VOLCANIC AND TECTONIC FEATURES OF CRATER AITKEN

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Crater Aitken on the Lunar far side resembles the more familiar crater Tsiolkovsky although it is smaller, measuring about 140 km. in diameter. However, Aitken and some of the adjacent craters also show unique landforms which appear to be of both constructional volcanic and compressional tectonic origin. These landforms have been studied in both metric and panoramic photography from the Apollo 17 mission.

The general morphology of Aitken suggests an impact origin. There is a central peak, and a highly fractured, chaotic floor resembling that of Aristarchus is exposed on the north side of the crater. There is a large secondary crater, probably of impact origin, on the north rim. Most of the floor is covered by a dark, mare-like fill. In this fill there are a number of low crater rings 8-10 km. in diameter which enclose clusters of bulbous, bun-like domes. Several of these craters show internal "high lava marks". There are also several indistinct drowned craters which may have enclosed dome-like structures. Between these craters the dark fill is essentially featureless, except for numerous small impact craters. Locally, there are short rille-like depressions, marginal scarps, and wrinkle-ridges. The latter may be traced into the crater wall where they merge with slumps and thrust faults. Similar rille-like features and wrinkle-ridges appear in Tsiolkovsky.

A crater northeast of Aitken shows a remarkable pattern of slumps and faults, part of a sinuous set of faults which can be traced for at least 150 km. and which may continue beyond the northern limit of photography. The fault slices show a lobate, flow-like form which could easily be mistaken for lava flows or fronts of ejecta blankets. This feature may be the equivalent of a "wrinkle-ridge" developed in deep regolith of the far side highlands.

A second crater west of Aitken is about 25 km. in diameter and encloses a raised, fractured, plug-like mass with a subhorizontal undulating surface. Several craters are centered on the annular depression between the plug and the crater walls. The plug and its enclosing crater appear to be related to

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north-south and east-west trending lines of pit craters in the adjacent highlands.

The origin of many of these landforms cannot be unequivocally demonstrated. The Aitken dark fill is almost certainly mare-type basalt lava. The internal craters with enclosed domes and "high lava marks" are interpreted as vents from which most of the mare fill issued (see also El Baz, 1973) and into which there was some final drain-back. The domes may be late-stage viscous extrusions, or simply fractured mare fill, caught in the vent during drainback and modified by impact erosion. Wrinkle-ridges are not concentric with the central fill and are not restricted to it, so cannot be the result of isostatic subsidence, as suggested for some mare ridges (1) nor can they be flow fronts as suggested by El Baz (2). These ridges, and reverse faulting which crosses the highlands northeast of Aitken may be attributed to regional east-west compression. The tholoid-like central fill in the crater west of Aitken is most readily interpreted as a viscous extrusion, possibly a large-scale equivalent of the dome complexes within Aitken.

REFERENCES

(1) Bryan, W. B., 1973, Wrinkle-ridges as deformed surface crust on ponded mare lava. Proc. Fourth Lunar Sci. Conf., 1, p. 93-106.

(2) El Baz, F., 1973, Aitken Crater and its environs. Apollo 17 Prelim. Sci. Rpts., in press.