

PLANETARY SCIENCE

Fresh Signs of Volcanic Stirrings Are Radiating From Venus

Scientists long viewed Venus as a possible twin of Earth, but in recent decades the differences have begun outweighing the similarities. Venus is so hot that lead would melt on its surface, and geologists eventually pronounced Venus to be free of plate tectonics. Is there nothing these siblings have in common?

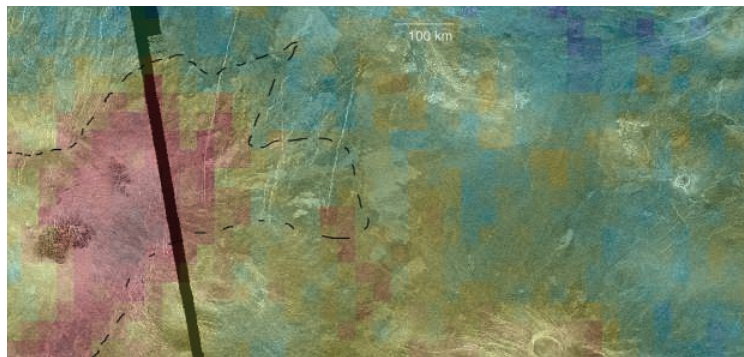
In a paper published online this week in *Science* (www.sciencemag.org/cgi/content/abstract/science.1186785), researchers report new evidence that Venus is still reshaping its surface—as well as cooling its interior—through volcanic outpourings like Hawaii's or Iceland's. One contingent of planetary scientists has long held that most of the venusian surface renewed itself half a billion years ago in a single volcanic paroxysm and has been nearly dormant since, but the *Science* authors argue that Venus also resembles Earth in steadily resurfacing itself.

Planetary scientists are welcoming additional evidence of a geologically youthful Venus. “These lava flows have to be young,” says planetary scientist M. Darby Dyar of Mount Holyoke College in South Hadley, Massachusetts. “The most likely explanation is volcanism going on right now.”

Present-day volcanism had seemed plausible. Radar

imaging by the Magellan probe in the early 1990s revealed nine “hot spots,” low rises each a couple of thousand kilometers across. Lava flows had obviously streamed from the hot spot centers. Magellan gravity measurements also indicated that plumes of hot rock are slowly rising beneath venusian hot spots, much as plumes rise beneath Hawaii and Iceland to feed their eruptions.

But researchers couldn't put an age on the flows. So planetary scientist Suzanne Smrekar of NASA's Jet Propulsion Laboratory in Pasadena, California, and colleagues looked at observations of three hot spots by the Visible and Infrared Thermal Imaging Spectrometer (VIRTIS) on the European Space Agency's Venus Express, which is still in orbit. VIRTIS found that the hot spots radiate distinctly more heat than the rest of the



Lookin' hot, and young. Extensive venusian lava flows (within dashed line) radiate heat more efficiently (pinks), implying they are less weathered and therefore young.

planet does. The group infers that the hot spot flows are probably still relatively fresh and unweathered by the 460°C temperature and crushing carbon dioxide atmosphere.

No one has weathered enough Venus-like rock under venusian conditions to say just how recently the hot-spot lavas flowed. But when Smrekar and her colleagues assumed wide ranges of plausible lava volumes and lava production rates in their calculations, they got flow ages ranging from a few million years down to 2500 years. For a planet that's been around 4.6 billion years, that's young. The group goes further by suggesting that such widespread expanses of young-looking lava must have been produced by a steady, long-term, relatively slow volcanic outpouring rather than a single long-ago catastrophe.

“They certainly have identified some very young flows,” says planetary scientist Mark Bullock of the Southwest Research Institute in Boulder, Colorado. “That's exciting.” It means that, like Earth, Venus is actively cooling its interior and reshaping its exterior through volcanism. But is such plume-fed, hot-spot volcanism the only way Venus has operated? “I don't think we know,” says planetary scientist Sean Solomon of the Carnegie Institution for Science in Washington, D.C. He and others see too many assumptions, uncertainties, and extrapolations in the case against venusian catastrophism. Someone, they say, needs to start cooking up a lot more venusian rock.

—RICHARD A. KERR

NATURAL DISASTERS

Scientists Count the Costs of Chile's Quake

Chilean scientists have estimated that the magnitude-8.8 earthquake that rocked the country on 27 February caused some \$200 million in damage to research facilities and equipment. Researchers are asking the government for emergency funding and for the establishment of a seismology center that would, among other things, run the nation's tsunami warning system.

The quake shook laboratories, burned down an important chemistry center, and wrecked an oceanographic station, potentially setting back Chilean science by years (*Science*, 12 March, p. 1308).

Scientists Unified for the Reconstruction of Chile, a lobby group formed follow-

ing the disaster, said this week that it will send a list of seven recommendations to Chile's minister of education to get research in the country back on track. The list includes additional grants for students whose projects are on hold and an emergency \$90 million line of credit so researchers can replace damaged equipment. “We lost very expensive instruments that you can only buy in the U.S., Europe, or Japan,” says Alfonso Droguett, a communications official at the University of Chile.

The recommendations grew out of a meeting held in mid-March in Santiago chaired by Raúl Morales Segura, dean of sciences at the University of Chile. The

group now includes the country's leading scientific societies and universities.

Among the scientists' recommendations is to transfer control of the tsunami warning system from the navy to a new national seismology center run by scientists. The navy came under intense criticism for failing to provide an early warning of the tsunami that followed the quake. “We want a system where the scientists, not the uniformed people, are in charge,” says Droguett. In principle, such a system would be similar to the one in the United States, where tsunami warnings are handled by the National Oceanic and Atmospheric Administration.

—ANTONIO REGALADO