

# VIEW FROM PELE'S MOUNTAIN



Looking west from Mauna Loa Observatory, 1976

Life and Times at the Mauna Loa Observatory in the Late Seventies

By

John M. Miller

2007



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**Pele:** “Described as "She-Who-Shapes-The-Sacred-Land" in ancient Hawaiian chants, the volcano goddess, Pele, was passionate, volatile, and capricious. In modern times, Pele has become the most visible of all the old gods and goddesses. Dwelling in the craters of the Big Island's volcanoes, she has been sending ribbons of fiery lava down the mountainside and adding new land around the southeastern shore almost continuously since 1983. She is usually accompanied by a white dog”  
Kona Coffee Growers Association

### **Early Days**

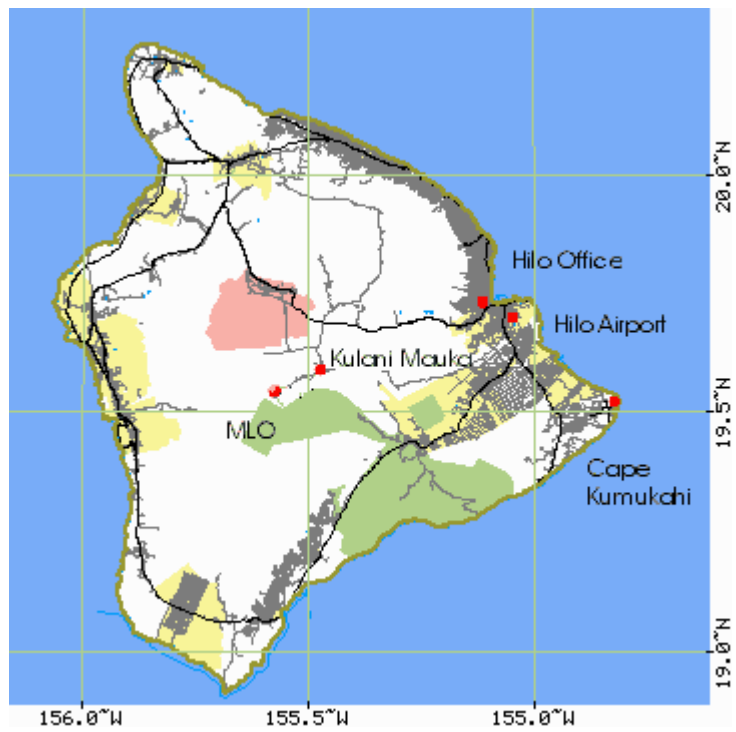
When I grew up in rural Virginia, Hawaii appeared to me as a remote and exotic place somewhere in the middle of the Pacific Ocean. My first conscious point of reference to Hawaii was when I was sick with the mumps and listened to the radio all day long. At that time the Arthur Godfrey Show took up a large portion of the morning airtime. Godfrey had become an enthusiastic fan of the Hawaiian Islands. He presented several Hawaiian singers and had learned to play the ukulele himself. This music was quite different from our own country music. With these early impressions, I did not have a great interest to go there.

### **Geophysical Monitoring for Climatic Change**

After finishing my graduate work at Penn State in meteorology with a specialty in atmospheric chemistry, I joined the Air Resources Laboratory (ARL) of the National Oceanic and Atmospheric Administration (NOAA), Silver Spring, MD in 1972. At that time, Lester Machta, ARL Director, and Don Pack, Deputy Director, were developing a program called Geophysical Monitoring for Climate Change (GMCC). As a newly appointed Presidential Intern at ARL, I was assigned to spend my first year working on this program. The idea was to set up a network of observatories in remote parts of the world to track the changes in atmospheric chemistry and their impact on the climate. Measurements such as the greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O and CFCs), aerosol properties, chemistry of precipitation, solar radiation and other parameters that were considered markers for climate change were to be part of the program. It must be remembered that in the seventies the question of climate change was not such a burning public issue that it is now. Machta and Pack had the foresight to see the importance of these measurements. Eventually in the next thirty years, an international network of over 20 stations based on their scientific premises was established under sponsorship of the World Meteorological Organization (WMO).

