



Fig. 1. Venera 13 landing site panorama, side A (penetrometer side), in original perspective prior to transformation. See Table 2 for details of spacecraft scale.

with diameters greater than 1 cm. The areal distribution of fragments and their shapes, sizes, surface textures, fracture patterns, structure, and relative albedo were noted. Fragmental material with grain sizes less than 1 cm is classified as fines/soil. The areal distribution, relative albedo, and presence or absence on the spacecraft of this material was studied. Finally, the relationship between bedrock, fragments, and fines/soil was examined. The basic observations are summarized in Table 3. Previous analyses of the Venera sites can be found in the work by Florensky *et al.* [1977a, b, c, d, 1982a, b, 1983a, b, c].

Venera 9

There is no unambiguous bedrock unit visible in the Venera 9 panorama (Figures 3 and 4), although there are a few far-field features and some apparently highly buried fragments suggestive of a bedrock component. Fragments dominate the Venera 9 scene, from small particles at the limits of resolution to 0.7-m boulders in the near field and perhaps larger ones in the far field. More than 50% of the region is littered with angular to subangular blocks, many of which are platy or tabular. A significant number of these blocks are polygonal in outline, and many display planar fractures. Some of the intermediate-size fragments (<30 cm) appear to be layered, while others have an apparently fluted surface. Dark spots in several of the more compact blocks appear to represent circular to subcircular cavities, possibly containing soil. Various degrees of burial are suggested by the fragment orientations. A possible fillet can be observed in one of the highly inclined fragments in the near field; such a feature could be due to fine materials displaced by the turbulent gas flow from the free-fall descent of the spacecraft. A few of the lower-albedo blocks appear to be highly inclined relative to the plane of the surface and could be buried to a significant extent. Other fragments are clearly perched on the soil or on other rocks. A somewhat

imbricate relationship is suggested by the spatial distribution of many of the fragments. The most fundamental observations with regard to the fragment population at Venera 9 are that (1) many fragments are angular to subangular and have polygonal outlines and planar fractures, (2) there is a variety of surface textures represented on the blocks: ridges, ledges, layers, and pits can be observed, (3) the size distribution is bimodal [Garvin *et al.*, 1981b; Keldysh, 1979; Florensky *et al.*, 1983b] with one group of blocks 1–10 cm in size and another 30–70 cm (there is no strong evidence for a continuous spectrum of fragment sizes at the site), and (4) the spatial distribution is continuous (there are no obvious zones where fragments are much less (or more) abundant than the norm).

Below the limits of resolution, the fines/soil at the Venera 9 site may have diverse characteristics. This is suggested by the variable albedo of the soil distributed between the larger fragments. The lighting at the surface of Venus is diffuse, much like that of an overcast day on earth [Keldysh, 1979]. Soviet photometric measurements at this site [Moshkin *et al.*, 1979] identified a possible dust spurt during landing which would suggest the presence of materials less than 100 μm in diameter [Garvin, 1981].

Both a near and far horizon appear to be visible on the left-hand side of the panorama. The horizon at right does not exhibit this appearance. Although the resolution of features in the far field is poor, blocks observed out to the near horizon are comparable in size to the largest in the near field. These larger blocks appear to be inclined much like some of the lower-albedo near-field blocks.

In summary, the large abundance of fragments (from just above the limits of resolution to blocks tens of centimeters in dimension) dominates the Venera 9 site. The variable degree of burial of fragments throughout the Venera 9 scene, coupled with their generally polygonal and tabular appearance are important observations for the local area. Of all the Venera



Fig. 2. Venera 14 landing site panorama, side A, prior to transformation.