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International Barium Releases Article #28

by T. Neil Davis

This column is provided as a public service by the Geophysical Institute, University of Alaska Fairbanks, in cooperation with the UAF research community. T. Neil Davis is a seismologist at the institute.

Strange lights seen in Alaskan skies on late February and early March 1978 evenings have a reasonable explanation. These were chemical releases performed at high altitude aboard rockets flown from the University's Poker Flat rocket range near Fairbanks.

The two most beautiful sequences, on February 27 and March 1, were conducted by a group of Danish scientists, the first truly international users of Alaska's scientific rocket range.

Each Danish rocket released a chemical called trimethylaluminum (TMA, for short) as it sped upward through altitude 80 km (50 miles). At this altitude the rocket was still in darkness and the TMA formed a yellowish trail. Then as the rocket entered sunlight, the TMA being released glowed a beautiful blue color.

By photographing the deformation of the TMA trail with cameras at Arctic Village, Fort Yukon and Fairbanks, the Danish scientists measured the wind in the region through which the rocket was flying.

A minute or so later, the rocket released a puff of barium gas. The barium release soon formed two clouds that drifted apart. One part,

composed of ionized barium, drifted away westward under the influence of the electric field in the high atmosphere. Thus by tracking it, the Danes could measure the electric field. Two more barium releases and then a second TMA release, performed as the rocket fell back toward the earth, allowed additional measurements of the wind and electric field over an extended region above Alaska.

The highest barium releases were at altitude 270 km, high enough to be easily seen all over Alaska and western Canada wherever the sky was clear.

People have wondered if there was a connection between the barium releases and the extensive auroras that occurred throughout each night following the chemical release. The answer is yes, but the releases did not cause the aurora. It was the other way around. By observing with various instruments, it was known that extensive auroras were already occurring over Alaska when the releases were made in evening twilight. Since the objective was to measure the effects of the aurora on the high-altitude winds, the rockets were purposely flown during times of extensive naturally occurring aurora.

[Aurora Index](#)[Main Index](#)

[\[Aurora Index\]](#) [\[Main Index\]](#)