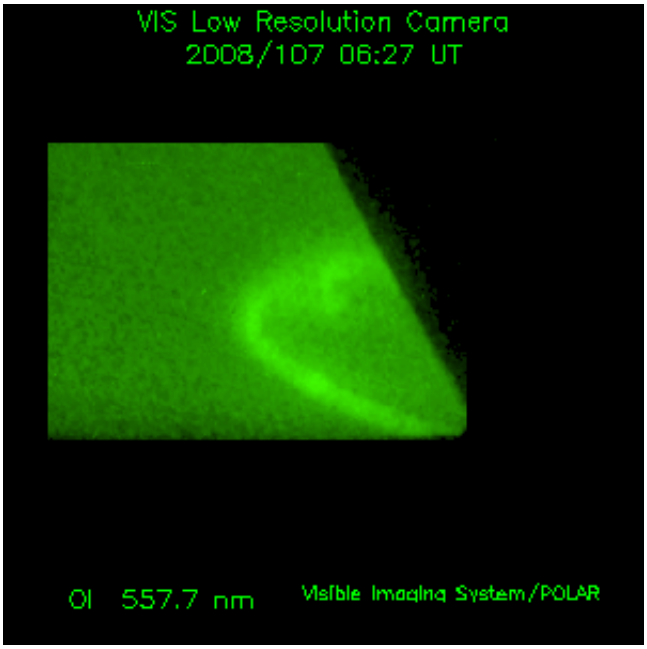
'Broken Heart' Image the Last for NASA's Long-Lived Polar Mission

April 29 2008



Polar Mission scientists dubbed the mission's final image, taken April 16, 2008, "The Broken Heart" because of its shape. Credit: NASA/Polar

As far as endings go, this one's a real heart breaker. NASA's Polar satellite concludes its successful mission at the end of April with a breathtaking visible-light image of the colorful dancing lights of the aurora. The Polar team has dubbed this final image "The Broken Heart."

When the Polar satellite launched February 24, 1996, the plan was for a two-year science mission to study the lights that form a ring around

Earth's north and south magnetic poles, known as the Northern and Southern Lights, or auroras. Polar has exceeded expectations by a decade.

"We've gone well beyond our original plan and into our dreams," says John Sigwarth of NASA's Goddard Space Flight Center in Greenbelt, Md., of Polar's amazing 12-year run.

Polar orbits from Earth's North Pole to its South Pole to study how solar wind particles and their energy enter Earth's magnetosphere, the area surrounding Earth dominated by its magnetic field. Polar also revealed how those particles and their energy end up in Earth's atmosphere, and how the radiation belts form and dissipate.

The satellite completes an orbit every 17½ hours, passing over one pole at a maximum altitude of about 32,000 miles and diving past Earth's equator to the opposite pole at a minimum distance of only about 3,200 miles. As Polar flies over the north and south poles, three of the satellite's 12 instruments capture images of auroras in ultraviolet, X-ray, and visible light. The other nine instruments take measurements of charged particles and Earth's electric and magnetic fields throughout its journey around Earth.

"Polar ran out of fuel during its final maneuver in February," says Sigwarth, project scientist for the Polar spacecraft. "But even after the fuel was exhausted, we continued to maneuver on the cold helium gas that was left in the tank," he explains.

Sigwarth likens the satellite's post-fuel feat to "using the force of your breath as you breathe out to propel yourself backwards" if you happen to be traveling through space like a satellite. But now Polar has run out of breath.

The plan is to turn off the satellite April 28 slightly ahead of a likely fatal encounter with the sun. From its current orientation, Polar will drift slowly, allowing the energy from our nearest star to quickly overwhelm the satellite. If Polar were left on, first to go would be its radiators, batteries, and transmitters. These would overheat and probably fail. The satellite's planned turn off at the end of April will allow controllers to send the final commands before Polar meets its fate.

During its lifetime, Polar has had many accomplishments. Observations of energetic neutral atoms have provided the first-ever global images of substorm injections that are the sequence of events that lead to energetic auroral displays. These neutral atom images clearly show the broad extent in space of these energetic atoms and their instantaneous nature in time.

Polar observations have also revealed that solar storms deposit so much energy into Earth's ionosphere that it expands to fill the magnetosphere all the way out to its boundaries, yielded the first-ever global X-ray images of auroras, and shown how dynamic pressure pulses, or "gusts" in the solar wind, influence the magnetosphere, ionosphere, and auroral ovals, rings around Earth's magnetic poles where auroras are seen.

Source: by Laura Layton, NASA's Goddard Space Flight Center