GMCC was initiated with the transfer of the Mauna Loa Observatory (MLO) to ARL from another NOAA lab. MLO had been established in 1956 at 3400m on the side of the Mauna Loa volcano, located on the Big Island of Hawaii. From the very beginning, Dave Keeling, a scientist from Scripps Institution, had maintained the key

CO<sub>2</sub> measuring system at the observatory. Since it's founding, there were a number of other measurement systems that had been installed at MLO. Over the years, the observatory came close to being shut down because of the difficulty of finding the needed resources to support the station's measurement programs in such a harsh and difficult terrain. The new concept of GMCC provided a solid justification and funding for the long-term continuance of MLO. The GMCC network was originally planned to have six baseline stations. However, because of later funding restrictions only four were established at that time: MLO, Barrow, Alaska, American Samoa and the South Pole. After three decades, the measurements at these sites have been critical in understanding the changing composition of the atmosphere and climate.



The map of the Big Island of Hawaii with MLO

### **The Road to Pele's Mountain**

As I began to work at ARL on GMCC in mid-1972, Don Pack kept me busy on the logistics of setting up the three new stations and reviewing the programs at MLO. Many of the scientists in the new GMCC program were located in ARL's Boulder lab. Don was eager to get a number of measurement programs started, and he called an annual meeting in the fall of 1972, which was later to become a tradition that include not only GMCC but also invited cooperating scientists. Since Pack felt that it was important for me to see the observatories and talk with the staff, he sent me to Barrow and MLO.

So on June 14, 1974, I landed for the first time in Hawaii. It was a spectacular flight, since I had visited Barrow first and then flew directly via Anchorage to Honolulu. The quick change from midnight sun and snow in Barrow to Honolulu's tropical breezes was jarring. I had one day in Honolulu before I flew to Hilo and promptly got nice a

sunburn on Waikiki beach and could not go out in the sun again the whole time I was in Hawaii. Ron Fegley, MLO director, and Judy Pereira, his secretary, met me at the airport. I spent a week there during which I traveled with the MLO staff from Hilo to the observatory. The drive involved almost 45 miles one way and going from sea level to 11,150 ft (3400m). I was thrilled with the change of terrain from the lush jungle to the barren lava rock around MLO.



MLO looking northeast, 1974

This first visit was unforgettable because of the wonderful Aloha spirit of the staff. Besides Ron and Judy, at that time Howard Ellis; John Chin; Bernard Mendonca; Al Shibata; Alan Yoshinaga; and Barry Bodhaine were on the staff. During this first visit I thought that I would someday like to work at MLO. Pele was calling.

#### **The Siren Call of Pele**

My stay at MLO turned out to be the beginning of several visits to the station during 1974 and 1975. Don Pack retired in July 1975 and Kirby Hansen became the director of GMCC and moved the headquarters to Boulder. During this time, Kirby and I plus other GMCC specialists traveled to Australia to discuss with scientists there the establishment of a GMCC-type observatory in Tasmania, Australia. This was eventually to become the Cape Grim Observatory and constituted along with Barrow, Alaska, American Samoa and MLO the nucleus of the World Meteorological Organization's Global Atmosphere Watch worldwide network of background observatories.

In this same year, Ron Fegley had asked to return to the mainland and the position of director of Mauna Loa became open. What to do? Pele decided and with a lot of bureaucratic maneuvering by Kirby I was on my way to Hawaii.

#### **First Days**

On July 20, 1976, Sylvia and I landed at the new airport in Hilo. Like on my first visit, Ron and Judy met us at the airport and we went immediately to the Hilo Lagoon for poo poos (snacks) and drinks. It was a good start to what I expected to be a four-year stay at MLO. My arrival did make the front page of the Hilo Herald-Tribune (see next page).

