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New Satellite Station Gathers Images of Alaska

A new satellite-receiving antenna, installed in August 2001 on top of the International Arctic Research Center, soon will be used by researchers, state agencies, commercial fishermen and others interested in viewing large portions of Alaska from above.

The antenna, which became operational in the fall of 2001, receives detailed images of Earth that can help scientists detect the location of hotspots within wildfires and determine the extent of spruce bark beetle damage among stands of white spruce trees in Alaska.

"This is the beginning of a service that can benefit every Alaska village and town," said Geophysical Institute Director Roger Smith.

The antenna will gather data from the Moderate Resolution Imaging Spectroradiometer (MODIS), an instrument carried aboard two NASA satellites: the EOS Terra and the EOS Aqua.

Geophysical Institute Professor Buck Sharpton, the project's chief scientist, said that the high-latitude location of the receiving station offers many advantages. Polar-orbiting satellites pass over Fairbanks at least nine times each day, compared to half as many passes each day in Seattle or any other city in the northern part of the Lower 48.

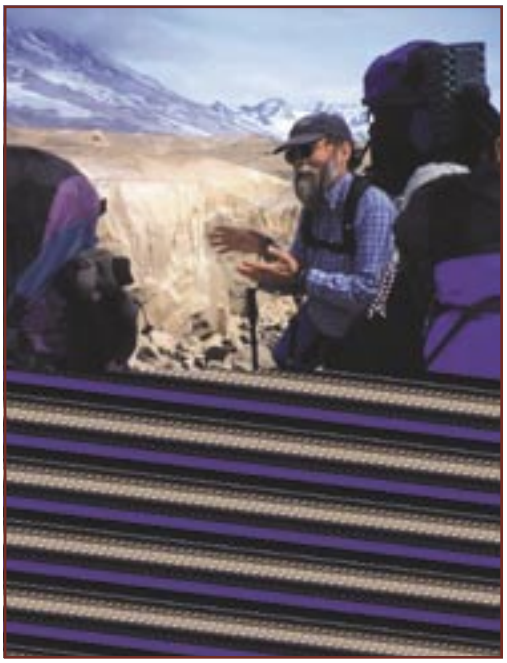
"This is a satellite sensor that's designed to monitor natural hazards, assess natural resources and understand climate variablility associated with global climate change – three things that are on everybody's minde right now," Sharpton said.

More coverage allows the MODIS to produce frequent images of large

portions of Alaska. The device detects the energy emitted and reflacted by everything on earth, even the blues and yellows given off by plankton blooms and the reflected differences between healthy spruce needles and needles from trees affected by the sprce bark beetle.

"the satellite can track stands of stressed trees versus healthy trees versus dead trees, and it can track that front as it goes along," Sharpton said.

In August 2001, contractors and Geophysical Institute researchers assembled a new antenna and installed it on top of the International Arctic Research Center.
The antenna will use a Moderate Resolution Imaging Spectroradiometer that will enable scientists from the University of Alaska to view Alaska from above. Photos of the antenna were taken by Jeff Pederson of the Geophysical Institute Digital Design Center.



Researching the Valley of Ten Thousand Smokes

Geophysical Institute scientists have a long history of research in Alaska's Valley of Ten Thousand Smokes, the site of the largest eruption in the world during the 20th century.

Geophysical Institute Professor of Volcanology John Eichelberger continued that tradition in the summer of 2001 when he lead a group of volcanologists and students on an excursion sponsored by the Alaska Volcano Observatory and the Volcano Hazard Program of the United States Geological Survey.

The trip into the desolate valley was an opportunity for Eichelberger to introduce student to the rigors and rewards of fieldwork. He also was able to show fellow volcanologists one of the world's most outstanding eruption sites. His intent was to stimulate collaborations with scientists from other institutions and thereby raise the level of scientific effort focused on Alaska's volcanoes. Eichelberger also used the trip to introduce National Park Service staff to the geology and hiking routes in their seldom-visited backyard.

