Soviets Report Lightning on Venus

On Dec. 21, only days after five U.S. probes had plumbed the atmosphere of Venus, the Soviet Venera 12 landing craft settled with a bump onto the haze-wrapped planet's sunlit side. Out of sight of earth and depending on a passing mothership for communications relay, it provided only 110 minutes of data after landing in the hellish environment, but the brief report was enough to set a new record for survival on Venus, eclipsing by three minutes the 1972 mark of Venera 8. Then, on Dec. 25, came the landing of Venera 11, which touched down about 800 kilometers from its twin and added another 95 minutes of data to the store.

Venus, of course, made its presence known as only it can. The first lander reported a surface pressure of 88 atmospheres and a temperature, "during the last minutes before touchdown," of 460°C (860°F), according to a Tass report. The second craft indicated an identical pressure, although the post-landing temperature, Tass said, was only 446°C (835°F). In addition to these and other measurements, however, the landers made another contribution, described by Soviet Intercosmos Council chairman Boris Petrov as "radically new data," and by several U.S. scientists contacted by SCIENCE NEWS as "exciting," "wonderful" and "fantastic": lightning — and, according to Soviet press accounts, a lot of it.

The instruments aboard the descending landers were reportedly activated about 62 km above the surface, a few kilometers lower than those aboard the U.S. Pioneer Venus probes. The action, however, was considerably farther down, beginning, according to the Novosti Press Agency report, when Venera 12 was about 10 km above the surface. "The descent," reported Tass, "took place in 'unclement weather.' The *groza* [thunderstorm] instrument recorded fairly frequent electrical discharges in the atmosphere during the descent. One weighty discharge made the surroundings resound for 15 minutes after the device had landed."

The existence of lightning on Venus is not entirely unexpected, according to several U.S. scientists. The source, however, is likely to raise considerable question. Data from past Veneras have indicated, for example, that the low-altitude winds are very slow, presumably inhibiting friction and similar effects. Dust particles rubbing together could build up charges, but the Pioneer Venus probes found the bottom 35 to 45 km of atmosphere to be almost totally free of particles. The sulfuric acid in the upper atmosphere would be a good candidate as an electrolyte — it is, after all, found in car batteries — but it too seems to be primarily confined to high altitudes.

"These electrical-storm discharges," said Petrov in an interview with a Soviet correspondent, "have been recorded both at very high frequencies and at relatively low ones. This indicates that the atmosphere of Venus is a dynamic and very complex formation, and which is alive and in which processes take place in a far more active way than [in] that of the earth."

Yet it was not precisely clear from early accounts just what the Veneras had found, particularly the reference to making "the surroundings resound for 15 minutes." The landers were said to carry both electric-field detectors and acoustic devices (suggesting something like microphones to listen for thunder), but what kind of electrical or acoustic effect would last that long on Venus? On earth, says James Warwick of Science Applications, Inc., the electromagnetic "whistlers" produced by lightning bolts last perhaps tens of seconds at the longest, as they "mirror" back and forth on the planet's strong magnetic field lines. But the magnetic field of Venus is extremely weak. Thunder reverberating for 15 minutes is a stunning concept, yet one might expect the dense Venusian atmosphere to dissipate acoustic energy more readily than does earth's. Whatever the answer, says Warwick, the existence of lightning on Venus would indicate that "the range of conditions under which lightning is expected to occur in nature is much greater than we have thought."

Scientists have also speculated on the possibility of lightning on Jupiter, and the U.S. Galileo orbiter-and-probe, to be launched in a few years, is planned to carry a lightning detector down into the Jovian atmosphere. As for Venus, further data will probably depend on Soviet spacecraft. The U.S. Pioneer Venus orbiter still circles the planet, but according to Frederic Scarf of TRW, Inc., symptoms of lightning are probably unable to get above the substantial ionosphere. In the works, however, is a Soviet-French mission in which balloons are to be deployed *in* the Venusian atmosphere for a few days of constant data-gathering.

Also significant could be the effect of lightning on the planet's bizarre atmospheric chemistry. "If you think of it as a quiescent atmosphere," says one U.S. researcher, "you could get very wrong results."

In addition to the lightning measurements, the landers measured the atmosphere's composition and structure, in many ways similarly to the studies by the Pioneer Venus probes. One significant finding by the Soviet craft supported a Pioneer Venus measurement that has been controversial because it conflicts with data from another sensor (SN: 12/16/78, p. 420): "The ratio of argon 36 to argon 40 on Venus," says a Tass report, "was 200 to 300 times higher than on earth," which could bear on differences in the primordial mixture from which the planets formed.

Were there any photos from the latest landers? They carried cameras, and U.S. scientists this week were still trying to find out. But one Tass report, sent several hours after the second lander had ceased functioning, said: "Three years ago, owing to the two first, *and so far only* [emphasis added] telepanoramas received from Soviet automatic probes, the planet for the first time revealed details of its surface." □

A rapid test for Legionnaires' disease

Because Legionnaires' disease, a newly discovered and often fatal bacterial pneumonia, keeps on popping up, and because the antibiotic erythromycin can dramatically help Legionnaires' disease victims, physicians are eager to procure a test that can rapidly, safely, specifically and sensitively diagnose the disease. A technique that meets three of these requirements, and possibly the fourth as well with some refinement, is reported in the January ANNALS OF INTERNAL MEDICINE by Claire V. Broome of the Center for Disease Control in Atlanta and her colleagues.

Ever since Legionnaires' disease first made headlines in 1976, medical scientists have been exploring different ways of diagnosing it, but none of them has proved satisfactory. The bacterium that causes the disease, for instance, is virtually impossible to culture. What's more, while this bacterium is a Gram-stain organism, it stains poorly or not at all with a Gram stain in tissues or tissue exudates. And as for immunofluorescent staining of blood samples suspected of containing the bacterium, antibodies directed against it and labeled with fluorescent dye only reveal it three weeks after onset of the disease. By then it may be too late to save a patients's life with erythromycin.

Recently, though, immunofluorescent staining was shown to reveal rapidly and accurately the Legionnaires' disease bacterium in lung tissue taken from victims of the disease. Collecting sputum samples from patients, however, is less hazardous than collecting lung tissue samples from them. So Broome and her colleagues hypothesized that immunofluorescent staining of sputum samples also reveals the Legionnaires' disease bacterium quickly and accurately. Such staining might thus prove to be the best diagnostic test yet for

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