addition to Pagan and Anatahan, Agrihan, the next island north of Pagan, erupted in 1917, and Farallon de Pajaros, the northernmost island in the Marianas, erupted in 1967.

When a Marianas volcano is erupting, pilots in flight, as well as those handling flight-planning on the ground, must be kept informed of where the volcanic ash is going, and at what flight levels. Pilots and dispatchers should always consult the latest volcanic ash advisories issued by the VAAC, as well as any volcanic ash SIGMETs issued by WFO Guam.

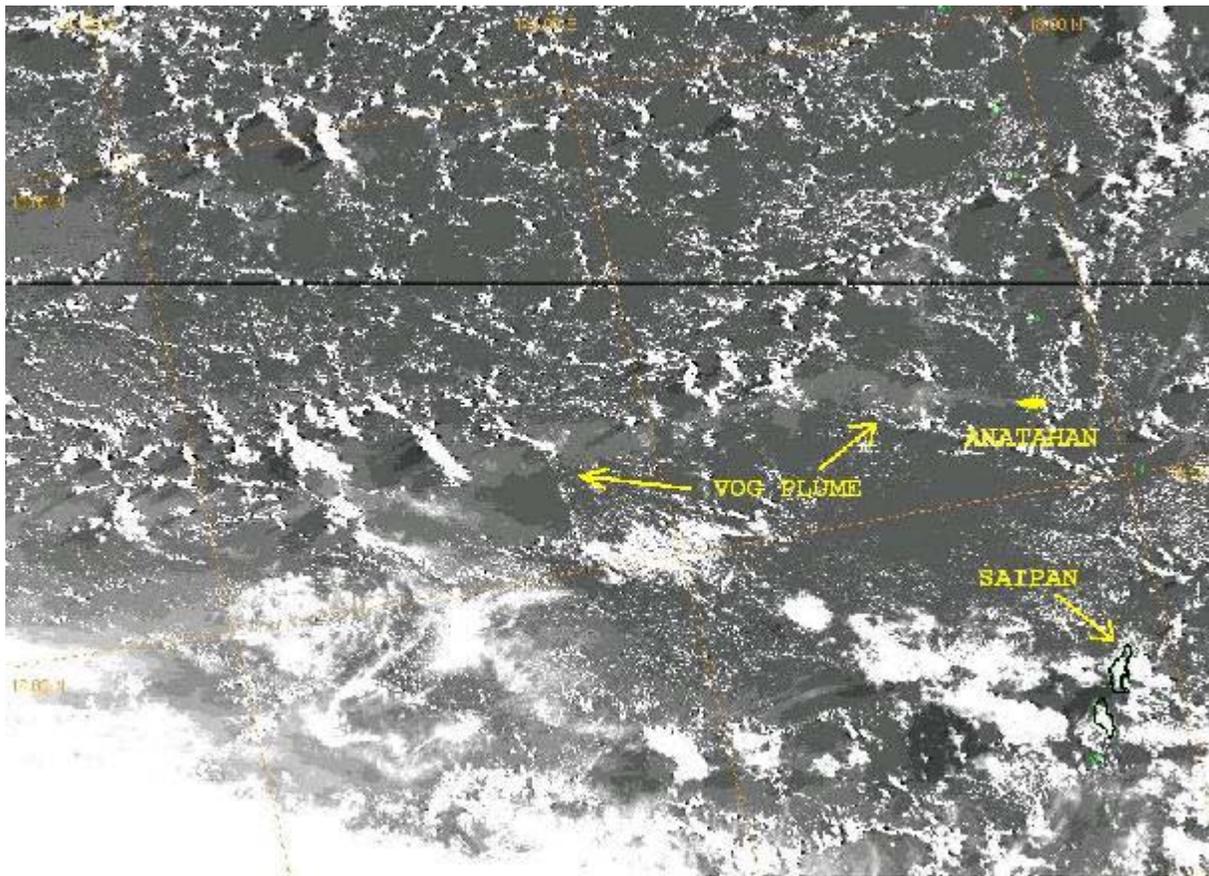
As mentioned in the article on Page 8, WFO Guam's SIGMET responsibility will transfer to WFO Honolulu September 29, 2004. →



**Figure 4.** GOES-9 visible imagery showing the plume at 2125Z on June 10, 2003 (7:25 a.m., June 11, Guam time). The contrast has been enhanced to make the plume more visible.



**Figure 5.** In this GOES-9 IR image from 2213Z July 10, 2003 (8:13 a.m., July 11, Guam time), no plume is visible, even though the contrast has been greatly enhanced.



**Figure 6.** In this DMSP polar orbiter visible image from 2100Z on July 18, 2003 (7 a.m., Guam time, on July 19), the plume is barely visible, even after greatly enhancing the image's contrast. At this point, the plume was judged to consist solely of vog. As a result, volcanic ash SIGMETs were discontinued by WFO Guam the following day.

# NWS Pacific Region Redraws Lines to Reflect Met Watch office Change

By Genevieve Cruz Miller, Meteorologist in Charge, NWS Guam  
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On September 29, the Pacific Region's Honolulu Forecast Office and Guam Forecast Office will undergo a major change in their Met Watch Office (MWO) designations.

