VOL. 99 • NO. 4 • APR 2018

EOS®

Earth & Space Science News

Belgian Gravimeter Sets Record

Art's Window to the Anthropocene

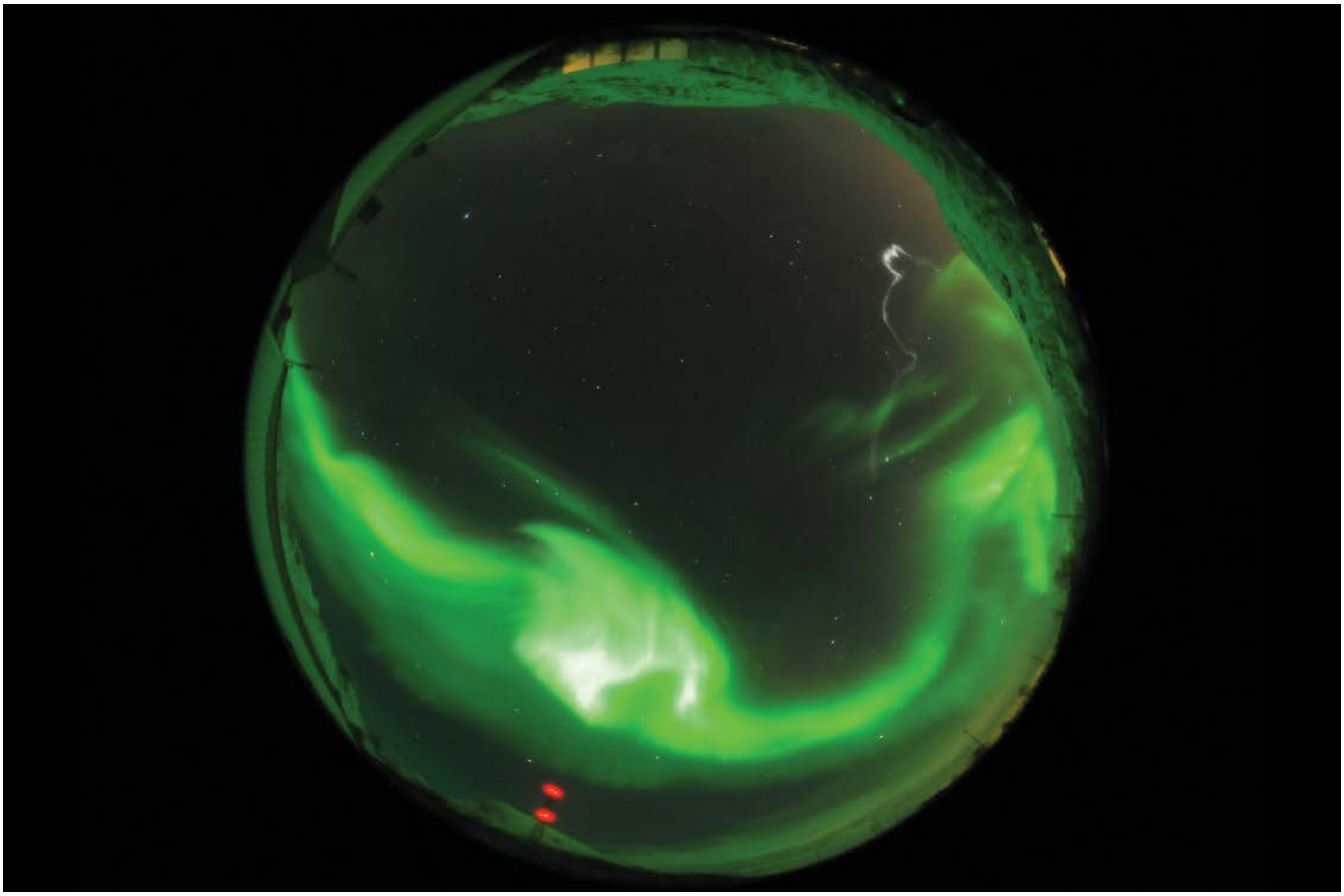
China's R&D Funding Growing

INNOVATIVE WAYS TO USE

DRONES

AGU 100
ADVANCING EARTH AND SPACE SCIENCE

Sounding Rockets Probe the Northern Lights Above Norway



An all-sky image with the breakup aurora (bottom) and a trail of the luminescent puff (top right). Credit: National Institute of Polar Research, Japan

When a dazzling aurora lights up the polar skies, it's a sign of a disturbance in Earth's magnetosphere, the magnetic shield that protects our planet from solar radiation. The aurora borealis and aurora australis—also known as the northern and southern lights—occur when solar particles penetrate Earth's magnetic field and collide with oxygen and nitrogen, releasing photons that make the sky glow blue, green, red, and yellow. Now, thanks in part to the lucky timing of a sounding rocket, researchers have obtained rare measurements of wind speeds near an aurora as it began to dance.

Auroras often start with a single arc that brightens as it darts poleward and then breaks into many shimmering bands of light. Scientists aren't entirely sure of what causes this dance, called a substorm, but one hypothesis is that it occurs when a surge of solar plasmas shifts the direction of wind in the upper reaches of Earth's atmosphere, causing energy in the magnetosphere to contract and then snap back like a rubber band.

Oyama et al. set out to investigate this dynamic process near the Andøya Space Center in Norway, where scientists frequently launch sounding rockets into the thermosphere, a thick, electron-dense atmospheric layer that begins roughly 85 kilometers above Earth and absorbs much of the Sun's ultraviolet radiation. The sounding rocket released luminescent puffs of vapor into the thermosphere just as the substorm began, allowing the team to measure nearby wind speeds. The team also used a ground-based optical imaging tool called a Fabry-Pérot interferometer to measure wind speeds on the basis of shifting wavelengths of light near the auroral arc.

Taken together, the two measurements reveal that although wind speeds within about 70 kilometers of the auroral arc increased sharply as the substorm gained intensity, winds between 160 and 200 kilometers away from the arc's edge were not affected. The finding adds to scientists' understanding of how energy and mass flow throughout the dynamic layers of Earth's magnetized upper layers of atmosphere and could help scientists predict the effects of major disturbances such as solar flares. (*Journal of Geophysical Research: Space Physics,* https://doi.org/10.1002/2017JA024613, 2017) **—Emily Underwood, Freelance Writer**