# Mauna Loa Study: Why Is the Earth Cooling?

By Erlinda Villamor  
*Times Herald-Examiner*

Is the earth cooling or warming? The amount of carbon dioxide in the earth's atmosphere is increasing inexorably and would tend to make the earth warmer, yet recent records show that the earth is actually cooling off, according to officials at Mauna Loa Observatory.

Such is the complexity of the atmospheric studies that the world weather will continue to baffle man, according to Dr. Ronald Fegley, outgoing director of the observatory. He said the increase in the global concentration of carbon dioxide would seem to bear out the theory of the "greenhouse effect" which holds that the earth is warming because carbon dioxide acts by trapping heat in the atmosphere.

However, Fegley said recent records show that world temperature, at least over the northern hemisphere, has been

going down since 1960.

"We don't know what's causing this cooling off and what its effects are on the world's weather," Fegley said. "There's still so much that is not known about our atmosphere. It's a very complicated subject; there just are too many variables."

Proponents of the theory that the earth is cooling base their position on the amount of dust that man has been injecting into the atmosphere. Dust particles or aerosol tend to act as a curtain in the atmosphere, blocking the sun's rays and reducing the earth's temperature. However, Fegley said, data from the Mauna Loa observatory have shown no increase in the amount of aerosol.

"Any change in the volcanic dust content of the air will surely affect solar radiation and weather patterns," Fegley said. "But so far, the amount of aerosol has remained stable."

Fegley, who has been at the helm of

the observatory for four years, leaves this week for the Mainland to join the National Oceanic and Atmospheric Administration's central laboratory in Boulder, Colo. He will be succeeded by Dr. John Miller, 38, research meteorologist for NOAA in Maryland.

"All we know is that there have been tremendous weather changes over the past years, but we don't know what's causing each of these changes," Fegley said.

Miller cited several reasons for the fluctuation in the carbon dioxide in the atmosphere: the decreasing ocean temperature which works much like a cold bottle of Pepsi cola when it is being opened; the amount of vegetation, and the continuous burning of fossil fuel.

Measurements taken at the Mauna Loa Observatory show that the carbon dioxide concentration increased from 315 parts per million in 1958 to 330 parts per million in 1975.

"It's definitely on the rise, and this

could have implications on the world's climatic changes," said Miller, who holds a doctorate degree in meteorology from the Pennsylvania State University.

Fegley and Miller said data are too scant for scientists to explain past and recent climatic aberrations such as prolonged drought, devastating storms and heavy rain.

Information on atmospheric composition is being collected and monitored at three other observatories run by NOAA's Geophysical Monitoring for Climatic Change Program. These are in Point Barrow, Alaska, Cape Maitahi, Samoa and at the South Pole.

Fegley said additional observatory sites are being considered: one on the west coast of the U.S., another on the west coast of South America and the third in Bermuda.

Mauna Loa, the largest of the four observatories, started operations in 1958.

Measurements made at these ob-

servatories do not take into consideration local pollutants.

"These sites were chosen because

they represent values of global pollution, not local pollution," Miller explained.



DR. RONALD FEGLEY  
 ... To Colorado



DR. JOHN MILLER  
 ... New Observatory director

Ron Fegley and I.



The Federal Building

One of the first items on my agenda was moving the Hilo office of MLO from the University of Hawaii Cloud Physics Observatory (CPO) to the downtown Federal Building. Though the CPO liked working with us, they needed more space. The Federal Building had been constructed during the thirties and could have doubled as a presidential palace and was probably patterned after a mainland structure with plenty of marble, stucco and bricks. As can be seen above, it was beautiful, but not much thought had been given to the almost monthly earthquakes that struck Hilo. Of course most were just slight shocks that did little damage. The windows would rattle and all was over. However, there were also more serious earthquakes. MLO's secretary, Judy Pereira, had a sixth sense when a big one was imminent. Shouting "Earthquake" somehow she knew in advance and she was out of the door in seconds before it struck. I do remember that after one rather strong quake, I went to the men's room, which was all marble and glass and would have fit better in a Washington, DC, museum. One of the massive marble stall dividers had broken off and fallen into the next stall. Luckily no one was in there when it happened.