From June 6 through 8th. 1912, more than 30 cubic kilometers of ash and pumice erupted, buring 65 square kilometers and creating the Valley of Ten Thousand Smokes.

The valley today still holds more than 150 meters of ash, with no trees or shrubs growing 90 years after the eruption. The valley's resemblance to the moon inspired NASA to bring Apollo astronauts there in the mid-1960s so they could easily identify a landscape shaped by volcanoes.

Geophysical Institute scientists benefited from NASA's interest by receiving funding from the agency in the late 1960s and early 1970s for basic research in the Valley of Ten Thousand Smokes.

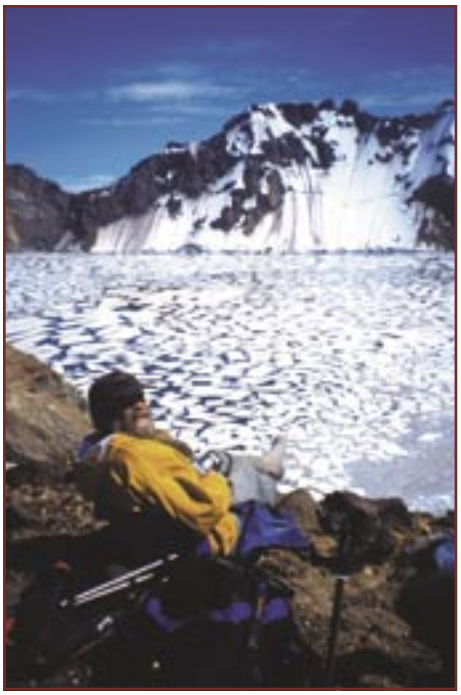
With help from NASA-contracted helicopters, Geophysical Institute scientists built the first research hut at Baked Mountain in 1965. Another hut was built in 1970 after a windstorm blew away everything outside the original cabin. The huts still stand, protecting researchers from the area's extreme rain and windstorms.

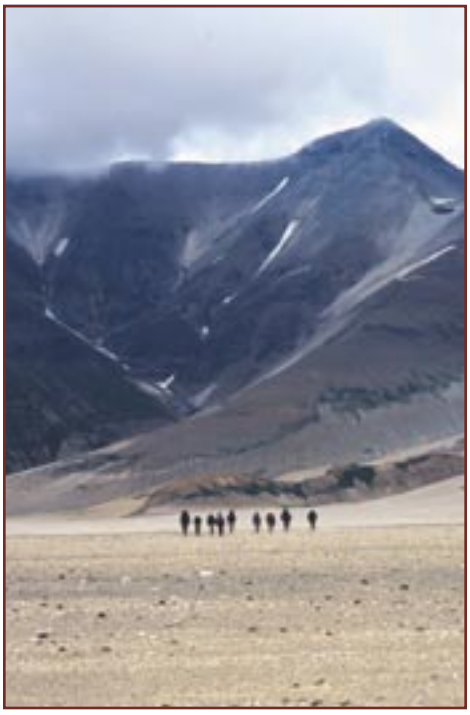
The Valley of Ten Thousand Smokes has been researched more than any other single study area in Alaska, and has provided many Geophysical Institute scientists and students with the opportunity to undertake and publish studies. The late Geophysical Institute Professor Jurgen Kienle spent the summer of 1966 in Baked Mountain huts with his wife Linde. The pair monitored seismic stations and performed gravity observations, an occasion the two described as their honeymoon.

In 1967. Dipak Ray of the Geophysical Institute was the first student to earn a Ph.D. for his work in the Valley of Ten Thousand Smokes. He performed research on the geochemistry and petrology of Mt. Trident lavas.

Institute graduate students have earned degrees by studying the volcanogy in the valley ever since. In 2001, Michelle Coombs earned a Ph.D. for her research on magma storage and mixing conditions at Southwest Trident volcano. In 2000, Arthur Jolly earned his Ph.D. for examining the seismic structure of the Katrnai area. After participating in the summer 2001 excursion into the valley, Graham Hill, a graduate student in volcanology at the Geophysical Institute, plans to study the relationship between Mount Katmai and Novarupta volcano, keeping an institute tradition alive.

