American Meteorological Society
Wright Memorial Chapter

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Minutes from 18 December 2008 Meeting

AMS Wright Memorial Chapter meeting of 18 December 2008
Meeting at Little York Tavern, Huber Heights, OH

LtCol Doug Tunney gave a presentation on weather support in Iraq.

Minutes from 22 January 2009 Meeting

AMS Wright Memorial Chapter meeting of 22 January 2009
Meeting at Elinor's Amber Rose, Dayton, OH

"My Tales of Meteorological Support in Greenland"

By Mr. Mike Haap

In January of 1960, Mike Haap enlisted in the US Army with a written guarantee to be trained as a weather observer. This was after the Air Force didn't offer such a guarantee. He was trained at Ft. Monmouth, New Jersey where he was asked to stay to be a teacher. Mike declined since he believed you needed experience to be a good trainer. Also, he didn't tell them he'd be a nervous wreck teaching.

In July he was assigned to Yuma Test Station, which is 25 miles north of Yuma, AZ with a high temp of 117° F. Only they told him he had special talents to be their supply clerk. Even after protests to the 1st Sergeant and commanding officer, he started in supply. Fortunately after a couple of months he saw a posting for volunteers for Greenland for weather support for the Army's Polar Research. He was transferred to the Field Section to get some experience. This consisted of field observations and Pilot Balloon (Pibal) releases for low level winds in support of the SD-2 Drone launches, artillery firings and impact areas, and Honest John rocket launches.

In January 1961 he and Eugene "Bear" Backhaus were sent to Ft. Huachuca in southwest Arizona for "Arctic training" along with eight others. Previously this training was in Houghton, Michigan. It actually snowed one evening. One of the highlights was the Bear getting 45 gigs for his cubicle and bunk area – like what were they going to do to him – send him to Greenland? In early February the ten soldiers were sent to Greenland via McGuire AFB, Goose Bay, Labrador and Thule AB.

Mike was assigned to Tuto West, a five-man weather station with Sgt. Manny Held, Cook Thompson, Bear, and Jesse Shatto. It was located about ten miles from Thule AB on the coast and about seven miles

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We're on the Web!

www.ametsoc.org/chapters/wrightmem/index.html

from Camp Tuto, the main Army base, at the edge of the Greenland ice cap. Recent web postings claim the edge is now three or more miles inland. Three days after they arrived, the troops who had been thru the dark winter went up on the roof of the station to wait for the sun to appear. Sgt Held, his Jewish NCOIC, who was more like your favorite uncle – smart, funny, and lots of good advice sent Mike and Bear to the Thule AB Post Exchange to buy cameras from Manny's Danish friends. Mike bought his first camera, a 35mm German Agfa Super Silette. The Agfa has manual settings with a built in light meter. Mike still has it. Bear bought a high end 35 mm. All of the slides were taken by the Agfa.

In April, Mike was transferred to Camp Century - City Under the Ice 100 miles up on the ice cap. He and Edsel Wynn, who was from Yuma, travelled by heavy swing – large sleds pulled by D-9 Caterpillars with wide tacks - over 125 miles of winding trail. The lowest temperature experienced was -38° F. The three observers pulled 12-hour shifts with 24 hours off. Surprisingly it was well tolerated.

Camp Century was constructed in 1959 by digging trenches into the ice cap with a Peter Plow. As the plow dug each deeper layer, it took a wider swath to create a tunnel wider at the bottom with the top covered by a steel arch. The tunnels were interconnected off the main tunnel. Power was supplied by a portable nuclear reactor. Otherwise too much diesel fuel would have to be transported– with your hidden and some not so hidden crevices on the trail. 100 men wintered over, with about 200 active in the summer. The warmest temp was around 32° F. With the sun shining and calm wind, Mike would take his hourly observations in his tee shirt.

Since Greenland is a desert climate, the hardest observation was to figure out how much snow fell. This was complicated by the blowing or drifting snow along with all of the Hoar frost that covered everything, including the snow on the ground. A number of slides showed the Hoar frost covering the instruments and the 200 foot weather tower. They took Pibals as the conditions dictated. One day he had been reporting middle clouds, only to release the balloon and have it disappear in the low clouds within a few minutes. They had a couple of Phase I – winds of 35 mph or more which created whiteouts.

Susie the Arctic Fox was shown eating scraps left on the window of the escape hatch of the weather station. The station was one of the few buildings on the surface. All of the other facilities were in the tunnels to protect them from drifting snow. Sgt Score, the Non Commissioned Officer In Charge, had a small dozer dig out the station and supply building.

