Reassessment of Features in the Aden Crater Lava Flows, Dona Ana Co., New Mexico

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Aden Crater lava field, encompassing 75 sq km in south central New Mexico, offers excellent examples of features of relatively young (18.2-17.5 ka), low viscosity basalt flows associated with an Icelandic-type shield cone. Improved images and recent field examination allow re-evaluation of the lava field’s surface features. The cone consists of an upper channeled flow facies that passes into a lobate flow facies. The outer flanks are characterized by a scabby facies consisting of intercalated thin flows. The bulk of the lava field consists of inflated flows extending across the surrounding surface. These distal flows consist of many inflation plateaus characterized by steep flow margins with peripheral fractures, and flat, level upper surfaces.

The current re-examination of the pits at Aden recognizes four types: inflation pits on inflated flows; simple collapse pits; rootless shield cones; and irregular collapsed tumuli. Collapse pits occur on the upper flanks of the cone and result from removal of still liquid lava from beneath a thin lava crust. The crust was too thin to support itself once the mobile interior flowed away, and the crust collapsed into the depression. The result is a minor depression lined by broken lava crustal fragments. Rootless shield cones are formed by local tumuli on the flow surface that lift the semi-hardened crust in to a positive relief dome. Lava extrusion from the dome flows away from the central pit crater in all directions forming radial lava channels. Rootless shield central pits range from 3-10 meters in diameter. The cones rise 2-4 meters above the surrounding flow. The interior of the pit crater atop the cone is usually filled with broken lava—suggesting that a lava crust may have formed over the pit and collapsed as lava was withdrawn. Collapse tumuli are the largest of the pits on the flanks of the cone. They are unique in that they are irregularly shaped in plan view and surrounded by a raised rim of blocky basalt. The floors are either blocky lava or relative smooth slabs of lava much like the surrounding surface outside the pits. Smooth floor material is crossed by large, intersecting clefts. Previously interpreted as explosion pits based on the presence of blocky raised rims, these irregularly shaped pits are reassessed as collapsed lava-rise tumuli that were too weak to develop as inflation plateaus. Upon close examination, the blocky rim has a double crest with and intervening trough. Blocky rim material over-lies both smooth floor and floor fractures. Lava channels are found draining away from the pits. We propose that the pits with raised, blocky rims are collapsed large tumuli that spilled lava to the surface in much the same manner as rootless shield cones. The blocky raised rims are simply shattered remnants of a thin lava crust that could not support itself after removal of the under-lying lava.

Keywords:
Aden Crater, collapse tumuli, inflation plateau, rootless vents, shield cone