Jovian comet crash: Puzzles and insights

More than 2 months after the fragments of Comet Shoemaker-Levy 9 plowed into Jupiter, astronomers continue their struggle to understand exactly what the impacts have revealed about the inside of the gaseous planet. But if much of the Jovian interior remains a mystery, the debris carried aloft by the collisions have dredged up new insights about the planet's upper atmosphere.

Minutes after several of the larger fragments hit Jupiter, plumes of dark debris shot through the Jovian cloud tops. Over days to weeks, as the dusty material slowly settled, high-altitude winds set some of the debris adrift.

Just as a colored dye traces the swirling motion of water, the dark blotches in the upper atmosphere have enabled scientists to trace the motion of Jovian winds at new heights. "This is the first time we have measured the wind speed of Jupiter in the upper atmosphere," says John T. Clarke of the University of Michigan in Ann Arbor.

Using the Hubble Space Telescope to observe in the far-ultraviolet — wavelengths that detect the highest-altitude debris — Clarke's team measured how fast the wind blows in Jupiter's upper atmosphere and thermosphere, some 100 to 400 kilometers above the planet's visible clouds. They find that at these altitudes the Jovian wind moves at roughly 1 km per second.

Clarke and other Hubble researchers presented their findings about the Jovian collisions last week at a press briefing in Washington, D.C.

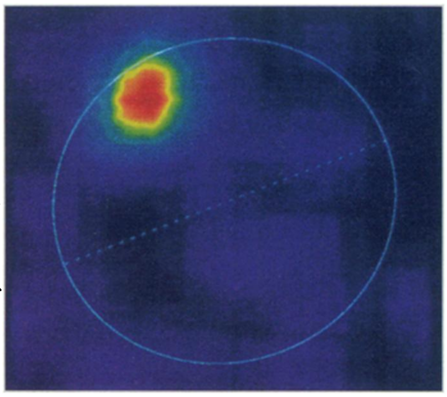
Clarke previously reported Hubble's detection of two short-lived auroral arcs in Jupiter's northern midlatitudes. The telescope observed the features in the ultraviolet about 45 minutes after the K impact, one of the larger fragments of Shoemaker-Levy 9, struck the planet's southern hemisphere.

Auroras form when charged particles spiral along Jupiter's magnetic field lines and crash into the atmosphere above the planet's polar regions. But these arcs lasted only an hour and resided at latitudes lower than any northern aurora ever observed on Jupiter, Clarke notes. Models indicate that the arcs appeared in a region magnetically linked to the K impact site in the south.

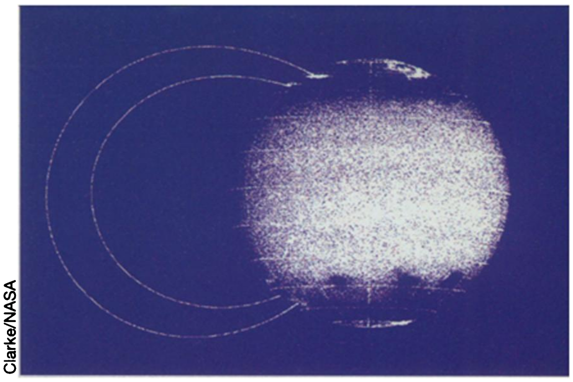
Data from the X-ray satellite ROSAT, which detected an X-ray burst in Jupiter's northern midlatitudes minutes after the K impact, may shed light on the auroras. The intensity of the burst suggests that highly energetic charged particles generated the two arcs.

Clarke speculates that the K impact disturbed ions and electrons normally confined to radiation belts that encircle Jupiter. (Similar bands, the Van Allen radiation belts, surround Earth.) The disturbance could have caused a substantial number of the particles to leak into the planet's northern hemisphere, creating the X-ray burst and auroral arcs, he says.

Clarke suggests that the K impact may have created an electromagnetic wave that propagated up through Jupiter's magnetic field, altering the path of charged particles in the belt. ROSAT scientist J. H. Waite Jr. of the Southwest Research Institute in San Antonio, Texas, notes that the X-ray burst appeared rapidly — even before a plume from the K impact became visible from Earth. This suggests, he says, that the fastest particles in the belt — electrons — generated the arcs. — *R. Cowen*



Waite, G. Randy Gladstone, et al./Southwest Res. Inst.



Clarke/NASA

Left: ROSAT image of Jupiter shows an X-ray burst just minutes after fragment K of Comet Shoemaker-Levy 9 struck the planet. Above: Hubble image of Jupiter, taken in the far-ultraviolet 45 minutes after the K impact, shows two auroral arcs at northern latitudes never before observed to have an auroral glow.

Scientists hail platelet factor's promise

Though seemingly little more than bits of cytoplasm afloat in the blood, platelets play a key role in clotting. AIDS patients and those undergoing chemotherapy or bone-marrow transplants lose platelet-producing cells and risk bleeding to death.

Typically, these patients receive multiple transfusions of platelets, an expensive treatment entailing several risks, including the chance that the recipient's immune system may destroy the newcomers.

For years, researchers tried to find chemicals that regulate the body's platelet-producing cells, called megakaryocytes. They thought those chemicals caused megakaryocytes to multiply, mature, and bud off platelets.

The key breakthrough came in 1990, when a team from INSERM in Paris found a leukemia virus gene that matches a mouse gene for a molecular docking site, the mpl receptor. That receptor resembles other mammalian receptors for chemicals that regulate blood-cell growth. "When they isolated the [mpl] receptor, they had no idea what it was doing," notes Barbara P. Schick of Thomas Jefferson University in Philadelphia. The French group soon learned that without functioning mpl receptors, platelet counts plummeted.

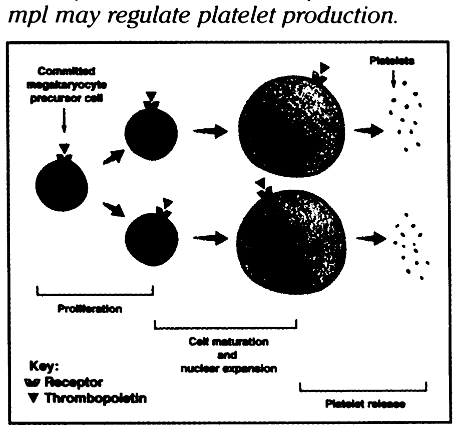
Several research teams then used mpl to find thrombopoietin, which indeed proved to be not one, but apparently all the long-sought platelet regulators. Four reports in the June 16 NATURE and another in the July 1 CELL detail the mouse and human versions of this regulator and its gene.

Meanwhile, another team was developing a strain of mice that lack mpl. The platelet count in these animals is 85 percent lower than normal, Mark W. Moore of Genentech, a biotechnology company in South San Francisco, and his colleagues reported in the Sept. 2 SCIENCE. The results emphasize mpl's — and thrombopoietin's — importance in platelet production, says Moore.

Also, in these mice "there's no alteration of other cell types," he adds. "That's a good indication, clinically." Most chemicals affecting the production of one component of blood also affect others, so using them as treatments can have unwanted side effects.

"This [finding] potentially has a great deal of importance," says Schick, who discussed the promise of thrombopoietin in the Sept. 29 NEW ENGLAND JOURNAL OF MEDICINE. — *E. Pennisi*

Three places where thrombopoietin and mpl may regulate platelet production.



Schick/New Eng. J. Med.