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A quiet sun spurs questions on future auroras

The sun's sluggish activity over the last year has brought many faithful aurora watchers to the experts at the Geophysical Institute. They want to know why there have been so few aurora-filled nights and when they can expect the bands and curls of light to reappear in the night sky. Unfortunately, there isn't an easy answer to their questions.

The aurora is dependent on the sun. Generally the solar wind provides a slow, steady breeze of solar particles that collide with Earth's magnetosphere, but it's the perturbations in this steady breeze – the occasional solar flare or coronal mass ejection, which sends a large wave of energized particles racing toward Earth – that create the vibrant, active auroras seen near Earth's poles.

Solar activity typically follows an 11–year cycle. Dirk Lummerzheim, a professor emeritus of aeronomy at the Geophysical Institute, says we're at the minimum of that cycle now, but a quick bounce-back isn't predicted. He says it will likely be a slow ascent.

On Aug. 1, 2010, a coronal mass ejection burst off the sun, igniting a moderate flash of auroral activity. From vantages in Canada and along the U.S./Canadian border, auroras were visible on several evenings. The recent solar event and subsequent auroras renewed hope that aurora-filled nights may be in the not-so-distant future.

photo by Poul Jenson

So will the winter of 2010 bring more auroras? Scientists are cautiously optimistic.

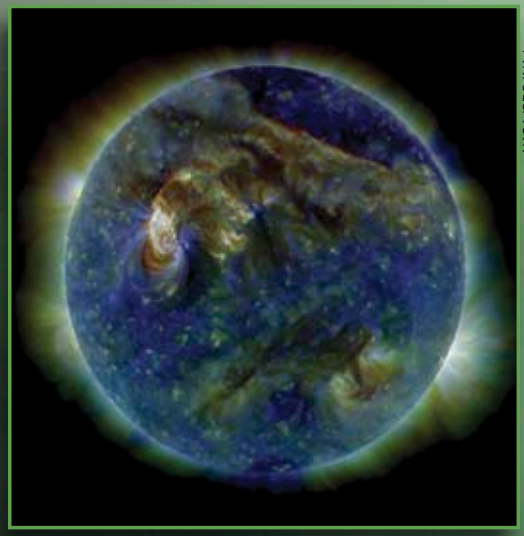
"Even though aurora predictions are a lot like reading tea leaves at the moment, I'm still daring to make predictions, " Lummerzheim said.

"There is cause for optimism," said Charles Deehr in late August. "The aurora is going to increase in activity for the next three or four years."

Deehr, a professor emeritus of physics and a longtime forecaster at the institute, says aurora-filled nights will become more prevalent, but the change will be gradual. Therefore, aurora watchers will have to remain patient.

Lummerzheim and Deehr, both retired, update the Geophysical Institute's online aurora forecast from afar. The scientists base their predictions on available solar wind data and many years of combined research on the phenomenon.

To view the recent aurora forecast online, visit the institute's website at: http://www.gi.alaska.edu.



NASA/SDO/AIA image

DANCING LIGHTS – Above, the aurora lights up the night sky over Alaska. At right, an extreme ultraviolet image of the sun in mid-eruption on Aug. 1, 2010. A solar flare appears as a white area on the upper left. Different colors represent different gas temperatures.

background photo by Poul Jenson

Scientists analyze 100 years of Fairbanks weather data

Fairbanks is the only place in Interior Alaska with more than a century of good weather records. Gerd Wendler and Martha Shulski combed through the numbers for Fairbanks and wrote a paper, "A Century of Climate Change for Fairbanks, Alaska," that appeared recently in the journal Arctic.

Wendler is the director of the Geophysical Institute's Alaska Climate Research Center. Shulski is a former ACRC climatologist now with the University of Nebraska-Lincoln. Along with a multitude of other climate data, the scientists wrote of these Fairbanks facts:

- From 1906 to 2006, Fairbanks' mean annual temperature rose from minus 3.6 degrees to minus 2.2 degrees Celsius, an increase of 1.4 degrees. This temperature increase is about twice the global value, showing clearly the "polar amplification" in temperature change.
- Winter, spring and summer data showed a temperature increase, while autumn showed a slight temperature decrease for the 100-year period.
- The frequency of frigid temperatures like minus 40 degrees Fahrenheit have decreased dramatically, while the frequency of very warm days (warmer than 26.7 degrees Celsius or 80 degrees Fahrenheit) has increased slightly.
- The length of the growing season has increased by 45 percent.
- Precipitation decreased by 11 percent since 1916.
- The overall temperature trend is positive, as expected from increasing greenhouse gases. However, the temperature increase is non-linear, with multi-decadal variations. In 1976, Fairbanks experienced a sudden temperature increase, which could be related to the Pacific Decadal Oscillation, wrote Wendler and Shulski in the paper's conclusion.