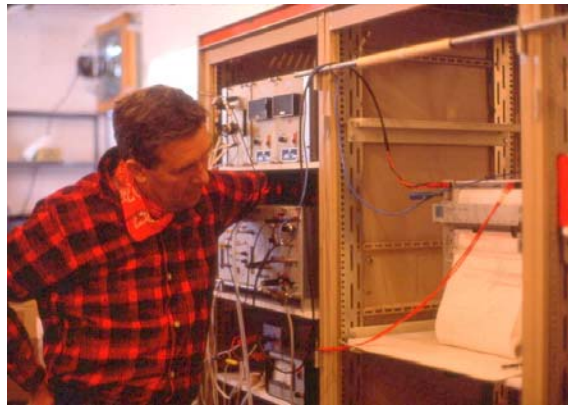
## MLO People

Before describing the beautiful and unique physical features of Mauna Loa, I want to talk about the MLO staff. The most important person on the staff was Judy Pereira. She had been at the MLO Hilo office for many years and was the glue that held the observatory together. There is no question that the one thing that visiting scientists remember is Judy's Hawaiian spirit of hospitality. She has a wonderful account on the MLO Website of her thirty years at the observatory.



Judy Periera

Though many scientists and technicians were to work at MLO, four staff members were outstanding in dedicating all of their profession life to the observatory. Here are a few remembrances of them during my time at MLO.



Howard Ellis

Howard Ellis was the most senior staff member when I arrived at the observatory. During the lean years, he saved MLO by keeping the program going with minimal staff and served as director intermittently for five years. While I was at MLO, I encouraged him to write down some of his memories from his long service. They are available on the MLO Website.





Alan Yoshinaga

Alan Yoshinaga just retired from MLO this year with over 34 years of federal service at MLO. Alan had only been on the staff for a few years when I arrived and was a chemist by training. My scientific interest at the time was precipitation chemistry (acid rain). This was the public environmental issue discussed in all the newspapers; same as global warming is today. It was therefore decided to set up a chemistry lab at MLO. The newest analytical tool out on the market was an ion chromatograph (IC) just developed by the Dionex Company. The IC is now a standard instrument in a modern analytical lab. The only place to set up a lab was the basement of the Federal Building - definitely not the ideal place to do chemical analysis. Bravely we went ahead and got an IC which was Dionex's first commercial model. As it turned out, Dionex expected us to help them solve all their initial startup difficulties!



Al Shibata

Al Shibata was the electronic technician for the observatory. Al worked hard to keep all the various instruments running. A very quiet person, you could depend on Al to



do things right. He probably went up the mountain more than anyone on the staff. He was such a pleasure to work with. Sadly Al passed away in April 1999.



John Chin

John Chin, now retired, was a very important scientist at MLO. For years he worked on the world-famous carbon dioxide record initiated by Dave Keeling. Dave and John are shown above during the dedication of the Keeling building at MLO during the 40<sup>th</sup> anniversary celebration in 1997. Dave has since passed away. John was famous for another issue: He had a tunafish sandwich and banana for lunch year in and year out.



Kin Coulson

Another person who must be mentioned is Kin Coulson. He came as a visiting scientist from the University of California/Davis during my tenure and followed me as MLO director.



Some of the staff in 1978

### **Working On Pele's Mountain**

Going from Hilo's lush tropical warmth and greenery to the barren landscape of Mauna Loa was always a stark contrast for both the staff, who made the trip many times, and for first-time visitors. The changing vistas were an intriguing sight as we passed from tropical jungle to savanna to bare volcanic rock. From the following pictures, it can be seen that MLO is a small enclave on the side of Pele's mountain.





Aerial pictures taken by Jack Lockwood, USGS, in the mid-seventies



MLO in 1976

During MLO's first twenty years, there had been numerous short-term experiments, and in many cases the scientists had abandoned equipment and parts at the observatory when they departed. Seeing this "junk", I began my cleanup campaign and we hauled several truckloads of stuff to the dump. I exchanged a house trailer (in perfect shape preserved by the mountain's dry air) for roadwork by the Kulani Mauka prison located on the lower reaches of Mauna Loa.