When the MWOs were first established, the Oakland Oceanic Flight

Information Region (FIR) boundaries in the Pacific were designated to two individual offices. One was the Honolulu Forecast Office, then known as WSFO Honolulu, and the other was the Navy Oceanography Command Detachment on Guam (NOCD

Guam). These boundaries were based on the satellite footprint and communication set-up at that time. The line divided the aviation responsibilities for both offices at the 160 degree east longitude mark. Generally, SIGMET and TAF responsibilities west of that

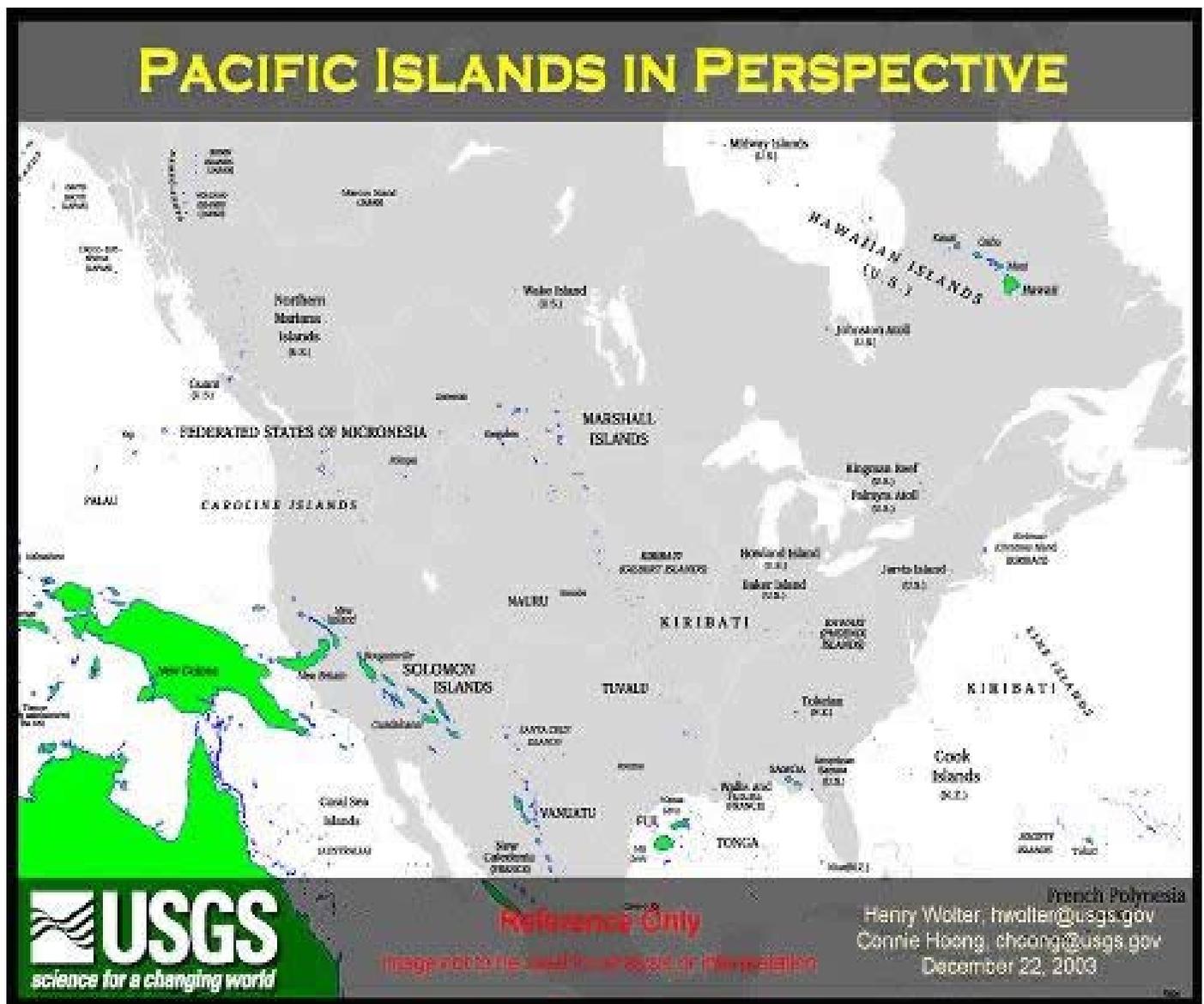


Figure 1. Areal extent of Pacific Islands in relation to the Contiguous United States

boundary in the Oakland FIR belonged to the Navy. Anything east of the boundary fell under the Honolulu Forecast Office area of responsibility.

When the NOCD Guam was spun down in 1995, the forecasting responsibilities were turned over to the newly opened National Weather Service Forecast Office on Guam.

Not only did the Guam office maintain the MWO designation, providing convective, volcanic and tropical cyclone SIGMETs as well as TAFs and airport weather warnings, the office also extended its responsibilities to include:

- ◆ Daily public forecasts
- ◆ Marine forecasts
- ◆ Tropical cyclone watch/warning responsibilities

Areas covered are:

- ◆ Guam
- ◆ Commonwealth of the Northern Marianas Islands
- ◆ Republic of Palau
- ◆ Federated States of Micronesia
- ◆ Republic of the Marshall Islands.

This covered roughly the region from 130 degrees east longitude to the international date line.

In recent years, the Pacific Region has looked into ways of streamlining its operations. With the communications systems more advanced and the different satellite systems available at more than one office, it was decided that the region would streamline to one MWO.

This change will not only give all of the NWS Pacific Region's International SIGMET responsibilities to the Honolulu Forecast Office, but will also transfer the TAF duties for three air-

ports that fall in the zone between 160 east longitude and the date line to the Guam Forecast Office. These include the Kosrae, Kwajalein, and Majuro international airports.

The upcoming change simplifies the programs of both offices. For the Guam Forecast Office, the aviation area of responsibility will correspond with the area of responsibility of the public/marine/tropical cyclone programs.

For the Honolulu Forecast Office, the entire Oakland FIR in the Pacific Region will be treated as a single entity. But the most noted response is by the local aviation community who view this as a welcome change. ➔

*Genevieve Cruz Miller is the Meteorologist-In-Charge at NWS Guam. A native of Guam, Ms. Miller has been with the National Weather Service Pacific Region for 16 years.*