SCIENCE NEWS of the week

Saturn's 'Ring Rain'

It is a provocative concept: that the rings of Saturn, besides being the most spectacular in the solar system, somehow may also be yielding a better look at the planet itself. Yet several lines of evidence seem to be supporting just such a possibility.

Though Saturn's atmosphere carries a pattern of parallel bands much like the dramatic stripes of Jupiter, everything about the Saturnian version looks more subtle, since earth-based telescopes and passing spacecraft alike must view it through a layer of high-altitude haze. In some places, however, the banding is more pronounced, as though some planetary-scale anti-smog project were somehow stripping away the haze.

In a sense, hypothesizes John E. P. Connerney of NASA's Goddard Space Flight Center in Greenbelt, Md., that may be just what is happening. And running the cleanup, he says, are Saturn's rings.

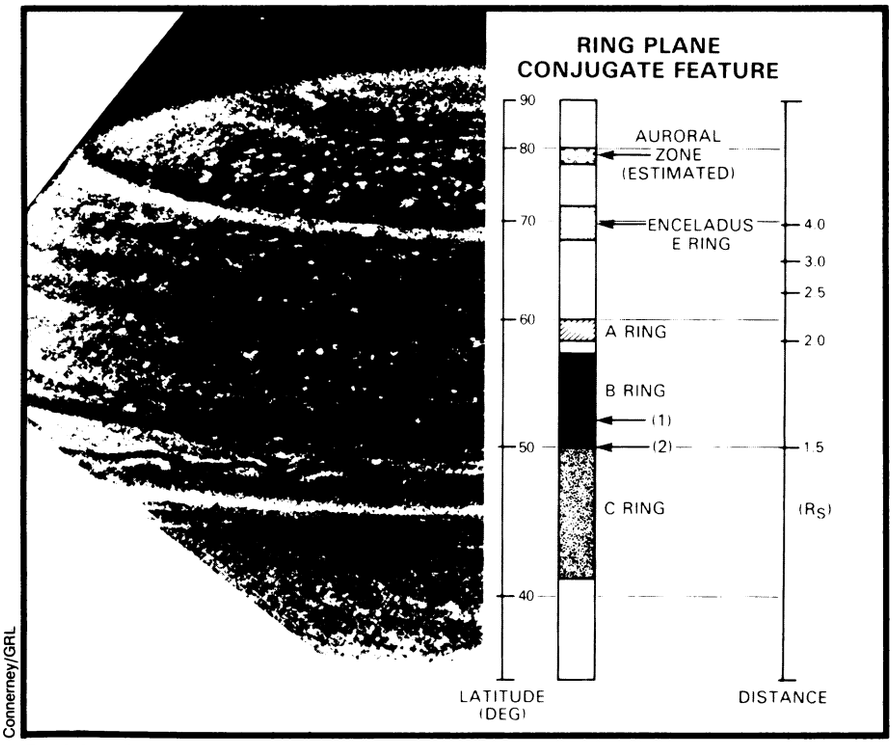
The key to Connerney's model is the planet's magnetic field, which extends far enough into space that its lines of force encompass the rings. The particles that make up the rings, many researchers believe, include a substantial amount of frozen water. When tiny meteoroids or collisions between ring particles chip off tiny bits of the ice, often measuring only millionths of an inch in size, they can be left with an electric charge. If the ice bits are low enough in mass, their charges can cause them to be trapped on the magnetic field lines, which will carry them down to Saturn's atmosphere.

Also important to Connerney's idea is the fact that the axis of the magnetic field is almost exactly aligned with the planet's axis of rotation. This means that each field line emerges from the planet's northern hemisphere at a given latitude, curves around and reenters at a given latitude in the south. The result is that all the field lines that go through a given radial position in the rings on their way from northern to southern hemisphere also intersect Saturn's atmosphere at the same northern- and southern-latitude bands. And those bands, therefore, are where the ice bits go.

"Water diffusing downward in the atmosphere," Connerney writes in the August GEOPHYSICAL RESEARCH LETTERS, "may be expected to condense out in the stratosphere, using haze particles as condensation nuclei." The resulting haze particle "clumps," he suggests, would then be massive enough to fall to lower altitudes, effectively removing the haze from overhead.

Two regions linked to Saturn's B-ring, where the ring shows marked changes in optical depth, are the likeliest candidates (see "1" and "2" on cover), Connerney says, but there are others. The band labeled "E" on the cover is found where field lines link the planet with the E-ring and Saturn's moon Enceladus, while the dart points to a band linked with the inner part of the A-ring. In addition, Voyager data show these bands to be warmer, perhaps because of the absence of haze, and depleted in ionospheric electrons, possibly associated with the incoming charged ice particles.

"Ring rain," Connerney calls it — making over the face of Saturn. *— J. Eberhart*



Connerney/GRL

Dark bands in the upper atmosphere over the planet's northern hemisphere (contrast-enhanced Voyager 2 photo at left) are shown together with their latitudes (center) and the portions of the rings that may be releasing tiny particles of frozen water onto the same Saturnian magnetic field lines that intersect the atmosphere at those latitudes.

At Ruiz: Small but ominous eruptions

The Colombian volcano Nevado del Ruiz erupted two Sundays in a row in late July. On the 20th, it belched a stream of ash and dust for about two minutes; on the 27th, it erupted for a full 90 minutes, but not as energetically as it had the week before. Neither episode was nearly as violent as the eruption on Nov. 13, 1985, which melted part of the mountain glacier, causing mudflows that killed more than 22,000 people (SN:11/23/85,p.326). But scientists are viewing the July events as further evidence that another catastrophic eruption may be on the way.

"The more eruptions you have, the more you know that the conduit is open," says Norman G. Banks of the Cascades Volcano Observatory in Vancouver, Wash., who is project chief of the U.S. Geological Survey team studying the Colombian volcano.

Ruiz has been rumbling continuously for three months now. At this point, the mountain tremors are so strong and steady that they are overloading seismicity measuring instruments on the scene, according to Stanley N. Williams, a volcanologist at Louisiana State University in Baton Rouge, who has spent much of this year studying the volcano.

Another ominous sign is the great quantity of gas venting from the crater. Ruiz is releasing more than 5,000 tons of sulfur dioxide each day, Williams says. There is some hope that this activity is serving to "de-gas" the magma inside the mountain and make the volcano less volatile, but it may instead indicate only that magma is moving underground.

"Since May 5, the volcano has had almost uninterrupted tremors, inflation and gas release," Williams says. "This is considered activity premonitory to an eruption, and it just keeps going and going and going." *— M. Murray*