In the past the main building (now the Keeling Building) had been used mostly as a living space and many of the measurement programs were housed in other buildings. This was not a very efficient way of configuring the observatory. Overnight stays were rare and another building could be used as sleeping quarters. Thus the modernization of the main building was undertaken. It was a major disruption but it was worth the effort.



Before



After



Putting up the new aerosol intake

Most measurement programs were now installed in the main building. To give an idea of what was measured during that time period, the list from 1977 is given on the following page. Details of this period are given in Geophysical Monitoring for Climatic Change Summary Reports 1976, 1977 and 1978.

Table 1. Summary of Sampling Programs at Mauna Loa in 1977

Monitoring Programs	Instrument	Sampling Frequency
<u>Gases</u>		
Carbon dioxide	URAS-2 infrared gas analyzer	Continuous
	Evacuated glass flasks	Weekly
Surface ozone	Electrochemical concentration cell (ECC)	Continuous
	Dasibi ozone meter	Continuous
Total ozone	Dobson spectrophotometer	Discrete
Fluorocarbons	Pressurized flasks	Weekly
<u>Aerosols</u>		
Stratospheric aerosols	Lidar	Weekly
Condensation nuclei	Gardner counter	Discrete
	Pollak counter	Discrete
	General Electric counter	Continuous
Optical properties	Four-wavelength nephelometer	Continuous
<u>Solar Radiation</u>		
Global spectral irradiance	Ultraviolet radiometer	Continuous
	Five Eppley pyranometers	Continuous
Direct spectral irradiance	Eppley normal-incidence pyrheliometer	Continuous
	Filter wheel pyrheliometer	Discrete
Water vapor hygrometer	Faskett	Continuous
<u>Meteorology</u>		
Temperature/dewpoint	Hygrothermograph	Continuous
	Thermistor/dewpoint cell	Continuous
Pressure	Barograph	Continuous
	Pressure transducer	Continuous
Precipitation	8" raingauge	Discrete
	Tipping bucket gauge	Continuous
Wind speed/direction	Anemometer/vane	Continuous
<u>Precipitation Chemistry</u>		
Chemical composition of precipitation samples	pH meter, conductivity bridge, ion chromatograph	Discrete
<u>Cooperative Programs</u>		
Carbon dioxide - SIO	Applied Physics infrared analyzer	Continuous
	Evacuated flasks	2 mo <sup>-1</sup>
Carbon monoxide - Max Planck Institut	Chemical reaction with HgO	Continuous
Total NO <sub>2</sub> - Aeronomy Lab/NOAA	Spectrometer	Discrete
Surface SO <sub>2</sub> , NO <sub>2</sub> - EPA	Chemical bubbler system	Every 12 days
Surface tritium - Univ. of Miami	Molecular sieve	Discrete
Total surface particulates - DOE and EPA	Hi-volume filter	Discrete/ Continuous
Atmospheric electricity - APCL/NOAA	Field mill, air conductivity device, surface antenna	Continuous
Stratospheric Aerosol - AFGL	Volz twilight photometer	Continuous
Erythema spectrum - Temple Univ.	Ultraviolet meter	Continuous
Precipitation chemistry - DOE and EPA	Precipitation collector	Discrete
Cloud water - ASRC	Cloud water collector	Discrete

Geophysical Monitoring  
For Climatic Change  
No. 6

Summary Report 1977



U.S. GOVERNMENT  
PRINTING OFFICE  
1977



## Views From Pele's Mountain

One of the joys working at MLO was the beauty of the many moods of the mountain. Below are some of those views.



The road to MLO



Reaching the observatory and looking back towards Hilo



The sky was ever changing – spectacular sunset and view towards Maui



## 20<sup>th</sup> Anniversary of Living With Pele

During my time at MLO, we celebrated the 20<sup>th</sup> anniversary of MLO. It is hard to believe that the 50<sup>th</sup> anniversary will be this year, 2007. The observatory, after its modernization, was rededicated with the appropriate Hawaiian ceremony.

