

Pacific Rainfall Data Void

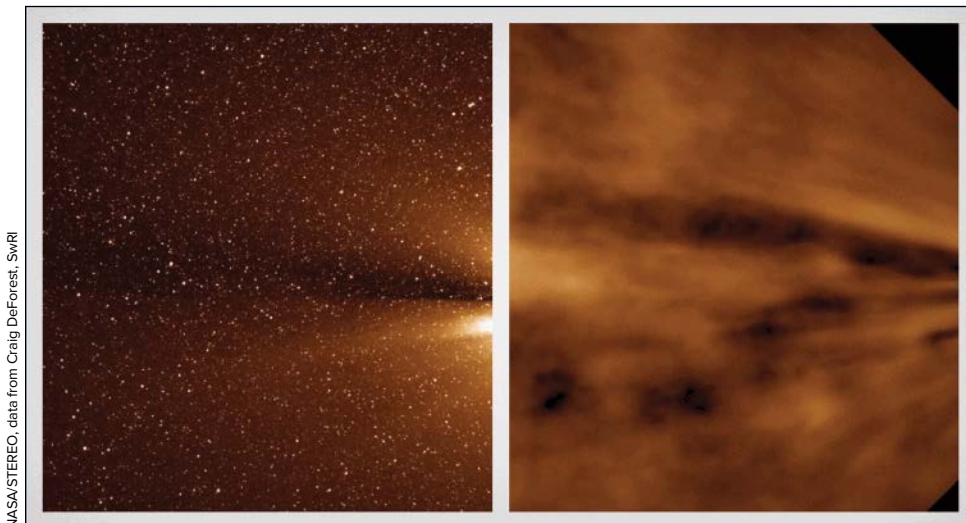
New Digital Maps of Alaska

Engaging in the Fight
Against Harassment

THE GEOMAGNETIC BLITZ OF 1941



Scientists Get First Glimpse of Solar Wind as It Forms



NASA/STEREO, data from Craig DeForest, SwRI

Two views of the solar wind: STEREO's images (left) before computer processing and (right) after processing. Scientists used an algorithm to dim the light coming from the background star field.

What does solar wind look like when it first forms from the Sun's corona? Now, with new satellite images manipulated to remove background light, scientists can answer that question.

"This is part of the last major connection we need to make to understand how [the Sun] influences the environment around the Earth," Craig DeForest, an astrophysicist at the Southwest Research Institute in Boulder, Colo., told *Eos*. DeForest is the lead author on a recent paper describing the novel technique, published last month in the *Astrophysical Journal* (<http://bit.ly/ApJ-Solar-Wind>).

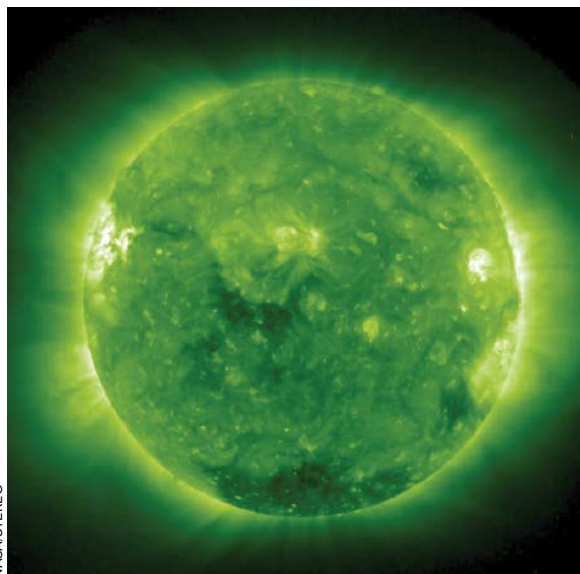
A Tricky Search

Back in the 1960s, scientists discovered the solar wind, a constant flow from the Sun of extremely high temperature plasma that's so hot the Sun's gravity can't hold it. Scientists knew that the solar wind was somehow connected to the Sun's corona—the bright layer of the Sun's atmosphere that can be seen during a solar eclipse—but until now, scientists weren't sure how one transitioned into the other.

This transition is important because "we're trying to understand, among other things, why the solar wind near the Earth is variable and gusty," DeFor-

est said. This gustiness can affect things like the trajectory of coronal mass ejections—huge magnetic explosions from the Sun that, when they hit Earth, can knock out telecommunications, short out satellite circuitry, and damage electrical transmission lines.

But studying the transition between the corona and the solar wind is difficult because



NASA/STEREO

An extreme ultraviolet light image of the Sun and its corona. Here the solar wind is very faint against a background of stars and interplanetary dust.

the solar wind is very faint against a background full of stars and interplanetary dust, DeForest said, making it hard to discern exactly what is happening as the solar wind gets created.

When scientists looked at previous images and "saw the [corona] fade, it was difficult to tell whether it was fading in an absolute sense or dropping below stellar background," DeForest continued.

"We're trying to understand, among other things, why the solar wind near the Earth is variable and gusty."

Unfixing the View

With computer-processed images from NASA's Solar Terrestrial Relations Observatory (STEREO), the scientists have finally observed this transition. The processing removed objects of "fixed brightness," DeForest said, like the dust cloud that fills the inner solar system and the background stars themselves. That left the moving and variable features of the solar wind itself.

Scientists already knew that masses of particles in the corona are controlled by magnetic fields, which gives the Sun its "rays"—similar to those in a child's drawing, DeForest said. The new images revealed the farthest reaches of the magnetically controlled corona, showing that once the material travels about a third of the distance from the Sun to the Earth, the magnetic fields weaken enough that solar wind particles can disperse from the field lines and fan out more like an earthly wind.

According to NASA, the solar wind transforms from rays to dispersed particles in a manner analogous to the way water from a water gun or hose breaks up into a spray: Closer to the water gun, the water is one mass, but as it moves farther from the gun, it disperses into many individual droplets.

Investigating the solar wind transition region will help scientists predict the arrival and strength of the Sun's outbursts—Earth-bound coronal mass ejections—after they pass through a full astronomical unit of the existing solar wind, DeForest said.

By **JoAnna Wendel**, Staff Writer