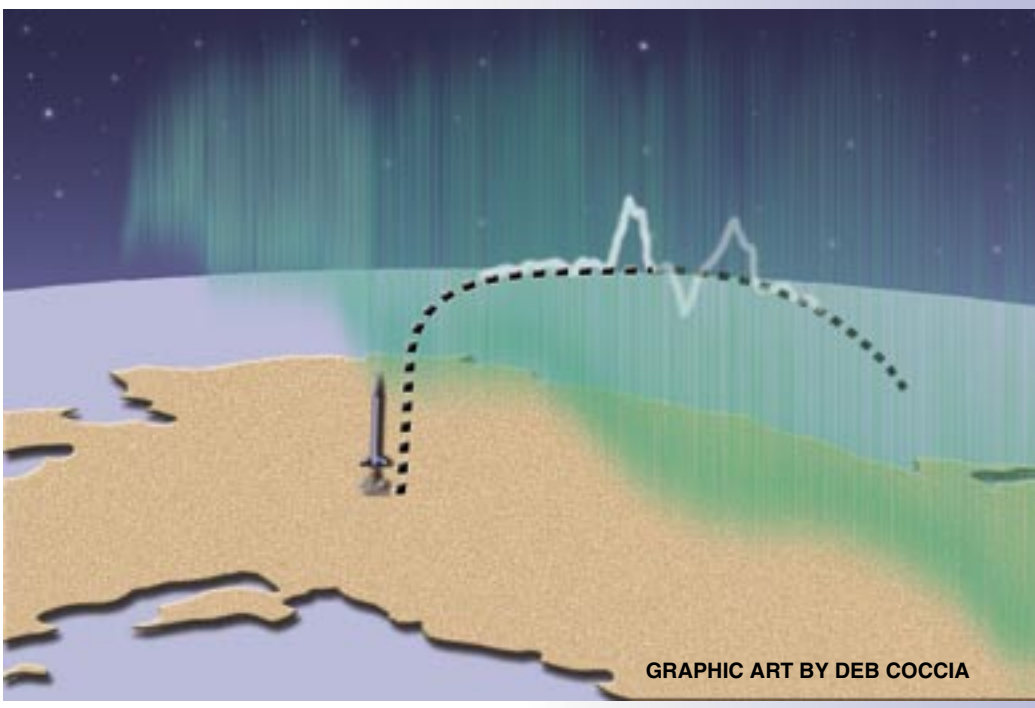
Photo Captions -- Geophysical Institute Science Writer Ned Rozell took most of the photgraphs on these pages while on a field trip to the Valley of Ten Thousand Smokes with Professor of Volcanology John Eichelberger. Eichelberger took the panoramic shot, above, of Katmai Caldera, which was created by the largest eruption in the world during the 20th century. Geophysical Institute scientists have studied this dramatic landscape since the late 1960's, building two shelter cabins that are still used by hikers and researchers today.





Researcher to Tip Rocket Science on its Side

The figure below depicts the flight path of the launch scheduled for January 2003. Camera sites associated with the launch will be located at Arctic Village and Toolik Lake in Alaska, and Old Crow in the Yukon Territory, as shown on the Alaska map at right.



Geophysical Institute Assistant Professor of Physics Mark Conde will attempt to turn the world of rocket science on its side with an aurora experiment scheduled for January 2003. Conde is the principal investigator of the first institute-led rocket launch at Poker Flat Research Range since 1995.

The experiment will differ from other Poker Flat launches because the rocket will tip on its side in mid-flight.

"The whole idea of tipping a rocket on its side is brand new," Conde said.

Once the rocket is free of the drag imposed by lower atmosphere gases, it will tip on its side, enabling the rocket to pierce a curtain of aurora horizontally.

While traveling horizontally at about 3 kilometers per second, the rocket will release a harmless chemical trail of trimethyl aluminum. The trail will provide scientists with the opportunity to measure and map vertical winds in the ionosphere.

