nection with the 5-kpc ring, and thus infrared emission provides another means of investigating galactic structure.

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Erosion and the rocks of Venus

THE remarkable photographs of the surface of Venus returned by the Venera 9 and 10 spacecraft have revealed the presence, in two different sites, of a variety of rocklike forms, some angular and some smooth. Press reports[1] express surprise at the absence of very efficient erosional mechanisms. It may be useful to point out instead that it is the presence, not the absence, of erosional mechanisms on Venus which is surprising. The degree of erosion of surface rocks on Venus is determined by an equilibrium between the rate of production and the rate of destruction of surface rocks. The principal causes of erosion of terrestrial rocks—running water, diurnal and seasonal temperature changes, particularly in deserts, and aeolian abrasion—are all absent on Venus. The surface temperature of 750 K is above the critical point temperature of water. Ground based radioastronomical measurements, a comparison of the temperatures measured by Venera spacecraft at a variety of solar zenith angles, together with the high heat capacity of the massive Venus atmosphere, all clearly demonstrate that the diurnal temperature differences are a few degrees K at most[2,3]. The obliquity of the rotation axis of Venus is so small that there are effectively no seasons on the planet. The efficiency of aeolian abrasion depends on the velocity to a power $\geqslant 3$; since both theory and observation show the velocities in the lower atmosphere of Venus to be about an order of magnitude less than at comparable regions in the Earth's atmosphere, it follows that sandblasting on Venus is at most 10^{-3} as efficient as on Earth[4].

The problem is to find a suitable source of erosion of surface rocks—a problem somewhat similar to that raised by the radar discovery of large, presumably impact, basins which, when compared with their lunar, martian and mercurian equivalents, are remarkably shallow. Two mechanisms for the erosion of crater ramparts on the surface of Venus can be suggested[4]; I propose that they may also be important for the erosion of the rocks photographed by Venera 9 and 10. The atmosphere of Venus contains hydrochloric acid at a mixing ratio of $\sim 10^{-6}$, hydrofluoric acid at $\sim 10^{-8}$ and sulphuric acid at larger mixing ratios which, however, are as yet undetermined for the lower atmosphere of the planet[5]. Chemical weathering for lengthy periods by such a mixture of strong acids, even in very dilute concentrations, may be quite adequate to erode angular projections of siliceous rocks.

A second possibility arises from the high surface temperature of Venus. Although these temperatures are not sufficiently high to melt silicates, they are high enough to bring many rather common geochemical materials (for example, NaOH, KOH, HgS and KNO_2) near or to their melting points. If the rocks of Venus are comprised of such materials, even in abundances of a few tenths of a percent, the rheological properties of their low melting point components may, over long periods, be adequate to soften the contours of surface rocks. Deformation of the walls of large basins will occur over long periods, even if the lowest melting point of abundant constituents is considerably above 750 K.

With typical terrestrial values of the subsurface temperature gradient, the high surface temperature of Venus implies that the melting points of silicates should be reached a few tens of kilometres subsurface. The 'granitic' values of the uranium–potassium–thorium radioisotope ratios[6], as determined by Venera 8, suggest that a terrestrial value to the subsurface temperature gradient may be a good first approximation. In this case, access of magmatic material from the interior of Venus to its surface should be considerably easier than on Earth and significant fractions of the surface may be frozen lava fields, having reached thermal equilibrium at the low temperature of 750 K. This may provide both a source of rocks too young to have been eroded and a means of filling large craters and impact basins.

Venera 9 and 10 are the first spacecraft to obtain *in situ* photographs of the surface of another planet and photographs which they have obtained open a new field of very high resolution comparative planetology.

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Airborne ultraviolet studies of Venus

BECAUSE of the high atmospheric extinction in the ultraviolet at ground level, an airborne platform offers distinct advantage for planetary optical measurements in the wavelength region below 3,500 Å. The joint NASA–ESO Space Shuttle simulation programme (ASSESS) provided an opportunity for conducting such measurements aboard NASA's Convair 990 jet aircraft, at an altitude of ~ 40,000 feet. The following summary of these measurements is a supplement to the published report on the ASSESS experiments[1].

The experimental setup for airborne planetary ultraviolet studies consisted of a two-dimensional gyro-stabilised plane mirror (a heliostat) placed near a quartz side window in the aircraft. Objects outside the aircraft could be viewed at elevations between 10° and 40°. A 14" diameter Cassegrain telescope was fitted with an image position analyser star tracker which fed electrical signals to the movable secondary mirror in the telescope for stabilisation of rapid changes in image position and also to the heliostat to compensate for slow changes that were not compensated for by the gyros of the heliostat. Once an object was acquired, this system automatically tracked it within the elevation and azimuth ranges through which the heliostat could be driven to look at an object through the aircraft window.

Our primary objective was to observe Venus in the ultraviolet region. The telescope image size diameter was ~ 0.5 mm. A quartz lens magnified this to a 5-mm disk in the slit plane of a 1-m Ebert–Fastie spectrophotometer.