In July, Mike returned to Yuma Test Station. In July of 1962, he returned to Greenland as a quick replacement for a Sergeant who couldn't return. Mike was assigned to Tuto West again. He had been scheduled to go to Tuto East, but due to being late, didn't go. He did regret not getting to Tuto East which was about nine miles up the

slope of the ice cap from Camp Tuto.

He showed slides of Arctic Hares, another Arctic Fox, that Al Way almost fed out of his hand. The station was on a low hill covered with dirt and rocks with some type of Arctic grass. Melt streams ran thru the valleys. On one hike, Al Way and Mike explored a small ice field with a tunnel under it cut by a melt stream.

He considered this tour at Tuto West a very easy assignment. This was evident by the many slides of the area, including a trip to a Coast Guard Loran Station about 25 miles to the south on the coast.

In October he took a short leave at home in Cincinnati during the Cuban Missile Crisis. On 21 December he was discharged from Yuma so he could be home for Christmas.

In 1966, Camp Century was abandoned, except the reactor which was disassembled. The constant pressure and movement of the ice on the tunnels became too much to continue to try to shave sides of the tunnels. A borrowed photo from a military report on Century shows one of the buildings crushed by the ice.

Mike plans on posting his 250 slides either on Steffen Winther's great web site or possibly on his own site. This is after he figures out how to separate the files from the chapters that they are imbedded in. Mike would also like to return to Thule AB and the old Army sites. He has written a screenplay based upon his time in Greenland.

Steffen's site is http://www.thuleforum.com/

As Steffen says, "Stay in touch, and carry the torch high for Thule: a rare Spot on planet earth."

Minutes from 26 February 2009 Meeting

AMS Wright Memorial Chapter meeting 26 February 2009
Meeting at Beef O'Brady's , Beavercreek OH

President Fiorino opened the meeting with a few remarks:
Dr Fiorino thanked Wright Memorial Chapter members and commented that this year's large dry ice tornado chamber was a crowd pleaser. Special thanks go out to Mr Bruce Clay, who donated the chamber from his local 4H club. Also, our gratitude goes to Ms Allison Schauer for organizing the booth for our Chapter, and purchasing the dry ice. The treasurer was authorized to repay Ms Schauer. Dr. Fiorino proceeded to present Wright-Patterson Education Outreach Certificates of Appreciation to Chapter Members that participated at TechFest 2009.

Next Dr Fiorino reminded attendees that we have again been invited to serve as judges in the West District Science Fair held at Central State University on March 21, 2009. He then introduced the evening's speaker, Air Force Institute of Technology (AFIT) student Capt Seth Marek.

West District Science Fair is scheduled for 21 March 2009. He encourages members to register to be judges. http://www.centralstate.edu/academics/sciencefair/forms/judges.html

Captain Seth Marek's presentation, "A Computational Tool For Evaluating THz Imaging Performance In Brownout Conditions At Land Sites Throughout The World"

Captain Marek presented a brief review of his thesis paper, "A

Computational Tool for Evaluating THz Imaging Performance In Brownout Conditions at Land Sites Throughout the World". Rotary wing pilots in deserts (and in powdery snows) often are forced to land in zero visibility, blinded by the turbulent clouds of dust raised from their rotor's downwash. According to the US Army Safety Center, spatial disorientation accidents result in the loss of an average of 40 lives per year, as well as destroyed equipment, and failed missions. It is a matter of grave concern to all rotor-wing pilots operating in desert conditions.

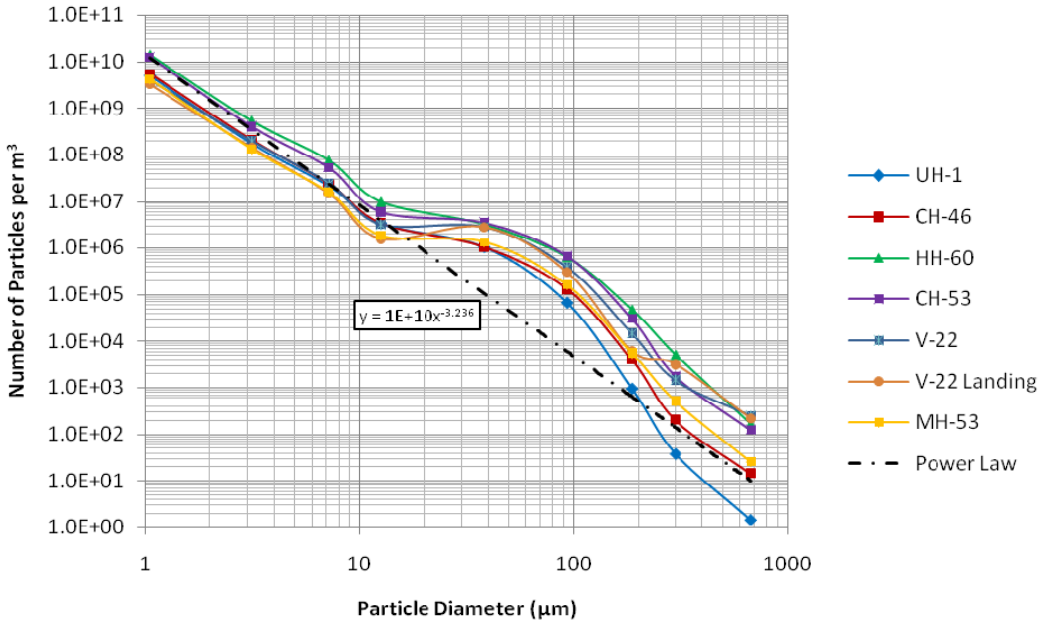
Brownout occurs when a helicopter's rotors kick up soil and sand obscuring visibility.

