

Overlapping Ballistic Ejecta Fields: Separating Distinct Blasts at Kings Bowl, Idaho

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Abstract

Kings Bowl is a ~2200ka pit crater created by a phreatic blast along a volcanic fissure in the eastern Snake River Plain (ESRP), Idaho. The main crater measures approximately 80m in length, 30m in width, and 30m in depth, with smaller pits located nearby on the Great Rift fissure, and has been targeted by the FINESSE team as a possible analogue for Cyane Fossae, Mars. The phreatic eruption is believed to have occurred due to the interaction of groundwater with lava draining back into the fissure following a lava lake high stand, erupting already solidified basalt from this and previous ESRP lava flows. The contemporaneous draw back of the lava with the explosions may conceal some smaller possible blast pits as more lava drained into the newly formed pits. Ballistic ejecta from the blasts occur on both sides of the fissure. To the east, the ballistic blocks are mantled by fine tephra mixed with eolian dust, the result of a westerly wind during the explosions. We use differential GPS to map the distribution of ballistic blocks on the west side of the fissure, recording position, percent vesiculation, and the length of 3 mutually perpendicular axes for each block >20cm along multiple transects parallel to the fissure. From the several hundred blocks recorded, we have been able to separate the ballistic field into several distinct blast deposits on the basis of size distributions and block concentration. The smaller pits identified from the ballistic fields correspond broadly to the northern and southern limits of the tephra/dust field east of the fissure. Soil formation and bioturbation of the tephra by sagebrush have obliterated any tephrostratigraphy that could have been linked to individual blasts. The ballistic block patterns at Kings Bowl may be used to identify distinct ejecta groups in high-resolution imagery of Mars or other planetary bodies.

Publication:

American Geophysical Union, Fall Meeting 2015, abstract id. V51D-3065

Pub Date: December 2015 Bibcode: 2015AGUFM.V51D3065B

Keywords:

8428 Explosive volcanism; VOLCANOLOGY; 8430 Volcanic gases; VOLCANOLOGY; 8434 Magma migration and fragmentation; VOLCANOLOGY; 8486 Field relationships; VOLCANOLOGY