because only there is PVO flying low enough to be in the dense portion of the ionosphere where the 100-hertz (Hz) bursts are generated. Part of that latitude range also happens to include two admittedly volcanic-looking regions called Beta and Aphrodite, but it also encompasses an even larger amount of less-intriguing-looking territory. Taylor and Cloutier note, in fact, that when the terrain is divided into the 260 five-degree-square areas that have each produced at least three bursts, more than 85 percent of them lie *outside* the highlands. Furthermore, in a paper submitted to SCIENCE – and called "Venus: Dead or alive?" – the authors note that the abrupt onsets and cessations of the troughs match those of the 100 Hz noise.

There is more to the ion trough case, but there is also more to the case for volcanism. Perhaps the next-best-known item is the finding from PVO's ultraviolet mass spectrometer that the amount of sulfur dioxide (SO_2) in the top of the Venusian atmosphere has decreased markedly since the spacecraft got there in December 1978. Larry W. Esposito of the University of Colorado in Boulder has suggested that this could be evidence that a major volcanic eruption took place on Venus shortly before the spacecraft's arrival, spewing forth a vast concentration of SO_2 that has been lessening ever since (SN: 10/1/83, p. 213).

Taylor and Cloutier maintain that Esposito's interpretation of the "claimed SO_2 behavior" was "clearly stimulated by the claimed 'lightning' signal clustering," part of a "bandwagon effect" that led to over-interpretation of one piece after another of uncertain "evidence." Esposito himself, however, says he was led to his interpretation by observations with a similar instrument of Mexico's El Chichón volcano. "I was always skeptical about the lightning until I saw this in our data," he says. And would volcanism have come to mind if the subject of Venusian lightning had never been raised? Says Esposito, "Absolutely."

Venusian volcanoes are a loaded question – with more answering needed.

– J. Eberhart

Has DOD exaggerated SDI's promise?

The Strategic Defense Initiative (SDI) – also known as the "Star Wars" program – costs as much annually as the total research and development budget for all the U.S. armed services combined and stands to become the largest military research program ever undertaken, according to a newly released report. Interviews with people leading SDI research, however, cast serious doubts on the validity of recent Department of Defense (DOD) claims about the program's progress, feasibility and goals, according to the report. This staff study was commissioned by senators William Proxmire (D-Wis.), J. Bennett Johnston (D-La.) and Lawton Chiles (D-Fla.). Proxmire is a member of the defense appropriations subcommittee; Johnston and Chiles are members of the budget committee.

The senators publicly released a 64-page unclassified version of the study on March 31. Based on interviews with more than 40 scientists, engineers, defense experts and military officials "deeply involved in the program," most of them unnamed, the report concludes that technological obstacles to an effective defense against incoming ballistic missiles "are much more complex than originally envisioned." Contrary to claims by administration and SDI officials, the study finds, "the program's scientists and military planners ... have not concluded that SDI is militarily and economically feasible. They presently have little idea whether it is."

Moreover, the study says, "SDI research has not progressed nearly as rapidly as has been portrayed by senior administration and SDI officials." Such exaggeration, according to key SDI scientists interviewed for the report, undermines the credibility of program researchers and is generating resentment among program scientists. One researcher told the Senate study team that the situation "is driving good people out of the program."

Finally, the study says, there have been a number of major shifts in program priorities in the past year or two – especially in the beam-weapons program (SN: 7/21/84, p. 42). These changes include: a dramatic deemphasis of chemical lasers; diminished interest in neutral particle beams and X-ray lasers, except for use in discriminating between warheads and decoys in midcourse trajectories; and promotion of the induction linac free-electron laser as the top-priority candidate for shooting down missiles in their boost phase.

Such changes indicate that SDI research "is still at a very early stage," according to Douglas Waller, James Bruce and Douglas Cook, the study's authors. And that suggests that DOD's early-1990s timetable for selecting what research technologies to develop for an operational ballistic-missile defense system not only is arbitrary but also may lead to potentially bad and costly choices, the Senate analysts conclude.

Though DOD expects to issue a written response to the critical Senate analysis, that response was not available at press time.

– J. Raloff

Waiting for the Poincaré proof

To mathematicians, especially topologists, proving the Poincaré conjecture would be something like being the first to climb Mt. Everest. For more than 80 years, numerous mathematicians have stumbled over this infamous problem, always slipping somewhere along the way. Sometimes, only a tiny gap – a subtle error buried within pages of mathematics – has halted the ascent.

The latest claim, reported in the March 20 NATURE, comes from the University of Warwick in Coventry, England. There, Colin Rourke and Portuguese graduate student Eduardo Rêgo recently announced success in proving the Poincaré conjecture. However, no one else has yet verified the proffered proof.

"There's some skepticism in the community because there have been many false proofs," says mathematician Joan S. Birman of Columbia University in New York City. "So people are weighing it carefully before deciding whether this is a proof or not. Nevertheless, it seems to have passed some tests."

Simply put, the Poincaré conjecture proposes that no matter how distorted or twisted its shape may be, any object that mathematically behaves like a three-dimensional sphere *is* a three-dimensional sphere. Although this sounds obvious, the difficulty lies in the enumeration of all the different ways in which three-dimensional space can be stretched and molded to form geometric objects.

Over the years, topologists have invented a variety of techniques, including "surgery" and "handle theory," to classify and characterize all these objects and to show which shapes are related to one another, not just in three but also in higher dimensions (SN: 7/17/82, p. 42). Rourke and Rêgo's proof is based on an ingenious combination of handle theory and surgery.

One mathematician who has examined the proof closely is Wolfgang Haken of the University of Illinois at Urbana-Champaign. "It looks similar to things I tried 15 or so years ago," he says, "but there is one new idea." Using this idea, Haken tried to recreate the proof but failed. "I could not find a mistake," says Haken, "but I could not confirm it [the proof] either."

Now Haken is waiting to see a more complete version of Rêgo and Rourke's proof. "Maybe there is a second new idea, which I did not realize is there," says Haken, "and it will work."

"It's hard to catch a subtle mistake," says Robion Kirby of the University of California at Berkeley, who has also started to study the proof. "I don't know how soon there'll be a definitive answer on this."

– I. Peterson