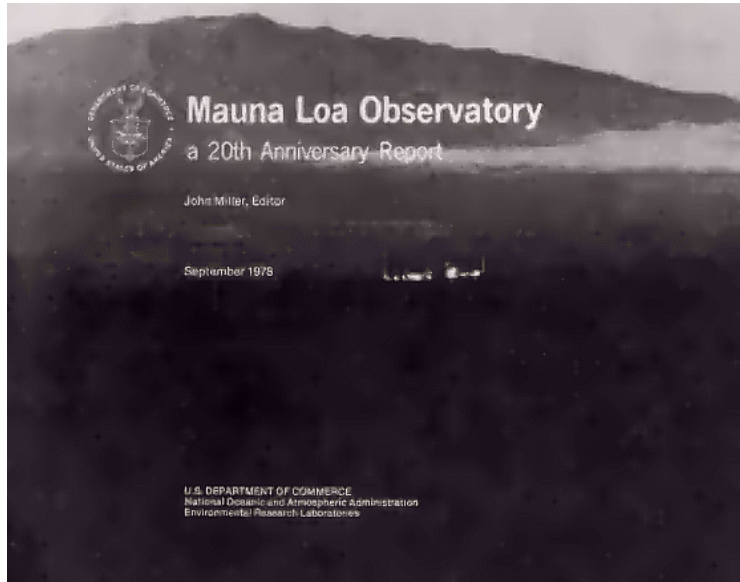


Senator Akaka and the blessing ceremony 1978

The event hit the front pages of the Hawaii Tribune-Herald January 29, 1978 (see below).



To mark the anniversary of the Mauna Loa Observatory, a 20<sup>th</sup> Anniversary Report was compiled. Many pictures of the ceremony and MLO history are included in this report, which is available on the MLO Website.



### **Pele's Magic and Blessing**

Living on the Big Island did not only involve work at Mauna Loa Observatory. Pele's magic was all over the island. One has to begin with the wonderful town of Hilo and our house situated on an extinct cinder cone, Halai Hill. There was a spectacular view of Hilo Bay. But the beauty of island is evident as you travel around the island.



The house on Halai Hill with a view over my favorite Plumeria bush

My favorite spots include the Hamakua coast, Waipio valley, Waimea/Parker Ranch, Hawi, Hapuna Beach, Kailua/Kona, City of Refuge, South Point, Pahoa, Kilauea and Puna. A whole separate paper could be written about these wonderful places that hold many memories. I could always understand why the ancient Hawaiians believed in so many gods – just the way the light and winds interacted made one think that there were spirits abroad. One of my favorite places was the Hawaii Volcanoes National Park, where one could view the Kilauea volcano (4000 ft). The fourteen-mile crater rim hiking trail was quite varied. It lead by the smoldering Kilauea crater to the Kau desert, where



one can pick Ohelo berries. It continued further into a tropical jungle where orchids grew wild.



On the Crater Rim Trail



Ohelo berries and orchids along the Crater Rim Trail

If I were to choose my most favorite place on the island, it would be Bird Park (Kipuka Puauulu) and the Mauna Loa Strip Road. Though this is within the National Park, it is not so often visited by tourists. It is a beautiful area that starts at a large ohia/koa forest and moves up from savanna grassland to bare lava rock. Here you can see and feel Pele's magic.



Bird Park



Higher on the Mauna Loa Strip Road with Mauna Loa in the background

Another magical place where I felt I would meet Pele was the cliffs overlooking Puna. Though within the National Park, the overlook was even more remote. A combination of light and breezes gives a feeling of being close to the Hawaiian gods.



The Puna lookout

The most important gift that Pele gave us was Katja, our daughter, born November 14, 1977, in Hilo Hospital.



Kamaaina Iki



Pele showed us the beauty of Hawaii's landscape and people and wished us Aloha after two years and forty-seven days in this island paradise when I was transferred to ARL Headquarters as Deputy Director.



February 14, 2007