The Department of Defense has placed placed a high priority on making desert landings safer for rotor-wing aircraft. Some solutions work in specific cases, for example, there are ways of preparing the landing zone with water or dust retardants which keep visibility high enough for safe landings. Another approach is called "See and Remember" where a digital image of the landing zone is taken moments before landing and then viewed on the instrument panel so the pilot can navigate "heads down" while observing the image of the zone, even after it is completely lost in dust clouds. This helps as long as nothing moves to change the scene, such as wildlife or vehicle traffic. The Army is also training pilots to approach landing zones faster and keep the dust clouds behind the field of view for as long as possible. Can meteorologist's actually forecast brownout conditions? This problem is very complex and there has been little success at forecasting using the tools available to forecasters today. So, can sensors be found with the proper wavelength to "see through" the dust?

Sensors of many wavelengths have been tested to this point with marginal success at seeing through dust clouds. Infrared camera's can see minimally better than visible, but ranges in thick clouds still remain less than 5 meters and are not adequate. Longer wavelength radars can penetrate the dust clouds but do not have the needed "image resolution" to determine what is actually under the aircraft. Radiating this energy also serves as a beacon revealing the location of the aircraft to listeners at great distances. DoD missions often require an element of surprise, which can be easily foiled by these emissions. This research focused on the 0.66 THz band which can both image through thick dust and the low powered signal also attenuates rapidly to maintain desired stealth. The goals of this research were to model transmission in dust using a modified version of AFIT's Laser Environmental Effects Definition and Reference (LEEDR) software.

This first required a detailed characterization of the brownout cloud including particle density and size distribution for desert regimes and also for mid-latitude regimes.

The wind erosion process which whips soil into the air is not well understood. Favorable sources for dust storms require dry topsoils, little vegetation, and windy conditions. When winds reach a certain speed, usually above 10 kts, a saltation process begins and sands begin to bound downwind. As the roving sand strikes the surface it raises more soil particles. Each airborne particle will now do the same and the process grows in number and considerable mass of soil is soon displaced into the air and downwind. Most sub-micron sized particles can remain aloft for days. Larger particles of a few hundred micron-diameter will settle out quickly some kilometers away from their source. A study at the Yuma Proving Ground in 2006 carefully measured the density and size distribution of dust clouds generated underneath hovering helicopters. As expected, smaller helicopters raised smaller dust clouds than larger, heavier, ones. Both generated zero visibility dust clouds, the heavier rotorcraft were able to kick up two orders of magnitude more large particles. This study did provide a good example of the density and size distribution of dust cloud particles. Densities were found to be several grams of particles per cubic meter of air and a “Marshall-Palmer-like” size distribution was also assumed.

