



The Measurement of CO₂ in the Mid-Seventies at Mauna Loa: A Historical Perspective

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Mauna Loa Observatory



Dedication of the Observatory in 1956



Observatory in 1976



Geophysical Monitoring for Climatic Change

In 1972, Lester Machta, Director of the Air Resources Laboratory /NOAA and Don Pack, Deputy Director, proposed a program called Geophysical Monitoring for Climatic Change (GMCC). 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 (CO₂, CH₄, N₂O and CFCs), ozone, 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 24 stations based on their scientific premises, was established and coordinated by the Global Atmosphere Watch of the World Meteorological Organization. In January 1990, GMCC became an independent laboratory which was renamed the Climate Monitoring and Diagnostics Laboratory (CMDL). Recently, CMDL has been absorbed into the Earth System Research Laboratory/NOAA as the Global Monitoring Division.



Summary: The First Twenty Years

- With the establishment of the Geophysical Monitoring for Climatic Change in 1972, the continuation of the Mauna Loa Observatory as a global monitoring site was assured.
- Because of the importance of the CO₂ measurement, a second Infrared CO₂ analyzer (URAS2) was installed at the observatory by NOAA/GMCC. Both instruments (SIO and NOAA) required weekly calibration using CO₂ standard gas tanks provided by SIO.
- In 1978 C.D. Keeling made the following statement which is certainly true today:
 “The increasing amount of CO₂ in the atmosphere from the burning of fossil fuels has become a serious environmental concern. Central to this concern is the question whether a rise in CO₂ constitutes a peril to man by raising world temperatures, as many scientists now claim. That a rise in CO₂ is occurring is unquestionable; however, Mauna Loa Observatory (MLO) data are providing dramatic evidence of that: they show amounts more than 10% over amounts recorded before the Industrial Revolution, and a rise of 6% in the last 19 years alone”

Mauna Loa Observatory a 20th Anniversary Report

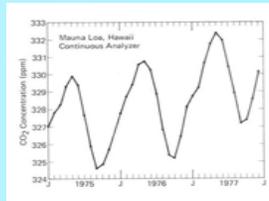
Carbon Dioxide Measurements at Mauna Loa



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, C. D. (Dave) Keeling, a scientist from Scripps Institution of Oceanography (SIO), maintained the key CO₂ measuring system at the observatory. Since its 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. The measurements at these sites have been critical in understanding the changing composition of the atmosphere and climate.

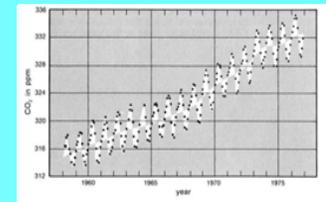


Scripps IR CO₂ Analyzer (Applied Physics) in the Sixties



Early NOAA CO₂ record

Through 1974, the SIO Infrared CO₂ analyzer (Applied Physics Co) was the only continuous measurement of CO₂ at MLO, completing a seventeen year record. Because of the importance of this measurement, it was decided to establish a second continuous measurement system using URAS 2T, an IR analyzer which was installed in June 1974. Both instruments required weekly calibration using standards provided by SIO. Paper chart recorders were used to record the data for both instruments. The NOAA instrument's data were also recorded in central computer. The data were sent to Scripps, La Jolla and GMCC, Boulder respectively. The dedication of John Chin at MLO and Dave Moss at SIO insured that high quality CO₂ was collected at MLO for many years.



SIO CO₂ record through 1977



John Chin working on CO₂ data



Dave Keeling and John Chin (1997)



Both IR Analyzers with calibration tanks