

# Scientists launch rockets to test atmospheric conditions

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Clemson University space physicists have traveled around the world to launch rockets to test atmospheric conditions.

This shows the fourth launch of a rocket at Poker Flat Research Range. Center: time exposure of first- and second-stage firetrail. Background: auroral arc in the north. Scientists most recently launched a salvo of four rockets over Alaska to study turbulence in the upper atmosphere. The launches took place at Poker Flat Research Range north of Fairbanks as part of a NASA sounding rocket campaign.

Associate professor of physics and astronomy Gerald Lehmacher is the principal investigator for the experiment and was assisted by graduate students Shelton Simmons and Liyu Guo.

"After six days of cloudy and snowy weather, we had perfect conditions with a clear, moonless night sky over interior Alaska," said Lehmacher. "We needed excellent viewing conditions from three camera sites to photograph the luminescent trails the payloads produced in the upper atmosphere."

The rockets were 35-foot, two-stage Terrier Orions. They released trimethyl aluminum that creates a glowing vapor trail nearly 87 miles up. Sensitive cameras on the ground track the trails. From that Lehmacher and his team can analyze upper-atmospheric winds by tracking how the vapor trails form, billow, disperse and diffuse. Two of the rockets had an additional deployable payload with instrumentation to measure electron

density and neutral temperature and turbulence.

The instrumented sections are a collaboration of Clemson with Penn State University and the Leibniz-Institute for Atmospheric Physics in Germany. The University of Alaska assisted in the study with ground-based laser radar and other optical instruments. The project is sponsored by a NASA grant for three years.

In January, Clemson physicists traveled to Norway to carry out a joint experiment with Japanese scientists to study atmospheric winds and circulation from heating created by electrical currents associated with Northern Lights displays. The measurements were made with instruments flown on a Japanese S-310 rocket launched from the Andoya Rocket Range in northern Norway, as well as a suite of sensitive radar and camera instruments on the ground.

Source: Clemson University

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