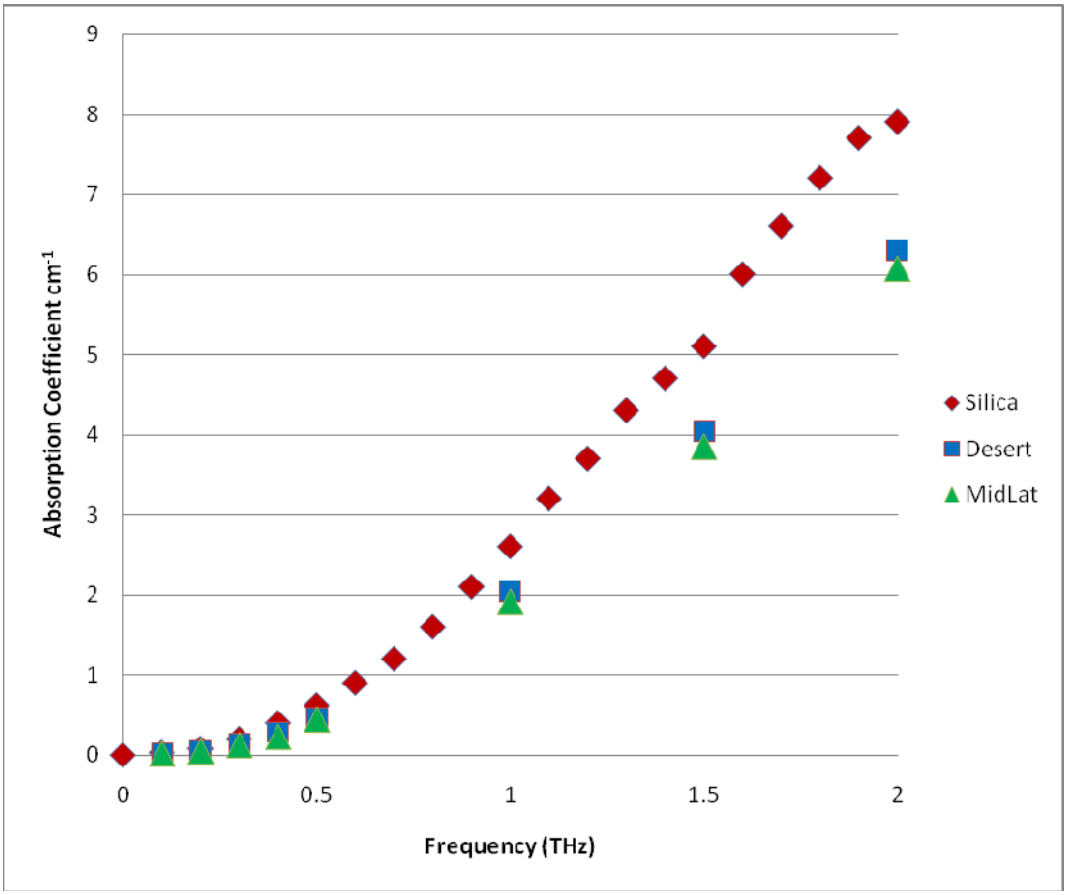


Yuma Proving Ground dust distribution fitted with Power Law that was incorporated into LEEDR code

Next question, what are the optical properties of these clouds in THz (0.66) domain? Optical properties are a material’s response to exposure to electromagnetic radiation and depend on many things. Atomic structure of atmospheric constituents can absorb or attenuate radiant energy. An example of this is cloud cover at night. The clouds absorb and re-radiate the earth’s long wave radiation. Another key factor is particle size, if the size of the dust is almost equal to the wavelength of the radiation, scattering occurs. Another big factor is exposure to humidity. Soil particles and aerosols absorb moisture and

expand in size as humidity increases. This can be seen in morning hazes which burn off as relative humidity decreases later in the morning. With each aerosol type and wavelength there is a complex index of refraction, and the response of aerosols to terahertz

Ratio comparison from Silica paper papers were used to calculate Desert and Mid-Latitude Brownout optical properties



THz absorption coefficients as quoted in literature

frequencies has not been well studied before.

Silica Absorption Coefficient (cm^{-1})				
	0.5 THz	**1.0 THz**	**1.5 THz**	**2.0 THz**
Literature Values	0.62 ±0.02	2.6 ±0.1	5.0 ±0.2	7.8 ±0.2

Capt Marek then described how he used an earlier study on silica at shorter wavelengths to extrapolate to the terahertz wavelengths. He compared ratios to determine an estimated absorption coefficient and refractive index for a dust cloud at 0.66 THz. With these values he was able to modify the LEEDR transmission software code into the terahertz range. Now, he ran the code for several different visibilities and wavelengths to determine the path transmittance. He could also calculate the minimum power needed to be radiated to "burn through" the dust cloud for enough visibility for a safe landing – a surprisingly low 30 microWatts. These low power waves will be quickly attenuated in the atmosphere and by one kilometer range they are negligible so it will provide a safe level of covertness.

In conclusion a tool was developed to evaluate THz imaging through brownout conditions. This tool will prove to be valuable because it

eliminates the need for operators to develop special landing techniques to avoid a brownout. It also eliminates the need to try and forecast a brownout because with this capability one can be assured that they will be able to see through the cloud and meet mission objectives. Therefore, this research holds a promising technology to mitigate the effects of rotorcraft brownout when it occurs.

Images from TechFest 2009

Photographs by Paul Gehred and Mary Bedrick.

"Tornado Chamber" (Left) and "Tornado in a Bottle" (Right) Demonstration proved fun for people of all Ages at the 2009 TechFest at Sinclair Community College in Dayton.

The Wright Memorial Chapter booth was very popular at TechFest 2009 held at Sinclair Community College (14-15 February 2009)

Shutterbugs – Submit your latest and greatest weather shots to our newsletter! Send them via e-mail to: mary.bedrick@wpafb.af.mil