Computer models suggest that heat from the aurora generates an upwelling plume, which like a candle flame, causes air around it to rise. If this is so, heat from the aurora should cause the chemicals released during the rocket experiment to rise upward in a horizontal plume about 200 kilometers long.

The plume should be visible overhead as a blue-white contrail created when the chemical released from the rocket reacts with oxygen in the atmosphere.

Conde and his colleagues intend to map the vertical wind traced by this plume every two kilometers from camera sites at Arctic Village and Toolik Lake in Alaska, and at Old Crow in the Yukon Territory.

"The plume will be visible low in the sky from Fairbanks, but people in Arctic Village will have box seats," Conde said.

The 55-foot rocket also will contain payloads designed by Geophysical Institute Professor of Physics John Craven and University of Alaska students supervised by Professor of Electrical Engineering Joe Hawkins.

Craven will launch two photometers designed to map the structure of the aurora, and Hawkins' students will add a relative plasma density probe to measure the density of free ions and electrons along the rocket path.

Conde admits that he did not dream up the idea of tilting a rocket's trajectory sideways to perform his research. He attributes the idea to fellow Geophysical Institute scientists.

Professor of Physics Hans Nielsen once suggested releasing a horizontal chemical trail from an orbiting payload launched from Kodiak Island.

Craven recommended using a suborbital rocket to release the horizontal trail. conde was skeptical because he knew sub-orbital sounding rockets cannot fly truly horizontal.

"But eventually I reallized that we would be able to make the sub-orbital trajectory flat enough to do the science I wanted," Conde said.

With that insight, Conde designed a suitable sounding rocket mission, then pursued and received funding from NASA. NASA scientists are interested in the project because the tilting of the rocket's trajectory is unprecedented.

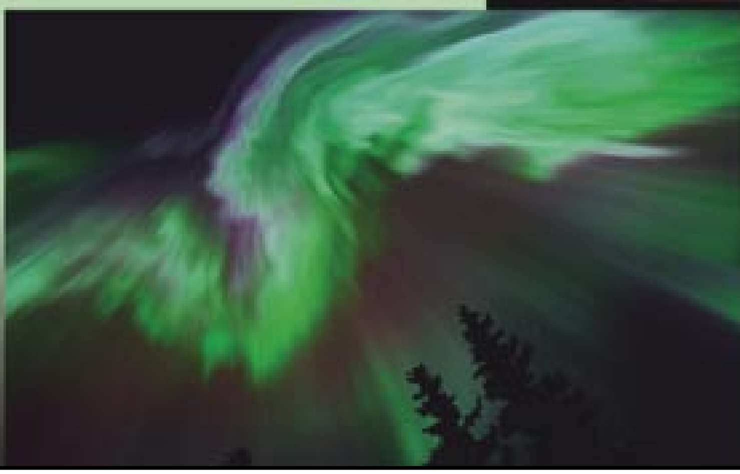
To ensure the rocket will not fly off course while horizontal, a NASA flight safety officer will be present during the launch. The safety officer will use telemetry and radar data to monitor flight performance, then decide when it is safe for the third stage of the rocket to fire and propel the rocket horizontally throgh the aurora. The third stage of the rocket will not fire automatically.

If all goes as planned, the research will help scientists learn more about the role the aurora plays in the mixing of ionospheric gases. It should also cause space physicists to view the sounding rocket as a more versatile research tool.

Aurora Updated

Syun-Ichi Akasofu, the director of the International Arctic Research Center, is updating Aurora Borealis, The Amazing Northern Lights, a book published by the Alaska Geographic Society in 1979. In 2002, Alaska Geographic will publish the new version of the book, which has become the most popular in the Alaska Geographic series. The new version of the book will include updated text and new photographs, including images by Jack Finch and Jan Curtis, a GI climatologist who recently accepted a job as Wyoming's state climatologist.

The photographs on this page will be included in the new version of Aurora Borealis, The Amazing Northern Lights, to be published by the Alaska Geographic Society in 2002. The top and lower left photographs were taken by Jan Curtis. The lower right photograph was taken by Jack Finch.



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