Astronomy

Ron Cowen reports from Washington, D.C., at the World Space Congress

Tracing the source of Triton's geysers

When the Voyager 2 spacecraft flew by Neptune's moon Triton in 1989, it detected a dramatic phenomenon: geysers of carbon-rich material that shoot 8 kilometers above the moon's surface (SN: 3/24/90, p.191). Now Tobias Owen of the University of Hawaii in Honolulu and his colleagues think they have identified the nitrogen power source that likely drives these geysers.

The researchers speculate that heat released when frozen molecular nitrogen shifts from one crystalline state to another may fuel the geysers. Owen notes that both forms of nitrogen ice could coexist at Triton's surface temperature, a frigid 37 kelvins. And in comparing a laboratory model of Triton's surface with his team's recent observations of the satellite's infrared spectra, Owen found evidence that both types of nitrogen ice are indeed present. Owen and his group made their observations in May, using the United Kingdom Infrared Telescope atop Mauna Kea in Hawaii.

Scientists believe that icy bodies such as Triton, Pluto, and other residents of the outer solar system were formed by an agglomeration of icy planetesimals, or comets. Carrying the cometary link a step further, Owen speculates that in addition to accounting for Triton's geysers, a sudden venting of heat due to a shift in the structure of nitrogen ice may also explain outbursts on comets, such as Halley's explosive brightening more than two years ago (SN: 10/12/91, p.239). Pockets of frozen molecular nitrogen carried by comets may trigger the outbursts, he says.

Raindrops on Titan

Sporting an atmosphere denser than that of any other moon known in the solar system, Titan, Saturn's largest satellite, has long intrigued astronomers. Some researchers believe that Titan's chemical composition — literally frozen in place by its chilly temperature and preserved by its oxygen-poor environment — provides a snapshot of chemical evolution as it existed on Earth soon after our planet first formed.

Little wonder, then, that planetary scientists look forward to 1997, when NASA and the European Space Agency plan to launch the Cassini/Huygens mission to Saturn and its moons. The mission's mother ship will orbit Saturn, while the Huygens probe will parachute through Titan's thick cloud layer, giving astronomers their first glimpse at the surface of this icy satellite. In designing the probe, some scientists have worried that methane droplets in Titan's lower atmosphere could freeze on the instrument, much the way unwanted ice crystals can form on the body of an airplane in winter. Methane "rain" that formed ice deposits on the Titan probe for an extended period could obscure the probe's camera lens and damage the instrument.

Ralph D. Lorenz, a graduate student at the University of Kent at Canterbury, England, and a former engineer on the probe project, now reports that the freezing rain should not cause problems. Previous calculations by other researchers, based on Voyager data, indicate that the surface of Titan has a temperature of about 99 kelvins. Lorenz reports that this chilly temperature is nonetheless warm enough to melt the frozen methane rapidly once the probe descends below 14 kilometers in the atmosphere.

Lorenz also calculates that liquid methane in the clouds could form raindrops as big as hazelnuts — some 9 millimeters across. Such drops are about 50 percent bigger than the largest water raindrops on Earth. But any rain on Titan would fall far more softly because of the satellite's denser atmosphere and lower gravity. For example, he notes, a raindrop on Earth might take a minute to fall 1 kilometer, but a methane drop on Titan would require nearly an hour.

Earth Science

Following the track of 80,000 wet Nikes

When Seattle resident Curtis C. Ebbesmeyer learned that a severe storm had dumped a shipment of Nike athletic shoes into the Pacific Ocean, he immediately began searching for the shoes washed up on shore. His purpose was not to pick up a free pair of hightops. Ebbesmeyer, an oceanographer at Evans-Hamilton, Inc., wanted to use the wayward Nikes to study how ocean currents wind through the northeast Pacific.

The 80,000 shoes went overboard in May 1990, about 800 kilometers southeast of the Alaskan Peninsula. Six months to a year later, they began appearing on beaches of British Columbia, Washington, and Oregon. After learning of the spill, Ebbesmeyer began calling beachcombers to find out precisely when the shoes arrived at various spots.

All told, Ebbesmeyer tracked down reports of about 1,300 shoes washing ashore. He contacted W. James Ingraham Jr. of the National Oceanic and Atmospheric Administration in Seattle, who modeled the path of the drifting shoes. The two researchers described their work in the Aug. 25 EOS, published by the American Geophysical Union.

Strange as it seems, the shoe spill is not all that different from planned drift experiments. During past projects in the area, researchers released tens of thousands of drift bottles over a period of several years and recovered a few thousand.

The shoe data can help in testing oceanographic models used to study currents, Ebbesmeyer says. When he and Ingraham simulated the spill with a model of the subarctic Pacific, the model predicted the shoes would drift due east and arrive first at Vancouver Island. That calculation wasn't far off. The shoes actually arrived first in nearby Washington, and then at Vancouver Island a few months later. Over the winter, the shoes flowed to the northwest with the prevailing currents and then came back southeast the following spring.

The researchers report that floating Nikes have recently turned up at the northern end of the big island of Hawaii. If they survive for a few more years, some of the shoes should eventually reach Asia and Japan. Sneakers that landed along the Pacific Northwest were wearable even after a year of floating in the ocean. Ebbesmeyer can attest to that; he just bought a pair of size 12 basketball shoes from a beachcomber.

Detecting accelerated sea level rise

The global sea level is currently rising by 1 to 2 millimeters per year, but that rate should soon increase dramatically if greenhouse gases warm the globe as much as many scientists forecast. Some oceanographers have proposed watching for this acceleration as an indication that global greenhouse warming has indeed begun. But a new study suggests it may be difficult to detect quickly an acceleration in sea level rise.

Researchers who study sea level use records from coastal tide gauges to tell whether the oceans have been rising relative to the land. So far, most studies have not detected any acceleration in the rate of sea level rise, but some have suggested that tide gauge records in the next three decades should be able to detect an acceleration, if one occurs.

Oceanographer Bruce C. Douglas, of the National Oceanic and Atmospheric Administration in Washington, D.C., disagrees with that optimistic proposal. Because sea level records at individual sites can fluctuate significantly over any single decade, tide gauge records less than 50 years old can yield drastically different findings, Douglas reports in the Aug. 15 Journal of Geophysical Research.

He suggests researchers can cut the time it takes to spot an acceleration by learning what causes the long-term fluctuations in sea level. He expects that research programs currently under way will aid that effort. Satellite measurements of sea level can also speed detection of an accelerated rise, he adds.