SEASONS IN THE INTERIOR *– Winter, spring and summer temperatures in Fairbanks have increased from 1906 to 2006, while autumn temperatures showed a slight decrease. From the top, photos by Frank Kovalchek; Bill Raften, U.S. Fish and Wildlife Service; Dmitry A. Mottl; and © Twildlife/Dreamstime.*

Arctic haze is on the wane

Arctic haze, a blob of dirty air that blurs Alaska views in springtime, seems to be losing its punch.

By comparing air measurements in Barrow from the 1970s to 2008, scientists have found that pollution particles from factories in Russia and Eurasia have decreased in the last 30 years.

"The Arctic haze is disappearing," said Glenn Shaw, who did pioneering research on the phenomenon and is the co-author of a recent paper on its decrease. "We don't know why."

Shaw, a professor emeritus at the Geophysical Institute, has in years past stopped passersby to point out how Arctic haze – pollution particles in the air that scatter light – has obliterated views of the Alaska Range in springtime. In recent years, he has noticed that the vistas have been much clearer from Fairbanks, and instruments in Barrow seem to back that up.

"There's less of the industrial signal, of what's typically been known as Arctic haze," said Patricia Quinn, a research chemist with NOAA's Pacific Marine Environmental Laboratory in Seattle and lead author of the study, which appeared in the Nov. 23, 2009 issue of Atmospheric Chemistry and Physics.

***HAZE**–Above, Arctic haze over northern Alaska as seen behind a NASA P3B aircraft in April 2008. In the background is a photo of factory emissions, which contribute to Arctic haze.*

First named by an Air Force pilot in the 1950s, Arctic haze appears in the north from about January until early May, when a more active atmosphere flushes and dilutes what Shaw once called an Africa-size amoeba of dirty air that sloshes over the top of the globe. The decrease in that sort of pollution may be due to less smelting of heavy metals in Russia and improved emission technology.

"I personally think they're pumping less junk into the atmosphere," Shaw said. "Things have changed."

"I think emissions have dropped in Europe just because we've been cleaning up," Quinn said. "And when the Soviet Union collapsed, their productivity dropped, and so did everything that was emitting these pollutants."

Weather could also be a factor, the researchers wrote. The weakening of the Siberian High during the last 25 years might be idling the pump that pushed pollutants northward to the Arctic.

Though the industrial portion of Arctic haze may be on the wane, researchers found surprising levels of soot from the burning of wheat stubble and boreal forest when they sampled the air over Alaska on a spring mission in 2008. Scientists hadn't found that smoky signal in the Arctic haze sampled in the 1970s.

And, though springtime emissions of industrial pollution have decreased at Barrow, during the last decade of summers the air sensors at Barrow have sniffed more sulfuric compounds in the air. These are probably the emissions of billions of little creatures in the ocean known as phytoplankton.

"It could be because of more open ice, or because warmer air and sea-surface temperatures are enhancing biological activity," Quinn said.

Eicken awarded for pioneering sea ice research

Professor of Geophysics Hajo Eicken was awarded the 2010 Louis Agassiz Medal by the European Geosciences Union. The EGU selected Eicken for his outstanding contribution to the study of both the physical and biological properties of sea ice and for the pioneering methods Eicken applied in the field as well as the laboratory.

The EGU's Division on Cryospheric Sciences established the Louis Agassiz Medal in 2005 in honor of the scientific achievements of Louis Agassiz. The medal is awarded yearly to individuals that provide outstanding scientific contributions to the understanding of the cryosphere on Earth and elsewhere in the solar system.

AWARD *– Hajo Eicken (left) was awarded the Louis Agassiz Medal (right) for his sea ice research.*

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GEOPHYSICAL INSTITUTE
University of Alaska Fairbanks
903 Koyukuk Drive
P.O. Box 757320
Fairbanks, AK 99775-7320

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