SPACE SCIENCES

From our reporter at the annual meeting of the American Astronomical Society's Division of Planetary Sciences in Austin

The winds of Mars

The near-global dust storm that was blanketing Mars when the Mariner 9 spacecraft got there in November 1971 may have been triggered by the same mechanism that raises giant dust clouds on the steppes of Russia, the mountain-ringed valleys of Iran and the high plains east of the U.S. Rocky Mountains. The Martian storm, like previous ones in 1956 and in July 1971, appears to have been unleashed by a river of polar air sweeping down from the Martian north pole, along a valley crossing the planet's equator and onto the slopes ringing the plains of Hellas in the southern hemisphere, according to Peter M. Woiceshyn and Arvydas J. Kliore of the Jet Propulsion Laboratory in Pasadena.

In the July 1971 storm, says Woiceshyn, who studied it in data from Lowell Observatory, a wall of dust more than 50 kilometers high swept down the west slopes of Hellas at more than 500 kilometers per hour. Mariner 9 data showed the November dust clouds to be towering as much as 70 kilometers above the surface. On earth the winds are much slower, but the atmosphere is 100 times denser, enabling it still to raise dust storms as much as 7 kilometers high.

"The gravity flow produced from cold air streaming over the top of a mountain ridge is like a combination of a waterfall and a tidal wave," Woiceshyn says. Pouring down the slopes, it creates turbulence, raising the dust from the bottom and whipping it into fluffy, lobate clouds that roll across the plains obscuring everything in their path.

Last year, Woiceshyn points out, scientists from the National Center for Atmospheric Research in Boulder conducted Project Dustorm I, now being analyzed to determine the actual atmospheric dust concentrations produced by dust storms on earth. Mars, he adds, is a natural laboratory to aid such studies, since it is free of the oceans, urban "heat islands" and other features that make terrestrial meteorological processes so difficult to analyze.

Venus: Sulfuric implications

Since the discovery of sulfuric acid droplets in the tops of the clouds of Venus (SN: 12/15/73, p. 379), scientists have been working to understand their implications for the planet's chemistry. William B. Rossow of Princeton University believes that the droplets may be produced at the bottom of the clouds rather than at the top (as prevailing photochemical theories would require), which could mean that the planet's lower atmosphere is oxidizing rather than reducing. This would be a possible sign of substantial oxygen as water outgassing in the early history of Venus.

Earth-based data show that all the droplets above the clouds fall in a narrow size range around 1 micron. If they formed by coagulation, with big ones absorbing little ones, intermediate sizes from different stages in the process would be visible, Rossow says, and they're not. The same thing may also be true for progressive growth by condensation. The alternative, suggests Rossow, is that formation takes place beneath the clouds. If so, he says, the supposed destruction of sulfuric acid descending from above the clouds cannot be taking place, so the atmosphere cannot be a reducing one, as has been proposed to create molecules that could be photochemically recombined above the clouds. An oxidizing atmosphere would be strong evidence of early oxygen outflow from the planet, probably water molecules, though not necessarily in liquid form.