Venera 15 and 16 at work: A factor in U.S. Venus plans?

The American Astronomical Society's Division for Planetary Sciences (DPS) — the principal U.S. professional society engaged in studying the worlds of the solar system — held its annual meeting last week, sandwiched between two other events that could bear on the future of its endeavors. The week before, two unmanned Soviet spacecraft had gone into orbit around Venus to make radar maps of its surface (SN: 10/22/83, p. 263), a task similar to that planned for the first new U.S. planetary mission in years, just getting started in the budget. And the day after the DPS gathering ended in Ithaca, N.Y., some of the same researchers and others assembled in Washington, D.C., for what was expected to be the last full meeting of the Solar System Exploration Committee (SSEC). The group was put together in desperation by the National Aeronautics and Space Administration to devise an alternative to the grim possibility that the whole U.S. planetary program might be going down the tubes.

In Ithaca, the success of the Soviet probes and of the SSEC were both on the DPS members' minds.

There had been hints for a year or more that the Soviet spacecraft — Veneras 15 and 16 — would be carrying radar, and some Soviet scientists had even said so to American contacts. There was no official confirmation, however, until last week, when it was announced that radar data from both probes was being received on earth. The first results from Venera 15 arrived on Oct. 16, six days after it went into orbit. "On the picture," reported the Soviet news agency Tass, "one discerns impact craters, hills, major fractures, benches, mountain ridges and details of the relief with sizes varying from one to two kilometers." A similar resolution was cited for Venera 16, which had arrived on Oct. 14, beginning its radar transmissions on Oct. 20.

This is considerably sharper than images provided in recent years by the U.S. Pioneer Venus orbiter, the first spacecraft to have mapped Venus by radar, whose best radar resolution was about 20 km. More to the point, however, is that the Venera resolution is about four times coarser than that planned for NASA's planned Venus Radar Mapper (VRM), scheduled for launching in the spring of 1988. VRM, according to Gordon Pettengill of the Massachusetts Institute of Technology, in Cambridge, will map more than 90 percent of the planet with radar resolution as sharp as 250 to 500 meters.

But official Soviet accounts, as well as scientist-to-scientist conversations, suggest that VRM would not be merely a Venera copy with some advantage in the sharpness of its images. Though only limited information was available at press time, the two Veneras appear to be concentrating on the planet's north polar region, including the pole itself, while VRM will be bringing its still greater resolution to bear on the vast middle latitudes. There lie such surface features as Aphrodite Terra, a huge, continent-like uplift zone wrapping halfway around Venus, and Beta Regio, an area replete with signs of possible tectonic activity and believed by some researchers to be one of the youngest parts of the surface — and the most likely to be volcanically active still.

Farther north is another huge "continent," Ishtar Terra, topped by the towering Maxwell Montes, the highest elevation on the planet. Though Ishtar is more than two-thirds of the way from the equator to the North Pole, its roughness and high reflectively have made it a readily accessible target even for earth-based radar studies. Donald Campbell of the Arecibo radio observatory in Puerto Rico, in fact, showed the DPS members recent Arecibo images that reveal several new "craters" on Ishtar, with resolution as sharp as 1.5 km, in the same range as that claimed for the Veneras. To the south in the Beta region, the Arecibo images show even more details of that tectonically worked-over terrain, with linear features suggesting possible evidence of surface-modifying processes on a vast scale.

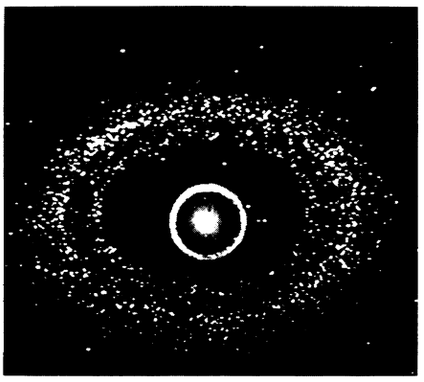
Some U.S. researchers have expressed surprise at the possibility that *both* Veneras would be positioned to concentrate on the North Pole, greatly reducing the sharpness of radar images from near-equatorial latitudes. The next Soviet Venus mission is expected to send two automated landing craft down to the vicinity of Aphrodite, the huge central "continent," and improved radar maps of the proposed landing sites would presumably be welcome. Earth-based radar can help, however, and U.S. data from Arecibo as well as the Goldstone facility in California have been made available to the Soviets for past landings.

There could be another reason, however, for the Veneras' all-northern mission. According to one Soviet broadcast, "When the first station finishes working, the other station will begin working." This could mean that they are designed to operate in sequence, possibly a sign that the probes are powered by batteries with finite lifetimes. It takes 243 days — about eight months — for Venus to rotate completely beneath a polar-orbiting spacecraft, noted Pettengill this week, so perhaps Venera 15 is intended to handle the first four months, after which Venera 16 would take over. U.S. researchers expect more answers to be forthcoming from the Soviets, now that both craft are working. But Soviet press accounts have already indicated that "thermal mapping" is also in progress (presumably radiometry, with implications for the surface composition).

Meanwhile, the SSEC met in Washington, drawing up plans for its final report. Its initial report, recommending a "core program" of reduced-cost planetary missions through the end of the century (SN: 4/16/83, p. 250), is believed to have been getting a favorable reception from NASA, the administration and Congress alike. The future of part 2, however — a group of more elaborate, "augmented" missions such as landing craft (should the economy permit) — is the planetologists' next uncertainty.

— J. Eberhart

Sun's dust rings confirmed



Wide World Photos

This computer-enhanced image of infrared (IR)-radiating dust encircling the sun is the first photographic proof of a phenomenon that was originally hypothesized in 1927. Last week, Shizo Isobe of Tokyo University and Toshinori Maihara of Kyoto University presented their findings at a meeting of the Japanese Astronomical Society in Mito City, Japan. The IR spectra were detected in June during a solar eclipse in Indonesia by a video-equipped high altitude balloon.

Robert MacQueen at the University of Colorado's High Altitude Observatory in Boulder carried out similar experiments from Bolivia and detected part of the ring in 1967. He says, "This picture is intriguing because other observations of the ring have been limited to small regions. But this is the first to show their distribution around the sun."

The dust presumably originates in the outer solar system and, attracted by the sun's gravity, takes 10 million years to form a sphere near the surface where it glows and emits IR waves before vaporizing. The photo is a two-dimensional image constructed from composites of data. "We should not use the word photo in a literal sense here. They built this photo but how they did it is an important question," MacQueen said. "I would also ask if the elliptical appearance of the sphere is real. I assume from the photo the dust forms an eggshell around the sun. This would tell us about the spiraling path the particles travel toward the sun."