Magellan spotlights Venus' highs and glows

For two years the Magellan spacecraft bounced radar signals off the surface of Venus, mapping the planet's craggy topography. At the same time, one of the craft's two radio antennas listened to natural emissions from the Venusian surface, measuring the amount of heat given off as radio waves by different areas.

Scientists had already hailed the first set of Magellan maps – generated after the craft had orbited Venus for just eight months and examined 80 percent of the planet's surface – as exhibiting higher resolution than the most detailed global maps of Earth (SN: 12/21&28/91, p.424). This week, researchers released the final set of global topographic and emission maps derived from Magellan. The craft still studies Venus but ended its radar and emissions mapping in September. The new maps, which cover 98 percent of Venus' surface, highlight several curious features, says Jeffrey Plaut of the Jet Propulsion Laboratory in Pasadena, Calif.

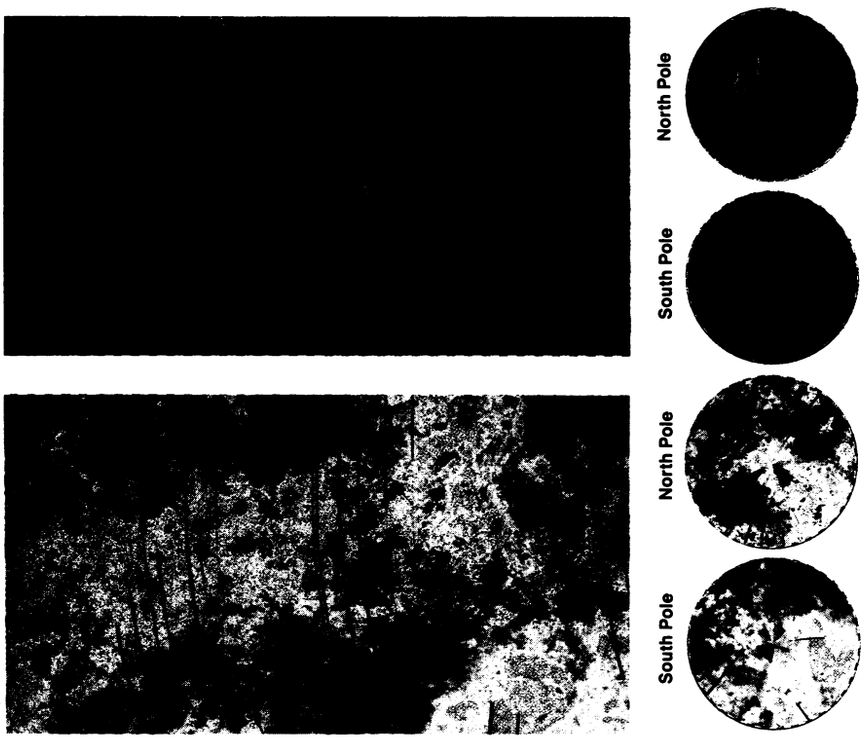
Consider, he says, the emissions map, which indicates how efficiently a region of the planet radiates radio waves compared to an ideal radiator at the same temperature. The map shows that mountaintops and volcanoes generally emit less radio waves than regions at lower altitudes. Researchers have proposed that the lower temperatures and pressures at higher elevations on Venus may permit the formation and long-term survival of materials, such as iron sulfide, that are good electrical conductors and would inhibit radio-wave emission.

Gordon H. Pettengill of the Massachusetts Institute of Technology notes that if a compound similar to iron sulfide indeed covers the more mountainous parts of Venus, then these regions must exhibit a fine-scale roughness to account for the radio-wave emissions recorded by Magellan. Alternatively, he says, a thick layer of a pure, highly porous, glassy substance could explain the lower emissions. Volcanic activity on Venus might have spewed out such glassy material, he adds.

Equally puzzling, says Pettengill, is that the elevation at which radio emission on Venus takes a nose dive differs by two to three kilometers, depending upon the location of the elevated area. Researchers, he says, have not come up with a good explanation for the phenomenon – nor for why the tops of certain high-altitude areas show a slight increase in radio emission.

Another feature may be easier to understand. Plaut suggests that the horseshoe-shaped structures that surround the western edge of craters on Venus may stem from the impact of the meteorite that carved out the crater. The debris kicked up by the collision could have been carried by the planet's westerly wind before it resettled on the surface.

– R. Cowen



In these Magellan maps of Venus' surface, rectangles show regions that lie between 69° N and 69° S latitude; circles show the polar regions. Topographic maps (top row) render highest elevations on Venus in red, the lowest in blue; gray indicates unmapped areas. Emission maps (bottom row) indicate areas that radiate the most radio waves (red) and the least (blue). Higher elevations radiate far less.

Cholesterol worries? Nibble more on less

For years, the American Heart Association has urged us to eat less fat – especially saturated fat. What more can a diner do? Nibble.

All other things being equal, a new study shows, when people apportion their calorie ration for the day over nine meals instead of the standard three, two major risk factors for heart disease drop: concentrations of both total and "bad," or low-density-lipoprotein (LDL), cholesterol in the blood.

Earlier studies suggested that more, smaller meals might offer such benefits. But those studies tended to use "a quite impractical meal frequency" – 17, in one case – notes Jim Mann of the University of Otago in New Zealand. Moreover, says Mann, an author of the new report, those studies sometimes included as few as five subjects – often just men – who ate institutionally prepared meals, sometimes in a hospital.

The Otago team recruited nine men and 10 women for a pair of two-week, at-home trials involving a balanced, low-fat diet – each deriving just 30 percent of its calories from fat. With help from a comprehensive nutrient list for foods (given in 70-calorie portions), each subject decided how to meet the diet's energy and nutrient limits.

In one trial, people ate 25 percent of the day's calories at breakfast, 25 percent at lunch, and most of the rest at dinner. Though recruits could snack twice a day, these supplements could total only 140 calories. On the other, equal-calorie diet, volunteers ate every hour or two. Six snack-size meals throughout the morning and afternoon contained 8.3 percent each of the day's calories. The three evening meals each contained twice as many calories.

Compared to the three-meal diet, the nine-meal diet saw total concentrations of cholesterol in the blood fall 6.5 percent and LDL cholesterol fall 8.1 percent. If every 1 percent drop in total cholesterol corresponds to a 2 percent drop in heart-disease risk, then "there could be a mean 13 percent reduction [in risk] when meal frequency is increased from three to nine meals per day," the researchers conclude in the March AMERICAN JOURNAL OF CLINICAL NUTRITION.

Stephen C. Cunnane of the University of Toronto coauthored – and participated in – the earlier, 17-meal-per-day trial. Though it yielded impressive drops in cholesterol, he notes, "you were dying to go off that program as soon as it started." The new study, he says, gets "essentially the same result" with an easier regimen. *– J. Raloff*